

CONTRACT N40085-09-B-0112

NAVFAC SPECIFICATION
NO. 05-09-0112

MAJOR INTERIOR/EXTERIOR REPAIRS, BUILDING 205
AT THE
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

DESIGN BY:

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New Bern NC

A/E Contract: N62470-04-D-2279

SPECIFICATION PREPARED BY:

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Date: 20 May 2009

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Contract drawings are as follows:

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60003051	G-001	Cover Sheet
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60003054	C-101	Site Layout, Utility & Grading Plan
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60003070	A-402	Exterior Stair Plan and Details
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60003072	A-601	Door Schedule / Signage Schedule
60003073	A-602	Door and Frame Details
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60003086	MP-101	First Floor Mechanical Piping New Work Plan
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60003104	P-601	Plumbing Supply Riser Diagram
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SECTION 01 11 00

SUMMARY OF WORK

09/08

PART 1 GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

1.1.1 Project Description

The work includes demolition of interior finishes, plumbing, mechanical and electrical systems; new interior layout and finishes, new plumbing, mechanical, electrical systems, new sprinkler system and new fire alarm system and incidental related work.

1.1.2 Location

The work shall be located at the Marine Corps Base, Camp Lejeune, North Carolina, approximately as shown. The exact location will be indicated by the Contracting Officer.

1.2 EXISTING WORK

In addition to "FAR 52.236-9, Protection of Existing Vegetation, Structures, Equipment, Utilities, and Improvements":

- a. Remove or alter existing work in such a manner as to prevent injury or damage to any portions of the existing work which remain.
- b. Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as approved by the Contracting Officer. At the completion of operations, existing work shall be in a condition equal to or better than that which existed before new work started.

1.3 LOCATION OF UNDERGROUND FACILITIES

The Contractor will be responsible for obtaining the services of a professional utility locator to scan the construction site with electromagnetic or sonic equipment, and mark the surface of the ground where existing underground utilities are discovered. Verify the elevations of existing piping, utilities, and any type of underground obstruction not indicated or specified to be removed but indicated or discovered during scanning in locations to be traversed by piping, ducts, and other work to be installed. Verify elevations before installing new work closer than nearest manhole or other structure at which an adjustment in grade can be made.

1.3.1 Notification Prior to Excavation

Notify the Contracting Officer 48 hours prior to starting excavation work in order to permit making arrangements with public works personnel to scan the area for unmarked utilities. Obtain station digging permits prior to starting excavation work.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 01 12 00

CUTTING AND PATCHING

01/07

PART 1 GENERAL

1.1 CUTTING

Shall be done by sawing along straight lines. The amount cut out shall be the minimum necessary to accommodate the new work. No flame cutting will be permitted without written permission of the Officer in Charge of Construction.

1.2 HOLES

Shall be rotary drilled. The size shall be the minimum necessary to accommodate the new work.

1.3 PATCHING

Shall be done with materials which match the existing in color, quality and surface texture when finished.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 01 14 00

WORK RESTRICTIONS

01/07

PART 1 GENERAL

1.1 CONTRACTOR ACCESS AND USE OF PREMISES

1.1.1 Station Regulations

Ensure that Contractor personnel employed on the Station become familiar with and obey Station regulations. Keep within the limits of the work and avenues of ingress and egress as directed. Do not enter restricted areas unless required to do so and until cleared for such entry. Wear hard hats in designated areas. Do not enter any restricted areas unless required to do so and until cleared for such entry. The Contractor's equipment shall be conspicuously marked for identification.

1.1.2 Working Hours

Regular working hours shall consist of an eight and one-half hour period established by the Contracting Officer, Monday through Friday, excluding Government holidays.

1.1.3 Work Outside Regular Hours

Work outside regular working hours requires Contracting Officer approval. Provide written request at least 15 calendar days prior to such work to allow arrangements to be made by the Government for inspecting the work in progress. During periods of darkness, the different parts of the work shall be lighted in a manner approved by the Contracting Officer.

1.1.4 Occupied and Existing Buildings

The Contractor shall be working in an existing building and around existing buildings which are occupied. Do not enter the buildings without prior approval of the Contracting Officer.

The existing buildings and their contents shall be kept secure at all times. Provide temporary closures as required to maintain security as directed by the Contracting Officer.

Provide dust covers or protective enclosures to protect existing work that remains during the construction period.

The Government will remove and relocate other Government property in the areas of the buildings scheduled to receive work.

1.1.5 Utility Cutovers and Interruptions

- a. Make utility cutovers and interruptions after normal working hours or on Saturdays, Sundays, and Government holidays. Conform to procedures required in the paragraph "Work Outside Regular Hours."
- b. Ensure that new utility lines are complete, except for the

connection, before interrupting existing service.

- c. Interruption to water, sanitary sewer, storm sewer, telephone service, electric service, air conditioning, heating, fire alarm shall be considered utility cutovers pursuant to the paragraph entitled "Work Outside Regular Hours." This time limit includes time for deactivation and reactivation.
- d. Operation of Station Utilities: The Contractor shall not operate nor disturb the setting of control devices in the station utilities system, including water, sewer, electrical, and steam services. The Government will operate the control devices as required for normal conduct of the work. The Contractor shall notify the Contracting Officer giving reasonable advance notice when such operation is required.

1.2 SECURITY REQUIREMENTS

Contract Clause "FAR 52.204-2, Security Requirements and Alternate II,"
"FAC 5252.236-9301, Special Working Conditions and Entry to Work Area."

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 01 20 00.00

PRICE AND PAYMENT PROCEDURES

01/07

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

U.S. ARMY CORPS OF ENGINEERS (USACE)

COE EP-1110-1-8

(1995) Construction Equipment Ownership
and Operating Expense Schedule

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00, "Submittal Procedures."

SD-01 Preconstruction Submittals

Schedule of prices

1.3 SCHEDULE OF PRICES

1.3.1 Data Required

Within 15 calendar days of notice of award, prepare and deliver to Contracting Officer a schedule of prices (construction contract) on the forms furnished by the Government. Provide a detailed breakdown of the contract price, giving quantities for each of the various kinds of work, unit prices, and extended prices therefor. Schedule of prices shall be separated by individual building numbers with subtotals for each building.

1.3.2 Schedule Instructions

Payments will not be made until the schedule of prices has been submitted to and approved by the Contracting Officer. Identify the cost for site work, and include incidental work to the 5 foot line. Identify costs for the building(s), and include work out to the 5 foot line. Workout to the 5 foot line shall include construction encompassed within a theoretical line 5 feet from the face of exterior walls and shall include attendant construction, such as cooling towers, placed beyond the 5 foot line.

1.3.3 Schedule Requirements for HVAC TAB

The field work Section 23 08 00.00 20, "HVAC Testing/Adjusting/Balancing" shall be broken down in the Schedule of Prices and in the Construction Progress Documentation by separate line items which reflect measurable deliverables. Specific payment percentages for each line item shall be determined on a case by case basis for each contract. The line items shall be as follows:

- a. Approval of Design Review Report: The TABS Agency is required to conduct a review of the project plans and specifications to identify any feature, or the lack thereof, that would preclude successful testing and balancing of the project HVAC systems. The resulting findings shall be submitted to the Government to allow correction of the design. The progress payment shall be issued after review and approval of the report.
- b. Approval of the pre-field engineering report: The TABS Agency submits a report which outlines the scope of field work. The report shall contain details of what systems will be tested, procedures to be used, sample report forms for reporting test results and a quality control checklist of work items that must be completed before TABS field work commences.
- c. Season I field work: Incremental payments are issued as the TABS field work progresses. The TABS Agency mobilizes to the project site and executes the field work as outlined in the pre-field engineering report. The HVAC water and air systems are balanced and operational data shall be collected for one seasonal condition (either summer or winter depending on project timing).
- d. Approval of Season I report: On completion of the Season I field work, the data is compiled into a report and submitted to the Government. The report is reviewed, and approved, after ensuring compliance with the pre-field engineering report scope of work.
- e. Completion of Season I field QA check: Contract QC and Government representatives meet the TABS Agency at the jobsite to retest portions of the systems reported in the Season I report. The purpose of these tests are to validate the accuracy and completeness of the previously submitted Season I report.
- f. Approval of Season II report: The TABS Agency completes all Season II field work, which is normally comprised mainly of taking heat transfer temperature readings, in the season opposite of that under which Season I performance data was compiled. This data shall be compiled into a report and submitted to the Government. On completion of submittal review to ensure compliance with the pre-field engineering report scope, progress payment is issued. Progress payment is less than that issued for the Season I report since most of the water and air balancing work effort is completed under Season I.

1.4 CONTRACT MODIFICATIONS

In conjunction with the Contract Clause "DFARS 252.236-7000, Modification Proposals-Price Breakdown," and where actual ownership and operating costs of construction equipment cannot be determined from Contractor accounting records, equipment use rates shall be based upon the applicable provisions of the [COE EP-1110-1-8](#).

1.5 CONTRACTOR'S PAYMENT REQUEST

1.5.1 Proper Payment Request

A proper request for payment/invoice shall comply with all requirements specified in this Section and the contract payment clauses. If any invoice does not comply with these requirements, it shall be returned with a

statement of the reasons why it was not a proper invoice. A proper payment request/invoice includes the following information, completed forms, and number of copies indicated. Upon request, the Contracting Officer will furnish copies of Government forms.

- a. Contractor's Invoice on NAVFAC Form 7300/30, which shall show the basis for arriving at the amount of the invoice. Submit one original and two copies.
- b. Contractor's Monthly Estimate for Voucher (LANTNAVFACENGCOM Form 4-4330/110). Submit original and two copies.
- c. Payment Certification. Furnish as specified in "FAR Clause 52.232-5 (c) Payments under Fixed-Price Construction Contracts." Submit one original.
- d. QC Invoice Certification. Furnish as specified in Section 01 45 10, "Quality Control." Submit one original.

1.5.1.1 Progress Payments

In addition to the requirements stated in Paragraph 1.5.1, "Proper Payment Request" above, the Contractor's request for progress payments shall include the following:

- a. Updated Progress Schedule: Furnish an updated progress schedule as specified in contract clause FAR 52.236-15 "Schedules for Construction Contracts" and Section 01 32 16, "Construction Progress Documentation." Submit one copy.

1.5.1.2 Final Payments

The request for final payment is submitted after completion and acceptance of all work and all other requirements of the contract. Before submitting the final invoice the Contractor shall meet with the appropriate Government representatives to determine the final invoice amount, including the assessment of liquidated damages, if any, and to make sure the final release is complete and accurate. In addition to the requirements in Paragraph 1.5.1, "Proper Payment Request" above, the Contractor's request for final payment shall include the following:

- a. A final release executed on the standard form provided by the Contracting Officer. Submit two originals with final payment request.
- b. NC Tax certified statement and report for the prime and each subcontractor (FAR 52.229-7). Submit two copies.
- c. As-built drawings (if applicable).
- d. Warranties (if applicable).
- e. O&M manuals (if applicable).
- f. Final payrolls (FAR 52.222-6).
- g. A release for an assignment of claims (if applicable). Submit three originals.

1.5.2 Procedures for Submitting Payment Request

- a. The Contractor may submit only one invoice for payment each month as the work progresses.
- b. The invoice shall be delivered to the ROICC Office, Administrative Branch, between five calendar days before and five calendar days after the contract award date. Invoices received outside this schedule shall be returned to the Contractor unprocessed. The Contractor will have to wait until the following month to submit their next invoice.
- c. Invoices shall be delivered during normal work hours from 7:30 AM up to 4:00 PM (EST), Monday through Friday, excluding holidays.

1.6 PAYMENTS TO THE CONTRACTOR

Payments will be made on submission of a proper payment request/invoice by the Contractor.

1.6.1 Obligation of Government Payments

The obligation of the Government to make payments required under the provisions of this contract will, at the discretion of the Contracting Officer, be subject to the following:

- a. Reasonable retention and/or deductions due to defects in material or workmanship; potential liquidated damages; and/or failure to comply with any other requirements of the contract.
- b. Claims which the Government may have against the Contractor under or in connection with this contract; and
- c. Unless otherwise adjusted, repayment to the Government upon demand for overpayments made to the Contractor.
- d. Failure to provide up to date record drawings not current as stated in Contract Clause "FAC 5252.236-9310, Record Drawings"; NC State tax certified statement and report in accordance with FAR 52.229-2; labor payrolls in accordance with FAR 52.222-6; as-built drawings in accordance with Section 01 45 10, "Quality Control"; warranties and O&M manuals; and any other requirements in the contract.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 01 30 00

ADMINISTRATIVE REQUIREMENTS

05/09

PART 1 GENERAL

1.1 SUBMITTALS

Submit the following in accordance with the Section 01 33 00, "Submittal Procedures."

SD-01 Preconstruction Submittals

List of contact personnel

1.2 MINIMUM INSURANCE REQUIREMENTS

Procure and maintain during the entire period of performance under this contract the following minimum insurance coverage:

- a. Comprehensive general liability: \$500,000 per occurrence
- b. Automobile liability: \$200,000 per person, \$500,000 per occurrence, \$20,000 per occurrence for property damage
- c. Workmen's compensation as required by Federal and State workers' compensation and occupational disease laws,
- d. Employer's liability coverage of \$100,000, except in States where workers compensation may not be written by private carriers,
- e. Others as required by State law.

1.3 ELECTRONIC MAIL (EMAIL)

- a. The Contractor is required to establish and maintain electronic mail (email) capability along with the capability to open various electronic attachments in Microsoft, Adobe Acrobat, and other similar formats.
- b. Within 10 days after contract award; the Contractor shall provide the Contracting Officer a single (only one) email address for the ROICC office to send communications related to this contract correspondence. The ROICC office may also use email to notify the Contractor of base access conditions when emergency conditions warrant, such as hurricanes, terrorist threats, etc.
- c. Multiple email addresses are not authorized.
- d. It is the Contractor's responsibility to make timely distribution of all ROICC email within its own organization, including field office(s).
- e. The Contractor shall promptly notify the Contracting Officer, in writing, of any changes to their email address.

1.4 CONTRACTOR PERSONNEL REQUIREMENTS

1.4.1 Subcontractors and Personnel

Furnish a [list of contact personnel](#) of the Contractor and subcontractors including addresses and telephone numbers for use in the event of an emergency. As changes occur and additional information becomes available, correct and change the information contained in previous lists.

1.4.2 Identification Badges

Identification badges will be furnished without charge. Application for and use of badges will be as directed below. Immediately report instances of lost or stolen badges to the Contracting Officer. Employees are required to resubmit a complete 50 state criminal records check in order to renew their contractor badge.

1.4.3 Business Access Security Requirements

1.4.3.1 Business Access Definition

Contractor/subcontractor employees requiring installation access to MCB, Camp Lejeune or MCAS New River, N.C. must obtain a Business Access Identification Badge for that particular installation. Regularly scheduled delivery personnel, to include FEDEX, UPS, Pick-up and deliveries, should, also, follow the Business Access guidelines described below. Personnel requiring Business Access Identification Badges shall submit all documentation listed below. Badges are not required if the contracted position requires the employee to obtain a Common Access Card (CAC) which will be identified separately within the Government contract.

1.4.3.2 Installation Security Access Requirements

Contractor shall accomplish the security requirements below within 10 days after award or prior to performance under the contract.

1.4.3.3 Business Access Identification Badge Requirement

In order to obtain a Business Access Identification Badge for access to MCB, Camp Lejeune, and satellite activities, or MCAS New River, NC, all personnel providing services under this contract shall be required to present the documentation below to the following offices, as applicable:

MCB, Camp Lejeune, NC and its satellite activities. Report as follows:

1. Identification Card Center, 60 Molly Pitcher Road for badge (910-450-8444).

MCAS New River, NC. Report as follows:

1. S-4 (Facilities Office), Bldg AS-211 (1st Deck) for registration on contractor's list (910-449-6310).
2. Pass and Identification Office, Bldg AS-211 (1st Deck) for badge and vehicle decal (910-449-5427/5428).

1.4.3.4 Proof of Employee Citizenship or Legal Alien Status

Employers may participate in the E-verify program (1-888-464-4218, www.DHS.gov/e-verify) allowing U.S. employers to verify name, DOB, and SSN along with immigration information for non-citizens, against federal databases in order to verify the employment eligibility of both citizens and non-citizen new hires.

1.4.3.5 Proof of Criminal Records Check

Commercial and contract employees must provide proof a complete 50 state criminal records check on an annual basis. The record check may be obtained from any of the following internet investigative services: Kroll (former Infolink Screening Services) at www.kroll.com, Castle Branch at www.castlebranch.com, or any other investigative services company that provides records checks for all 50 states. These services also validate social security card numbers. All criminal history checks must be completed no more than 30 days prior to start date of contract. (Note: These internet screening services are listed as possible sources for obtaining a criminal background check. The United States government and the United States Marine Corps do not endorse nor are they affiliated with any of these services).

1.4.3.6 Letter Provided By Contracting Officer Indicating Contract

Letter provided by Contracting Officer indicating contract, contract period and prime contractor. Proof of employment on a valid Government contract (e.g., a letter on company letterhead from the prime contractor including contract number and term).

1.4.3.7 Photo ID

Valid state or federal issued picture identification card. Acceptable documents include state drivers license, DMV issued photo identification, or alien registration card.

1.4.3.8 National Crime Investigation Center (NCIC) Check

Provost Marshals are authorized to conduct a national crime information center (NCIC) check of all persons entering the installation, if/where applicable, the NCIC check may include drivers's license query, wants and warrants, and criminal history.

1.4.4 Denial of Access

Installation access shall be denied if it is determined that an employee:

- a. Is on the National Terrorist Watch List
- b. Is illegally present in the United States.
- c. Is subject to an outstanding warrant.
- d. Has knowingly submitted an employment questionnaire with false or fraudulent information.
- e. Has been issued a debarment order and is currently banned from military installations.

- f. Is a Registered Sexual Offender.
- g. Has been convicted of a felony or a drug crime within the past five years.
- h. Individuals who have received a DUI/DWI in the last year may be allowed access to the installation, but will not be permitted to drive on the installation.
- i. Any reason the Installation Commander deems reasonable for the good order and discipline.

1.4.5 Appeal Process

All appeals should be directed to the Base Inspector's Office for any individual that has been denied access to the Base.

1.4.6 Display of Badges

Contractors/subcontractors shall prominently display their badges on their person at all times. Upon completion/termination of this contract or an individual's employment, the Contractor shall collect and turn in to the Pass & ID Office all badges. If the Contractor fails to obtain the employee's badge, the Pass & ID Office will be notified within 24 hours. Immediately report instances of lost or stolen badges to the Contracting Officer.

1.4.7 Contractor and Subcontractor Vehicle Requirements

Each vehicle to be used in contract performance shall show the Contractor's or subcontractor's name so that it is clearly visible and shall always display a valid state license plate and safety inspection sticker. To obtain a vehicle decal, which will be valid for one year or contract period, whichever is shorter, Contractor or subcontractor vehicle operators shall provide to the Vehicle Registration Office, 60 Molly Pitcher Road for vehicle decal (910-451-1158):

- a. An installation sponsor request forwarded to provost Marshall office
- b. A valid form of Federal or state government I.D.
- c. If driving a motor vehicle, a valid driver's license, vehicle registration and proof of insurance

Upon completion/termination of this contract or an individual's employment, the Contractor shall collect and turn in to Vehicle Registration all Government vehicle decals. If any are not collected, the Contractor shall notify the Vehicle Registration Office within 24 hours.

1.4.8 Security Checks

Contractor personnel and vehicles shall only be present in locations relevant to contract performance. All Contractor personnel entering the base shall conform to all Government regulations and are subject to such checks as may be deemed necessary to ensure that violations do not occur. Employees shall not be permitted on base when such a check reveals that their presence would be detrimental to the security of the base. Subject to security regulations, the Government will allow access to an area for

servicing equipment and/or performing required services. Upon request, the Contractor shall submit to the Contracting Officer questionnaires and other forms as may be required for security purposes.

1.4.9 Subcontractor Special Requirements

1.4.9.1 Asbestos Containing Material

All contract requirements of Section 02 82 16, "Removal and Disposal of Asbestos Materials," assigned to the Private Qualified Person (PQP) shall be accomplished directly by a first tier subcontractor.

1.4.9.2 Space Temperature Control, HVAC TAB, and Apparatus Inspection

All contract requirements of Section 23 73 33, "Heating, Ventilating, and Cooling System," Section 23 09 54, "Direct Digital Control System," shall be accomplished directly by a first tier subcontractor. No work required by Section 23 73 33 or 23 09 54 shall be accomplished by a second tier subcontractor.

1.5 SUPERVISION

Have at least one qualified supervisor capable of reading, writing, and conversing fluently in the English language on the job site during working hours. In addition, if a Quality Control (CQ) representative is required on the contract, then that individual shall also have fluent English communication skills.

NOTE: If training and experience requirements of Section 01 45 10, "Quality Control" and 01 35 29, "Safety and Occupational Health Requirements" have been met the supervisor may also serve as QC Manager and Site Safety and Health Officer (SSHO).

1.6 PRECONSTRUCTION CONFERENCE

After award of the contract but prior to commencement of any work at the site, meet with the Contracting Officer to discuss and develop a mutual understanding relative to the administration of the value engineering and safety program, preparation of the schedule of prices, shop drawings, and other submittals, scheduling programming, and prosecution of the work. Major subcontractors who will engage in the work shall also attend.

1.7 PARTNERING

To increase the likelihood of successful performance of this contract, the Government requires cohesive partnerships with its Contractors and Subcontractors. Key stakeholders, including the Clients who will receive services, principal individuals from NAVFAC, the performance assessment team, and representative(s) of the installation(s) will be invited to participate in the partnering process. Key members of the prime and subcontractors teams, including senior management personnel, must participate. The partnership will draw on the strength of each organization in an effort to achieve quality contract services done right the first time, within the contract price, as scheduled, and without any safety mishaps.

Contract Partnering Level C

This level of partnering discusses partnering concepts and benefits and should become a part of the pre-performance conference. The senior

Government and Contractor stakeholders present will jointly host the partnering sessions. The partners will determine the frequency of the follow-on sessions. The partnering sessions should be held at locations agreed to by the partners. Partnering sessions should be held at or near the location of the activity Contracting Office. The participants shall bear their own costs for meals, lodging, and transportation associated with partnering.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 01 31 50

TRANSFER AND ACCEPTANCE OF MILITARY REAL PROPERTY

01/07

PART 1 GENERAL

1.1 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00
SUBMITTAL PROCEDURES:

SD-11 Closeout Submittals

Interim DD-1354, Transfer & Acceptance of Military Real Property

1.2 Interim DD-1354, Transfer & Acceptance of Military Real Property

Submit Interim DD-1354 thirty (30) days prior to beneficial occupancy date
(draft copy attached).

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

-- End of Section --

TITLE: Major Interior and Exterior Repairs, Bldg 205

TRANSFER AND ACCEPTANCE OF MILITARY REAL PROPERTY

Form Approved
OMB No. 0704-0188

PAGE 1 OF 2 PAGES

The public reporting burden for the collection of information is estimated to average 30 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to the Department of Defense, Executive Services and Communications Directorate (0704-0188). Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

PLEASE DO NOT RETURN YOUR COMPLETED FORM TO THE ABOVE ORGANIZATION

1. FROM (Installation/Activity/District and ZIP Code) ROICC/OICC JACKSONVILLE, NORTH CAROLINA AREA 1005 MICHAEL ROAD CAMP LEJEUNE, NC 28542-2521	2. DATE PREPARED (YYYYMMDD) 20090529	3. PROJECT/JOB NUMBER 09-0112	4. SERIAL NUMBER 2009-0075	9. TRANSACTION DETAILS a. <input type="checkbox"/> NEW CONST. <input checked="" type="checkbox"/> EXISTING FAC. <input checked="" type="checkbox"/> CAPITAL IMP. <input type="checkbox"/> OTHER (Specify)		b. <input type="checkbox"/> PHYS. COM. AVAIL. <input type="checkbox"/> BENF/O <input type="checkbox"/> PARTIAL BOD <input type="checkbox"/> FINANCIAL COM. <input checked="" type="checkbox"/> OTHER (Specify) Draft
5. TO (Installation/Activity/Service, ZIP Code & INSNO) COMMANDING GENERAL ATTN: PUBLIC WORKS DIVISION MARINE CORPS BASE PSC BOX 20004 CAMP LEJEUNE, NC 28542-0004	6. SITE/INSNO/ NAME M67001	7. CONTRACT NUMBER(S)	8. DRAWING NUMBER(S) 60003051 thru 60003117	c. <input checked="" type="checkbox"/> DRAFT <input type="checkbox"/> FINAL <input type="checkbox"/> INTERIM		d. EFFECTIVE DATE (YYYYMMDD)

10. ITEM NO.	11. FACILITY NO.	12. CATEGORY CODE	13. CATCODE DESCRIPTION	14. TYPE	AREA		OTHER		19. COST	20. FUND SOURCE	21. FUND ORG	22. INTER-EST CODE	23. ITEM REMARKS
					15. UNIT OF MEAS 1	16. TOTAL QUANTITY UM 1	17. UNIT OF MEAS 2	18. TOTAL QUANTITY UM2					
1	205	610-10	Admin Office	P	SF	2660	SF			3	8	1	
2	205	610-72	Sqdm Hdqtrs	P	SF	23942	SF			3	8	1	
3													
4													
5													
6													
7													

a. TRANSFERRED BY (Typed Name and Signature)	d. DATE SIGNED (YYYYMMDD)	25.a. ACCEPTED BY (Typed Name and Signature)	b. DATE SIGNED (YYYYMMDD)
c. TITLE (Area Engr./Base Engr./DPW)		c. TITLE (DPW/RPAO)	26. PROPERTY VOUCHER NUMBER

27. CONSTRUCTION DEFICIENCIES (attach blank sheet for continuations)
THIRD MEASUREMENT =

NOTE: THE ATTACHED SUPPORT FACILITY NUMBERS AND CATCODES
ARE NOT ALL INCLUSIVE. THEY ARE LISTED HERE AS A COURTESY
ONLY.

28. PROJECT REMARKS (attach blank sheet for continuation)

Height: Width: Length: Regular:
P & D Cost: **\$90,809.00**
S & A Cost:
Construction Cost:
Subtotal:
Equipment Cost:
Total Project Cost:

DD 1354 Prepared by: **Darrell Crisp 910-451-5507 Ext 3268**

INSTRUCTIONS

GENERAL. This form has been designed and issued for use in connection with the transfer of military real property between the military departments and to or from other government agencies. It supersedes ENG Forms 290 and 290B (formerly used by the Army and Air Force)

Existing instructions issued by the military departments relative the the preparation of DD Form 1354 are applicable to this revised form to the extent that the various items and columns on the superseded forms have been retained. The military departments may

For detailed instructions on how to fill out this form, please refer to Unified Facilities Criteria (UFC) 1-300-08, dated 17 December 2003.

SPECIFIC DATA ITEMS.

1. **From.** Name and address of the transferring agency.
2. **Date Prepared.** Date of actual preparation. Enter all dates in YYYYMMDD format (Example: March 31, 2004 = 20040331).
3. **Project/Job Number.** Project number on a DD Form 1354 or Individual Job Order Number.
4. **Serial Number.** Sequential serial number assigned by the preparing organization. (e.g., 2004-0001).
5. **To.** Name and address of the receiving installation, activity, and service of the Real Property Accountable Officer (RPAO).
6. **Site/INSNO and Name.** Site or installation number and site name where the constructed facility is located.
7. **Construct Number(s).** Contract number(s) for this project.
8. **Drawing Number(s).** Drawing number(s) or CAD identifier(s) for project components.
9. **Transaction Details.**
 - a. Type of Transaction. Mark (X) only one box.
 - b. When/Event. When or event causing preparation of DD Form 1354. X only one box.
 - c. Version, Draft, Interim, or Final DD Form 1354. X only one box.
 - d. Effective Date. Effective date for transaction; start date of depreciation.
10. **Item Number.** Use a separate item number for each facility, no item number for additional usages.

11. **Facility Number.** Unique facility number identified in Real Property Inventory.
12. **Category Code.** The category code describes the facility usage.
13. **Catcode Description.** The category code name which describes the facility usage.
14. **Type.** Type of construction. **P** for Permanent; **S** for Semipermanent; **T** for Temporary
15. **Area: Unit of Meas 1.** Area unit of measure; use SF, SY, AC only
16. **Total Quantity UM 1.** The total area for the measure identified in Item 15. Use negative numbers for demolition.
17. **Other: Unit of Meas 2.** Unit of Measure 2 is the capacity or other measurement unit (e.g., LF, MB, EA, etc.).
18. **Total Quantity UM 2.** The total capacity/other for the measure identified in Item 17.
19. **Cost.** Cost for each facility; for capital improvements to existing facilities, show amount of increase only.
20. **Fund Source.** Enter the Fund Source Code for this item, i.e., 01-MILCON, 02-BRAC, 03-O&M, etc.
21. **Funding Organization.** Enter the code for the organization responsible for replacing this facility at the end of its useful life, i.e., 00-Army Active, 01-Army Reserve, 02-Army National
22. **Interest Code.** Enter the code that reflects government interest or ownership in the facility, i.e., 01-Owned by DoD, 02-Owned by Federal Government (non-DoD), etc.
23. **Item Remarks.** Remarks pertaining only to the item number identified in Item 10; show cost sharing.
24. **Statement of Completion.** Typed name, signature, title, and date of signature by the responsible transferring individual or agent.
25. **Accepted By.** Typed name, signature, title, and date of signature by the RPAO or accepting official.
26. **Property Voucher Number.** Next sequential number assigned by the RPAO in voucher register.
27. **Construction Deficiencies.** List construction deficiencies in project during contractor turnover inspection.
28. **Project Remarks.** Project level remarks, continuation of blocks, and used to explain "other" entries in Item 9.

DD Form 1354 Addendum

CLASS 2 PROPERTY RECORD DATA

ACTIVITY UIC: _____ DD Form 1354, Item 6
ACTIVITY NAME: _____ DD Form 1354, Item 5
SPEC AREA _____
PR NO _____
FACILITY NO: _____ DD Form 1354, Item 11

LOCATION GENERAL INFO

COUNTRY: iNFADS fills this based on UIC and Special Area
RPTG-CLMT-UIC _____
ACTION TYPE _____ (Acquisition, Capital Improvement, Disposal)
STATE: iNFADS fills this based on UIC and Special Area
COUNTY: iNFADS fills this based on UIC and Special Area
CITY: iNFADS fills this based on UIC and Special Area
FACILITY NAME: _____ Completed by gaining installation
MAP GRID: _____ Completed by gaining installation
FORMER ACTIVITY UIC: _____ DD Form 1354, Item 1, Transfer only
FORMER PR NO.: _____ Transfers within Dept of Navy only
FACILITY TYPE: _____ Determined by Prime Use Category Code
FAMILY HOUSING INDICATOR: _____ Y/N

MEASUREMENTS

LENGTH _____
WIDTH _____
HEIGHT _____
DEPTH _____
AREA/UM _____
STORIES _____
IRREGULAR _____ (Y or N)
ATTIC _____ (Y or N)
BASEMENT _____ (Y or N)
MEZZANINE _____ (Y or N)
PENTHOUSE _____ (Y or N)

CONSTRUCTION

YEAR BUILT _____ (New Construction)
YEAR IMPROVED _____ (Capital Improvement)
CURR PROJ NO _____ (Capital Improvement)
ORIG PROJ NO _____ (New Construction)

CONSTRUCTION TYPE _____ (P, S, T, or R)
HERITAGE ASSET DATA - _____ Transfers only

MAINTENANCE

PRIME USE CAT CODE _____ (Largest Category Code for facility on DD Form 1354, Item 12)
MAINT FUND CODE _____ (Supplied by gaining installation)
MAINT RESP _____ (Supplied by gaining installation)
COST REF DOCUMENT NUMBERS: _____ DD Form 1354, Item 7

EXCESS / DISPOSAL (DISPOSAL DD FORM 1354 ONLY)

EXCESS ACTION CODE _____
EXCESS ACTION DATE _____
DISPOSAL METHOD _____
DISPOSAL DATE _____
EFD DISPOSAL CONTRACT _____
GSA DISPOSAL CONTRACT _____
DISP CONSOL PR _____

STATUS / UTILIZATION

USER UIC/OG ID _____ (Supplied by gaining installation)
CATEGORY CODE _____ DD Form 1354, Item 12
USE _____ (Optional)
AREA/UM _____ DD Form 1354, Items 15 and 16
OTHER/UM _____ DD Form 1354, Items 17 and 18
ALT/UM _____ Must be put in Remarks section of DD Form 1354, where applicable.

SECTION 01 32 16

CONSTRUCTION PROGRESS DOCUMENTATION

01/07

PART 1 GENERAL

1.1 SUBMITTALS

Submit the following in accordance with Section 01 33 00, "Submittal Procedures."

SD-01 Preconstruction Submittals

Construction schedule

Equipment delivery schedule

1.2 CONSTRUCTION SCHEDULE

Within 21 days after receipt of the Notice of Award, prepare and submit to the Contracting Officer for approval a Critical Path Method (CPM), Network Schedule in accordance with the terms in Contract Clause "FAR 52.236-15, Schedules for Construction Contracts," except as modified in this contract. Primavera Suretrak 3.0 will be utilized to produce and update all progress schedules.

1.2.1 HVAC TAB Milestones

Requirements for the milestones related to HVAC TAB work, Section 23 08 00.00 20, "HVAC Testing/Adjusting/Balancing," are specified in Section 01 20 00, "Price and Payment Procedures."

1.3 EQUIPMENT DELIVERY SCHEDULE

1.3.1 Initial Schedule

Within 30 calendar days after approval of the proposed construction schedule, submit for Contracting Officer approval a schedule showing procurement plans for materials, plant, and equipment. Submit in the format and content as prescribed by the Contracting Officer, and include as a minimum the following information:

- a. Description.
- b. Date of the purchase order.
- c. Promised shipping date.
- d. Name of the manufacturer or supplier.
- e. Date delivery is expected.
- f. Date the material or equipment is required, according to the current construction schedule.

1.4 NETWORK ANALYSIS SYSTEM (NAS)

The Contractor shall use the critical path method (CPM) to schedule and control construction activities. The Network shall have a minimum of 25 activities and a maximum of 50 activities. The schedule shall identify as a minimum:

- a. Construction time for all major systems and components;
- b. Major submittals and submittal processing time; and
- c. Major equipment lead time.

1.4.1 CPM Submittals and Procedures

Submit all network analysis and updates in hard copy. Also submit CPM network schedule on 3 1/2 inch high density (1.4 MB) floppy disks. The network analysis system shall be submitted using SureTrak 3.0 software and be capable of running on an IBM compatible computer (IBM is a registered trademark of International Business Machines), operating with "Microsoft Windows 95". The network analysis system shall be kept current, with changes made to reflect the actual progress and status of the construction.

1.5 UPDATED SCHEDULES

Update the construction schedule and equipment delivery schedule at monthly intervals or when schedule has been revised. Reflect any changes occurring since the last update. Submit copies of the purchase orders and confirmation of the delivery dates as directed.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 01 33 00

SUBMITTAL PROCEDURES

01/07

PART 1 GENERAL

1.1 SUMMARY

1.1.1 Government-Furnished Information

Submittal register database and submittal management program will be delivered to the contractor, by contracting officer on 3 1/2 inch disk. Register database will have the following fields completed, to the extent that will be required by the Government during subsequent usage.

Column (c): Lists specification section in which submittal is required.

Column (d): Lists each submittal description (SD No. and type, e.g. SD-04 Drawings) required in each specification section.

Column (e): Lists one principal paragraph in specification section where a material or product is specified. This listing is only to facilitate locating submitted requirements. Do not consider entries in column (e) as limiting project requirements.

Column (f): Indicate approving authority for each submittal. The Contracting Officer is approving authority for all submittals.

The database and submittal management program will be extractable from the disk furnished to contractor, for operation on contractor's IBM compatible personal computer with 640kb RAM, a hard drive, and 3 1/2 inch high density floppy disk drive.

1.2 DEFINITIONS

1.2.1 Submittal

Shop drawings, product data, samples, and administrative submittals presented for review and approval. Contract Clauses "FAR 52.236-5, Material and Workmanship," paragraph (b) and "FAR 52.236-21, Specifications and Drawings for Construction," paragraphs (d), (e), and (f) apply to all "submittals."

1.2.2 Types of Submittals

All submittals are classified as indicated in paragraph "Submittal Descriptions (SD)". Submittals also are grouped as follows:

- a. Shop drawings: As used in this section, drawings, schedules, diagrams, and other data prepared specifically for this contract, by contractor or through contractor by way of subcontractor, manufacturer, supplier, distributor, or other lower tier contractor, to illustrate portion of work.
- b. Product data: Preprinted material such as illustrations, standard

schedules, performance charts, instructions, brochures, diagrams, manufacturer's descriptive literature, catalog data, and other data to illustrate portion of work, but not prepared exclusively for this contract.

- c. Samples: Physical examples of products, materials, equipment, assemblies, or workmanship that are physically identical to portion of work, illustrating portion of work or establishing standards for evaluating appearance of finished work or both.
- d. Administrative submittals: Data presented for reviews and approval to ensure that administrative requirements of project are adequately met but not to ensure directly that work is in accordance with design concept and in compliance with contract documents.

1.2.3 Submittal Descriptions (SD)

SD-01 Preconstruction Submittals

Certificates of insurance
Surety bonds
List of proposed subcontractors
List of proposed products
Construction Progress Schedule
Submittal schedule
Schedule of values
Health and safety plan
Work plan
Quality control plan
Environmental protection plan

SD-02 Shop Drawings

Drawings, diagrams and schedules specifically prepared to illustrate some portion of the work.

Diagrams and instructions from a manufacturer or fabricator for use in producing the product and as aids to the contractor for integrating the product or system into the project.

Drawings prepared by or for the contractor to show how multiple systems and interdisciplinary work will be coordinated.

SD-03 Product Data

Catalog cuts, illustrations, schedules, diagrams, performance charts, instructions and brochures illustrating size, physical appearance and other characteristics of materials or equipment for some portion of the work.

Samples of warranty language when the contract requires extended product warranties.

SD-04 Samples

Physical examples of materials, equipment or workmanship that illustrate functional and aesthetic characteristics of a material or product and establish standards by which the work can be judged.

Color samples from the manufacturer's standard line (or custom color samples if specified) to be used in selecting or approving colors for the project.

Field samples and mock-ups constructed on the project site establish standards by which the ensuring work can be judged. Includes assemblies or portions of assemblies which are to be incorporated into the project and those which will be removed at conclusion of the work.

SD-05 Design Data

Calculations, mix designs, analyses or other data pertaining to a part of work.

SD-06 Test Reports

Report signed by authorized official of testing laboratory that a material, product or system identical to the material, product or system to be provided has been tested in accord with specified requirements. (Testing must have been within three years of date of contract award for the project.)

Report which includes findings of a test required to be performed by the contractor on an actual portion of the work or prototype prepared for the project before shipment to job site.

Report which includes finding of a test made at the job site or on sample taken from the job site, on portion of work during or after installation.

Investigation reports

Daily checklists

Final acceptance test and operational test procedure

SD-07 Certificates

Statements signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements. Must be dated after award of project contract and clearly name the project.

Document required of Contractor, or of a supplier, installer or subcontractor through Contractor, the purpose of which is to further quality of orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel qualifications.

Confined space entry permits.

SD-08 Manufacturer's Instructions

Preprinted material describing installation of a product, system or material, including special notices and Material Safety Data sheets concerning impedances, hazards and safety precautions.

SD-09 Manufacturer's Field Reports

Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's

standards or instructions.

Factory test reports.

SD-10 Operation and Maintenance Data

Data intended to be incorporated in operations and maintenance manuals.

SD-11 Closeout Submittals

Documentation to record compliance with technical or administrative requirements or to establish an administrative mechanism.

As-built drawings

Special warranties

Posted operating instructions

Training plan

1.2.4 Approving Authority

Person authorized to approve submittal.

1.2.5 Work

As used in this section, on- and off-site construction required by contract documents, including labor necessary to produce construction and materials, products, equipment, and systems incorporated or to be incorporated in such construction.

1.3 SUBMITTALS

Submit the following in accordance with the requirements of this section.

SD-11 Closeout Submittals

Submittal register

1.4 USE OF SUBMITTAL REGISTER DATABASE

Prepare and maintain submittal register, as the work progresses. Use electronic submittal register program furnished by the Government or any other format. Do not change data which is output in columns (c), (d), (e), and (f) as delivered by government; retain data which is output in columns (a), (g), (h), and (i) as approved.

1.4.1 Submittal Register

Submit submittal register as an electronic database, using submittals management program furnished to contractor. Submit with quality control plan and project schedule required by Section 01 45 10, "Quality Control" and Section 01 32 16, "Construction Progress Documentation." Do not change data in columns (c), (d), (e), and (f) as delivered by the government. Verify that all submittals required for project are listed and add missing submittals. Complete the following on the register database:

Column (a) Activity Number: Activity number from the project schedule.

Column (g) Contractor Submit Date: Scheduled date for approving authority to receive submittals.

Column (h) Contractor Approval Date: Date contractor needs approval of submittal.

Column (i) Contractor Material: Date that contractor needs material delivered to contractor control.

1.4.2 Contractor Use of Submittal Register

Update the following fields in the government-furnished submittal register program or equivalent fields in program utilized by contractor.

Column (b) Transmittal Number: Contractor assigned list of consecutive numbers.

Column (j) Action Code (k): Date of action used to record contractor's review when forwarding submittals to QC.

Column (l) List date of submittal transmission.

Column (q) List date approval received.

1.4.3 Approving Authority Use of Submittal Register

Update the following fields in the government-furnished submittal register program or equivalent fields in program utilized by contractor.

Column (b).

Column (l) List date of submittal receipt.

Column (m) through (p).

Column (q) List date returned to contractor.

1.4.4 Contractor Action Code and Action Code

Entries used will be as follows (others may be prescribed by Transmittal Form):

NR - Not Received

AN - Approved as noted

A - Approved

RR - Disapproved, Revise, and Resubmit

1.4.5 Copies Delivered to the Government

Deliver one copy of submitted register updated by contractor to government with each invoice request. Deliver in electronic format, unless a paper copy is requested by contracting officer.

1.5 PROCEDURES FOR SUBMITTALS

1.5.1 Reviewing, Certifying, Approving Authority

QC organization shall be responsible for reviewing and certifying that submittals are in compliance with contract requirements. The Contracting Officer is the approving authority for all submittals.

1.5.2 Constraints

- a. Submittals listed or specified in this contract shall conform to provisions of this section, unless explicitly stated otherwise.
- b. Submittals shall be complete for each definable feature of work; components of definable feature interrelated as a system shall be submitted at same time.
- c. When acceptability of a submittal is dependent on conditions, items, or materials included in separate subsequent submittals, submittal will be returned without review.
- d. Approval of a separate material, product, or component does not imply approval of assembly in which item functions.

1.5.3 Scheduling

- a. Coordinate scheduling, sequencing, preparing and processing of submittals with performance of work so that work will not be delayed by submittal processing. Allow for potential requirements to resubmit.
- b. Except as specified otherwise, allow review period, beginning with receipt by approving authority, that includes at least 15 working days for submittals for QC manager approval and 20 working days for submittals for contracting officer approval. Period of review for submittals with contracting officer approval begins when Government receives submittal from QC organization. Period of review for each resubmittal is the same as for initial submittal.
- c. For submittals requiring review by fire protection engineer, allow review period, beginning when government receives submittal from QC organization, of 45 working days for return of submittal to the contractor. Period of review for each resubmittal is the same as for initial submittal.

1.5.4 Variations

Variations from contract requirements require Government approval pursuant to contract Clause entitled "FAR 52.236-21, Specifications and Drawings for Construction" and will be considered where advantageous to government.

1.5.4.1 Considering Variations

Discussion with contracting officer prior to submission, will help ensure functional and quality requirements are met and minimize rejections and resubmittals. When contemplating a variation which results in lower cost, consider submission of the variation as a Value Engineering Change Proposal (VECP).

1.5.4.2 Proposing Variations

When proposing variation, deliver written request to the contracting officer, with documentation of the nature and features of the variation and why the variation is desirable and beneficial to government. If lower cost is a benefit, also include an estimate of the cost saving. In addition to documentation required for variation, include the submittals required for the item. Clearly mark the proposed variation in all documentation.

1.5.4.3 Warranting That Variation Are Compatible

When delivering a variation for approval, contractor warrants that this contract has been reviewed to establish that the variation, if incorporated, will be compatible with other elements of work.

1.5.4.4 Review Schedule Is Modified

In addition to normal submittal review period, a period of 10 working days will be allowed for consideration by the Government of submittals with variations.

1.5.5 Contractor's Responsibilities

- a. Determine and verify field measurements, materials, field construction criteria; review each submittal; and check and coordinate each submittal with requirements of the work and contract documents.
- b. Transmit submittals to QC organization in accordance with schedule on approved Submittal Register, and to prevent delays in the work, delays to government, or delays to separate contractors.
- c. Advise contracting officer of variation, as required by paragraph entitled "Variations."
- d. Correct and resubmit submittal as directed by approving authority. When resubmitting disapproved transmittals or transmittals noted for resubmittal, the contractor shall provide copy of that previously submitted transmittal including all reviewer comments for use by approving authority. Direct specific attention in writing or on resubmitted submittal, to revisions not requested by approving authority on previous submissions.
- e. Furnish additional copies of submittal when requested by contracting officer, to a limit of 20 copies per submittal.
- f. Complete work which must be accomplished as basis of a submittal in time to allow submittal to occur as scheduled.
- g. Ensure no work has begun until submittals for that work have been returned as "approved," or "approved as noted", except to the extent that a portion of work must be accomplished as basis of submittal.

1.5.6 QC Organization Responsibilities

- a. Note date on which submittal was received from contractor on each submittal.

- b. Review each submittal; and check and coordinate each submittal with requirements of work and contract documents.
- c. Review submittals for conformance with project design concepts and compliance with contract documents.
- d. Act on submittals, determining appropriate action based on QC organization's review of submittal.

(1) When QC manager is approving authority, take appropriate action on submittal from the possible actions defined in paragraph entitled, "Actions Possible."

(2) When contracting officer is approving authority or when variation has been proposed, forward submittal to Government with certifying statement or return submittal marked "not reviewed" or "revise and resubmit" as appropriate. The QC organization's review of submittal determines appropriate action.

- e. Ensure that material is clearly legible.
- f. Stamp each sheet of each submittal with QC certifying statement or approving statement, except that data submitted in bound volume or on one sheet printed on two sides may be stamped on the front of the first sheet only.

(1) When approving authority is contracting officer, QC organization will certify submittals forwarded to contracting officer with the following certifying statement:

"I hereby certify that the (equipment) (material) (article) shown and marked in this submittal is that proposed to be incorporated with contract Number N40085-09-0112, is in compliance with the contract drawings and specification, can be installed in the allocated spaces, and is submitted for Government approval.

Certified by Submittal Reviewer _____, Date _____
(Signature when applicable)

Certified by QC manager _____, Date _____"
(Signature)

- g. Sign certifying statement or approval statement. The person signing certifying statements shall be QC organization member designated in the approved QC plan. The signatures shall be in original ink. Stamped signatures are not acceptable.
- h. Update submittal register database as submittal actions occur and maintain the submittal register at project site until final acceptance of all work by contracting officer.
- i. Retain a copy of approved submittals at project site, including contractor's copy of approved samples.

1.5.7 Government's Responsibilities

When approving authority is contracting Officer, the Government will:

- a. Note date on which submittal was received from QC manager, on each

submittal for which the contracting officer is approving authority.

- b. Review submittals for approval within scheduling period specified and only for conformance with project design concepts and compliance with contract documents.
- c. Identify returned submittals with one of the actions defined in paragraph entitled "Actions Possible" and with markings appropriate for action indicated.

1.5.8 Actions Possible

Submittals will be returned with one of the following notations:

- a. Submittals marked "not reviewed" will indicate submittal has been previously reviewed and approved, is not required, does not have evidence of being reviewed and approved by contractor, or is not complete. A submittal marked "not reviewed" will be returned with an explanation of the reason it is not reviewed. Resubmit submittals returned for lack of review by contractor or for being incomplete, with appropriate action, coordination, or change.
- b. Submittals marked "approved" "approved as submitted" authorize contractor to proceed with work covered.
- c. Submittals marked "approved as noted" authorize contractor to proceed with work as noted provided contractor takes no exception to the notations.
- d. Submittals marked "revise and resubmit" or "disapproved" indicate submittal is incomplete or does not comply with design concept or requirements of the contract documents and shall be resubmitted with appropriate changes. No work shall proceed for this item until resubmittal is approved.

1.6 FORMAT OF SUBMITTALS

1.6.1 Transmittal Form

Transmit each submittal, except sample installations and sample panels, to office of approving authority. Transmit submittals with transmittal form prescribed by contracting officer and standard for project. The transmittal form shall identify contractor, indicate date of submittal, and include information prescribed by transmittal form and required in paragraph entitled "Identifying Submittals." Process transmittal forms to record actions regarding sample panels and sample installations.

1.6.2 Identifying Submittals

Identify submittals, except sample panel and sample installation, with the following information permanently adhered to or noted on each separate component of each submittal and noted on transmittal form. Mark each copy of each submittal identically, with the following:

- a. Project title and location.
- b. Construction contract number.
- c. Section number of the specification section by which submittal is

required.

- d. Submittal description (SD) number of each component of submittal.
- e. When a resubmission, alphabetic suffix on submittal description, for example, SD-10A, to indicate resubmission.
- f. Name, address, and telephone number of subcontractor, supplier, manufacturer and any other second tier contractor associated with submittal.
- g. Product identification and location in project.

1.6.3 Format for Product Data

- a. Present product data submittals for each section as a complete, bound volume. Include table of contents, listing page and catalog item numbers for product data.
- b. Indicate, by prominent notation, each product which is being submitted; indicate specification section number and paragraph number to which it pertains.
- c. Supplement product data with material prepared for project to satisfy submittal requirements for which product data does not exist. Identify this material as developed specifically for project.

1.6.4 Format for Shop Drawings

- a. Shop drawings shall not be less than 8 1/2 by 11 inches nor more than 30 by 42 inches.
- b. Present 8 1/2 by 11 inches sized shop drawings as part of the bound volume for submittals required by section. Present larger drawings in sets.
- c. Include on each drawing the drawing title, number, date, and revision numbers and dates, in addition to information required in paragraph entitled "Identifying Submittals."
- d. Dimension drawings, except diagrams and schematic drawings; prepare drawings demonstrating interface with other trades to scale. Shop drawing dimensions shall be the same unit of measure as indicated on the contract drawings. Identify materials and products for work shown.

1.6.5 Format of Samples

- a. Furnish samples in sizes below, unless otherwise specified or unless the manufacturer has prepackaged samples of approximately same size as specified:
 - (1) Sample of Equipment or Device: Full size.
 - (2) Sample of Materials Less Than 2 by 3 inches: Built up to 8 1/2 by 11 inches.
 - (3) Sample of Materials Exceeding 8 1/2 by 11 inches: Cut down to

8 1/2 by 11 inches and adequate to indicate color, texture, and material variations.

(4) Sample of Linear Devices or Materials: 10 inch length or length to be supplied, if less than 10 inches. Examples of linear devices or materials are conduit and handrails.

(5) Sample of Non-Solid Materials: Pint. Examples of non-solid materials are sand and paint.

(6) Color Selection Samples: 2 by 4 inches.

(7) Sample Panel: 4 by 4 feet.

(8) Sample Installation: 100 square feet.

- b. Samples Showing Range of Variation: Where variations are unavoidable due to nature of the materials, submit sets of samples of not less than three units showing extremes and middle of range.
- c. Reusable Samples: Incorporate returned samples into work only if so specified or indicated. Incorporated samples shall be in undamaged condition at time of use.
- d. Recording of Sample Installation: Note and preserve the notation of area constituting sample installation but remove notation at final clean up of project.
- e. When color, texture or pattern is specified by naming a particular manufacturer and style, include one sample of that manufacturer and style, for comparison.

1.6.6 Format of Administrative Submittals

- a. When submittal includes a document which is to be used in project or become part of project record, other than as a submittal, do not apply contractor's approval stamp to document, but to a separate sheet accompanying document.
- b. Operation and Maintenance Manual Data: Submit in accordance with Section 01 78 23, "Operation and Maintenance Data." Include components required in that section and the various technical sections.

1.7 QUANTITY OF SUBMITTALS

1.7.1 Number of Copies of Product Data

- a. Submit five copies of submittals of product data requiring review and approval only by the Contracting Officer. Submit three copies of submittals of product data for operation and maintenance manuals.

1.7.2 Number of Copies of Shop Drawings

Submit shop drawings in compliance with quantity requirements specified for product data.

1.7.3 Number of Samples

- a. Submit two samples, or two sets of samples showing range of variation, of each required item. One approved sample or set of samples will be retained by approving authority and one will be returned to contractor.
- b. Submit one sample panel. Include components listed in technical section or as directed.
- c. Submit one sample installation, where directed.
- d. Submit one sample of non-solid materials.

1.7.4 Number of Copies of Administrative Submittals

- a. Unless otherwise specified, submit administrative submittals compliance with quantity requirements specified for product data.
- b. Submit administrative submittals required under "SD-19 Operation and Maintenance Manuals" to conform to Section 01 78 23, "Operation and Maintenance Data."

1.8 FORWARDING SUBMITTALS

1.8.1 Samples and Submittalsr

Except as otherwise noted, submit samples and submittals to:

Maune Balangia Faulkenberry Architects, PA
317 C Pollock Street
New Bern, NC 28560

1.8.1.1 Administrative Submittals

Submit administrative submittals for asbestos/lead removal and environmental protection plan to the Resident Officer in Charge of Construction (ROICC/OICC).

1.8.1.2 Fire Protection and Fire Alarm System Submittals

Submit fire protection and fire alarm system submittals to NAVFAC MidLant, NAVFAC MIDLANT Fire Protection Engineer, 9742 Maryland Ave., Building Z-140, Room 219, Norfolk, VA 23511.

1.8.1.3 TAB Submittals

Submit to ROICC/OICC for all projects.

1.8.2 Shop Drawings, Product Data, and O&M Data

As soon as practicable after award of the contract, and before procurement or fabrication, submit shop drawings, product data and O&M Data required in the technical sections of this specification.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION						CONTRACTOR											
Major Interior/Exterior Repairs, Building 205																	
ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT CLASSIFICATION REVIEWER	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		APPROVING AUTHORITY				MAILED TO CONTR/	REMARKS	
						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/	DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER			ACTION CODE
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		01 20 00	SD-01 Preconstruction Submittals														
			Schedule of prices	1.3													
		01 30 00	SD-01 Preconstruction Submittals														
			List of contact personnel	1.4.1													
		01 31 50	SD-11 Closeout Submittals														
			Interim DD-1354, Transfer & Acceptance of Military Real Property	1.2													
		01 32 16	SD-01 Preconstruction Submittals														
			Construction schedule	1.2													
			Equipment delivery schedule	1.3													
		01 33 00	SD-11 Closeout Submittals														
			Submittal register	1.4.1													
		01 35 29	SD-01 Preconstruction Submittals														
			Accident Prevention Plan (APP)	1.9													
			Activity Hazard Analysis (AHA)	1.10													
			Crane Critical Lift Plan	1.9.1													
			Crane Work Plan	1.9.1													
			Crane Operators	1.7.1.6													
			SD-06 Test Reports														
			Reports	1.14													
			Accident Reports	1.14.1													
			Monthly Exposure Reports	1.14.3													
			Regulatory Citations and Violations	1.14.4													
			Crane Reports	1.14.5													

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ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT CLASSIFICATION REVIEWER	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION	MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
		01 35 29	SD-07 Certificates														
			Confined Space Entry Permit	1.11													
			Certificate of Compliance	1.14.6													
			Third Party Certification of Barge-Mounted Mobile Cranes	1.14.7													
		01 45 10	SD-11 Closeout Submittals														
			QC PLAN	1.6													
		01 50 00	SD-03 Product Data														
			Backflow preventers	2.1													
			SD-06 Test Reports														
			Backflow Preventer Tests	3.1													
			SD-07 Certificates														
			Backflow Tester Certifications	1.3													
			Backflow Preventers Certificate	1.3.1													
		01 57 19	SD-11 Closeout Submittals														
			Solid waste disposal permit	1.4.1													
			Disposal permit for hazardous waste	1.4.2													
			Environmental training documentation	1.2													
			Permit to transport hazardous waste	1.4.3													
			Hazardous waste certification	1.4.4													
			Annual Report of Products	2.1													
			Containing Recovered Materials														
		01 59 00	SD-03 Product Data														

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ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT CLASSIFICATION REVIEW	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION	MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
		01 59 00	Trailer	2.1													
		01 77 00	SD-10 Operation and Maintenance Data														
			Equipment/product warranty list	1.3.1													
			SD-11 Closeout Submittals														
			As-built drawings	1.2.1													
			GIS Deliverables	1.2.2													
			Record of materials	1.2.3													
			Maximo requirements	1.2.4													
			Equipment/product warranty tag	1.3.2													
		02 41 00	SD-01 Preconstruction Submittals														
			Existing Conditions	1.6.1													
			SD-07 Certificates														
			Demolition Plan	1.9													
			Notifications	1.4.1													
			SD-11 Closeout Submittals														
			Receipts	1.4.2													
		02 50 00	SD-03 Product Data														
			Pavement	1.4													
			Tack coat	2.2													
			Prime coat	2.1													
			Culvert pipe	2.8													
			Stone	2.6.2													
			SD-05 Design Data														
			Job-mix formula	1.2.1													
		02 82 16	SD-06 Test Reports														

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ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT CLASSIFICATION REVIEW	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS	
						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE			DATE OF ACTION
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		02 82 16	Air sampling results	1.5.2													
			Pressure differential recordings for local exhaust system	1.5.3													
			Clearance sampling	3.3.3.3													
			SD-07 Certificates														
			Asbestos hazard abatement plan	1.5.1													
			SD-11 Closeout Submittals														
			Daily log	1.5.5													
			North Carolina permit	1.5.6													
			Modifications to the North Carolina permit	1.5.7													
			Asbestos Inspection Reporting Form	1.5.8													
		02 82 33.12	SD-03 Product Data														
			Vacuum filters	1.5.4													
			Respirators	1.5.1													
			SD-06 Test Reports														
			Monitoring Results	1.4.4													
			SD-07 Certificates														
			Qualifications of CIH	1.4.1													
			Testing laboratory	1.4.2													
			Rental equipment notification	1.5.3													
			Preparation of Surfaces Coated with Lead-Contaminated Paint	1.4.3													
			Work Plan														
			Respiratory protection program	1.3.4													

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Major Interior/Exterior Repairs, Building 205						CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY					
ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT CLASSIFICATION REVIEW	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION	MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
		02 82 33.12	Hazard communication program disposal facility	1.3.5													
			Hazardous waste management plan	3.4													
			Vacuum filters	1.3.6													
			SD-11 Closeout Submittals manifest	1.5.4													
			medical examinations	3.4													
			training certification	1.3.1													
		02 82 33.13	SD-03 Product Data	1.3.3.1													
			Vacuum filters	1.6.4													
			Respirators	1.6.1													
			SD-06 Test Reports														
			Monitoring Results	1.4.4													
			SD-07 Certificates														
			Qualifications of CIH	1.4.1													
			Testing laboratory	1.4.2													
			Materials coated with lead-containing paint removal work plan	1.4.3													
			Rental equipment notification	1.6.3													
			work plan	1.3.8													
			Respiratory protection program	1.3.4													
			Hazard communication program	1.3.5													
			disposal	3.4.4													

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Major Interior/Exterior Repairs, Building 205						CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY					
ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT CLASSIFICATION REVIEW	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION	MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
		02 82 33.13	Hazardous waste management plan	1.3.6													
			Vacuum filters	1.6.4													
			SD-11 Closeout Submittals														
			disposal	3.4.4													
			medical examinations	1.3.1													
			training certification	1.3.3.1													
		02 84 16	SD-07 Certificates														
			Qualifications of CIH	1.8.1													
			Training Certification	1.8.1													
			PCB and Lamp Removal Work Plan	1.8.2													
			PCB and Lamp Disposal Plan	1.8.3													
			SD-11 Closeout Submittals														
			Transporter certification	3.5.2													
			Certification of Decontamination	3.2.4													
			Certificate of Disposal and/or recycling	3.5.2.1													
			DD Form 1348-1	3.5.3.2													
		04 20 00	SD-03 Product Data														
			Clay or Shale Brick	2.2													
			Concrete Masonry Units (CMU)	2.4													
			Cement	2.6.3													
			Insulation	2.11													
			Flashing	2.13													
			Cold Weather Installation	1.6.2													

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ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT CLASSIFICATION REVIEWER	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS	
						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE			DATE OF ACTION
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		04 20 00	SD-04 Samples														
			Clay or Shale Brick	2.2													
			Portable Panel	1.4.2													
			SD-05 Design Data														
			Unit Strength Method	1.2.1.1													
			SD-06 Test Reports														
			Efflorescence Test	3.13.1													
			Masonry Cement	2.6.3													
			SD-07 Certificates														
			Clay or Shale Brick	2.2													
			Concrete Brick	2.3													
			Concrete Masonry Units (CMU)	2.4													
			Anchors, Ties, and Bar Positioners	2.8													
			Expansion-Joint Materials	2.12													
			Joint Reinforcement	2.9													
			Reinforcing Steel Bars and Rods	2.10													
			Masonry Cement	2.6.3													
			Insulation	2.11													
			Admixtures for Masonry Mortar	2.6.1													
			Admixtures for Grout	2.7.1													
			SD-08 Manufacturer's Instructions														
			Masonry Cement	2.6.3													
		05 40 00	SD-03 Product Data														
			studs,joists	2.1													
			SD-07 Certificates														

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Major Interior/Exterior Repairs, Building 205																	
ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT CLASSIFICATION REVIEWER	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS	
						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE			DATE OF ACTION
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		05 40 00	Load-bearing cold-formed metal framing	1.4													
			Welds	3.1.1													
		05 50 13	SD-02 Shop Drawings														
			Access doors and panels	2.3													
			SD-03 Product Data														
			Access doors and panels	2.3													
		06 10 00	SD-03 Product Data														
			Plastic Lumber	2.1.2													
			SD-10 Operation and Maintenance Data														
			Plastic	1.4.4													
		06 20 00	SD-02 Shop Drawings														
			Detail Drawings	1.3													
		07 11 13	SD-07 Certificates														
			Materials	1.3													
		07 12 00	SD-03 Product Data														
			Prefabricated laminated asphalt waterproofing	2.6													
			Prefabricated copper fabric	2.7													
			Membrane fabric	2.3													
			Reinforcing Fabric	3.3.3.1													
			SD-08 Manufacturer's Instructions														
			Application	3.3													
		07 21 13	SD-03 Product Data														
			Block or board insulation	2.1													

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ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT OR A/E REVIEWER CLASSIFICATION	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS	
						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE			DATE OF ACTION
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		07 21 13	Accessories	2.3													
			SD-08 Manufacturer's Instructions														
			Block or Board Insulation	2.1													
			Adhesive	2.3.1													
		07 21 16	SD-03 Product Data														
			Blanket insulation	2.1													
			Accessories	2.3													
			SD-08 Manufacturer's Instructions														
			Insulation	3.3.1													
		07 21 23	SD-03 Product Data														
			Loose fill insulation	2.1													
			SD-08 Manufacturer's Instructions														
			Loose Fill Insulation	2.1													
		07 31 13	SD-03 Product Data														
			Shingles	2.1.1													
			SD-04 Samples														
			Shingles	2.1.1													
			SD-08 Manufacturer's Instructions														
			Application	3.3													
		07 40 00	SD-07 Certificates														
			Vinyl siding	2.1													
			Vinyl soffit	2.2													
			accessories	2.5													
		07 84 00	SD-02 Shop Drawings														
			Firestopping Materials	2.1													
			SD-07 Certificates														

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TITLE AND LOCATION Major Interior/Exterior Repairs, Building 205						CONTRACTOR											
ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT OR CLASSIFICATION REVIEWER	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS	
						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE			DATE OF ACTION
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		07 84 00	Firestopping Materials	2.1													
			Installer Qualifications	1.5													
			Inspection	3.3													
		07 92 00	SD-03 Product Data														
			Sealants	2.1													
			Primers	2.2													
			Bond breakers	2.3													
			Backstops	2.4													
			SD-07 Certificates														
			Sealant	3.3.6													
		08 11 13	SD-02 Shop Drawings														
			Doors	2.1													
			Doors	2.1													
			Frames	2.6													
			Frames	2.6													
			SD-03 Product Data														
			Doors	2.1													
			Frames	2.6													
		08 14 00	SD-02 Shop Drawings														
			Doors	2.1													
			SD-03 Product Data														
			Doors	2.1													
			Accessories	2.2													
			warranty	1.4													
			Fire resistance rating	2.1.2													
			SD-06 Test Reports														

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						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION		
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		08 14 00	Split resistance	2.4													
			Cycle-slam	2.4													
			Hinge loading resistance	2.4													
		08 41 00	SD-02 Shop Drawings														
			Components	2.1.6													
			Components	2.2													
			SD-03 Product Data														
			Components	2.1.6													
			Components	2.2													
			SD-04 Samples														
			Components	2.1.6													
			Components	2.2													
			SD-07 Certificates														
			Components	2.1.6													
			Components	2.2													
		08 71 00	SD-02 Shop Drawings														
			Hardware schedule	1.3													
			Keying system	2.3.5													
			SD-03 Product Data														
			Hardware items	2.3													
			SD-08 Manufacturer's Instructions														
			Installation	3.1													
			SD-10 Operation and Maintenance														
			Data														
			Hardware Schedule	1.3													
			SD-11 Closeout Submittals														

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ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT CLASSIFICATION REVIEW	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS	
						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE			DATE OF ACTION
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		08 71 00	Key Bitting	1.4													
		08 81 00	SD-03 Product Data														
			Insulating Glass	1.6.1													
			SD-04 Samples														
			Insulating Glass	1.6.1													
			SD-07 Certificates														
			Insulating Glass	1.6.1													
			SD-08 Manufacturer's Instructions														
			Setting and sealing materials	2.3													
			Glass setting	3.2													
		09 29 00	SD-03 Product Data														
			Cementitious backer units	2.1.6													
			Glass Mat Water-Resistant	2.1.4													
			Gypsum Tile Backing Board														
			Water-Resistant Gypsum	2.1.3													
			Backing Board														
			Impact Resistant Gypsum Board	2.1.5													
			Accessories	2.1.9													
			SD-07 Certificates														
			Asbestos Free Materials	2.1													
			SD-08 Manufacturer's Instructions														
			Material Safety Data Sheets	2.1													
		09 30 00	SD-03 Product Data														
			Tile	2.1													
			Setting-Bed	2.2													
			Reinforcing Wire Fabric	2.2.6													

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						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE			DATE OF ACTION
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		09 30 00	SD-04 Samples														
			Tile	2.1													
			Marble Thresholds	2.5													
		09 51 00	SD-04 Samples														
			Acoustical Units	2.1													
		09 65 00	SD-03 Product Data														
			Resilient Flooring and Accessories	2.8													
			Adhesives	2.4													
			Vinyl Composition Tile	2.1													
			Wall Base	2.2													
			SD-04 Samples														
			Resilient Flooring and Accessories	2.8													
			SD-06 Test Reports														
			Moisture, Alkalinity and Bond Tests	3.3													
			SD-08 Manufacturer's Instructions														
			Surface Preparation	3.2													
			Installation	3.1													
			SD-10 Operation and Maintenance Data														
			Resilient Flooring and Accessories	2.8													
		09 68 00	SD-02 Shop Drawings														
			Installation	3.4													

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		09 68 00	Molding	2.5													
			SD-03 Product Data														
			Carpet	2.1													
			Carpet Moldings	2.3													
			Surface Preparation	3.1													
			Installation	3.4													
			Regulatory Requirements	1.3													
			SD-04 Samples														
			Carpet	2.1													
			Molding	2.5													
			SD-06 Test Reports														
			Moisture and Alkalinity Tests	3.2													
			SD-07 Certificates														
			Carpet	2.1													
			Regulatory Requirements	1.3													
			SD-10 Operation and Maintenance														
			Data														
			Carpet	2.1													
			Cleaning and Protection	3.5													
			Operational Service	1.7													
		09 90 00	SD-03 Product Data														
			Coating	2.1													
			Manufacturer's Technical Data	2.1													
			Sheets														
			SD-07 Certificates														
			Applicator's qualifications	1.3													

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		09 90 00	SD-08 Manufacturer's Instructions														
			Application instructions	3.2.1													
			Mixing	3.6.2													
			Manufacturer's Material Safety Data Sheets	1.7.2													
			SD-10 Operation and Maintenance Data														
			Coatings:	2.1													
		10 21 13	SD-02 Shop Drawings														
			Installation Drawings	3.2													
			Fabrication Drawings	1.3													
			SD-03 Product Data														
			Toilet Partition System	1.3													
			Cleaning and Maintenance Instructions	1.3													
			Colors And Finishes	2.6													
			Galvanized Steel Sheet	2.1.1													
			Sound Deadening Cores	2.1.2													
			Partition Panels and Doors	2.2													
			Anchoring Devices and Fasteners	2.1.3													
			Hardware and Fittings	2.1.5													
			Brackets	2.1.4													
			Door Hardware	2.1.6													
			Overhead-Braced Partitions	2.3													
			SD-04 Samples														

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		10 21 13	Colors and Finishes	2.6													
			Partition Panels	2.2													
			Hardware and Fittings	2.1.5													
			Anchoring Devices and Fasteners	2.1.3													
			SD-07 Certificates Certification	1.6													
		10 28 13	SD-03 Product Data														
			Finishes	2.1.2													
			Accessory Items	2.2													
			SD-07 Certificates Accessory Items	2.2													
		10 44 30	SD-02 Shop Drawings														
			Plaque signs	2.4.1													
			Letters	2.5													
			SD-03 Product Data Adhesive	2.7													
			SD-07 Certificates Fiber-reinforced polyester	2.1													
			Acrylic sheet	2.2													
		10 51 13	SD-02 Shop Drawings														
			Types	2.1													
			Location	1.4													
			Installation	3.1													
			Numbering system	3.2													
			SD-03 Product Data														

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		10 51 13	Material	2.2													
			Locking Devices	2.3.1													
			Handles	2.3.4													
			Finish	2.2.3													
			components	2.3													
			Assembly	3.1													
			SD-04 Samples														
			Color chips	1.5.1													
		10 52 20	SD-03 Product Data														
			Fire extinguishers	2.1													
			Fire extinguisher cabinets	2.2													
		12 21 00	SD-03 Product Data														
			Window Blinds	2.1													
			Installation	3.3													
			SD-04 Samples														
			Window Blinds	2.1													
			SD-08 Manufacturer's Instructions														
			Window Blinds	2.1													
			SD-10 Operation and Maintenance														
			Data														
			Window Blinds	2.1													
		21 13 00.00 20	SD-02 Shop Drawings														
			Sprinkler heads and piping	1.4													
			system layout														
			Electrical wiring diagrams	1.4.8													
			SD-03 Product Data														

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		21 13 00.00 20	Piping	2.2													
			Alarm valves	2.2.4													
			Valves	2.2.7													
			Sprinkler heads	2.2.2													
			Pipe hangers and supports	2.2.6													
			Pressure switch	2.2.5													
			Fire department connections	2.2.12													
			Mechanical couplings	2.2.1													
			Backflow Preventer	2.2.8													
			SD-05 Design Data														
			Sprinkler system design	1.4													
			SD-06 Test Reports														
			Preliminary tests	3.2.1													
			SD-07 Certificates														
			Qualifications of installer	1.6.1													
			SD-10 Operation and Maintenance Data														
			Alarm valves	2.2.4													
			Backflow preventer	2.2.8													
			SD-11 Closeout Submittals														
			As-built drawings	1.4.9													
		21 13 16.00 20	SD-02 Shop Drawings														
			Sprinkler heads and piping system layout	1.3.8													
			Electrical wiring diagrams	1.3.8													
			SD-03 Product Data														

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		21 13 16.00 20	Piping	2.1													
			Valves	2.1.10													
			Sprinkler heads	2.1.2													
			Pipe hangers and supports	2.1.9													
			Low air pressure supervisory switch	2.1.7													
			Dry pipe valves	2.1.4													
			Air compressor	2.1.8													
			Mechanical couplings	2.1.1													
			Pressure Switch	2.1.6													
			SD-05 Design Data														
			Sprinkler system design	1.3													
			SD-06 Test Reports														
			Preliminary tests	3.2.1													
			SD-07 Certificates														
			Qualifications of installer	1.5.1													
			SD-10 Operation and Maintenance Data														
			Dry pipe valves	2.1.4													
			Air compressor	2.1.8													
			SD-11 Closeout Submittals														
			As-built drawings of each system	1.3.9													
		22 00 00	SD-06 Test Reports														
			Tests, Flushing and Disinfection	3.6													
			SD-07 Certificates														
			Materials and Equipment	1.3													

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(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		22 00 00	Bolts	2.1.1													
			SD-10 Operation and Maintenance Data														
			Plumbing System														
			Plumbing System	3.6.1													
		23 07 00	SD-03 Product Data														
			Piping insulation	2.1													
			Piping insulation finishes	2.1.7													
			Heating, ventilating, and air conditioning systems insulation	2.2													
			Duct insulation finishes	2.2.4													
			Accessory materials	2.5													
			Adhesives, sealants, and coating compounds	2.4													
		23 08 00.00 20	SD-06 Test Reports														
			DALT and TAB Work Execution Schedule	3.7													
			DALT and TAB Procedures Summary	3.7													
			Design review report	3.7													
			Pre-Final DALT report	3.7													
			Final DALT report	3.7													
			TAB report for Season 1	3.7													
			TAB report for Season 2	3.7													
			SD-07 Certificates														

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		23 08 00.00 20	Independent TAB agency and personnel qualifications	1.9													
			Advance notice of Pre-Final DALT field work	3.3.2													
			Advance notice of Pre-Final DALT field work	3.7													
			Completed Pre-Final DALT Work Checklist	3.7													
			Completed Pre-Final DALT Work Checklist	3.7													
			Advance Notice of Season 1 TAB Field Work	3.7													
			Completed Season 1 Pre-TAB Work Checklist	3.7													
			Completed Season 1 Pre-TAB Work Checklist	3.7													
			Advance Notice of Season 2 TAB Field Work	3.7													
			Completed Season 2 Pre-TAB Work Checklist	3.7													
			Completed Season 2 Pre-TAB Work Checklist	3.7													
		23 09 54	SD-02 Shop Drawings														
			List of Symbols and Abbreviations Used on Drawings	1.7.4.2													
			List of I/O Points	1.7.4.3													

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(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		23 09 54	Equipment Components List	1.7.4.4													
			AC Power Table	1.7.4.5													
			Control system schematic	1.4.1.1													
			Ladder diagrams	1.4.1.2													
			Component wiring diagrams	1.4.1.3													
			Terminal strip diagrams	1.4.1.4													
			Communication architecture schematic	1.4.1.5													
			SD-03 Product Data														
			DDC hardware	1.7.1.1													
			DDC capabilities	1.7.1.2													
			Workstation software	1.7.1.3													
			Input devices	1.7.1.4													
			Output devices	1.7.1.5													
			Surge and transient protection	1.7.1.6													
			Hand-held terminal	1.3.7													
			Smoke detectors	2.9.1													
			SD-06 Test Reports														
			Field tests	3.3.3													
			Performance verification tests	3.3.4													
			SD-07 Certificates														
			Contractors Qualifications	1.7.5													
			Training	3.4													
			Pressure Tank Certification	1.7.6													
			SD-10 Operation and Maintenance Data														

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		23 09 54	Controls and HVAC System Operators Manual	1.7.10													
			DDC Manufacturer's Hardware and Software Manuals	1.7.12													
			SD-11 Closeout Submittals														
			Training course documentation	1.7.7													
			Service organizations	1.7.8													
			Contractor certification	1.7.9													
		23 73 33	SD-02 Shop Drawings														
			Temperature control systems	1.3.1													
			Automatic Flow Control Valves (AFCV)	1.3.2													
			Equipment layout drawings	1.3.3													
			SD-03 Product Data														
			air-handling units	2.1.1													
			Energy Recovery Ventilator	2.1.7													
			Air-cooled water chillers	2.1.2													
			Series variable air volume (VAV) terminals	2.1.3													
			Hot water converters	2.1.4													
			Pumps	2.1.5													
			Fire dampers	2.3.6													
			Expansion tanks	2.5.9													
			Air separators	2.5.10													
			Pipe hangers and supports	2.5.1													
			Flexible pipe connectors	2.5.7													

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		23 73 33	Dampers	2.3.3													
			Diffusers, registers, and grilles	2.3.4													
			Filter boxes	2.3.7													
			Flexible round ducts	2.3.8													
			Valves	2.4.7													
			Pipe and fittings	2.4													
			Solids-from-water separator	2.5.13													
			SD-06 Test Reports														
			air-handling units	2.1.1													
			Energy Recovery Ventilator	2.1.7													
			Air-cooled water chillers	2.1.2													
			Series variable air volume (VAV) terminals	2.1.3													
			SD-07 Certificates														
			Certification of welders' qualifications	1.3.5													
			Equipment field test plans	1.3.6													
			SD-08 Manufacturer's Instructions														
			Installation manual	1.3.4													
			SD-10 Operation and Maintenance														
			Data														
			air-handling units	2.1.1													
			Energy Recovery Ventilator	2.1.7													
			Air-cooled water chillers	2.1.2													
			Series variable air volume (VAV) terminals	2.1.3													

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ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT CLASSIFICATION REVIEW	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION	MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
		23 73 33	Pumps	2.1.5													
			Fire dampers	2.3.6													
			SD-11 Closeout Submittals														
			Air-cooled water chillers	2.1.2													
			Air filter inventory	1.3.7													
		26 06 00	SD-03 Product Data														
			Ground rods	2.1													
			Grounding and bonding conductors	2.3													
			SD-06 Test Reports														
			acceptance checks and tests	3.2.1													
			Ground resistance tests	1.2.1													
		26 12 19.10	SD-02 Shop Drawings														
			Pad-mounted transformer drawings	1.4.1													
			SD-03 Product Data														
			Pad-mounted transformers	2.2													
			SD-06 Test Reports														
			Acceptance checks and tests	3.6.1													
			SD-07 Certificates														
			Transformer losses	1.4.2													
			SD-09 Manufacturer's Field Reports														
			design tests	2.6.2													
			routine and other tests	2.6.3													

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CONTRACT NO.

TITLE AND LOCATION						CONTRACTOR											
Major Interior/Exterior Repairs, Building 205																	
ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT CLASSIFICATION REVIEW	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS	
						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE			DATE OF ACTION
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		26 12 19.10	SD-10 Operation and Maintenance Data														
			Transformer(s)	1.5.1													
			SD-11 Closeout Submittals														
			Transformer test schedule	2.6.1													
		26 20 00	SD-02 Shop Drawings														
			Panelboards	2.9													
			SD-03 Product Data														
			Receptacles	2.8													
			Circuit breakers	2.9.2													
			Switches	2.7													
			Enclosed circuit breakers	2.10													
			Motor controllers	2.12													
			Manual motor starters	2.13													
			Surge protective devices	2.17													
			SD-06 Test Reports														
			600-volt wiring test	3.2.2													
			Ground-fault receptacle test	3.2.3													
			SD-07 Certificates														
			Fuses	2.11													
		26 51 00	SD-03 Product Data														
			Fluorescent lighting fixtures	2.1													
			Fluorescent electronic ballasts	1.5.1													
			Exit signs	2.5													
			Emergency lighting equipment	2.6													
		27 10 00	SD-02 Shop Drawings														

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TITLE AND LOCATION						CONTRACTOR											
Major Interior/Exterior Repairs, Building 205																	
ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT OR CLASSIFICATION REVIEWER	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS	
						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE			DATE OF ACTION
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		27 10 00	Telecommunications drawings	1.7.1													
			Distribution frames	2.4													
			SD-03 Product Data														
			Telecommunications cabling	2.3.1													
			Patch panels	2.4.4													
			Telecommunications outlet/connector assemblies	2.6													
			Equipment support frame	2.4.1													
			Building protector assemblies	2.4.2													
			Connector blocks	2.4.3													
			Protector modules	2.4.2.1													
			SD-06 Test Reports														
			Telecommunications cabling testing	3.3.1													
			Factory reel tests	3.3.1.2													
			SD-07 Certificates														
			Contractor Qualifications	1.7.3.1													
			Manufacturer Qualifications	1.7.3.2													
			Test plan	1.7.4													
			SD-10 Operation and Maintenance Data														
			Telecommunications cabling and pathway system	3.1.1													
		28 31 76	SD-02 Shop Drawings														
			Wiring Diagrams	3.2.1													
			System Operation	2.2													

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TITLE AND LOCATION						CONTRACTOR											
Major Interior/Exterior Repairs, Building 205						CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY					
ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT CLASSIFICATION REVIEW	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION	MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
		28 31 76	Notification Appliances	2.12													
			Amplifiers	2.9													
			As-Built Drawings	3.5.2													
			SD-03 Product Data														
			Technical Data And Computer Software	1.9													
			Fire alarm control panel	1.9													
			Fire Alarm And Mass Notification Control Panel (FACP/FMCP)	2.8													
			Manual stations	2.11													
			Batteries	2.7.1													
			Battery chargers	2.7.2													
			Smoke sensors	2.5													
			Wiring	2.19													
			Notification appliances	2.12													
			Amplifiers	2.9													
			Tone generators	2.9													
			Digitalized voice generators	2.9													
			Waterflow detectors	2.14													
			Tamper switches	2.13													
			ELECTROMAGNETIC DOOR HOLDERS	2.15													
			SD-05 Design Data														
			System Operation	2.2													
			Battery power	2.7.1.2													
			SD-06 Test Reports														

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CONTRACT NO.

TITLE AND LOCATION						CONTRACTOR											
Major Interior/Exterior Repairs, Building 205						CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY					
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		28 31 76	Field Quality Control	3.5													
			Testing Procedures	3.5.1													
			Smoke sensor testing	2.5.2													
			SD-07 Certificates														
			Installer	1.5.1.4													
			SD-09 Manufacturer's Field Reports														
			Mass Notification System	1.5.3.2													
			SD-10 Operation and Maintenance Data														
			Operation and Maintenance (O&M) Instructions	1.7													
			Instruction of Government Employees	3.6													
		31 11 00	SD-03 Product Data														
			Nonsaleable Materials	3.6.2													
			SD-04 Samples														
			Tree wound paint	2.1													
			Herbicide	2.2													
		31 23 00.00 20	SD-01 Preconstruction Submittals														
			Shoring and Sheeting Plan	1.7.1													
			Dewatering work plan	1.7.2													
			SD-06 Test Reports														
			Borrow Site Testing	1.6													
			Fill and backfill	3.14.2.1													
			Select material	3.14.2.2													

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Major Interior/Exterior Repairs, Building 205						CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY					
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		31 23 00.00 20	Density tests	3.14.2.3													
		31 31 16	SD-03 Product Data														
			Termiticide Application Plan	3.3.6													
			Termiticides	2.1													
			Foundation Exterior	3.3.3													
			Utilities and Vents	3.3.4													
			Crawl and Plenum Air Spaces	3.3.5													
			Verification of Measurement	3.1													
			Application Equipment	3.4.1													
			Warranty	1.6													
			SD-04 Samples														
			Termiticides	2.1													
			SD-06 Test Reports														
			Equipment Calibration and Tank Measurement	3.4.1													
			Soil Moisture	1.5.1													
			Quality Assurance	1.3													
			SD-07 Certificates														
			Qualifications	1.3.1													
		33 11 00	SD-03 Product Data														
			Piping Materials	2.1.1													
			Water distribution main	2.1													
			Water service line	2.2													
			Indicator posts	2.1.2.2													
			Corporation stops	2.2.2.1													
			Valve boxes	2.1.2.3													

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Major Interior/Exterior Repairs, Building 205						CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		APPROVING AUTHORITY						
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		33 11 00	Valve boxes	2.2.2.11													
			SD-07 Certificates														
			Water distribution main	2.1													
			Water service line	2.2													
			Lining	2.1.1.1													
			SD-08 Manufacturer's Instructions														
			Installation	3.1.1													
		33 30 00	SD-03 Product Data														
			Pipeline materials	2.1													
		33 32 16.13	SD-03 Product Data														
			Pipe and fittings	2.1													
			Check valves	2.2.1													
			Submersible sewage grinder pumps	2.3													
			Pump motor	2.4													
			Flexible flanged coupling	2.1.5													
			SD-10 Operation and Maintenance														
			Data														
			Submersible Sewage Grinder Pumps	2.3													
		33 63 13	SD-02 Shop Drawings														
			Heat Distribution System design	1.4.3													
			SD-03 Product Data														
			Pipe	2.3.1													
			Insulation	2.2													
			Fittings	2.3.2													

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CONTRACT NO.

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		33 63 13	Anchors	1.3.3													
			Expansion joints	2.4													
			Coatings	1.2.7													
			Conduit	2.1.6													
			Field Connection of Casing Sections	2.1.12													
			SD-05 Design Data														
			Pipe-stress and system expansion calculations	1.2.6													
			Manufacturer's data sheets	1.2.7													
			SD-07 Certificates														
			Work plan	1.2.8													
			Quality assurance	1.2.9													
			Thermal performance testing	1.2.10													
			UHDS manufacturer certification	1.2.4													
			UHDS design	1.3.2													
			Certificate of compliance	1.2.11													
			Testing firm qualification	1.2.12													
			Welds	1.2.13													
			SD-10 Operation and Maintenance Data														
			Heat distribution system	1.2.15													
			SD-11 Closeout Submittals														
			Daily written report	1.2.14													
		33 71 02	SD-03 Product Data														

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CONTRACT NO.

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Major Interior/Exterior Repairs, Building 205						CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY					
ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT CLASSIFICATION REVIEW	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION	MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
		33 71 02	Medium voltage cable terminations	2.1.5													
			600 volt wires and cables	2.1.3.1													
			SD-06 Test Reports														
			Acceptance checks and tests	3.2.1													
		33 82 00	SD-02 Shop Drawings														
			Telecommunications Outside Plant	1.6.1.1													
			Telecommunications Entrance Facility Drawings	1.6.1.2													
			SD-03 Product Data														
			Wire and cable	2.8													
			Cable splices, and connectors	2.5													
			Closures	2.3													
			Building protector assemblies	2.2.1													
			Protector modules	2.2.2													
			Cross-connect terminal cabinets	2.4													
			Spare Parts	1.8.2													
			SD-06 Test Reports														
			Pre-installation tests	3.5.1													
			Acceptance tests	3.5.2													
			Outside Plant Test Plan	1.6.3													
			SD-07 Certificates														
			Telecommunications Contractor Qualifications	1.6.2.1													
			Key Personnel Qualifications	1.6.2.2													

SECTION 01 35 29

SAFETY AND OCCUPATIONAL HEALTH REQUIREMENTS

04/09

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z359.1 (1992; R 1999) Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components

ASME INTERNATIONAL (ASME)

ASME B30.3 (1996) Construction Tower Cranes

ASME B30.5 (2000) Mobile and Locomotive Cranes

ASME B30.8 (2000) Floating Cranes and Floating Derricks

ASME B30.22 (2000) Articulating Boom Cranes

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 10 (2007; Errata 2007; AMD 1 2007) Standard for Portable Fire Extinguishers

NFPA 241 (2004) Safeguarding Construction, Alteration, and Demolition Operations

NFPA 51B (2003) Fire Prevention During Welding, Cutting, and Other Hot Work

NFPA 70 (2007; AMD 1 2008) National Electrical Code - 2008 Edition

NFPA 70E (2004) Electrical Safety in the Workplace

U. S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1 (2008) Safety and Health Requirements Manual

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910 Occupational Safety and Health Standards

29 CFR 1910.146	Permit-required Confined Spaces
29 CFR 1910.94	Ventilation
29 CFR 1915	Confined and Enclosed Spaces and Other Dangerous Atmospheres in Shipyard Employment
29 CFR 1919	Gear Certification
29 CFR 1926	Safety and Health Regulations for Construction
29 CFR 1926.500	Fall Protection

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00
SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

- Accident Prevention Plan (APP)
- Activity Hazard Analysis (AHA)
- Crane Critical Lift Plan
- Crane Work Plan
- Proof of qualifications for Crane Operators

SD-06 Test Reports

Reports

Submit reports as their incidence occurs, in accordance with the requirements of the paragraph entitled, "Reports."

- Accident Reports
- Monthly Exposure Reports
- Regulatory Citations and Violations
- Crane Reports

SD-07 Certificates

- Confined Space Entry Permit
- Certificate of Compliance (Crane)
- Third Party Certification of Barge-Mounted Mobile Cranes

Submit one copy of each permit/certificate attached to each Daily Report.

1.3 DEFINITIONS

- a. Associate Safety Professional (ASP). An individual who is currently certified by the Board of Certified Safety Professionals.
- b. Certified Construction Health & Safety Technician (CHST). An individual who is currently certified as a CHST by the Board of Certified Safety Professionals.
- c. Certified Industrial Hygienist (CIH). An individual who is currently certified as a CIH by the American Board of Industrial Hygiene.
- d. Certified Safety Professional (CSP). An individual who is currently certified as a CSP by the Board of Certified Safety Professionals.
- e. Certified Safety Trained Supervisor (STS). An individual who is currently certified as an STS by the Board of Certified Safety Professionals.
- f. Competent Person for Fall Protection. A person who is capable of identifying hazardous or dangerous conditions in the personal fall arrest system or any component thereof, as well as their application and use with related equipment, and has the authority to take prompt corrective measures to eliminate the hazards of falling.
- g. High Visibility Accident. Any mishap which may generate publicity and/or high visibility.
- h. Low-slope roof. A roof having a slope less than or equal to 4 in 12 (vertical to horizontal).
- i. Medical Treatment. Treatment administered by a physician or by registered professional personnel under the standing orders of a physician. Medical treatment does not include first aid treatment even though provided by a physician or registered personnel.
- j. Multi-Employer Work Site (MEWS). A multi-employer work site, as defined by OSHA, is one in which many employers occupy the same site. The Government considers the Prime Contractor to be the "controlling authority" for all work site safety and health of the subcontractors.
- k. Operating Envelope. The area surrounding any crane. Inside this "envelope" is the crane, the operator, riggers, rigging gear between the hook and the load, the load and the crane's supporting structure (ground, rail, etc.).
- l. Qualified Person for Fall Protection. A person with a recognized degree or professional certification, extensive knowledge, training and experience in the field of fall protection who is capable of performing design, analysis, and evaluation of fall protection systems and equipment.
- m. Recordable Injuries or Illnesses. Any work-related injury or illness that results in:
- (1) Death, regardless of the time between the injury and death, or the length of the illness;
 - (2) Days away from work;

- (3) Restricted work;
- (4) Transfer to another job;
- (5) Medical treatment beyond first aid;
- (6) Loss of consciousness; or
- (7) A significant injury or illness diagnosed by a physician or other licensed health care professional, even if it did not result in (1) through (6) above.

n. Site Safety and Health Officer (SSHO). The superintendent or other qualified or competent person who is responsible for the on-site safety and health required for the project. The Contractor quality control (QC) person cannot be the SSHO, even though the QC has safety inspection responsibilities as part of the QC duties.

o. Steep roof. A roof having a slope greater than 4 in 12 (vertical to horizontal).

p. "USACE" property and equipment specified in USACE EM 385-1-1 should be interpreted as Government property and equipment.

q. Weight Handling Equipment (WHE) Accident. A WHE accident occurs when any one or more of the six elements in the operating envelope fails to perform correctly during operation, including operation during maintenance or testing resulting in personnel injury or death; material or equipment damage; dropped load; derailment; two-blocking; overload; and collision, including unplanned contact between the load, crane, and/or other objects. A dropped load, derailment, two-blocking, overload and collision are considered accidents even though no material damage or injury occurs. A component failure (e.g., motor burnout, gear tooth failure, bearing failure) is not considered an accident solely due to material or equipment damage unless the component failure results in damage to other components (e.g., dropped boom, dropped load, roll over, etc.).

1.4 CONTRACTOR SAFETY SELF-EVALUATION CHECKLIST

Contracting Officer will provide a "Contractor Safety Self-Evaluation checklist" to the Contractor at the pre-construction conference. The checklist will be completed monthly by the Contractor and submitted with each request for payment voucher. An acceptable score of 90 or greater is required. Failure to submit the completed safety self-evaluation checklist or achieve a score of at least 90, will result in a retention of up to 10 percent of the voucher.

1.5 REGULATORY REQUIREMENTS

In addition to the detailed requirements included in the provisions of this contract, work performed shall comply with USACE EM 385-1-1, and the following laws, ordinances, criteria, rules and regulations. Submit matters of interpretation of standards to the appropriate administrative agency for resolution before starting work. Where the requirements of this specification, applicable laws, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirements shall apply.

1.6 DRUG PREVENTION PROGRAM

Conduct a proactive drug and alcohol use prevention program for all workers, prime and subcontractor, on the site. Ensure that no employee uses illegal drugs or consumes alcohol during work hours. Ensure there are no employees under the influence of drugs or alcohol during work hours. After accidents, collect blood, urine, or saliva specimens and test the injured and involved employees for the influence of drugs and alcohol. A copy of the test shall be made available to the Contracting Officer upon request.

1.7 SITE QUALIFICATIONS, DUTIES AND MEETINGS

1.7.1 Personnel Qualifications

Work performed under this contract shall meet Level 2.

1.7.1.1 Site Safety and Health Officer (SSHO)

Site Safety and Health Officer (SSHO) shall be provided at the work site at all times to perform safety and occupational health management, surveillance, inspections, and safety enforcement for the Contractor. The SSHO shall meet the following requirements:

Level 1:

Worked on similar projects.
10-hour OSHA construction safety class or equivalent within last 3 years.
Competent person training as needed.

Level 2:

A minimum of 3 years safety work on similar project.
30-hour OSHA construction safety class or equivalent within last 3 years.
Competent person training as needed.

Level 3:

A minimum of 5 years safety work on similar projects.
30-hour OSHA construction safety class or equivalent within the last 5 years.
An average of at least 24 hours of formal safety training each year for the past 5 years.
Competent person training as needed.

Level 4:

A minimum of 10 years safety work of a progressive nature with at least 5 years of experience on similar projects.
30-hour OSHA construction safety class or equivalent within the last 5 years.
An average of at least 24 hours of formal safety training each year for the past 5 years with training for competent person status for at least the following areas of competency: Excavation; Scaffolding; Fall protection; Hazardous energy; Confined space; Health hazard recognition, evaluation and control of chemical, physical and biological agents; Personal protective equipment and clothing to include selection, use and maintenance.

Level 5:

An Associate Safety Professional (ASP), Certified Safety Trained

Supervisor (STS) and/or Construction Health & Safety Technician (CHST).

A minimum of 10 years safety work of a progressive nature with at least 5 years of experience on similar projects.

30-hour OSHA construction safety class or equivalent within the last 5 years.

An average of at least 24 hours of formal safety training each year for the past 5 years with training for competent person status for at least the following areas of competency: Excavation; Scaffolding; Fall protection; Hazardous energy; Confined space; Health hazard recognition, evaluation and control of chemical, physical and biological agents; Personal protective equipment and clothing to include selection, use and maintenance.

Level 6: A

Certified Safety Professional (CSP) and/or Certified Industrial Hygienist (CIH).

A minimum of 10 years safety work of a progressive nature with at least 5 years of experience on similar projects.

30-hour OSHA construction safety class or equivalent within the last 5 years.

An average of at least 24 hours of formal safety training each year for the past 5 years with training for competent person status for at least the following areas of competency: Excavation; Scaffolding; Fall protection; Hazardous energy; Confined space; Health hazard recognition, evaluation and control of chemical, physical and biological agents; Personal protective equipment and clothing to include selection, use and maintenance.

1.7.1.2 Certified Safety Professional (CSP) and/or Certified Industrial hygienist (CIH)

Provide a Certified Safety Professional (CSP) and/or Certified Industrial Hygienist (CIH) at the work site to perform safety and occupational health management, surveillance, inspections, and safety enforcement for the Contractor. The CSP and/or CIH shall be the safety and occupational health "competent person" as defined by USACE EM 385-1-1. The CSP and/or CIH shall have no other duties than safety and occupational health management, inspections, and/or industrial hygiene.

1.7.1.3 Associate Safety professional (ASP), Certified Safety Trained Supervisor (STS) and/or Construction Health and Safety Technician (CHST).

Provide an Associate Safety Professional (ASP); Certified Safety Trained Supervisor (STS); and/or Construction Health & Safety Technician (CHST) at the work site to perform safety management, surveillance, inspections, and safety enforcement for the Contractor to meet the designated safety level in paragraph 1.6.1. The ASP, STS, and/or CHST shall be the safety and occupational health "competent person" as defined by USACE EM 385-1-1. The ASP, STS, and/or CHST shall be at the work site at all times whenever work or testing is being performed and shall conduct and document daily safety inspections. The ASP, STS, and/or CHST shall have no other duties other than safety and occupational health management, inspections, and enforcement on this contract.

1.7.1.4 Competent Person for Confined Space Entry

Provide a competent person meeting the requirements of EM 385-1-1 who is assigned in writing by the Designated Authority to assess confined spaces

and who possesses demonstrated knowledge, skill and ability to:

- a. Identify the structure, location, and designation of confined and permit-required confined spaces where work is done;
- b. Calibrate and use testing equipment including but not limited to, oxygen indicators, combustible gas indicators, carbon monoxide indicators, and carbon dioxide indicators, and to interpret accurately the test results of that equipment;
- c. Perform all required tests and inspections specified in 29 CFR 1910.146 and 29 CFR 1915 Subpart B;
- d. Assess hazardous conditions including atmospheric hazards in confined space and adjacent spaces and specify the necessary protection and precautions to be taken;
- e. Determine ventilation requirements for confined space entries and operations;
- f. Assess hazards associated with hot work in confined and adjacent space and determine fire watch requirements; and,
- g. Maintain records required.

When the work involves marine operations that handle combustible or hazardous materials, this qualified person shall be a NFPA certified marine chemist.

1.7.1.5 Competent Person for the Health Hazard Control and Respiratory Protection Program

Provide a competent person meeting the requirements of EM 385-1-1 who is:

- a. Capable by education, specialized training and/or experience of anticipating, recognizing, and evaluating employee exposure to hazardous chemical, physical and biological agents in accordance with USACE EM 385-1-1, Section 6.
- b. Capable of specifying necessary controls and protective actions to ensure worker health.

1.7.1.6 Crane Operators

Crane operators shall meet the requirements in USACE EM 385-1-1, Section 16 and Appendix G. In addition, for mobile cranes with Original Equipment Manufacturer (OEM) rated capacities of 50,000 pounds or greater, crane operators shall be designated as qualified by a source that qualifies crane operators (i.e., union, a government agency, or an organization that tests and qualifies crane operators). Proof of current qualifications shall be provided.

1.7.2 Personnel Duties

1.7.2.1 Site Safety and Health Officer (SSHO)/Superintendent

- a. Conduct daily safety and health inspections and maintain a written log which includes area/operation inspected, date of inspection, identified hazards, recommended corrective actions, estimated and

actual dates of corrections. Safety inspection logs shall be attached to the Contractors' daily report.

- b. Conduct mishap investigations and complete required reports. Maintain the OSHA Form 300 and Daily Production reports for prime and sub-contractors.
- c. Maintain applicable safety reference material on the job site.
- d. Attend the pre-construction conference, pre-work meetings including preparatory inspection meeting, and periodic in-progress meetings.
- e. Implement and enforce accepted APPS and AHAs.
- f. Maintain a safety and health deficiency tracking system that monitors outstanding deficiencies until resolution. A list of unresolved safety and health deficiencies shall be posted on the safety bulletin board.
- g. Ensure sub-contractor compliance with safety and health requirements.
- h. Ensure an approved "Special Permission Energized Electrical Work Permit" prior to starting any activity on energized electrical systems.

Failure to perform the above duties will result in dismissal of the superintendent and/or SSHO, and a project work stoppage. The project work stoppage will remain in effect pending approval of a suitable replacement.

1.7.2.2 Certified Safety Professional (CSP), Certified Industrial Hygienist (CIH), Associate Safety Professional (ASP), Certified Safety Trained Supervisor (STS), and/or Certified Construction Health & Safety Technician (CHST)

- a. Perform safety and occupational health management, surveillance, inspections, and safety enforcement for the project.
- b. Perform as the safety and occupational health "competent person" as defined by USACE EM 385-1-1.
- c. Be on site whenever work or testing is being performed.
- d. Conduct and document safety inspections.
- e. Shall have no other duties other than safety and occupational health management, inspections, and enforcement on this contract.

If the CSP, CIH, ASP, STS, CHST is appointed as the SSHO all duties of that position shall also be performed.

1.7.3 Meetings

1.7.3.1 Preconstruction Conference

- a. The Contractor will be informed, in writing, of the date of the preconstruction conference. The purpose of the preconstruction conference is for the Contractor and the Contracting Officer's representatives to become acquainted and explain the functions and operating procedures of their respective organizations and to reach

mutual understanding relative to the administration of the overall project's Accident Prevention Plan (APP) before the initiation of work.

b. Contractor representatives who have a responsibility or significant role in accident prevention on the project shall attend the preconstruction conference. This includes the project superintendent, site safety and health officer, quality control supervisor, or any other assigned safety and health professionals who participated in the development of the APP (including the Activity Hazard Analyses (AHAs) and special plans, program and procedures associated with it).

c. The Contractor shall discuss the details of the submitted APP to include incorporated plans, programs, procedures and a listing of anticipated AHAs that will be developed and implemented during the performance of the contract. This list of proposed AHAs will be reviewed at the conference and an agreement will be reached between the Contractor and the Contracting Officer's representative as to which phases will require an analysis. In addition, a schedule for the preparation, submittal, review, and acceptance of AHAs shall be established to preclude project delays.

d. Deficiencies in the submitted APP will be brought to the attention of the Contractor at the preconstruction conference, and the Contractor shall revise the plan to correct deficiencies and re-submit it for acceptance. Work shall not begin until there is an accepted APP.

e. The functions of a Preconstruction conference may take place at the Post-Awqrd Kickoff meeting for Design Build Contracts.

1.7.3.2 Weekly Safety Meetings

Conduct weekly safety meetings at the project site for all employees. The Contracting Officer will be informed of the meeting in advance and be allowed attendance. Minutes showing contract title, signatures of attendees and a list of topics discussed shall be attached to the Contractors' daily report.

1.7.3.3 Work Phase Meetings

The appropriate AHA shall be reviewed and attendance documented by the Contractor at the preparatory, initial, and follow-up phases of quality control inspection. The analysis should be used during daily inspections to ensure the implementation and effectiveness of safety and health controls.

1.8 TRAINING

1.8.1 New Employee Indoctrination

New employees (prime and sub-contractor) will be informed of specific site hazards before they begin work. Documentation of this orientation shall be kept on file at the project site.

1.8.2 Periodic Training

Provide Safety and Health Training in accordance with USACE EM 385-1-1 and the accepted APP. Ensure all required training has been accomplished for all onsite employees.

1.8.3 Training on Activity Hazard Analysis (AHA)

Prior to beginning a new phase, training will be provided to all affected employees to include a review of the AHA to be implemented.

1.9 ACCIDENT PREVENTION PLAN (APP)

The Contractor shall use a qualified person to prepare the written site-specific APP. Prepare the APP in accordance with the format and requirements of USACE EM 385-1-1 and as supplemented herein. Cover all paragraph and subparagraph elements in USACE EM 385-1-1, Appendix A, "Minimum Basic Outline for Preparation of Accident Prevention Plan". Where a paragraph or subparagraph element is not applicable to the work to be performed indicate "Not Applicable" next to the heading. Specific requirements for some of the APP elements are described below at paragraph 1.8.1. The APP shall be job-specific and shall address any unusual or unique aspects of the project or activity for which it is written. The APP shall interface with the Contractor's overall safety and health program. Any portions of the Contractor's overall safety and health program referenced in the APP shall be included in the applicable APP element and made site-specific. The Government considers the Prime Contractor to be the "controlling authority" for all work site safety and health of the subcontractors. Contractors are responsible for informing their subcontractors of the safety provisions under the terms of the contract and the penalties for noncompliance, coordinating the work to prevent one craft from interfering with or creating hazardous working conditions for other crafts, and inspecting subcontractor operations to ensure that accident prevention responsibilities are being carried out. The APP shall be signed by the person and firm (senior person) preparing the APP, the Contractor, the on-site superintendent, the designated site safety and health officer and any designated CSP and/or CIH.

Submit the APP to the Contracting Officer 15 calendar days prior to the date of the preconstruction conference for acceptance. Work cannot proceed without an accepted APP. The Contracting Officer reviews and comments on the Contractor's submitted APP and accepts it when it meets the requirements of the contract provisions.

Once accepted by the Contracting Officer, the APP and attachments will be enforced as part of the contract. Disregarding the provisions of this contract or the accepted APP will be cause for stopping of work, at the discretion of the Contracting Officer, until the matter has been rectified.

Once work begins, changes to the accepted APP shall be made with the knowledge and concurrence of the Contracting Officer, project superintendent, SSSH and quality control manager. Should any unforeseen hazard become evident during the performance of work, the project superintendent shall inform the Contracting Officer, both verbally and in writing, for resolution as soon as possible. In the interim, all necessary action shall be taken by the Contractor to restore and maintain safe working conditions in order to safeguard onsite personnel, visitors, the public, and the environment.

Copies of the accepted plan will be maintained at the resident engineer's office and at the job site. The APP shall be continuously reviewed and amended, as necessary, throughout the life of the contract. Unusual or high-hazard activities not identified in the original APP shall be incorporated in the plan as they are discovered.

1.9.1 EM 385-1-1 Contents

In addition to the requirements outlines in Appendix A of USACE EM 385-1-1, the following is required:

- a. Names and qualifications (resumes including education, training, experience and certifications) of all site safety and health personnel designated to perform work on this project to include the designated site safety and health officer and other competent and qualified personnel to be used such as CSPs, CIHs, STSs, CHSTs. The duties of each position shall be specified.
- b. Qualifications of competent and of qualified persons. As a minimum, competent persons shall be designated and qualifications submitted for each of the following major areas: excavation; scaffolding; fall protection; hazardous energy; confined space; health hazard recognition, evaluation and control of chemical, physical and biological agents; personal protective equipment and clothing to include selection, use and maintenance.
- c. Confined Space Entry Plan. Develop a confined space entry plan in accordance with USACE EM 385-1-1, applicable OSHA standards 29 CFR 1910, 29 CFR 1915, and 29 CFR 1926, and any other federal, state and local regulatory requirements identified in this contract. Identify the qualified person's name and qualifications, training, and experience. Delineate the qualified person's authority to direct work stoppage in the event of hazardous conditions. Include procedure for rescue by contractor personnel and the coordination with emergency responders. (If there is no confined space work, include a statement that no confined space work exists and none will be created.)
- d. Health Hazard Control Program. The Contractor shall designate a competent and qualified person to establish and oversee a Health Hazard Control Program in accordance with USACE EM 385-1-1, Section 6. The program shall ensure that employees, on-site Government representatives, and others, are not adversely exposed to chemical, physical and biological agents and that necessary controls and protective actions are instituted to ensure health.
- e. Crane Critical Lift Plan. Prepare and sign weight handling critical lift plans for lifts over 75 percent of capacity of the crane or hoist (or lifts over 50 percent of the capacity of a barge mounted mobile crane's hoists) at any radius of lift; lifts involving more than one crane or hoist; lifts of personnel; and lifts involving more than rigging or operation, sensitive equipment, or unusual safety risks. The plan shall be submitted 15 calendar days prior to on-site work and include the requirements of USACE EM 385-1-1, paragraph 16.c.18. and the following:
 - (1) For lifts of personnel, the plan shall demonstrate compliance with the requirements of 29 CFR 1926.500(g).
 - (2) For barge mounted mobile cranes, barge stability calculations identifying barge list and trim based on anticipated loading; and load charts based on calculated list and trim. The amount of list and trim shall be within the crane manufacturer's requirements.
- f. Alcohol and Drug Abuse Plan

(1) Describe plan for random checks and testing with pre-employment screening in accordance with the DFAR Clause subpart 252.223-7004, "Drug Free Work Force."

(2) Description of the on-site prevention program

g. Fall Protection and Prevention (FP&P) Plan. The plan shall be site specific and address all fall hazards in the work place and during different phases of construction. It shall address how to protect and prevent workers from falling to lower levels when they are exposed to fall hazards above 1.8 m (6 feet). A qualified person for fall protection shall prepare and sign the plan. The plan shall include fall protection and prevention systems, equipment and methods employed for every phase of work, responsibilities, assisted rescue self-rescue and evacuation procedures, training requirements, and monitoring methods. Fall Protection and Prevention Plan shall be revised every six months for lengthy projects, reflecting any changes during the course of construction due to changes in personnel, equipment, systems or work habits. The accepted Fall Protection and Prevention Plan shall be kept and maintained at the job site for the duration of the project. The Fall Protection Plan shall be included in the Accident Prevention Plan (APP)

h. Training Records and Requirements. List of mandatory training and certifications which are applicable to this project (e.g. explosive actuated tools, confined space entry, fall protection, crane operation, vehicle operator, forklift operators, personal protective equipment); list of requirements for periodic retraining/certification; outline requirements for supervisory and employee safety meetings.

i. Occupant Protection Plan. The safety and health aspects of lead-based paint removal, prepared in accordance with Section 02 83 19.00 10 Lead Based Paint Hazard Abatement, Target Housing & Child Occupied Facilities, 02 82 33.13 20 Removal/Control and Disposal of Lead Containig Paint.

j. Lead Compliance Plan. The safety and health aspects of lead work, prepared in accordance with Section 02 83 13.00 20 Lead in Construction.

k. Asbestos Hazard Abatement Plan. The safety and health aspects of asbestos work, prepared in accordance with Section 02 2 16.00, "Engineering Control of Asbestos Containing Materials"

l. Site Safety and Health Plan. The safety and health aspects prepared in accordance with Section 01 35 30 Safety Health and Emergency Response (HTRW/UST).

m. PCB Plan. The safety and health aspects of Polychlorinated Biphenyls work, prepared in accordance with Sections 02 84 33, "Removal and Disposal of Polychlorinated Biphenyls (PCBs) and 02 61 23, "Removal and Disposal of PCB Contaminated Soils)".

n. Site Demolition Plan. The safety and health aspects prepared in accordance with Section 02 41 00.00 40, Demolition" and referenced sources. Include engineering survey as applicable.

o. Excavation Plan. The safety and health aspects prepared in accordance with Section 3100, Earthwork.

p. **Crane Work Plan.** The contractor shall provide a crane work plan to the Contracting Officer for acceptance. The crane work plan shall include the specific model of each crane and a drawing identifying their locations (exact), the dimensions, wheel sizes, number of wheels, wheel spacing, tire pressure(s), number of axles, axle spacing, minimum wheel load to be exerted during operations and maximum outrigger load to be exerted during operations. The Contractor shall allow at least 10 working days for acceptance/non-acceptance of the crane work plan. No crane operations shall begin prior to written acceptance of the crane plan by the Government. ROICC shall be the government approving authority.

1.10 **ACTIVITY HAZARD ANALYSIS (AHA)**

The Activity Hazard Analysis (AHA) format shall be in accordance with USACE EM 385-1-1. Submit the AHA for review at least 15 calendar days prior to the start of each phase. Format subsequent AHA as amendments to the APP. An AHA will be developed by the Contractor for every operation involving a type of work presenting hazards not experienced in previous project operations or where a new work crew or subcontractor is to perform work. The analysis must identify and evaluate hazards and outline the proposed methods and techniques for the safe completion of each phase of work. At a minimum, define activity being performed, sequence of work, specific safety and health hazards anticipated, control measures (to include personal protective equipment) to eliminate or reduce each hazard to acceptable levels, equipment to be used, inspection requirements, training requirements for all involved, and the competent person in charge of that phase of work. For work with fall hazards, including fall hazards associated with scaffold erection and removal, identify the appropriate fall protection methods used. For work with materials handling equipment, address safeguarding measures related to materials handling equipment. For work requiring excavations, include requirements for safeguarding excavations. An activity requiring an AHA shall not proceed until the AHA has been accepted by the Contracting Officer's representative and a meeting has been conducted by the Contractor to discuss its contents with everyone engaged in the activity, including on-site Government representatives. The Contractor shall document meeting attendance at the preparatory, initial, and follow-up phases of quality control inspection. The AHA shall be continuously reviewed and, when appropriate, modified to address changing site conditions or operations. The analysis should be used during daily inspections to ensure the implementation and effectiveness of the activity's safety and health controls.

The AHA list will be reviewed periodically (at least monthly) at the Contractor supervisory safety meeting and updated as necessary when procedures, scheduling, or hazards change.

Activity hazard analyses shall be updated as necessary to provide an effective response to changing work conditions and activities. The on-site superintendent, site safety and health officer and competent persons used to develop the AHAs, including updates, shall sign and date the AHAs before they are implemented.

The activity hazard analyses shall be developed using the project schedule as the basis for the activities performed. Any activities listed on the project schedule will require an AHA. The AHAs will be developed by the contractor, supplier or subcontractor and provided to the prime contractor for submittal to the Contracting Officer.

1.11 DISPLAY OF SAFETY INFORMATION

Within 1 calendar days after commencement of work, erect a safety bulletin board at the job site. The following information shall be displayed on the safety bulletin board in clear view of the on-site construction personnel, maintained current, and protected against the elements and unauthorized removal:

- a. Map denoting the route to the nearest emergency care facility.
- b. Emergency phone numbers.
- c. Copy of the most up-to-date APP.
- d. Current AHA(s).
- e. OSHA 300A Form.
- f. OSHA Safety and Health Protection-On-The-Job Poster.
- g. [Confined space entry permit](#).
- h. Hot work permit.
- i. A sign indicating the number of hours worked since last lost workday accident.
- j. Safety and Health Warning Posters.

1.12 SITE SAFETY REFERENCE MATERIALS

Maintain safety-related references applicable to the project, including those listed in the article "References." Maintain applicable equipment manufacturer's manuals.

1.13 EMERGENCY MEDICAL TREATMENT

Contractors will arrange for their own emergency medical treatment. Government has no responsibility to provide emergency medical treatment.

1.14 [REPORTS](#)

1.14.1 [Accident Reports](#)

- a. For recordable injuries and illnesses, and property damage accidents resulting in at least \$2,000 in damages, the Prime Contractor shall conduct an accident investigation to establish the root cause(s) of the accident, complete the Navy Contractor Significant Incident Report (CSIR) form or USACE Accident Report Form 3394 and provide the report to the Contracting Officer within 1 calendar day(s) of the accident. The Contracting Officer will provide copies of any required or special forms.
- b. For a weight handling equipment accident (including rigging gear accidents) the Prime Contractor shall conduct an accident investigation to establish the root cause(s) of the accident, complete the WHE Accident Report (Crane and Rigging Gear) form and provide the report to the Contracting Officer within 30 calendar days of the accident. Crane operations shall not proceed until cause is determined and corrective

actions have been implemented to the satisfaction of the Contracting Officer. The Contracting Officer will provide a blank copy of the accident report form.

1.14.2 Accident Notification

Notify the Contracting Officer as soon as practical, but not later than four hours, after any accident meeting the definition of Recordable Injuries or Illnesses or High Visibility Accidents, property damage equal to or greater than \$2,000, or any weight handling equipment accident. Information shall include contractor name; contract title; type of contract; name of activity, installation or location where accident occurred; date and time of accident; names of personnel injured; extent of property damage, if any; extent of injury, if known, and brief description of accident (to include type of construction equipment used, PPE used, etc.). Preserve the conditions and evidence on the accident site until the Government investigation team arrives on site and Government investigation is conducted.

1.14.3 Monthly Exposure Reports

Monthly exposure reporting to the Contracting Officer is required to be attached to the monthly billing request. This report is a compilation of employee-hours worked each month for all site workers, both prime and subcontractor. The Contracting Officer will provide copies of any special forms.

1.14.4 Regulatory Citations and Violations

Contact the Contracting Officer immediately of any OSHA or other regulatory agency inspection or visit, and provide the Contracting Officer with a copy of each citation, report, and contractor response. Correct violations and citations promptly and provide written corrective actions to the Contracting Officer.

1.14.5 Crane Reports

Submit crane inspection reports required in accordance with USACE EM 385-1-1, Appendix H and as specified herein with Daily Reports of Inspections.

1.14.6 Certificate of Compliance

The Contractor shall provide a Certificate of Compliance for each crane entering an activity under this contract (see Contracting Officer for a blank certificate). Certificate shall state that the crane and rigging gear meet applicable OSHA regulations (with the Contractor citing which OSHA regulations are applicable, e.g., cranes used in construction, demolition, or maintenance shall comply with 29 CFR 1926 and USACE EM 385-1-1 section 16 and Appendix H. Certify on the Certificate of Compliance that the crane operator(s) is qualified and trained in the operation of the crane to be used. For cranes at DOD activities in foreign countries, the Contractor shall certify that the crane and rigging gear conform to the appropriate host country safety standards. The Contractor shall also certify that all of its crane operators working on the DOD activity have been trained in the proper use of all safety devices (e.g., anti-two block devices). These certifications shall be posted on the crane.

1.14.7 Third Party Certification of Barge-Mounted Mobile Cranes

Barge-mounted mobile cranes shall be certified in accordance with 29 CFR 1919 by an OSHA accredited person.

1.15 HOT WORK

Prior to performing "Hot Work" (welding, cutting, etc.) or operating other flame-producing/spark producing devices, a written permit shall be requested from the Fire Division. CONTRACTORS ARE REQUIRED TO MEET ALL CRITERIA BEFORE A PERMIT IS ISSUED. The Contractor will provide at least two (2) twenty (20) pound 4A:20 BC rated extinguishers for normal "Hot Work". All extinguishers shall be current inspection tagged, approved safety pin and tamper resistant seal. It is also mandatory to have a designated FIRE WATCH for any "Hot Work" done at this activity. The Fire Watch shall be trained in accordance with NFPA 51B and remain on-site for a minimum of 30 minutes after completion of the task or as specified on the hot work permit.

a. Oil painting materials (paint, brushes, empty paint cans, etc.), and all flammable liquids shall be removed from the facility at quitting time. All painting materials and flammable liquids shall be stored outside in a suitable metal locker or box and will require re-submittal with non-hazardous materials.

b. Accumulation of trays, paper, shavings, sawdust, boxes and other packing materials shall be removed from the facility at the close of each workday and such material disposed of in the proper containers located away from the facility.

c. The storage of combustible supplies shall be a safe distance from structures.

d. Area outside the facility undergoing work shall be cleaned of trash, paper, or other discarded combustibles at the close of each workday.

e. All portable electric devices (saws, sanders, compressors, extension chord, lights, etc.) shall be disconnected at the close of each workday. When possible, the main electric switch in the facility shall be deactivated.

f. When starting work in the facility, Contractors shall require their personnel to familiarize themselves with the location of the nearest fire alarm boxes and place in memory the emergency phone number 911. ANY FIRE, NO MATTER HOW SMALL, SHALL BE REPORTED IMMEDIATELY.

g. Obtain services from the FIRE DIVISION for "HOT WORK" within or around flammable materials (such as fuel systems, welding/cutting on fuel pipes) or confined spaces (such as sewer wet wells, manholes, vaults, etc.) that have the potential for flammable or explosive atmospheres.

PART 2 PRODUCTS

2.1 CONFINED SPACE SIGNAGE

The Contractor shall provide permanent signs integral to or securely attached to access covers for all required confined spaces. Signs

wording: "DANGER--PERMIT-REQUIRED CONFINED SPACE - DO NOT ENTER -" in bold letters a minimum of 25 mm(one inch) in height and constructed to be clearly legible with all paint removed. The signal word "DANGER" shall be red and readable from 1.52 m(5 feet).

2.2 FALL PROTECTION ANCHORAGE

Fall protection anchorage, conforming to ANSI Z359.1, installed under the supervision of a qualified person in fall protection, shall be left in place for continued customer use and so identified by signage stating the capacity of the anchorage (strength and number of persons who may be tied-off to it at any one time).

PART 3 EXECUTION

3.1 CONSTRUCTION AND/OR OTHER WORK

The Contractor shall comply with USACE EM 385-1-1, NFPA 241, the APP, the AHA, Federal and/or State OSHA regulations, and other related submittals and activity fire and safety regulations. The most stringent standard shall prevail.

3.1.1 Hazardous Material Use

Each hazardous material must receive approval prior to being brought onto the job site or prior to any other use in connection with this contract. Allow a minimum of 10 working days for processing of the request for use of a hazardous material. Any work or storage involving hazardous chemicals or materials must be done in a manner that will not expose Government or Contractor employees to any unsafe or unhealthful conditions. Adequate protective measures must be taken to prevent Government or Contractor employees from being exposed to any hazardous condition that could result from the work or storage. The Prime Contractor shall keep a complete inventory of hazardous materials brought onto the work-site. Approval by the Contracting Officer of protective measures and storage area is required prior to the start of the work.

3.1.2 Hazardous Material Exclusions

Notwithstanding any other hazardous material used in this contract, radioactive materials or instruments capable of producing ionizing/non-ionizing radiation (with the exception of radioactive material and devices used in accordance with USACE EM 385-1-1 such as nuclear density meters for compaction testing and laboratory equipment with radioactive sources) as well as materials which contain asbestos, mercury or polychlorinated biphenyls, di-isocyanates, lead-based paint are prohibited. The Contracting Officer, upon written request by the Contractor, may consider exceptions to the use of any of the above excluded materials.

3.1.3 Unforeseen Hazardous Material

The design should have identified materials such as PCB, lead paint, and friable and non-friable asbestos. If additional material, not indicated, that may be hazardous to human health upon disturbance during construction operations is encountered, stop that portion of work and notify the Contracting Officer immediately. Within 14 calendar days the Government will determine if the material is hazardous. If material is not hazardous or poses no danger, the Government will direct the Contractor to proceed

without change. If material is hazardous and handling of the material is necessary to accomplish the work, the Government will issue a modification pursuant to "FAR 52.243-4, Changes" and "FAR 52.236-2, Differing Site Conditions."

3.2 PRE-OUTAGE COORDINATION MEETING

Contractors are required to apply for utility outages at least 15 days in advance. As a minimum, the request should include the location of the outage, utilities being affected, duration of outage and any necessary sketches. Special requirements for electrical outage requests are contained elsewhere in this specification section. Once approved, and prior to beginning work on the utility system requiring shut down, the Contractor shall attend a pre-outage coordination meeting with the Contracting Officer to review the scope of work and the lock-out/tag-out procedures for worker protection. No work will be performed on energized electrical circuits unless proof is provided that no other means exist.

3.3 FALL HAZARD PROTECTION AND PREVENTION

The Contractor shall establish a fall protection and prevention program, for the protection of all employees exposed to fall hazards. The program shall include company policy, identify responsibilities, education and training requirements, fall hazard identification, prevention and control measures, inspection, storage, care and maintenance of fall protection equipment and rescue and escape procedures.

3.3.1 Training

The Contractor shall institute a fall protection training program. As part of the Fall Hazard Protection and Prevention Program, the Contractor shall provide training for each employee who might be exposed to fall hazards. A competent person for fall protection shall provide the training. Training requirements shall be in accordance with USACE EM 385-1-1, section 21.A.16.

3.3.2 Fall Protection Equipment

The Contractor shall enforce use of the fall protection equipment designated for each specific work activity in the Fall Protection and Prevention Plan and/or AHA at all times when an employee is on a surface 1.8 m (6 feet) or more above lower levels. Fall protection systems such as guardrails, personnel fall arrest system, safety nets, etc., are required when working within 1.8m (6 feet) of any leading edge. In addition to the required fall protection systems, safety skiff, personal floatation devices, life rings etc., are required when working above or next to water in accordance with USACE EM 385-1-1, paragraphs 05.I. and 05.J. Personal fall arrest systems are required when working from an articulating or extendible boom, swing stages, or suspended platform. In addition, personal fall arrest systems may be required when operating other equipment such as scissor lifts if the work platform is capable of being positioned outside the wheelbase. The need for tying-off in such equipment is to prevent ejection of the employee from the equipment during raising, lowering, or travel. Fall protection must comply with 29 CFR 1926.500, Subpart M and USACE EM 385-1-1.

3.3.2.1 Personal Fall Arrest Equipment

Personal fall arrest equipment, systems, subsystems, and components shall meet ANSI Z359.1. Only a full-body harness with a shock-absorbing lanyard

or self-retracting lanyard is an acceptable personal fall arrest device. Body belts may only be used as a positioning device system (for uses such as steel reinforcing assembly and in addition to an approved fall arrest system). Harnesses shall have a fall arrest attachment affixed to the body support (usually a Dorsal D-ring) and specifically designated for attachment to the rest of the system. Only locking snap hooks and carabiners shall be used. Webbing, straps, and ropes shall be made of synthetic fiber. The maximum free fall distance when using fall arrest equipment shall not exceed 1.8 m (6 feet). The total fall distance and any swinging of the worker (pendulum-like motion) that can occur during a fall shall always be taken into consideration when attaching a person to a fall arrest system.

3.3.3 Fall Protection for Roofing Work

Fall protection controls shall be implemented based on the type of roof being constructed and work being performed. The roof area to be accessed shall be evaluated for its structural integrity including weight-bearing capabilities for the projected loading.

a. Low Sloped Roofs:

(1) For work within 1.8 m (6 feet) of an edge, on low-slope roofs, personnel shall be protected from falling by use of personal fall arrest systems, guardrails, or safety nets. A safety monitoring system is not adequate fall protection and is not authorized.

(2) For work greater than 1.8 m (6 feet) from an edge, warning lines shall be erected and installed in accordance with 29 CFR 1926.500 and USACE EM 385-1-1.

b. Steep Roofs: Work on steep roofs requires a personal fall arrest system, guardrails with toe-boards, or safety nets. This requirement also includes residential or housing type construction.

3.3.4 Safety Nets

If safety nets are used as the selected fall protection system on the project, they shall be provided at unguarded workplaces, leading edge work or when working over water, machinery, dangerous operations and or other surfaces where the use of ladders, scaffolds, catch platforms, temporary floors, fall arrest systems or restraint/positioning systems are impractical. Safety nets shall be tested immediately after installation with a drop test of 181.4 kg (400 pounds) dropped from the same elevation a person might fall, and every six months thereafter.

3.3.5 Existing Anchorage

Existing anchorages, to be used for attachment of personal fall arrest equipment, shall be certified (or re-certified) by a qualified person for fall protection in accordance with ANSI Z359.1. Existing horizontal lifeline anchorages shall be certified (or re-certified) by a registered professional engineer with experience in designing horizontal lifeline systems.

3.3.6 Horizontal Lifelines

Horizontal lifelines shall be designed, installed, certified and used under

the supervision of a qualified person for fall protection as part of a complete fall arrest system which maintains a safety factor of 2 (29 CFR 1926.500).

3.3.7 Guardrail Systems

Guardrails shall consist of top and mid-rails, post and toe boards. The top edge height of standard railing must be 42 inches plus or minus 3 inches above the walking/working level. When mid-rails are used, they must be installed at a height midway between the top edge of the guardrail system and the walking/working level. Posts shall be placed no more than 8 feet apart (29 CFR 1926.500 and USACE EM 385-1-1).

3.3.8 Rescue and Evacuation Procedures

When personal fall arrest systems are used, the contractor must ensure that the mishap victim can self-rescue or can be rescued promptly should a fall occur. A Rescue and Evacuation Plan shall be prepared by the contractor and include a detailed discussion of the following: methods of rescue; methods of self-rescue; equipment used; training requirement; specialized training for the rescuers; procedures for requesting rescue and medical assistance; and transportation routes to a medical facility. The Rescue and Evaluation Plan shall be included in the Activity Hazard Analysis (AHA) for the phase of work, in the Fall Protection and Prevention (FP&P) Plan, and the Accident Prevention Plan (APP).

3.4 PERSONAL PROTECTIVE EQUIPMENT

All personnel who enter a construction site area shall wear Personal Protective Equipment (PPE) at all times as outlined in the EM 385 1-1. In addition to the requirements of the EM 385 1-1, Safety Glasses (ANSI Z87.1) and High-Visibility Apparel (ANSI 107-2004 Performance Class II, Shirt or Vest) will be worn at all times on construction sites. Hearing protection is required in noise hazard areas or when performing noise hazard tasks. Mandatory PPE on all construction sites includes:

- a. Hard Hats
- b. Safety Glasses
- c. High-Visibility Shirt or Vest
- d. Safety-Toed Shoes or Boots

3.5 SCAFFOLDING

Employees shall be provided with a safe means of access to the work area on the scaffold. Climbing of any scaffold braces or supports not specifically designed for access is prohibited. Access to scaffold platforms greater than 6 m (20 feet) in height shall be accessed by use of a scaffold stair system. Vertical ladders commonly provided by scaffold system manufacturers shall not be used for accessing scaffold platforms greater than 6 m (20 feet) in height. The use of an adequate gate is required. Contractor shall ensure that employees are qualified to perform scaffold erection and dismantling. Do not use scaffold without the capability of supporting at least four times the maximum intended load or without appropriate fall protection as delineated in the accepted fall protection and prevention plan. Stationary scaffolds must be attached to structural building components to safeguard against tipping forward or backward.

Special care shall be given to ensure scaffold systems are not overloaded. Side brackets used to extend scaffold platforms on self-supported scaffold systems for the storage of material is prohibited. The first tie-in shall be at the height equal to 4 times the width of the smallest dimension of the scaffold base. Work platforms shall be placed on mud sills. Scaffold or work platform erectors shall have fall protection during the erection and dismantling of scaffolding or work platforms that are more than six feet. Delineate fall protection requirements when working above six feet or above dangerous operations in the Fall Protection and Prevention (FP&P) Plan and Activity Hazard Analysis (AHA) for the phase of work.

3.5.1 Stilts

The use of stilts for gaining additional height in construction, renovation, repair or maintenance work is prohibited.

3.6 EQUIPMENT

3.6.1 Material Handling Equipment

a. Material handling equipment such as forklifts shall not be modified with work platform attachments for supporting employees unless specifically delineated in the manufacturer's printed operating instructions.

b. The use of hooks on equipment for lifting of material must be in accordance with manufacturer's printed instructions.

c. Operators of forklifts or power industrial trucks shall be licensed in accordance with OSHA.

3.6.2 Weight Handling Equipment

a. Cranes must be equipped with:

(1) Load indicating devices (LIDs) and a boom angle or radius indicator,

(2) or load moment indicating devices (LMIs).

(3) Anti-two block prevention devices.

(4) Boom hoist hydraulic relief valve, disconnect, or shutoff (stops hoist when boom reaches a predetermined high angle).

(5) Boom length indicator (for telescoping booms).

(6) Device to prevent uncontrolled lowering of a telescoping hydraulic boom.

(7) Device to prevent uncontrolled retraction of a telescoping hydraulic boom.

b. The Contractor shall notify the Contracting Officer 15 days in advance of any cranes entering the activity so that necessary quality assurance spot checks can be coordinated. Contractor's operator shall remain with the crane during the spot check.

c. The Contractor shall comply with the crane manufacturer's

specifications and limitations for erection and operation of cranes and hoists used in support of the work. Erection shall be performed under the supervision of a designated person (as defined in ASME B30.5). All testing shall be performed in accordance with the manufacturer's recommended procedures.

d. The Contractor shall comply with ASME B30.5 for mobile and locomotive cranes, ASME B30.22 for articulating boom cranes, ASME B30.3 for construction tower cranes, and ASME B30.8 for floating cranes and floating derricks.

e. The presence of Government personnel does not relieve the Contractor of an obligation to comply with all applicable safety regulations. The Government will investigate all complaints of unsafe or unhealthful working conditions received in writing from contractor employees, federal civilian employees, or military personnel.

f. Each load shall be rigged/attached independently to the hook/master-link in such a fashion that the load cannot slide or otherwise become detached. Christmas-tree lifting (multiple rigged materials) is not allowed.

g. Under no circumstance shall a Contractor make a lift at or above 90% of the cranes rated capacity in any configuration.

h. When operating in the vicinity of overhead transmission lines, operators and riggers shall be alert to this special hazard and shall follow the requirements of USACE EM 385-1-1 section 11 and ASME B30.5 or ASME B30.22 as applicable.

i. Crane suspended personnel work platforms (baskets) shall not be used unless the Contractor proves that using any other access to the work location would provide a greater hazard to the workers or is impossible. Personnel shall not be lifted with a line hoist or friction crane.

j. A fire extinguisher having a minimum rating of 10BC and a minimum nominal capacity of 5lb of extinguishing agent shall be available at all operator stations or crane cabs. Portable fire extinguishers shall be inspected, maintained, and recharged as specified in NFPA 10, Standard for Portable Fire Extinguishers.

k. All employees shall be kept clear of loads about to be lifted and of suspended loads.

l. A weight handling equipment operator shall not leave his position at the controls while a load is suspended.

m. The Contractor shall use cribbing when performing lifts on outriggers.

n. The crane hook/block must be positioned directly over the load. Side loading of the crane is prohibited.

o. A physical barricade must be positioned to prevent personnel from entering the counterweight swing (tail swing) area of the crane.

p. A substantial and durable rating chart containing legible letters and figures shall be provided with each crane and securely mounted onto

the crane cab in a location allowing easy reading by the operator while seated in the control station.

q. Certification records which include the date of inspection, signature of the person performing the inspection, and the serial number or other identifier of the crane that was inspected shall always be available for review by Contracting Officer personnel.

r. Written reports listing the load test procedures used along with any repairs or alterations performed on the crane shall be available for review by Contracting Officer personnel.

s. The Contractor shall certify that all crane operators have been trained in proper use of all safety devices (e.g. anti-two block devices).

3.6.3 Equipment and Mechanized Equipment

a. Equipment shall be operated by designated qualified operators. Proof of qualifications shall be kept on the project site for review.

b. Manufacture specifications or owner's manual for the equipment shall be on site and reviewed for additional safety precautions or requirements that are sometimes not identified by OSHA or USACE [EM 385-1-1](#). Such additional safety precautions or requirements shall be incorporated into the AHAs.

c. Equipment and mechanized equipment shall be inspected in accordance with manufacturer's recommendations for safe operation by a competent person prior to being placed into use.

d. Daily checks or tests shall be conducted and documented on equipment and mechanized equipment by designated competent persons.

3.7 EXCAVATIONS

The competent person for excavations performed as a result of contract work shall be on-site when excavation work is being performed, and shall inspect, and document the excavations daily prior to entry by workers. The competent person must evaluate all hazards, including atmospheric, that may be associated with the work, and shall have the resources necessary to correct hazards promptly. The competent person shall perform soil classification in accordance with [29 CFR 1926](#).

3.7.1 Utility Locations

Prior to digging, the appropriate digging permit must be obtained. All underground utilities in the work area must be positively identified by a private utility locating service in addition to any station locating service and coordinated with the station utility department. Any markings made during the utility investigation must be maintained throughout the contract.

3.7.2 Utility Location Verification

The Contractor must physically verify underground utility locations by hand digging using wood or fiberglass handled tools when any adjacent construction work is expected to come within three feet of the underground system. Digging within .061 m (2 feet) of a known utility must not be

performed by means of mechanical equipment; hand digging shall be used. If construction is parallel to an existing utility the utility shall be exposed by hand digging every 30.5 m (100 feet) if parallel within 1.5 m (5 feet) of the excavation.

3.7.3 Utilities with Concrete Slabs

Utilities located within concrete slabs or pier decks, bridges, and the like are extremely difficult to identify. The location must be coordinated with station utility departments in addition to a private locating service. Outages on system utilities shall be used in circumstances where concrete chipping, saw cutting, or core drilling is required and utilities are unable to be completely identified.

3.7.4 Shoring Systems

Trench and shoring systems must be identified in the accepted safety plan and AHA. Manufacture tabulated data and specifications or registered engineer tabulated data for shoring or benching systems shall be readily available on site for review. Job-made shoring or shielding shall have the registered professional engineer stamp, specifications, and tabulated data. Extreme care must be used when excavating near direct burial electric underground cables.

3.7.5 Trenching Machinery

Trenching machines with digging chain drives shall be operated only when the spotters/laborers are in plain view of the operator. Operator and spotters/laborers shall be provided training on the hazards of the digging chain drives with emphasis on the distance that needs to be maintained when the digging chain is operating. Documentation of the training shall be kept on file at the project site.

3.8 ELECTRICAL

3.8.1 Conduct of Electrical Work

Underground electrical spaces must be certified safe for entry before entering to conduct work. Cables that will be cut must be positively identified and de-energized prior to performing each cut. Positive cable identification must be made prior to submitting any outage request for electrical systems. Arrangements are to be coordinated with the Contracting Officer and Station Utilities for identification. The Contracting Officer will not accept an outage request until the Contractor satisfactorily documents that the circuits have been clearly identified. Perform all high voltage cable cutting remotely using hydraulic cutting tool. When racking in or live switching of circuit breakers, no additional person other than the switch operator will be allowed in the space during the actual operation. Plan so that work near energized parts is minimized to the fullest extent possible. Use of electrical outages clear of any energized electrical sources is the preferred method. When working in energized substations, only qualified electrical workers shall be permitted to enter. When work requires Contractor to work near energized circuits as defined by the [NFPA 70](#), high voltage personnel must use personal protective equipment that includes, as a minimum, electrical hard hat, safety shoes, insulating gloves with leather protective sleeves, fire retarding shirts, coveralls, face shields, and safety glasses. In addition, provide electrical arc flash protection for personnel as required by [NFPA 70E](#). Insulating blankets, hearing protection, and switching suits may be

required, depending on the specific job and as delineated in the Contractor's AHA.

3.8.2 Arc Flash Risk/Hazard Analysis

Contractor shall provide an Arc Flash Risk/Hazard Analysis in accordance with NFPA 70E for all locations where workers may be exposed to arc flash hazard (work on energized electrical equipment). The Arc Flash Risk/Hazard Analysis shall be sealed and signed by a qualified professional engineer.

3.8.3 Arc Flash Risk/Hazard Analysis Qualifications

Contractor shall engage the services of a qualified organization to provide Arc Flash Risk/Hazard Analysis of the electrical distribution system. Organization shall be independent of the supplier, manufacturer, and installer of the equipment. The organization shall be a first tier subcontractor. This work shall not be performed by a second tier subcontractor.

- a. Submit name and qualifications of organization. Organization shall have been regularly engaged in providing Arc Flash Risk/Hazard Analysis for a minimum of 5 years.
- b. Submit name and qualifications of the professional engineer performing the analysis. Include a list of three comparable jobs performed by the engineer with specific names and telephone numbers for reference.

3.8.4 Special Permission Energized Electrical Work Permit

All work on energized electrical systems, including high voltage, must have an approved "Special Permission Energized Electrical Work Permit." The results of a Arc Flash Risk/Hazard Analysis, per NFPA 70E, shall be included in the "Special Permission Energized Electrical Work Permit" request. Flame-resistant (FR) clothing and personal protective equipment (PPE) shall be rated for a minimum of 8 calories per square centimeter even if the flash hazard analysis indicates a lower value. A blank copy of the permit request is attached. An editable version may be obtained from the Contracting Officer.

3.8.5 Portable Extension Cords

Portable extension cords shall be sized in accordance with manufacturer ratings for the tool to be powered and protected from damage. All damaged extension cords shall be immediately removed from service. Portable extension cords shall meet the requirements of NFPA 70.

3.9 WORK IN CONFINED SPACES

The Contractor shall comply with the requirements in Section 06.I of USACE EM 385-1-1 and OSHA 29 CFR 1910.146. Any potential for a hazard in the confined space requires a permit system to be used.

- a. Entry Procedures. Prohibit entry into a confined space by personnel for any purpose, including hot work, until the qualified person has conducted appropriate tests to ensure the confined or enclosed space is safe for the work intended and that all potential hazards are controlled or eliminated and documented. (See Section 06.I.05 of USACE EM 385-1-1 for entry procedures.) All hazards

pertaining to the space shall be reviewed with each employee during review of the AHA.

b. Forced air ventilation is required for all confined space entry operations and the minimum air exchange requirements must be maintained to ensure exposure to any hazardous atmosphere is kept below its' action level.

c. Ensure the use of rescue and retrieval devices in confined spaces greater than 1.5 m (5 feet) in depth. Conform to Sections 06.I.09, 06.I.10 and 06.I.11 of USACE EM 385-1-1.

d. Sewer wet wells require continuous atmosphere monitoring with audible alarm for toxic gas detection.

e. Include training information for employees who will be involved as entrants and attendants for the work. Conform to Section 06.I.06 of USACE EM 385-1-1.

f. Daily Entry Permit. Post the permit in a conspicuous place close to the confined space entrance.

3.10 CRYSTALLINE SILICA

Grinding, abrasive blasting, and foundry operations of construction materials containing crystalline silica, shall comply with OSHA regulations, such as 29 CFR 1910.94, and USACE EM 385-1-1, Appendix C. The Contractor shall develop and implement effective exposure control and elimination procedures to include dust control systems, engineering controls, and establishment of work area boundaries, as well as medical surveillance, training, air monitoring, and personal protective equipment.

3.11 HOUSEKEEPING

3.11.1 Clean-Up

All debris in work areas shall be cleaned up daily or more frequently if necessary. Construction debris may be temporarily located in an approved location, however garbage accumulation must be removed each day.

3.11.2 Falling Object Protection

All areas must be barricaded to safeguard employees. When working overhead, barricade the area below to prevent entry by unauthorized employees. Construction warning tape and signs shall be posted so they are clearly visible from all possible access points. When employees are working overhead all tools and equipment shall be secured so that they will not fall. When using guardrail as falling object protection, all openings shall be small enough to prevent passage of potential falling objects.

-- End of Section --

Special Permission Energized Electrical Work Permit

Permit Number: _____

Part I: Request for Special Permission

Job Order/Contract Number: _____

(1) Description of circuit/equipment: _____

(2) Job Location: _____

(3) Description of work to be done: _____

(4) Justification of why the circuit/equipment cannot be de-energized: _____

(5) Anticipated Duration of Work Requiring Special Permission: (hours/minutes) _____ On (date) _____

(6) Means Employed to Restrict Access of Unqualified Persons: _____

(7) Shock Hazard Analysis:

Voltage _____ Approach Boundaries: (distance) Limited _____ Restricted _____ Prohibited _____ Flash _____

(8) Flash Hazard Analysis: Calorie PPE required _____ (8 minimum)

Approach Boundaries to be crossed: (Check as applicable) Limited _____ Restricted _____ Prohibited _____ Flash Protection _____

(9) PPE to be used: (in addition to required daily wear)

Leather Gloves:	Yes _____ No _____
Voltage Rated Rubber Gloves with Leather Protectors	Yes _____ No _____
Safety Glasses	Yes _____ No _____
Arc Flash Face Shield rated 10-cal/cm sq or more	Yes _____ No _____
Arc Flash Hood rated 20 cal/cm sq or more	Yes _____ No _____
Safety Helmet	Yes _____ No _____
Balaclava (Head Sock)	Yes _____ No _____
Hearing Protection (single level)	Yes _____ No _____
Voltage Rated Tools	Yes _____ No _____
Hazard Risk Category 3 Clothing	Yes _____ No _____

(10) Source of Lighting: Outside Daylight _____ Inside Existing Artificial _____ Temporary Portable Lighting: (AC) _____ Battery _____

(11) Name of Employee(s) Assigned to Job and will receive job briefing before beginning work (sign in sheet required): _____

Requested By _____

Name Typed

Organization (BL / FEAD / PWO)

Phone #

Signature

Part II: Recommended Approval

Construction Safety Manager Concurrence: _____ Date: _____

Notification:

Operation Officer: _____ Date: _____

Executive Officer: _____ Date: _____

Approved by: _____ Date _____

Commanding Officer / Designee

SECTION 01 42 00

SOURCES FOR REFERENCE PUBLICATIONS

05/09

PART 1 GENERAL

1.1 REFERENCES

Various publications are referenced in other sections of the specifications to establish requirements for the work. These references are identified in each section by document number, date and title. The document number used in the citation is the number assigned by the standards producing organization, (e.g. ASTM B 564 Nickel Alloy Forgings). However, when the standards producing organization has not assigned a number to a document, an identifying number has been assigned for reference purposes.

1.2 ORDERING INFORMATION

The addresses of the standards publishing organizations whose documents are referenced in other sections of these specifications are listed below, and if the source of the publications is different from the address of the sponsoring organization, that information is also provided. Documents listed in the specifications with numbers which were not assigned by the standards producing organization should be ordered from the source by title rather than by number.

ACOUSTICAL SOCIETY OF AMERICA (ASA)
2 Huntington Quadrangle, Suite 1N01
Melville, NY 11747-4502
Ph: 516-576-2360
Fax: 516-576-2377
E-mail: asa@aip.org
Internet: <http://asa.aip.org>

ACI INTERNATIONAL (ACI)
38800 Country Club Drive
Farmington Hills, MI 48331
Ph: 248-848-3700
Fax: 248-848-3701
E-mail: bkstore@concrete.org
Internet: <http://www.concrete.org>

AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE (AHRI)
2111 Wilson blvd, Suite 500
Arlington, VA 22201
Ph: 703-524-8800
Fax: 703-528-3816
E-mail: ahri@ahrinet.org
Internet: <http://www.ahrinet.org>

AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL (AMCA)
30 West University Drive
Arlington Heights, IL 60004-1893
Ph: 847-394-0150
Fax: 847-253-0088

E-mail: amca@amca.org
Internet: <http://www.amca.org>

ALUMINUM ASSOCIATION (AA)
National Headquarters
1525 Wilson Boulevard, Suite 600
Arlington, VA 22209
Ph: 703-358-2960
Fax: 703-358-2961
Internet: <http://www.aluminum.org>

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)
1827 Walden Office Square
Suite 550
Schaumburg, IL 60173-4268
Ph: 847-303-5664
Fax: 847-303-5774
E-mail: webmaster@aamanet.org
Internet: <http://www.aamanet.org>

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)
444 North Capital Street, NW, Suite 249
Washington, DC 20001
Ph: 202-624-5800
Fax: 202-624-5806
E-Mail: info@ashto.org
Internet: <http://www.aashto.org>

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS (AATCC)
1 Davis Drive
P.O. Box 12215
Research Triangle Park, NC 27709-2215
Ph: 919-549-8141
Fax: 919-549-8933
E-mail: quantem@aatcc.org
Technical Questions: hammona@aatc.org
Internet: <http://www.aatcc.org>

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)
1330 Kemper Meadow Drive
Cincinnati, OH 45240
Ph: 513-742-2020
Fax: 513-742-3355
E-mail: mail@acgih.org
Internet: <http://www.acgih.org>

AMERICAN FOREST & PAPER ASSOCIATION (AF&PA)
American Wood Council
ATTN: Publications Department
1111 Nineteenth Street NW, Suite 800
Washington, DC 20036
Ph: 800-890-7732 or 202-463-2766
Fax: 202-463-2791
Internet: <http://www.awc.org/>

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)
One East Wacker Drive
Chicago, IL 60601-1802

Ph: 312-670-2400
Fax: 312-670-5403
Publications: 800-644-2400
E-mail: pubs@aisc.org
Internet: <http://www.aisc.org>

AMERICAN INSTITUTE OF TIMBER CONSTRUCTION (AITC)
7012 South Revere Parkway, Suite 140
Englewood, CO 80112
Ph: 303-792-9559
Fax: 303-792-0669
E-mail: info@aitc-glulam.org
Internet: <http://www.aitc-glulam.org>

AMERICAN IRON AND STEEL INSTITUTE (AISI)
1140 Connecticut Avenue, NW, Suite 705
Washington, DC 20036
Ph: 202-452-7100
Fax: 202-463-6573
Internet: <http://www.steel.org>

AMERICAN LUMBER STANDARDS COMMITTEE (ALSC)
P.O. Box 210
Germantown, MD 20875-0210
Ph: 301-972-1700
Fax: 301-540-8004
E-mail: alsc@alsc.org
Internet: <http://www.alsc.org>

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
1819 L Street, NW, 6th Floor
Washington, DC 20036
Ph: 202-293-8020
Fax: 202-293-9287
E-mail: info@ansi.org
Internet: <http://www.ansi.org/>

ARCHITECTURAL & TRANSPORTATION BARRIERS COMPLIANCE BOARD (ATBCB)
The Access Board
1331 F Street, NW, Suite 1000
Washington, DC 20004-1111
PH: 202-272-5434
FAX: 202-272-5447
Internet: <http://www.access-board.gov>
AOK 6/01
LOK 0/00

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING
ENGINEERS (ASHRAE)
1791 Tullie Circle, NE
Atlanta, GA 30329
Ph: 800-527-4723 or 404-636-8400
Fax: 404-321-5478
E-mail: ashrae@ashrae.org
Internet: <http://www.ashrae.org>

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)
1800 East Oakton Street
Des Plaines, IL 60018-2187

Ph: 847-699-2929
Fax: 847-768-3434
E-mail: customerservice@asse.org
Internet: <http://www.asse.org>

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)
901 Canterbury, Suite A
Westlake, OH 44145
Ph: 440-835-3040
Fax: 440-835-3488
E-mail: info@asse-plumbing.org
Internet: <http://www.asse-plumbing.org>

AMERICAN WATER WORKS ASSOCIATION (AWWA)
6666 West Quincy Avenue
Denver, CO 80235
Ph: 800-926-7337
Fax: 303-347-0804
Internet: <http://www.awwa.org>

AMERICAN WELDING SOCIETY (AWS)
550 N.W. LeJeune Road
Miami, FL 33126
Ph: 800-443-9353 - 305-443-9353
Fax: 305-443-7559
E-mail: info@aws.org
Internet: <http://www.aws.org>

AMERICAN WOOD PROTECTION ASSOCIATION (AWPA)
P.O. Box 361784
Birmingham, AL 35236-1784
Ph: 205-733-4077
Fax: 205-733-4075
E-mail: email@awpa.com
Internet: <http://www.awpa.com>

APA - THE ENGINEERED WOOD ASSOCIATION (APA)
7011 South 19th
Tacoma, WA 98466
Ph: 253-565-6600
Fax: 253-565-7265
E-mail: help@apawood.org
Internet: <http://www.apawood.org>

ARCHITECTURAL WOODWORK INSTITUTE (AWI)
146179 Westlake Drive, Suite 120
Potomac Falls, VA 20165
Ph: 571-323-3636
Fax: 571-323-3630
Internet: <http://www.awinet.org>

ASME INTERNATIONAL (ASME)
Three Park Avenue, M/S 10E
New York, NY 10016
Ph: 212-591-7722 or 800-843-2763
Fax: 212-591-7674
E-mail: infocentral@asme.org
Internet: <http://www.asme.org>

ASSOCIATED AIR BALANCE COUNCIL (AABC)
1518 K Street, NW
Washington, DC 20005
Ph: 202-737-0202
Fax: 202-638-4833
E-mail: info@aabc.com
Internet: <http://www.aabchg.com>

ASTM INTERNATIONAL (ASTM)
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken, PA 19428-2959
Ph: 610-832-9500
Fax: 610-832-9555
E-mail: service@astm.org
Internet: <http://www.astm.org>

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)
355 Lexington Avenue
17th Floor
New York, NY 10017
Ph: 212-297-2122
Fax: 212-370-9047
E-mail: assocmgmt@aol.com
Internet: <http://www.buildershardware.com>

CSA AMERICA INC (CSA/AM)
8501 East Pleasant Valley Road
Cleveland, OH 44131-5575
Ph: 216-524-4990
Fax: 216-520-8979
E-mail: cathy.rake@csa-america.org
Internet: <http://www.csa-america.org>

CARPET AND RUG INSTITUTE (CRI)
P.O. Box 2048
Dalton, GA 30722-2048
Ph: 800-882-8846 or 706-278-3176
Fax: 706-278-8835
Internet: <http://www.carpet-rug.com>

CAST IRON SOIL PIPE INSTITUTE (CISPI)
5959 Shallowford Road, Suite 419
Chattanooga, TN 37421
Ph: 423-892-0137
Fax: 423-892-0817
Internet: <http://www.cispi.org>

COPPER DEVELOPMENT ASSOCIATION (CDA)
260 Madison Avenue
New York, NY 10016
Ph: 212-251-7200
Fax: 212-251-7234
E-mail: questions@cda.copper.org
Internet: <http://www.copper.org>

ELECTRONIC INDUSTRIES ALLIANCE (EIA)
2500 Wilson Boulevard
Arlington, VA 22201-3834
Ph: 703-907-7500

Fax: 703-907-7501
Internet: <http://www.eia.org>

FM GLOBAL (FM)
1301 Atwood Avenue
P.O. Box 7500
Johnston, RI 02919
Ph: 401-275-3000
Fax: 401-275-3029
E-mail: information@fmglobal.com
Internet: <http://www.fmglobal.com>

FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC RESEARCH
(FCCCHR)
University of South California
Kaprielian Hall 200
Los Angeles, CA 90089-2531
Ph: 213-740-2032 or 800-545-6340
Fax: 213-740-8399
E-mail: fccchr@usc.edu
Internet: <http://www.usc.edu/dept/fccchr>

GLASS ASSOCIATION OF NORTH AMERICA (GANA)
2945 SW Wanamaker Drive, Suite A
Topeka, KS 66614
Ph: 785-271-0208
Fax: 785-271-0166
E-mail: gana@glasswebsite.com
Internet: <http://www.glasswebsite.com>

GREEN SEAL (GS)
1001 Connecticut Avenue, NW
Suite 827
Washington, DC 20036-5525
Ph: 202-872-6400
Fax: 202-872-4324
E-mail: [greenseal@greenseal.org](mailto:green seal@greenseal.org)
Internet: <http://www.greenseal.org>

GYPSUM ASSOCIATION (GA)
810 First Street, NE, Suite 510
Washington, DC 20002
Ph: 202-289-5440
Fax: 202-289-3707
E-mail: info@gypsum.org
Internet: <http://www.gypsum.org>

HARDWOOD PLYWOOD AND VENEER ASSOCIATION (HPVA)
P.O. Box 2789
Reston, VA 20195-0789
Ph: 703-435-2900
Fax: 703-435-2537
E-mail: hpva@hpva.org
Internet: <http://www.hpva.org>

ILLUMINATING ENGINEERING SOCIETY OF NORTH AMERICA (IESNA)
120 Wall Street, 17th Floor
New York, NY 10005
Ph: 212-248-5000

Fax: 212-248-5018
E-mail: iesna@iesna.org
Internet: <http://www.iesna.org>

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)
445 Hoes Lane
Piscataway, NJ 08855-1331
Ph: 732-981-0060
Fax: 732-981-1712
E-mail: customer-services@ieee.org
Internet: <http://www.ieee.org>

INSULATED CABLE ENGINEERS ASSOCIATION (ICEA)
P.O. Box 1568
Carrollton, GA 30112
Ph: 770-830-0369
Fax: 770-830-8501
Internet: <http://www.icea.net>

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1500 Bank Street, Suite 300
Ottawa, Ontario CANADA K1H 1B8
Ph: 613-233-1510
Fax: 613-482-9436
E-mail: info@igmaonline.org
Internet: <http://www.igmaonline.org>

INTERNATIONAL CODE COUNCIL (ICC)
5360 Workman Mill Road
Whittier, CA 90601
Ph: 562-699-0541
Fax: 562-699-9721
E-mail: webmaster@iccsafe.org
Internet: www.iccsafe.org

INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)
P.O. Box 687
106 Stone Street
Morrison, CO 80465
Ph: 303-697-8441
Fax: 303-697-8431
E-mail: neta@netaworld.org
Internet: <http://www.netaworld.org>

INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC)
3, rue de Varembe, P.O. Box 131
CH-1211 Geneva 20, Switzerland
Ph: 41-22-919-0211
Fax: 41-22-919-0300
E-mail: custserv@iec.ch
Internet: <http://www.iec.ch>

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)
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Fax: 41-22-733-3430
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Internet: <http://www.iso.ch>

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Internet: <http://www.mss-hq.com>

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Internet: <http://www.paintinfo.com/mpi>

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Fax: 630-790-3095
E-mail: naamm@gss.net
Internet: <http://www.naamm.org>

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1300 North 17th Street, Suite 1752
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Internet: <http://www.nema.org/>

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Fax: 617-770-0700
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Internet: <http://www.nfpa.org>

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Fax: 847-299-1183
Internet: <http://www.nrca.net>

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Ann Arbor, MI 48113-0140
Ph: 734-769-8010 or 800-NSF-MARK
Fax: 734-769-0109
E-mail: info@nsf.org
Internet: <http://www.nsf.org>

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (OECD)
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Fax: 33 1 45 24 85 00
E-mail: bookshop@oecd.org
Internet: <http://www.oecd.org>

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OECD Washington Center
2001 L Street, NW, Suite 650
Washington, DC 20036-4922
Ph: 202-785-6323
Fax: 202-785-0350
E-mail: washington.contact@oecd.org

PLASTIC PIPE AND FITTINGS ASSOCIATION (PPFA)
800 Roosevelt Road, Building C, Suite 20
Glen Ellyn, IL 60137
Ph: 630-858-6540
Fax: 630-790-3095
Internet: <http://www.ppfahome.org>

PLUMBING AND DRAINAGE INSTITUTE (PDI)
800 Turnpike Street, Suite 300
North Andover, MA 01845
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Fax: 978-557-0721
E-Mail: info@pdionline.org
Internet: <http://www.pdionline.org>

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Emeryville, CA 94608
Ph: 510-452-8000
Fax: 510-452-8001
E-mail: webmaster@scscertified.com
Internet: <http://www.scs1.com>

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION
(SMACNA)
4201 Lafayette Center Drive

Chantilly, VA 20151-1209
Ph: 703-803-2980
Fax: 703-803-3732
E-mail: info@smacna.org
Internet: <http://www.smacna.org>

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)
400 Commonwealth Drive
Warrendale, PA 15096-0001
Ph: 724-776-4841
Fax: 724-776-0790
E-mail: customerservice@sae.org
Internet: <http://www.sae.org>

SOUTHERN PINE INSPECTION BUREAU (SPIB)
4709 Scenic Highway
Pensacola, FL 32504-9094
Ph: 850-434-2611
Fax: 850-433-5594
E-mail: spib@spib.org
Internet: <http://www.spib.org>

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION (NCDOT)
No. 1 South Wilmington Street
P.O. Box 25201
Raleigh, NC 27611
phone: 919-733-2520
fax: 919-733-9150
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STEEL DOOR INSTITUTE (SDI/DOOR)
c/o Wherry Associates
30200 Detroit Road
Cleveland, OH 44145-1967
Ph: 440-899-0010
Fax: 440-892-1404
E-mail: leh@wherryassoc.com
Internet: <http://www.steeldoor.org>

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)
40 24th Street, 6th Floor
Pittsburgh, PA 15222-4656
Ph: 412-281-2331
Fax: 412-281-9992
E-mail: info@sspc.org
Internet: <http://www.sspc.org>

TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA)
2500 Wilson Blvd, . Suite 300
Arlington, VA 22201
Ph: 703-907-7700
Fax: 703-907-7727
Internet: <http://www.tiaonline.org>

TILE COUNCIL OF AMERICA (TCA)
100 Clemson Research Boulevard
Anderson, SC 29625
Ph: 864-646-8453
Fax: 864-646-2821

E-mail: literature@tileusa.com
Internet: <http://www.tileusa.com>

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Internet: <http://www.uni-bell.org>

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522 SW 5th Avenue
Suite 500
Portland, OR 97204-2122
Ph: 503-224-3930
Fax: 503-224-3934
E-mail: info@wwpa.org
Internet: <http://www.wwpa.org>

WINDOW AND DOOR MANUFACTURERS ASSOCIATION (WDMA)
1400 East Touhy Avenue, Suite 470
Des Plaines, IL 60018
Ph: 847-299-5200 or 800-223-2301
Fax: 847-299-1286
E-mail: admin@wdma.com
Internet: <http://www.wdma.com>

-- End of Section --

SECTION 01 45 10

QUALITY CONTROL

09/01

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

- ASTM A 880 (1996) Criteria for Use in Evaluation of Testing Laboratories and Organizations for Examination and Inspection of Steel, Stainless Steel, and Related Alloys
- ASTM C 1077 (1998) Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
- ASTM D 3666 (2000) Minimum Requirements for Agencies Testing and Inspecting Bituminous Paving Materials
- ASTM D 3740 (1999c) Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
- ASTM E 329 (2005b) Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction
- ASTM E 543 (1999) Evaluating Agencies that Perform Nondestructive Testing

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00, "Submittal Procedures."

SD-11 Closeout Submittals

Quality Control Plan (QC PLAN)

Submit a QC plan within 30 calendar days after receipt of Notice of Award.

1.3 INFORMATION FOR THE CONTRACTING OFFICER

Deliver the following to the Contracting Officer:

- a. Combined Contractor Production Report/Contractor Quality Control

Report (1 sheet): Original and 1 copy, by 10:00 AM the next working day after each day that work is performed;

- b. QC Specialist Reports and Test Results: Originals and 1 copy, by 10:00 AM the next working day after each day that work is performed;
- c. Testing Plan and Log, 1 copy, at the end of each month;
- d. QC Meeting Minutes: 1 copy, within 2 calendar days of the meeting;
- e. Rework Items List: 1 copy, by the last working day of the month and;
- f. QC Certifications: As required by the paragraph entitled "QC Certifications".

1.4 QC PROGRAM REQUIREMENTS

Establish and maintain a QC program as described in this section. The QC program consists of a QC Organization, a QC Plan, attending a QC Plan meeting, attending a Coordination and Mutual Understanding Meeting, conducting QC meetings, performing three phases of control, performing submittal review, ensuring testing is performed, and preparing QC certifications and documentation necessary to provide materials, equipment, workmanship, fabrication, construction and operations which comply with the requirements of this Contract. The QC program shall cover construction operations on-site and off-site and shall be keyed to the proposed construction sequence.

1.5 QC ORGANIZATION

1.5.1 QC Manager

1.5.1.1 Duties

Provide a QC Manager at the work site to manage and implement the QC program. The QC Manager is required to attend the QC Plan meeting, attend the Coordination and Mutual Understanding Meeting, conduct the QC meetings, perform the three phases of control, perform submittal review, ensure testing is performed and prepare QC certifications and documentation required in this Contract. The QC Manager is responsible for managing and coordinating the three phases of control and documentation performed by the QC specialists. In addition to managing and implementing the QC program, the QC Manager may perform the duties of project superintendent.

1.5.1.2 Qualifications

An individual with a minimum of five years experience as a foreman, superintendent, inspector, QC Manager, project manager, or construction manager on similar size construction contracts which included the major trades that are part of this Contract.

1.5.1.3 Construction Quality Management Training

In addition to the above experience and education requirements, the QC Manager shall have completed the course entitled "Construction Quality Management for Contractors." This course is periodically offered by the Navy and the Corps of Engineers. However, it is sponsored by both the AGC

and the ABC of Charlotte, North Carolina. Call one of the following to sign up for the next available class:

The Army Corps of Engineers, Baltimore District;
(Offered in Baltimore, MD)
Contact: Corps of Engineers, Baltimore District
10 South Howard Street
Baltimore, MD 21201
Phone: 410-962-2323

The Associated General Contractors (AGC), Virginia Chapter
in Cooperation with the Army Corps of Engineers, Norfolk District, and
the Naval Facilities Engineering Command, Atlantic Division.
(Offered at rotating locations in Norfolk, Williamsburg, and Richmond)
Contact: AGC of Virginia
8631 Maylan Drive, Parham Park
Richmond, VA 23294
Phone: 804-346-3383

Carolinas Associated General Contractors (CACG)
Contact: CACG
1100 Euclid Avenue
Charlotte, NC 28203
Phone: 704-372-1450 (ext. 5248)

Associated Builders and Contractors (ABC), Carolinas Chapter
Contact: ABC, Carolinas Chapter
3705 Latrobe Drive
Charlotte, NC 28211
Phone: 704-367-1331
or: 877-470-4819

1.5.2 Alternate QC Manager Duties and Qualifications

Designate an alternate for the QC Manager at the work site to serve in the event of the designated QC Manager's absence. The period of absence may not exceed two weeks at one time, and not more than 30 workdays during a calendar year. The qualification requirements for the Alternate QC Manager shall be three years of experience in one of the specified positions.

1.6 QC PLAN

1.6.1 Requirements

Provide for approval by the Contracting Officer, a QC plan submitted in a 3-ring binder with pages numbered sequentially that covers, both on-site and off-site work and includes, the following:

- a. A table of contents listing the major sections identified with tabs in the following order:

- I. QC ORGANIZATION
- II. NAMES AND QUALIFICATIONS
- III. DUTIES, RESPONSIBILITY AND AUTHORITY OF QC PERSONNEL
- IV. OUTSIDE ORGANIZATIONS
- V. APPOINTMENT LETTERS
- VI. SUBMITTAL PROCEDURES AND INITIAL SUBMITTAL REGISTER
- VII. TESTING LABORATORY INFORMATION
- VIII. TESTING PLAN AND LOG

- IX. PROCEDURES TO COMPLETE REWORK ITEMS
 - X. DOCUMENTATION PROCEDURES
 - XI. LIST OF DEFINABLE FEATURES
 - XII. PROCEDURES FOR PERFORMING THE THREE PHASES OF CONTROL
 - XIII. PERSONNEL MATRIX
 - XIV. PROCEDURES FOR COMPLETION INSPECTION
-
- b. A chart showing the QC organizational structure and its relationship to the production side of the organization.
 - c. Names and qualifications, in resume format, for each person in the QC organization.
 - d. Duties, responsibilities and authorities of each person in the QC organization.
 - e. A listing of outside organizations such as, architectural and consulting engineering firms that will be employed by the Contractor and a description of the services these firms will provide.
 - f. A letter signed by an officer of the firm appointing the QC Manager and stating that he/she is responsible for managing and implementing the QC program as described in this contract. Include in this letter the QC Manager's authority to direct the removal and replacement of non-conforming work.
 - g. Procedures for reviewing, approving and managing submittals. Provide the names of the persons in the QC organization authorized to review and certify submittals prior to approval.
 - h. Testing laboratory information required by the paragraphs entitled "Accredited Laboratories" or "Testing Laboratory Requirements", as applicable.
 - i. A Testing Plan and Log that includes the tests required, referenced by the specification paragraph number requiring the test, the frequency, and the person responsible for each test.
 - j. Procedures to identify, record, track and complete rework items.
 - k. Documentation procedures, including proposed report formats.
 - l. A list of the definable features of work. A definable feature of work is a task which is separate and distinct from other tasks and requires separate control requirements. As a minimum, if approved by the Contracting Officer, consider each Section of the Specifications as a definable feature of work. However, at times, there may be more than one definable feature of work in each Section of the Specifications.
 - m. A personnel matrix showing, for each section of the specification, who will perform and document the three phases of control, and who will perform and document the testing.
 - o. Procedures for Identifying and Documenting the Completion Inspection process. Include in these procedures the responsible party for punch out inspection, prefinal inspection, and final acceptance inspection.

1.6.2 Preliminary Work Authorized Prior to Approval

The only work that is authorized to proceed prior to the approval of the QC plan is mobilization of storage and office trailers and surveying.

1.6.3 Approval

Approval of the QC plan is required prior to the start of construction. The Contracting Officer reserves the right to require changes in the QC plan and operations as necessary to ensure the specified quality of work. The Contracting Officer reserves the right to interview any member of the QC organization at any time in order to verify his/her submitted qualifications.

1.6.4 Notification of Changes

Notify the Contracting Officer, in writing, of any proposed change, including changes in the QC organization personnel, a minimum of seven calendar days prior to a proposed change. Proposed changes must be approved by the Contracting Officer.

1.7 QC PLAN MEETING

Prior to submission of the QC plan, meet with the Contracting Officer to discuss the QC plan requirements of this Contract. The purpose of this meeting is to develop a mutual understanding of the QC plan requirements prior to plan development and submission.

1.8 COORDINATION AND MUTUAL UNDERSTANDING MEETING

After submission of the QC Plan, but prior to the start of construction, meet with the Contracting Officer to discuss the QC program required by this Contract. The purpose of this meeting is to develop a mutual understanding of the QC details, including forms to be used for documentation, administration for on-site and off-site work, and the coordination of the Contractor's management, production and QC personnel with the Contracting Officer. As a minimum, the Contractor's personnel required to attend shall include the project manager, project superintendent, and QC Manager. Minutes of the meeting shall be prepared by the QC Manager and signed by both the Contractor and the Contracting Officer.

1.9 QC MEETINGS

After the start of construction, the QC Manager shall conduct weekly QC meetings at the work site with the project superintendent and QC specialists. The QC Manager shall prepare the minutes of the meeting and provide a copy to the Contracting Officer within 2 working days after the meeting. The Contracting Officer may attend these meetings. The QC Manager shall notify the Contracting Officer at least 48 hours in advance of each meeting. As a minimum, the following shall be accomplished at each meeting:

- a. Review the minutes of the previous meeting;
- b. Review the schedule and the status of work:
 - Work or testing accomplished since last meeting

- Rework items identified since last meeting
 - Rework items completed since last meeting;
- c. Review the status of submittals:
- Submittals reviewed and approved since last meeting
 - Submittals required in the near future;
- d. Review the work to be accomplished in the next 2 weeks and documentation required. Schedule the three phases of control and testing:
- Establish completion dates for rework items
 - Preparatory phases required
 - Initial phases required
 - Follow-up phases required
 - Testing required
 - Status of off-site work or testing
 - Documentation required;
- e. Resolve QC and production problems; and
- f. Address items that may require revising the QC plan:
- Changes in QC organization personnel
 - Changes in procedures.

1.9.1 THREE PHASES OF CONTROL

The QC Manager shall perform the three phases of control to ensure that work complies with Contract requirements. The Three Phases of Control shall adequately cover both on-site and off-site work and shall include the following for each definable features of work: A definable feature of work is a task which is separate and distinct from other tasks and requires separate control requirements.

1.9.2 Preparatory Phase

Notify the Contracting Officer at least 48 hours in advance of each preparatory phase. Conduct the preparatory phase with the superintendent, and the foreman responsible for the definable feature. Document the results of the preparatory phase actions in the daily Contractor Quality Control Report. Perform the following prior to beginning work on each definable feature of work:

- a. Review each paragraph of the applicable specification sections;
- b. Review the Contract drawings;
- c. Verify that appropriate shop drawings and submittals for materials and equipment have been submitted and approved. Verify receipt of approved factory test results, when required;
- d. Review the testing plan and ensure that provisions have been made to provide the required QC testing;
- e. Examine the work area to ensure that the required preliminary work has been completed;

- f. Examine the required materials, equipment and sample work to ensure that they are on hand and conform to the approved shop drawings and submitted data;
- g. Review the safety plan and appropriate activity hazard analysis to ensure that applicable safety requirements are met, and that required Material Safety Data Sheets (MSDS) are submitted; and
- h. Discuss construction methods

1.9.3 Initial Phase

Notify the Contracting Officer at least 48 hours in advance of each initial phase. When construction crews are ready to start work on a definable feature of work, conduct the initial phase with the QC Specialists, the super intendent, and the foreman responsible for that definable feature of work. Observe the initial segment of the definable feature of work to ensure that the work complies with Contract requirements. Document the results of the initial phase in the daily Contractor Quality Control Report. Repeat the initial phase for each new crew to work on-site, or when acceptable levels of specified quality are not being met. Perform the following for each definable feature of work:

- a. Establish the quality of workmanship required;
- b. Resolve conflicts;
- c. Review the Safety Plan and the appropriate activity hazard analysis to ensure that applicable safety requirements are met; and
- d. Ensure that testing is performed by an approved laboratory.

1.9.4 Follow-Up Phase

Perform the following for on-going work daily, or more frequently as necessary until the completion of each definable feature of work and document in the daily Contractor Quality Control Report:

- a. Ensure the work is in compliance with Contract requirements;
- b. Maintain the quality of workmanship required;
- c. Ensure that testing is performed by an approved laboratory; and
- d. Ensure that rework items are being corrected.

1.9.5 Notification of Three Phases of Control for Off-Site Work

Notify the Contracting Officer at least two weeks prior to the start of the preparatory and initial phases.

1.10 SUBMITTAL REVIEW

Procedures for submittals are as described in Section entitled "Submittal Procedures."

1.11 TESTING

Except as stated otherwise in the specification sections, perform sampling

and testing required under this Contract.

1.11.1 Testing Laboratory Requirements

Provide an independent testing laboratory or establish a laboratory qualified to perform sampling and tests required by this Contract. When the proposed testing laboratory is not accredited by an acceptable accreditation program as described by the paragraph entitled "Accredited Laboratories", submit to the Contracting Officer for approval, certified statements signed by an official of the testing laboratory attesting that the proposed laboratory meets or conforms to the following requirements:

- a. Sampling and testing shall be under the technical direction of a Registered Professional Engineer (P.E) with at least 5 years of experience in construction material testing.
- b. Laboratories engaged in testing of concrete and concrete aggregates shall meet the requirements of [ASTM C 1077](#).
- c. Laboratories engaged in testing of bituminous paving materials shall meet the requirements of [ASTM D 3666](#).
- d. Laboratories engaged in testing of soil and rock, as used in engineering design and construction, shall meet the requirements of [ASTM D 3740](#).
- e. Laboratories engaged in inspection and testing of steel, stainless steel, and related alloys will be evaluated according to [ASTM A 880](#). Laboratories shall meet the requirements of [ASTM E 329](#).
- f. Laboratories engaged in nondestructive testing (NDT) shall meet the requirements of [ASTM E 543](#).
- g. Laboratories engaged in hazardous materials testing shall meet the requirements of OSHA and EPA.

1.11.2 Accredited Laboratories

Acceptable accreditation programs are the National Institute of Standards and Technology (NIST) National Voluntary Laboratory Accreditation Program (NVLAP), the American Association of State Highway and Transportation Officials (AASHTO) program and the American Association for Laboratory Accreditation (A2LA) program. Furnish to the Contracting Officer, a copy of the Certificate of Accreditation, Scope of Accreditation and latest directory of the accrediting organization for accredited laboratories. The scope of the laboratory's accreditation shall include the test methods required by the Contract.

1.11.3 Inspection of Testing Laboratories

Prior to approval of non-accredited laboratories, the proposed testing laboratory facilities and records shall be subject to inspection by the Contracting Officer. Records subject to inspection include equipment inventory, equipment calibration dates and procedures, library of test procedures, audit and inspection reports by agencies conducting laboratory evaluations and certifications, testing and management personnel qualifications, test report forms, and the internal QC procedures.

1.11.4 Capability Check

The Contracting Officer retains the right to check laboratory equipment in the proposed laboratory and the laboratory technician's testing procedures, techniques, and other items pertinent to testing, for compliance with the standards set forth in this Contract.

1.11.5 Test Results

Cite applicable Contract requirements, tests or analytical procedures used. Provide actual results and include a statement that the item tested or analyzed conforms or fails to conform to specified requirements. Conspicuously stamp the cover sheet for each report in large red letters "CONFORMS" or "DOES NOT CONFORM" to the specification requirements, whichever is applicable. Test results shall be signed by a testing laboratory representative authorized to sign certified test reports. Furnish the signed reports, certifications, and other documentation to the Contracting Officer via the QC Manager. Furnish a summary report of field tests at the end of each month. Attach a copy of the summary report to the last daily Contractor Quality Control Report of each month.

1.12 QC CERTIFICATIONS

1.12.1 Contractor Quality Control Report Certification

Each Contractor Quality Control Report shall contain the following statement: "On behalf of the Contractor, I certify that this report is complete and correct and equipment and material used and work performed during this reporting period is in compliance with the contract drawings and specifications to the best of my knowledge, except as noted in this report".

1.12.2 Invoice Certification

Furnish a certificate to the Contracting Officer with each payment request, signed by the QC Manager, attesting that as-built drawings are current and attesting that the work for which payment is requested, including stored material, is in compliance with contract requirements.

1.12.3 Completion Certification

Upon completion of work under this Contract, the QC Manager shall furnish a certificate to the Contracting Officer attesting that "the work has been completed, inspected, tested and is in compliance with the Contract".

1.13 DOCUMENTATION

Maintain current and complete records of on-site and off-site QC program operations and activities.

1.13.1 Contractor Production Report

Reports are required for each day that work is performed and shall be attached to the Contractor Quality Control Report prepared for the same day. Account for each calendar day throughout the life of the Contract. The reporting of work shall be identified by terminology consistent with the construction schedule. Contractor Production Reports are to be prepared, signed and dated by the project superintendent and shall contain the following information:

- a. Date of report, report number, name of contractor, contract number, title and location of Contract and superintendent present.
- b. Weather conditions in the morning and in the afternoon including maximum and minimum temperatures.
- c. A list of Contractor and subcontractor personnel on the work site, their trades, employer, work location, description of work performed and hours worked.
- e. A list of job safety actions taken and safety inspections conducted. Indicate that safety requirements have been met including the results on the following:
 - (1) Was a job safety meeting held this date? (If YES, attach a copy of the meeting minutes.)
 - (2) Were there any lost time accidents this date? (If YES, attach a copy of the completed OSHA report.)
 - (3) Was crane/manlift/trenching/scaffold/hv electrical/high work/hazmat work done? (If YES, attach a statement or checklist showing inspection performed.)
 - (4) Was hazardous material/waste released into the environment? (If YES, attach a description of incident and proposed action.)
- f. A list of safety actions taken today and safety inspections conducted.
- g. A list of equipment/material received each day that is incorporated into the job.
- h. A list of construction and plant equipment on the work site including the number of hours used, idle and down for repair.
- i. Include a "remarks" section in this report which will contain pertinent information including directions received, problems encountered during construction, work progress and delays, conflicts or errors in the drawings or specifications, field changes, safety hazards encountered, instructions given and corrective actions taken, delays encountered and a record of visitors to the work site.

1.13.2 Contractor Quality Control Report

Reports are required for each day that work is performed and for every seven consecutive calendar days of no-work and on the last day of a no-work period. Account for each calendar day throughout the life of the Contract. The reporting of work shall be identified by terminology consistent with the construction schedule. Contractor Quality Control Reports are to be prepared, signed and dated by the QC Manager and shall contain the following information:

- a. Identify the control phase and the definable feature of work.
- b. Results of the Preparatory Phase meetings held including the location of the definable feature of work and a list of personnel

present at the meeting. Indicate in the report that for this definable feature of work, the drawings and specifications have been reviewed, submittals have been approved, materials comply with approved submittals, materials are stored properly, preliminary work was done correctly, the testing plan has been reviewed, and work methods and schedule have been discussed.

- c. Results of the Initial Phase meetings held including the location of the definable feature of work and a list of personnel present at the meeting. Indicate in the report that for this definable feature of work the preliminary work was done correctly, samples have been prepared and approved, the workmanship is satisfactory, test results are acceptable, work is in compliance with the Contract, and the required testing has been performed and include a list of who performed the tests.
- d. Results of the Follow-up Phase inspections held including the location of the definable feature of work. Indicate in the report for this definable feature of work that the work complies with the Contract as approved in the Initial Phase, and that required testing has been performed and include a list of who performed the tests.
- e. Results of the three phases of control for off-site work, if applicable, including actions taken.
- f. List the rework items identified, but not corrected by close of business.
- g. List the rework items corrected from the rework items list along with the corrective action taken.
- h. Include a "remarks" section in this report which will contain pertinent information including directions received, quality control problem areas, deviations from the QC plan, construction deficiencies encountered, QC meetings held, acknowledgement that as-built drawings have been updated, corrective direction given by the QC Organization and corrective action taken by the Contractor.
- i. Contractor Quality Control Report certification.

1.13.3 Testing Plan and Log

As tests are performed, the QC Manager shall record on the "Testing Plan and Log" the date the test was conducted, the date the test results were forwarded to the Contracting Officer, remarks and acknowledgement that an accredited or Contracting Officer approved testing laboratory was used. Attach a copy of the updated "Testing Plan and Log" to the last daily Contractor Quality Control Report of each month.

1.13.4 Rework Items List

The QC Manager shall maintain a list of work that does not comply with the Contract, identifying what items need to be reworked, the date the item was originally discovered, and the date the item was corrected. There is no requirement to report a rework item that is corrected the same day it is discovered. Attach a copy of the "Contractor Rework Items List" to the last daily Contractor Quality Control Report of each month. The Contractor shall be responsible for including on this list items needing rework

including those identified by the Contracting Officer.

1.13.5 As-Built Drawings

The QC Manager is required to review the as-built drawings required by Section 01 11 00, "Summary of Work", to ensure that as-built drawings are kept current on a daily basis and marked to show deviations which have been made from the Contract drawings. The QC Manager shall initial each deviation and each revision. Upon completion of work, the QC Manager shall furnish a certificate attesting to the accuracy of the as-built drawings prior to submission to the Contracting Officer.

1.13.6 Report Forms

The following forms, which are attached at the end of this section, are acceptable for providing the information required by the paragraph entitled "Documentation". While use of these specific formats are not required, any other format used shall contain the same information:

- a. Combined Contractor Production Report and Contractor Quality Control Report (1 sheet), with separate continuation sheet
- b. Testing Plan and Log
- c. Rework Items List

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

CONTRACTOR PRODUCTION REPORT

(ATTACH ADDITIONAL SHEETS IF NECESSARY)

DATE

CONTRACT NO	TITLE AND LOCATION	REPORT NO
CONTRACTOR		SUPERINTENDENT
AM WEATHER	PM WEATHER	MAX TEMP F MIN TEMP F

WORK PERFORMED TODAY

Schedule Activity No.	WORK LOCATION AND DESCRIPTION	EMPLOYER	NUMBER	TRADE	HRS



WAS A JOB SAFETY MEETING HELD THIS DATE?
if YES attach copy of the meeting minutes
 YES NO

WERE THERE ANY LOST TIME ACCIDENTS THIS DATE?
if YES attach copy of completed OSHA report
 YES NO

WAS CRANE/MANLIFT/TRENCHING/SCAFFOLD/HV ELECTRICAL/HIGH WORK DONE?
if YES attach statement or checklist showing inspection performed
 YES NO

WAS HAZARDOUS MATERIAL/WASTE RELEASED INTO THE ENVIRONMENT?
if YES attach description of incident and proposed action
 YES NO

TOTAL WORK HOURS ON JOB SITE THIS DATE	
CUMULATIVE TOTAL OF WORK HOURS FROM PREVIOUS REPORT	
TOTAL WORK HOURS FROM START OF CONSTRUCTION	
<input type="checkbox"/> SAFETY REQUIREMENTS HAVE BEEN MET.	

LIST SAFETY ACTIONS TAKEN TODAY/SAFETY INSPECTIONS CONDUCTED

EQUIPMENT/MATERIAL RECEIVED TODAY TO BE INCORPORATED IN JOB

CONSTRUCTION AND PLANT EQUIPMENT ON JOB SITE TODAY. INCLUDE NUMBER OF HOURS USED TODAY

REMARKS

 CONTRACTOR/SUPERINTENDENT DATE

CONTRACTOR QUALITY CONTROL REPORT

(ATTACH ADDITIONAL SHEETS IF NECESSARY)

DATE

PHASE	@BLANK NOT APPLICABLE	YES	NO	IDENTIFY SPECIFICATION SECTION, DEFINABLE FEATURE OF WORK, LOCATION AND LIST PERSONNEL PRESENT
PREPARATORY	PLANS AND SPECS HAVE BEEN REVIEWED.	<input type="checkbox"/>	<input type="checkbox"/>	
	THE SUBMITTALS HAVE BEEN APPROVED.	<input type="checkbox"/>	<input type="checkbox"/>	
	MATERIALS COMPLY WITH APPROVED SUBMITTALS	<input type="checkbox"/>	<input type="checkbox"/>	
	MATERIALS STORED PROPERLY.	<input type="checkbox"/>	<input type="checkbox"/>	
	PRELIMINARY WORK WAS DONE CORRECTLY.	<input type="checkbox"/>	<input type="checkbox"/>	
	TESTING PLAN HAS BEEN REVIEWED.	<input type="checkbox"/>	<input type="checkbox"/>	
	WORK METHOD AND SCHEDULE DISCUSSED.	<input type="checkbox"/>	<input type="checkbox"/>	
	JOB SAFETY / HAZARD ANALYSIS ADDRESSED	<input type="checkbox"/>	<input type="checkbox"/>	
	INITIAL	PRELIMINARY WORK WAS DONE CORRECTLY	<input type="checkbox"/>	
SAMPLE HAS BEEN PREPARED/APPROVED		<input type="checkbox"/>	<input type="checkbox"/>	
WORKMANSHIP IS SATISFACTORY		<input type="checkbox"/>	<input type="checkbox"/>	
TEST RESULTS ARE ACCEPTABLE.		<input type="checkbox"/>	<input type="checkbox"/>	
WORK IS IN COMPLIANCE WITH THE CONTRACT.		<input type="checkbox"/>	<input type="checkbox"/>	
WORK COMPIES WITH SAFETY REQUIREMENTS		<input type="checkbox"/>	<input type="checkbox"/>	
TESTING PERFORMED & WHO PERFORMED TEST				
FOLLOW-UP	WORK COMPIES WITH CONTRACT AS APPROVED INITIAL PHASE	<input type="checkbox"/>	<input type="checkbox"/>	
	WORK COMPIES WITH SAFETY REQUIREMENTS	<input type="checkbox"/>	<input type="checkbox"/>	
	TESTING PERFORMED & WHO PERFORMED TEST			

REWORK ITEMS IDENTIFIED TODAY (NOT CORRECTED BY CLOSE OF BUSINESS)

REWORK ITEMS CORRECTED TODAY (FROM REWORK ITEMS LIST)

REMARKS

On behalf of the contractor, I certify that this report is completed and correct and equipment and material used and work performed during this reporting period is in compliance with the contract drawings and specifications to the best of my knowledge except as noted in this report.

AUTHORIZED QC MANAGER AT SITE

DATE

GOVERNMENT QUALITY ASSURANCE REPORT

DATE

QUALITY ASSURANCE REPRESENTATIVE'S REMARKS AND/OR EXCEPTIONS TO THE REPORT

GOVERNMENT QUALITY ASSURANCE MANAGER

DATE

CONTRACTOR QUALITY CONTROL REPORT CONTINUATION SHEET
 (ATTACH ADDITIONAL SHEETS IF NECESSARY)

DATE

PHASE	BLANK NOT APPLICABLE	YES	NO
PREPARATORY	PLANS AND SPECS HAVE BEEN REVIEWED	<input type="checkbox"/>	<input type="checkbox"/>
	THE SUBMITTALS HAVE BEEN APPROVED.	<input type="checkbox"/>	<input type="checkbox"/>
	MATERIALS COMPLY WITH APPROVED SUBMITTALS	<input type="checkbox"/>	<input type="checkbox"/>
	MATERIALS STORED PROPERLY.	<input type="checkbox"/>	<input type="checkbox"/>
	PRELIMINARY WORK WAS DONE CORRECTLY.	<input type="checkbox"/>	<input type="checkbox"/>
	TESTING PLAN HAS BEEN REVIEWED.	<input type="checkbox"/>	<input type="checkbox"/>
	WORK METHOD AND SCHEDULE DISCUSSED.	<input type="checkbox"/>	<input type="checkbox"/>
	JOB SAFETY / HAZARD ANALYSIS ADDRESSED	<input type="checkbox"/>	<input type="checkbox"/>

IDENTIFY SPECIFICATION SECTION, DEFINABLE FEATURE OF WORK, LOCATION AND LIST PERSONNEL PRESENT

PREPARATORY

PRELIMINARY WORK WAS DONE CORRECTLY	<input type="checkbox"/>	<input type="checkbox"/>
SAMPLE HAS BEEN PREPARED/APPROVED	<input type="checkbox"/>	<input type="checkbox"/>
WORKMANSHIP IS SATISFACTORY	<input type="checkbox"/>	<input type="checkbox"/>
TEST RESULTS ARE ACCEPTABLE.	<input type="checkbox"/>	<input type="checkbox"/>
WORK IS IN COMPLIANCE WITH THE CONTRACT.	<input type="checkbox"/>	<input type="checkbox"/>
WORK COMPLIES WITH SAFETY REQUIREMENTS	<input type="checkbox"/>	<input type="checkbox"/>

TESTING PERFORMED & WHO PERFORMED TEST

INITIAL

CONTRACTOR QUALITY CONTROL REPORT CONTINUATION SHEET
 (ATTACH ADDITIONAL SHEETS IF NECESSARY)

DATE

PHASE

(BLANK NOT APPLICABLE)

YES

NO

IDENTIFY SPECIFICATION SECTION, DEFINABLE FEATURE OF WORK, LOCATION AND LIST PERSONNEL PRESENT

WORK COMPLIES WITH CONTRACT AS APPROVED INITIAL PHASE	<input type="checkbox"/>	<input type="checkbox"/>
WORK COMPLIES WITH SAFETY REQUIREMENTS	<input type="checkbox"/>	<input type="checkbox"/>

FOLLOW-UP

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

01/07

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C511 (1997) Reduced-Pressure Principle Backflow-Prevention Assembly

FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC RESEARCH (FCCCHR)

FCCCHR-01 (1993) Manual of Cross-Connection Control

FCCCHR-USC (2002) List of Approved Backflow Prevention Assemblies

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00, "Submittal Procedures."

SD-03 Product Data

Backflow preventers

SD-06 Test Reports

Backflow Preventer Tests

SD-07 Certificates

Backflow Tester Certifications

Backflow Preventers Certificate of Full Approval

1.3 BACKFLOW TESTER CERTIFICATIONS

Certificate of Full Approval from FCCCHR-USC, University of Southern California, attesting that the design, size and make of each backflow preventer has satisfactorily passed the complete sequence of performance testing and evaluation for the respective level of approval. Certificate of Provisional Approval will not be acceptable.

1.3.1 Backflow Preventers Certificate

The Contractor shall submit a certificate recognized by the State or local

authority that states the Contractor has completed at least 10 hours or training in backflow preventer installations. The certificate must be current.

1.4 TEMPORARY UTILITIES

1.4.1 Availability of Utility Services

- a. The Contract clause related to utilities applies. Reasonable amounts of water and electricity from the nearest outlet will be provided free of charge for pursuance of work within a facility under this contract. If the nearest available outlet cannot be utilized by the Contractor because of improper voltage, insufficient current, improper pressure, incompatible connectors, etc., it shall be the responsibility of the Contractor to provide temporary utilities as required.
- b. Reasonable amounts of utilities for contractor trailers and storage buildings will be made available to the Contractor, when available. The Contractor shall be responsible for providing transformers, electrical service poles and drops for electrical services, and backflow preventer devices on connections to domestic water lines. Final taps and tie-ins to the Government utility grid will be made by the Contractor after approval by the Contracting Officer. Tap-in cost, if any, shall be the responsibility of the Contractor. Under no circumstances will taps to base fire hydrants be allowed for obtaining domestic water.

1.4.2 Trailers

Electrical service will be supplied by the Government, when available, except at Tarawa Terrace where Carolina Power and Light Company will be the supplier.

1.4.3 Energy and Utilities Conservation

The Contractor shall carefully conserve utilities furnished without charge. The Contractor, at his own expense and in a manner satisfactory to the Contracting Officer, shall install and maintain all necessary temporary connections and distribution lines and remove the same prior to final acceptance of the construction.

1.4.4 Location of Underground Utilities

Location and Protection of underground utilities shall be the responsibility of the Contractor. Where existing-to-remain piping, utilities, and underground obstructions of any type are indicated in locations to be traversed by new piping, ducts, and other excavations the elevations of the existing utilities and obstructions shall be determined before the new work is completed.

- a. In addition, the Contractor will be responsible for obtaining the services of a professional utility locator prior to digging. Contractor will provide documentation that the site has been surveyed and checked for underground utilities. All utilities must be located, including but not limited to power, water, sewer, storm drains, fiber optics, T.V. cable, telephone, and intrusion detection wiring. A set of known utility drawings will be available in the ROICC office for review to assist the locator.

- b. It is mandatory that the Contractor also contact the Base Telephone Office (451-2531) prior to accomplishing any digging at Camp Lejeune. A telephone office representative will assist in locating telephone lines.
- c. It is mandatory that the Contractor also contact Charter Communications, cable TV service prior to accomplishing any digging at Camp Lejeune, to ensure that all buried cable lines are identified. Contact Mr. Olin Criswell at 353-8677 for assistance.

1.4.4.1 The Locations of Underground Utilities shown at only approximate and the information provided may be incomplete. Contractor shall attempt to ascertain locations of existing underground utilities prior to and during digging operations.

1.4.4.2 Damage to Underground Utilities

Immediate notice shall be delivered to the Contracting Officer of any damage. The Contractor shall make temporary repairs immediately, and shall provide permanent repairs as soon as practicable. For any additional work required by reason of conflict between the new and existing work, an adjustment in contract price will be made in accordance with Contract clause entitled "Differing Site Conditions", if appropriate.

1.5 WEATHER PROTECTION

Take necessary precautions to ensure that roof openings and other critical openings in the building are monitored carefully. Take immediate actions required to seal off such openings when rain or other detrimental weather is imminent, and at the end of each workday. Ensure that the openings are completely sealed off to protect materials and equipment in the building from damage.

1.5.1 Building and Site Storm Protection

When a warning of gale force winds is issued, take precautions to minimize danger to persons, and protect the work and nearby Government property. Precautions shall include, but are not limited to, closing openings; removing loose materials, tools and equipment from exposed locations; and removing or securing scaffolding and other temporary work. Close openings in the work when storms of lesser intensity pose a threat to the work or any nearby Government property.

1.5.1.1 Hurricane Conditions of Readiness

Unless directed otherwise, comply with:

- a. Condition FIVE: Normal weather conditions are expected for the foreseeable future. No action is required.
- b. Condition FOUR (Sustained winds of 74 mph or greater expected within 72 hours): Contractors shall continue normal daily clean up and good house keeping practices. Collect and store in piles or containers scrap lumber, waste material, and rubbish for removal and disposal at the close of each work day. Stack lumber in neat piles less than 4 feet high. Prepare to remove or secure all debris, trash, or stored materials that could become missile hazards during high wind conditions. Meetings should be held

on-site with all subcontractors to review the measures that are going to need to be taken should the base go to a higher readiness condition. Contact the ROICC for any additional updates and upon completion of all required actions.

- c. Condition THREE (Sustained winds of 74 mph or greater expected within 48 hours): Once Condition 3 is set, contractors shall shift their focus from their normal activities to taking the actions that are required to prepare the job site for the potential of destructive weather. All debris and rubbish shall be removed from the site at the end of the workday. All stored materials shall either be removed from the job site or secured (metal straps or heavy lines/ropes). All tools, equipment and gear shall be secured at the end of the workday. Begin preparations to adequately secure the facility (windows boarded up, etc.). Meetings should be held on-site with all subcontractors to review the measures that are going to be taken should base go to a higher readiness condition. Contact the ROICC for any additional updates and upon completion of all required actions.
- d. Condition TWO (Sustained winds of 74 mph or greater expected within 24 hours): Cease all normal activities until the job-site is completely prepared for the onslaught of destructive weather. The job site should be completely free of debris, rubbish and scrap materials. The facility being worked on should be made weather-tight. All scaffolding planking shall be removed. All formwork and free standing structural steel shall be braced. All machinery, tools, equipment and materials shall be properly secured or removed from the job-site. Expend every effort to clear all missiles hazards and loose equipment from the job site. When the contractor secures for the day the job site should be left in a condition that is ready for the storm and the contractor should assume that they will not be allowed to return to their job site until after the storm passes and the base is reopened. Contact ROICC for additional updates and upon completion of required actions.
- e. Condition ONE (Sustained winds of 74 mph or greater expected within 12 hours): If still on the job site, the contractor will be required to immediately leave the base until the storm passes and the base is reopened.

1.6 STORAGE AREAS

The Contract Clause entitled "FAR 52.236-10, Operations and Storage Areas" and the following apply:

1.6.1 Storage Size and Location

The open site available for storage shall be confined to the indicated operations area. The storage area shall be coordinated with the government.

1.6.2 Storage in Existing Buildings

The Contractor shall be working in an existing building; the storage of material will be allowed on the ground floor.

1.7 TEMPORARY SANITARY FACILITIES

Provide adequate sanitary conveniences of a type approved for the use of persons employed on the work, properly secluded from public observation, and maintained in such a manner as required and approved by the Contracting Officer. Maintain these conveniences at all times without nuisance. Upon completion of the work, remove the conveniences from the premises, leaving the premises clean and free from nuisance. Dispose of sewage through connection to a municipal, district, or station sanitary sewage system. Where such systems are not available, use chemical toilets or comparably effective units, and periodically empty wastes into a municipal, district, or station sanitary sewage system, or remove waste to a commercial facility. Include provisions for pest control and elimination of odors.

1.8 TEMPORARY BUILDINGS

Locate these where directed and within the indicated operations area.

1.8.1 Trailers or Storage Buildings

Trailers or storage buildings will be permitted, where space is available, subject to the approval of the Contracting Officer. The trailers or buildings shall be in good condition, free from visible damage rust and deterioration, and meet all applicable safety requirements. Trailers shall be roadworthy and comply with all appropriate state and local vehicle requirements. Failure to maintain storage trailers or buildings to these standards shall result in the removal of non-complying units at the Contractor's expense. A sign not smaller than 24 by 24 inches shall be conspicuously placed on the trailer depicting the company name, business phone number, and emergency phone number. Trailers shall be anchored to resist high winds and must meet applicable state or local standards for anchoring mobile trailers.

PART 2 PRODUCTS

2.1 Backflow Preventers

Reduced pressure principle type conforming to the applicable requirements [AWWA C511](#). Provide backflow preventers complete with 150 pound flanged cast iron, mounted gate valve and strainer, 304 stainless steel or bronze, internal parts. The particular make, model/design, and size of backflow preventers to be installed shall be included in the latest edition of the List of Approved Backflow Prevention Assemblies issued by the [FCCCHR-USC](#) and shall be accompanied by a Certificate of Full Approval from [FCCCHR-USC](#).

PART 3 EXECUTION

3.1 REDUCED PRESSURE BACKFLOW PREVENTERS

Provide an approved reduced pressure backflow prevention assembly at each location where the Contractor taps into the Government potable water supply.

A certified tester(s) shall perform testing of backflow preventer(s) for proper installation and operation and provide subsequent tagging. [Backflow preventer tests](#) shall be performed using test equipment, procedures, and certification forms conforming to those outlined in the latest edition of the Manual of Cross-Connection Control published by the [FCCCHR-01](#). Test and tag each reduced pressure backflow preventer upon initial installation (prior to continued water use) and quarterly thereafter. Tag shall contain

the following information: make, model, serial number, dates of tests, results, maintenance performed, and signature of tester. Record test results on certification forms conforming to requirements cited earlier in this paragraph.

Not used.

-- End of Section --

SECTION 01 57 19

TEMPORARY ENVIRONMENTAL CONTROLS

10/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

U.S. DEPARTMENT OF DEFENSE (DOD)

- MIL-S-16165 (Rev E) Shielding Harnesses, Shielding Items and Shielding Enclosures for Use in the Reduction of Interference from Engine Electrical Systems
- MIL-STD-461 (Rev E) Control of Electromagnetic Interference Emissions and Susceptibility
- MIL-STD-462 (Rev D; Notice 4) Electromagnetic Interference Characteristics

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

- 40 CFR 261 Identification and Listing of Hazardous Waste
- 40 CFR 262 Generators of Hazardous Waste
- 40 CFR 263 Transporters of Hazardous Waste
- 40 CFR 264 Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
- 40 CFR 265 Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
- 40 CFR 300 National Oil and Hazardous Substances Pollution Contingency Plan
- 49 CFR 171 General Information, Regulations, and Definitions
- 49 CFR 172 Hazardous Materials Tables and Hazardous Materials Communications Regulations
- 49 CFR 178 Specifications for Packagings

1.2 Contractor Liabilities for Environmental Protection

Contractors shall complete and provide [environmental training documentation](#)

for training required by Federal, State, and local regulations.

1.3 DEFINITIONS

1.3.1 Sediment

Soil and other debris that have eroded and have been transported by runoff water or wind.

1.3.2 Solid Waste

Rubbish, debris, garbage, and other discarded solid materials, except hazardous waste as defined in paragraph entitled "Hazardous Waste," resulting from industrial, commercial, and agricultural operations and from community activities.

1.3.3 Sanitary Wastes

Wastes characterized as domestic sanitary sewage.

1.3.4 Rubbish

Combustible and noncombustible wastes such as paper, boxes, glass, crockery, metal, lumber, cans, and bones.

1.3.5 Debris

Combustible and noncombustible wastes such as ashes and waste materials resulting from construction or maintenance and repair work, leaves, and tree trimmings.

1.3.6 Chemical Wastes

This includes salts, acids, alkalies, herbicides, pesticides, and organic chemicals.

1.3.7 Garbage

Refuse and scraps resulting from preparation, cooking, dispensing, and consumption of food.

1.3.8 Hazardous Waste

Hazardous substances as defined in [40 CFR 261](#) or as defined by applicable State and local regulations.

1.3.9 Hazardous Materials

Hazardous materials as defined in [49 CFR 171](#) and listed in [49 CFR 172](#).

1.3.10 Landscape Features

Trees, plants, shrubs, and ground cover.

1.3.11 Lead Acid Battery Electrolyte

The electrolyte substance (liquid medium) within a battery cell.

1.3.12 Oily Waste

Petroleum products and bituminous materials.

1.3.13 Class I Ozone Depleting Substance (ODS)

Class I and Class II ODS are defined in Sections 602 (a and b) of The Clean Air Act.

1.4 SUBMITTALS

Submit the following in accordance with Section 01 33 00, "Submittal Procedures."

SD-11 Closeout Submittals

Solid waste disposal permit

Disposal permit for hazardous waste

Environmental training documentation

Permit to transport hazardous waste

Hazardous waste certification

Annual Report of Products Containing Recovered Materials

1.4.1 Solid Waste Disposal Permit

Submit one copy of a State and local permit or license for the solid waste disposal facility.

1.4.2 Disposal Permit for Hazardous Waste

Submit a copy of the applicable EPA and State permits, manifests, or licenses for transportation, treatment, storage, and disposal of hazardous waste by permitted facilities.

1.4.3 Permit to Transport Hazardous Waste

Submit one copy of the EPA or State permit license, or regulation for the transporter who will ship the hazardous waste to the permitted Treatment, Storage, and Disposal (TSD) facility.

1.4.4 Hazardous Waste Certification

Submit written certification that hazardous waste turned in for disposal was generated on Government property and is identified, packaged, and labeled in accordance with 40 CFR 261, 40 CFR 262, and 40 CFR 263.

1.5 ENVIRONMENTAL PROTECTION REGULATORY REQUIREMENTS

Provide and maintain, during the life of the contract, environmental protection as defined in this Section. Plan for and provide environmental protective measures to control pollution that develops during normal construction practice. Plan for and provide environmental protective measures required to correct conditions that develop during the construction of permanent or temporary environmental features associated

with the project. Comply with Federal, State, and local regulations pertaining to the environment, including but not limited to water, air, solid waste, and noise pollution.

1.6 ADMINISTRATIVE REQUIREMENTS

1.6.1 Licenses and Permits

Obtain licenses and permits pursuant to "FAR 52.236-7, Permits and Responsibilities" except for those permits which will be obtained by the Contracting Officer.

For permits obtained by the Contracting Officer, whether or not required by the permit, perform inspections of the work in progress, and submit certifications to the applicable regulatory agency, via the Contracting Officer, that the work conforms to the contract and permit requirements. The inspections and certifications shall be provided through the services of a Professional Engineer, registered in the State where the work is being performed. As a part of the quality control plan, which is required to be submitted for approval by the quality control section, provide a subitem containing the name, P.E. registration number, address, and telephone number of the professional engineer(s) who will be performing the inspections and certifications for each permit listed above.

1.7 GENERAL ENVIRONMENTAL MANAGEMENT SYSTEM AND ENVIRONMENTAL AWARENESS

The Contractor shall familiarize himself with requirements of the attached "Marine Corps Base (MCB), Camp Lejeune, Contractor Environmental Guide."

PART 2 PRODUCTS

2.1 ANNUAL REPORT OF PRODUCTS CONTAINING RECOVERED MATERIALS

The Contractor shall submit data annually (by December 1) products used during the previous fiscal year (October 1 - September 30) as required by 6002 of the Solid Waste Disposal Act as amended by Resource Conservation and Recovery Act (RCRA). Report forms is attached to end of this section as "Appendix A."

PART 3 EXECUTION

3.1 PROTECTION OF NATURAL RESOURCES

Preserve the natural resources within the project boundaries and outside the limits of permanent work. Restore to an equivalent or improved condition upon completion of work. Confine construction activities to within the limits of the work indicated or specified.

3.1.1 Land Resources

Except in areas to be cleared, do not remove, cut, deface, injure, or destroy trees or shrubs without Contracting Officer's permission. Do not fasten or attach ropes, cables, or guys to existing nearby trees for anchorages unless authorized by Contracting Officer. Where such use of attach ropes, cables, or guys is authorized, the Contractor shall be responsible for any resultant damage.

3.1.1.1 Protection of Trees

Protect existing trees which are to remain and which may be injured, bruised, defaced, or otherwise damaged by construction operations. Remove displaced rocks from uncleared areas. By approved excavation, remove trees with 30 percent or more of their root systems destroyed. Removal of trees and the procedure for removal requires approval of the Contracting Officer.

3.1.1.2 Landscape Replacement

Remove trees and other landscape features scarred or damaged by equipment operations, and replace with equivalent, undamaged trees and landscape features. Obtain Contracting Officer's approval before removal or replacement.

3.1.1.3 Temporary Construction

Remove traces of temporary construction facilities such as haul roads, work area, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other signs of construction. Grade temporary roads, parking areas, and similar temporarily used areas to conform with surrounding contours.

3.1.2 Water Resources

3.1.2.1 Oily Wastes

Prevent oily or other hazardous substances from entering the ground, drainage areas, or local bodies of water. Surround all temporary fuel oil or petroleum storage tanks with a temporary earth berm of sufficient size and strength to contain the contents of the tanks in the event of leakage or spillage.

3.2 HISTORICAL AND ARCHAEOLOGICAL RESOURCES

Carefully protect in-place and report immediately to the Contracting Officer historical and archaeological items or human skeletal remains discovered in the course of work. Stop work in the immediate area of the discovery until directed by the Contracting Officer to resume work. The Government retains ownership and control over historical and archaeological resources.

3.3 NOISE

Make the maximum use of low-noise emission products, as certified by the EPA. Blasting or use of explosives will not be permitted without written permission from the Contracting Officer, and then only during designated times.

3.4 RESTRICTIONS ON EQUIPMENT

3.4.1 Electromagnetic Interference Suppression

- a. Electric motors must comply with MIL-STD-461 relative to radiated and conducted electromagnetic interference. A test for electromagnetic interference will not be required for motors that are identical physically and electrically to those that have previously met the requirements of MIL-STD-461. An electromagnetic interference suppression test will not be required

for electric motors without commutation or sliprings having no more than one starting contact and operated at 3,600 revolutions per minute or less.

- b. Equipment used by the Contractor shall comply with MIL-S-16165 for internal combustion engines and MIL-STD-461 for other devices capable of producing radiated or conducted interference.
- c. Conduct tests for electromagnetic interference on electric motors and Contractor's construction equipment in accordance with MIL-STD-461 and MIL-STD-462. Test location shall be reasonably free from radiated and conducted interference. Furnish testing equipment, instruments, and personnel for making the tests; a test location; and other necessary facilities.

3.4.2 Radio Transmitter Restrictions

Conform to the restrictions and procedures for the use of radio transmitting equipment, as directed. Do not use transmitters without prior approval.

3.5 CONTROL AND DISPOSAL OF SOLID WASTES

Pick up solid wastes, and place in covered containers which are regularly emptied. Do not prepare or cook food on the project site. Prevent contamination of the site or other areas when handling and disposing of wastes. At project completion, leave the areas clean.

3.5.1 Disposal of Metal Paint Cans

All metal paint cans shall be taken to Building 962 for recycling. The cans shall be empty and completely dry. The cans shall be triple rinsed and stenciled "Triple Rinsed" prior to turn in. The Contractor shall give the Government 72 hours advance notice prior to turn-in. Contractor is responsible for rinsing, stenciling, crushing, and depositing in Government owned receptacle, located at Building 962.

3.5.2 Disposal of Rubbish and Debris

Rubbish and debris shall be taken off-base for disposal, unless specifically directed otherwise below:

Metals shall be taken to the DRMO disposal area at Lot 201, as specified.

<u>CATEGORY</u>	<u>CONSTRUCTION DEBRIS DISPOSAL - BASE SANITARY LANDFILL EXAMPLE/GENERAL INFORMATION FOR DEPOSIT IN THE LANDFILL</u>
Recyclable Cardboard	Breakdown corrugated cardboard boxes and deliver to the Base Recycling Center located at Building 982. If base personnel rejects the cardboard, take cardboard for off-base disposal.
Recyclable Wood Pallets	Deliver usable pallets to the Base Recycling Center located at Building 982. If base personnel rejects the pellets, take pallets for off-base disposal.
Untreated/Unpainted Wood	Deliver lumber, trees, stumps, limbs, tops, tops, and shrubs to the landfill separated from any other items, and place in locations as designated by the landfill operator.
Organic Matter	Deliver leaves, pine straw, grass clippings, and shrub clippings to the landfill separated from any other items, and place in locations as designated by the landfill operator. No bags or containers are allowed.
Asphalt Pavement	Remove pavement from Government property and deliver to an asphalt recycling establishment. Provide a record of the total tons of asphalt recycled and the corporate name and location of the recycling establishment receiving the removed asphalt.
*****	Weigh each and every vehicle delivering debris upon entrance and exit. Cover debris.
Asbestos	Refer to Section 02 82 16.
Lead Based Paint Materials	Refer to Section 02 82 33.13.
Metals	<p>Metals will not be accepted at the landfill. Remove metals from each and every category before delivery to landfill. (Example: Remove hardware from doors and windows.)</p> <p>Dispose of metal construction debris at Defense Reutilization Maintenance Office (DRMO).</p> <p>Aluminum, brass, copper, lead, other metal, electrical wiring, cable (cut in 3 foot or less sections)</p>

3.5.3 Garbage Disposal

Place garbage in approved containers, and move to a pickup point or disposal area, where directed.

3.5.4 Disposal Off-Base

- a. Provide 24-hour advance written notice to the Contracting Office of Contractor's intention to dispose of off base.
- b. Disposal at sites or landfills not holding a valid State of North Carolina permit is specifically prohibited. The prohibition also applies to sites where a permit may have been applied for but not yet obtained.
- c. Off-base disposal of construction debris outside the parameters of this paragraph at site without State permits and/or not in accordance with regulatory requirements shall require the Contractor at his own expense to remove, transport and relocate the debris to a State approved site. The Contractor shall also be required to pay any fines, penalties, or fees related to the illegal disposal of construction debris

3.6 CONTROL AND DISPOSAL OF HAZARDOUS WASTE

3.6.1 Hazardous Waste Generation

Handle generated hazardous waste in accordance with 40 CFR 262.

3.6.2 Hazardous Waste Disposal

Dispose of hazardous waste in accordance with Federal, State, and local regulations, especially 40 CFR 263, 40 CFR 264, and 40 CFR 265. Removal of hazardous waste from Government property shall not occur without prior notification and coordination with the Contracting officer. Transport hazardous waste by a permitted, licensed, or registered hazardous waste transported to a TSD facility. Hazardous waste shall be properly identified, packaged, and labeled in accordance with 49 CFR 172. Provide completed manifest for hazardous waste disposed of off-site to the Contracting Officer within 7 days of disposal. Hazardous waste shall not be brought onto the station.

3.6.3 Hazardous Waste Storage

Store hazardous waste in containers in accordance with 49 CFR 178. Identify hazardous waste in accordance with 40 CFR 261 and 40 CFR 262. Identify hazardous waste generated within the confines of the station by the station's EPA generator identification number.

3.6.4 Spills of Oil and Hazardous Materials

Take precautions to prevent spills of oil and hazardous material. In the event of a spill, immediately notify the Contracting Officer. Spill response shall be in accordance with 40 CFR 300 and applicable State regulations.

3.6.5 Lead-Acid Batteries

Dispose of lead-acid batteries that are not damaged or leaking at a

State-approved battery recycle or at a permitted or interim status hazardous waste TSD facility. For lead-acid batteries that are leaking or have cracked casings, dispose of the electrolyte solution using one of the following alternatives:

- a. An industrial waste water treatment plant, if available and approved by the Contracting Officer for disposing of lead-acid battery electrolyte.
- b. Dispose of the lead-acid battery electrolyte at a permitted or interim status hazardous waste TSD facility.

The management and disposal of waste lead-acid batteries and electrolyte shall comply with requirements for management and disposal of hazardous wastes.

3.6.6 Mercury Control

Prior to starting work, remove thermostats, switches, and other components that contain mercury. Upon removal, place items containing mercury in doubled polyethylene bags, label, and turn over to the Contracting Officer for disposal.

3.6.7 Petroleum Products

Protect against spills and evaporation during fueling and lubrication of equipment and motor vehicles. Dispose of lubricants to be discarded and excess oil.

3.6.8 Ozone Depleting Substances (ODS)

Remove ODS as specified in Section 02 41 00, "Demolition."

3.7 DUST CONTROL

Keep dust down at all times, including nonworking periods. Sprinkle or treat, with dust suppressants, the soil at the site, haul roads, and other areas disturbed by operations. Dry power brooming will not be permitted. Instead, use vacuuming, wet mopping, wet sweeping, or wet power brooming. Air blowing will be permitted only for cleaning nonparticulate debris such as steel reinforcing bars. Only wet cutting will be permitted for cutting concrete blocks, concrete, and bituminous concrete. Do not shake bags of cement, concrete mortar, or plaster unnecessarily.

3.8 QUARANTINE FOR IMPORTED FIRE ANT (4/82)

Onslow, Jones, and Cartaret Counties and portions of Duplin and Craven Counties have been declared a generally infested area by the United States Department of Agriculture (USDA) for the imported fire ant. Compliance with the quarantine regulations established by this authority as set forth in USDA Publication 301.81 of 31 December 1992, is required for operations hereunder. Pertinent requirements of the quarantine for materials originating on the Camp Lejeune reservation, the Marine Corps Air Station (Helicopter), New River and the Marine Corps Air Station, Cherry Point, which are to be transported outside Onslow County or adjacent suppression areas, include the following:

- a. Certification is required for the following articles and they shall not be moved from the reservation to any point outside

Onslow County and adjacent designated areas unless accompanied by a valid inspection certificate issued by an Officer of the Plant Protection and Quarantine Program (PPQ) of the U.S. Department of Agriculture.

- (1) Bulk soil
 - (2) Used mechanized soil-moving equipment. (Used mechanized soil-moving equipment is exempt if cleaned of loose noncompacted soil).
 - (3) Other products, articles, or means of conveyances, if it is determined by an inspector that they present a hazard of transporting spread of the imported fire ant and the person in possession thereof has been so notified.
- b. Authorization for movement of equipment outside the imported fire and regulated area shall be obtained from USDA, Animal and Plant Health Inspection Service (APHIS), Plant Protection and Quarantine (PPQ), Box 28, Goldsboro, North Carolina, 27533-0028, Attn: Mr. William Scroggins or Mr. Frank Best, telephone (919) 735-1941. If Mr. Scroggins or Mr. Best are not available, contact Mr. Jim Kelley at (910) 815-4667, the supervisor's office in Wilmington. Requests for inspection shall be made sufficiently in advance of the date of movement to permit arrangements for the services of authorized inspectors. The equipment shall be prepared and assembled so that it may be readily inspected. Soil on or attached to equipment, supplies, and materials shall be removed by washing with water or such other means as necessary to accomplish complete removal. Resulting spoil shall be wasted as necessary and as directed.

ANNUAL REPORT OF PRODUCTS CONTAINING RECOVERED MATERIALS

Contractor shall submit data annually (By 1 December) for the following products used during the previous fiscal year (1 October - 30 September) as required by 6002 of the Solid Waste Disposal Act as ammended by Resource Conservation and Recovery Act (RCRA):

Contract Number: _____ Fiscal Year: _____

<u>MATERIAL</u>	<u>UNIT</u>	<u>QUANTITY (CRM)</u>	<u>TOTAL QUANTITY</u>
<u>A. Insulation</u>			
1. Loose fill	Ft3		
2. Blanket or batt	Ft2		
3. Board	Ft2		
4. Spray-in-place	m3		
5. Other			
<u>B. Cement and Concrete</u>			
	yd3		
<u>C. Paper and Paper Products</u>			
1. Copy Paper	Box		
2. Printing/Writing Paper	Box		
3. Corrugated and fiberboard boxes	Box		
4. Folding boxboard and cartons	Box		
5. Stationary, office papers, envelopes, and computer paper	\$Amt		
6. Toilet tissue, paper towels, fasial tissue, paper napkins, doilies and industrial wipes	\$Amt		
7. Brown papers and coarse papers	Box		
8. Other			

APPENDIX A

<u>MATERIAL</u>	<u>DEFINITION</u>
1. Quantity (CRM)	Quantity used containing recovered materials.
2. Total Quantity	Quantity used containing recovered materials plus quantity used not containing recovered materials.
3. Unit	Ft3 (cubic feet), Ft2 (square feet), m3 (cubic meters), yd3 (cubic yards), box (number of boxes used), \$ Amt (dollar value of material used)
4. Loose-Fill Insulation	Includes, but is not limited to..."cellulose fiber, mineral fibers (fiberglass and rock wool), vermiculite, and perlite.
5. Blanket or Batt Insulation	Includes, but is not limited to... "mineral fibers (fiberglass and rock wool)."
6. Board Insulation	This category refers to sheathing, roof decking, and wood panel insulation. It includes, but is not limited to... "cellulose fiber fiberboard, perlite composite board, polyurethane, polyisocyanurate, polystyrene, phenolics, and composites."
7. Spray-in-place Insulation	Includes, but is not limited to... "foam-in-place polyurethane and polyisocyanurate, and spray-on cellulose."
8. Cement or Concrete Containing Recovered Materials, Cement, or Concrete Containing Fly Ash	
9. Copy Paper	This item refers to... "any grade of paper suitable for copying by the xerographic method."
10. Printing & Writing Paper	This item refers to... "paper designed for printing, other than newsprint, such as offset or book paper," and... "paper suitable for pen and ink, pencil, typewriter or printing."

APPENDIX A

<u>MATERIAL</u>	<u>DEFINITION</u>
11. Corrugated & Fiberboard Boxes	Corrugated boxes refer to... "boxes made of corrugated paperboard, which, in turn, is made from a fluted corrugating medium pasted to two flat sheets of paperboard (linerboard)." Fiber or fiberboard boxes refer to... "boxes made from containerboard, either solid fiber or corrugated paperboard (general term); or boxes made from solid paperboard of the same material throughout."
12. Folding Boxes and Cartons	This item refers to... "a paperboard suitable for the manufacture of folding cartons."
13. Stationery, Office Papers, Envelopes, and Manifold Business Forms	This item is considered self-explanatory, however, if questions arise refer to 40 CFR 250.4 for definitions of any of these items.
14. Toilet Tissue, Paper Towels, Facial Tissue, Paper Napkins, Doilies, and Industrial Wipes	This item is considered self-explanatory, however, if questions arise refer to 40 CFR 250.4 for definitions of any of these items.
15. Brown Papers, and Coarse Papers	Brown papers refer to... "papers usually made from unbleached kraft pulp and used for bags, sacks, wrapping paper, and so forth." Coarse papers refer to... "papers used for industrial purposes, as distinguished from those used for cultural or sanitary purposes."
16. Other	Any other type of paper not included in any of the above categories.

APPENDIX A

-- End of Section --

Marine Corps Base (MCB) Camp Lejeune Contractor Environmental Guide



August 2008

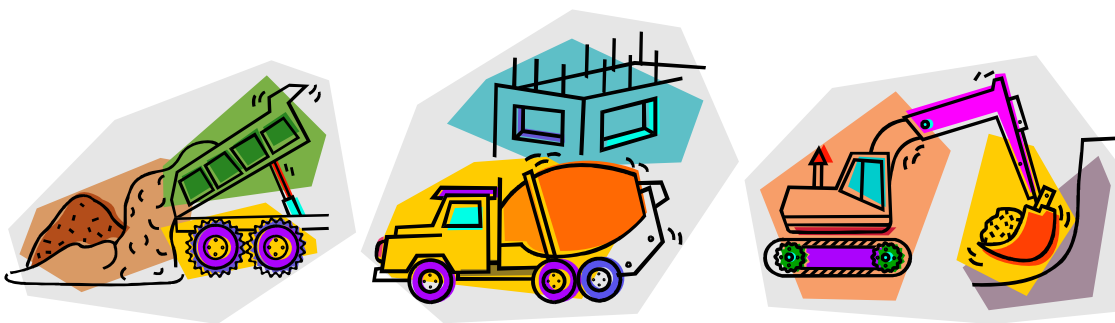


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Attachment 3-1 Spill Reporting Form

Attachment 4-1 Weekly Hazardous Waste (HW) Site Inspection Form, MCB
Camp Lejeune

Attachment 4-2 Weekly Hazardous Waste (HW) Site Inspection Form, MCAS
New River

Attachment A MCB Camp Lejeune, NC/MCAS New River General EMS and
Environmental Awareness Training for Contractors and Vendors

1.0 CONTRACTOR ENVIRONMENTAL GUIDE OVERVIEW

The purpose of this Contractor Environmental Guide is to assist contractors working aboard Marine Corps Base (MCB) Camp Lejeune (MCBCL) and Marine Corps Air Station (MCAS) New River (MCASNR) in complying with Federal and state environmental laws and regulations, as well as Marine Corps and local Installation environmental policies. This guide is designed to answer many of the environmental questions that arise as well as provide pertinent information on environmental topics and training requirements.

NOTE This document should be used only as a *guide* to environmental issues contractors may face while working aboard MCBCL and MCASNR. It is expected that contractors will work closely with their Resident Officer in Charge of Construction (ROICC) or Contract Representatives who will consult with the Environmental Management Division (EMD) at MCBCL and the Environmental Affairs Department (EAD) at MCASNR regarding environmental management issues, concerns, and/or questions.

NOTE This guide is designed to provide the Federal and state requirements and Marine Corps and Installation policies that pertain to MCBCL and MCASNR. It is the contractor's responsibility to know and comply with requirements and policies. Environmental personnel will assist contractors with compliance issues; however, the primary burden of regulatory identification, familiarity, and compliance lies with the contractor. This training *does not* replace any required regulatory environmental training as per contract requirements. Required environmental training should be completed *prior* to working at MCBCL or MCASNR, if required by your contract.

NOTE It is the contractor's responsibility to review the project-specific contract and specifications. Additional environmental requirements, submissions, and/or meetings not documented in this guide may be necessary.

This document should be used only as a *guide* to environmental issues contractors may face while working aboard MCBCL and MCASNR.

If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative, who will contact EMD or EAD if additional clarification is necessary.

1.1 KEY DEFINITIONS AND CONCEPTS

The following are key definitions and concepts used throughout this guide. If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative, who will contact the appropriate environmental office if additional clarification is necessary.

1.1.1 Key Definitions

- **Environment.** Surroundings in which an organization operates, including air, water, land, natural resources, flora, fauna, humans, and their interrelation.
- **Environmental Management Division (EMD).** MCBCL's environmental division responsible for environmental issues and compliance at MCBCL and MCASNR (with the exception of hazardous waste and hazardous materials at MCASNR).
- **Environmental Affairs Department (EAD).** MCASNR's environmental department responsible for hazardous waste/hazardous material issues at MCASNR.

1.1.2 Key Concepts

- **Comprehensive Environmental Training and Education Program (CETEP).** The Marine Corps training program designed to ensure that high-quality, efficient, and effective environmental training, education, and information are provided at all levels of the Marine Corps.
- **Environmental Management System (EMS).** The part of the overall management system that includes organizational structure, planning activities, responsibilities, practices, procedures, processes, and resources for developing, implementing, achieving, reviewing, and maintaining the Environmental Policy.
- **EMS Training.** Instruction that is designed to ensure that military and civilian personnel, including contractors and vendors, become familiar with the Installation's EMS and how it functions.
- **General Environmental Awareness Training.** Instruction that is designed to ensure that military and civilian personnel, including contractors and vendors, become familiar with the local environmental policies and programs for regulatory compliance, natural resource conservation, pollution prevention, and environmental protection.
- **Installation.** Throughout this document, Installation refers to all MCBCL property, including MCASNR and all outlying fields associated with MCBCL.

1.2 INSTALLATION BACKGROUND

MCB Camp Lejeune was established in 1941 in Onslow County along the southern coast of North Carolina. MCBCL is located just north of MCAS New River. MCBCL encompasses more than 153,000 acres, consisting of 26,000 acres of water and 127,000 acres of land.

The primary function of MCBCL is national defense, providing a home base for the II Marine Expeditionary Force (MEF), 2d Marine Division, 2d Marine Logistics Group, and other combat units and support commands. MCBCL's mission is to maintain combat ready units for expeditionary deployment. MCBCL maintains and utilizes supply warehouses;

maintenance shops; hazardous material and hazardous waste storage; bulk fuel storage and transfer facilities; fleet parking; housing areas; recreational areas; two golf courses; and a marina. Additionally, MCBCL is a self-sufficient Base, with its own steam-generating station, wastewater treatment plant, drinking water wells, drinking water treatment plants, and landfill.

MCASNR is the principal U.S. Marine Corps (USMC) helicopter operating location on the East Coast. The Air Station supports aircrew training in the H-53 helicopter. It is also the evaluation and prospective beddown site for the V-22 Osprey. The mission of MCASNR is to provide the necessary support for its tenant units, Marine Aircraft Group 26 (MAG-26) and MAG-29.

1.2.1 Environmental Management Division (EMD) and Environmental Affairs Department (EAD)

MCBCL's EMD, located within the Installation and Environment Department, is responsible for all natural resource and environmental matters aboard the Installation (with the exception of hazardous waste/hazardous material issues at MCASNR). EMD works closely with activities at MCBCL, educating and training personnel to comply with environmental laws while accomplishing the military mission.

The Environmental Affairs Department (EAD) is located at MCASNR. EAD and EMD work closely together. MCBCL and MCASNR participate together in one Environmental Management System (EMS).

1.2.2 Expectations

As contractors aboard the Installation, your commitment to strict compliance with environmental laws and regulations will assist the Installation in providing the best possible training facilities for today's Marines and Sailors while honoring our environmental responsibilities and objectives. Violation of environmental laws can result in severe civil or criminal penalties and fines.

1.3 OVERVIEW OF REQUIREMENTS

1.3.1 Contractor Environmental Guide

The following information is contained in the guide:

- MCBCL Contractor Environmental Guide
 - EMS overview and requirements
 - Environmental program specific requirements
- Attachment A: MCB Camp Lejeune/MCAS New River General EMS and Environmental Awareness Training for Contractors and Vendors

This guide and associated EMS and General Environmental Awareness training module is provided for review to contractors and their employees performing work aboard the Installation. Included is a summary of the EMS and environmental programs, as well as a summary of key requirements associated with the various environmental issues contractors may encounter while performing work aboard the Installation. Contractors are expected to work with their ROICC or Contract Representatives and the EMD/EAD when environmental concerns or issues arise.

1.3.2 Environmental and EMS Training

In accordance with Department of Defense (DoD) instructions and Marine Corps Orders (MCO), MCBCL and MCASNR have implemented Comprehensive Environmental Training and Education Programs (CETEP). The goal of CETEP is to ensure that appropriate environmental instruction and related information are provided to all levels of the Marine Corps in the most effective and efficient manner to achieve full compliance with all applicable environmental training requirements. A major component of the CETEP is to provide general environmental awareness training to all individuals associated with the Installation, including contractors.

In addition to CETEP requirements, the Installation has implemented an Installation-wide Environmental Management System. The EMS highlights the fact that the authority and principal responsibility for controlling environmental impacts belong to those commands, units, offices, and personnel (including contractors) whose activities have the potential to impact the environment.

All contractors should provide both EMS and General Environmental Awareness training to their employees. This guide, along with the training materials in Attachment A, satisfy these training requirements. The

This guide and associated EMS and General Environmental Awareness training module is provided for review to contractors and their employees performing work aboard MCB Camp Lejeune.

All contractors are provided both EMS and General Environmental Awareness training materials in this handbook to utilize in training their employees.

training module can also be accessed at the MCBCL EMD website at: <http://www.lejeune.usmc.mil/emd/> under “General EMS and Environmental Awareness Training for Contractors and Vendors.”

As such, contractors working aboard the Installation will do the following:

- Fulfill job responsibilities in compliance with environmental regulations and in conformance with EMS requirements.
- Complete all applicable environmental training and maintain associated records as per contract requirements.
- Review EMS and General Environmental Awareness training, and be aware of and understand the Environmental Policy.
- Contact their ROICC or Contract Representative immediately regarding environmental and/or EMS issues.

1.4 POINTS OF CONTACT

Table 1-1 lists the EMD Branches and their respective phone numbers. Contact your ROICC or Contract Representative, who may refer you to an EMD POC for environmental and EMS-related questions and/or concerns.

Table 1-1. EMD Points of Contact, 0730 to 1630 M–F

Branch/Program Area	Phone Number
MARINE CORPS BASE, CAMP LEJEUNE	
Environmental Management Division (EMD), I&E Dept	(910) 451-5003
Environmental Compliance Branch, EMD	(910) 451-5837
Hazardous Waste/Hazardous Material (HW/HM) Program	(910) 451-1482
Base HazMart	(910) 451-1482
Pollution Abatement System Program	(910) 451-1482
Environmental Quality Branch (Air Quality, Water Quality, Solid Waste, Permitting)	(910) 451-5068
Environmental Conservation Branch (Natural Resources, Cultural Resources)	(910) 451-5063
Conservation Law Enforcement	(910) 451-5226
MARINE CORPS AIR STATION, NEW RIVER	
Environmental Affairs Division (HW/HM issues aboard MCASNR)	(910) 449-5997

In the case of an environmental emergency, contact the appropriate party, as well as your ROICC or Contract Representative, as outlined in Table 1-2. Additional emergency response procedures are provided in Section 3.0 of this guide.

Table 1-2. Environmental Emergency Contacts

If you spill:	Call:
Hazardous waste	911
Unknown materials	911
Hazardous materials	911
Petroleum, oil, and lubricants (POL) and/or nonpetroleum oils (cooking oils and greases)	911

2.0 ENVIRONMENTAL MANAGEMENT SYSTEM

The Installation jointly operates an Environmental Management System (EMS). An EMS is a systematic way of continually implementing environmental requirements and evaluating performance. The EMS is founded on the principles of MCB Camp Lejeune and MCAS New River's Environmental Policy, which is endorsed by their respective Commanding Officers (COs). Three key principles of the Environmental Policy are to comply with relevant environmental laws and regulations, prevent pollution, and continually improve our EMS.

The purpose of the EMS is to sustain and enhance mission readiness and access to training areas through effective and efficient environmental management. The EMS highlights the fact that the authority and principal responsibility for controlling environmental impacts belong to those commands, units, offices, and personnel (including contractors and vendors) whose activities have the potential to impact the environment.

2.1 KEY DEFINITIONS AND CONCEPTS

The following key definitions and concepts are associated with environmental management systems. If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative, who will contact the appropriate environmental office if additional clarification is necessary.

Three key principles of the Environmental Policy are to comply with relevant environmental laws and regulations, prevent pollution, and continually improve our EMS.

If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative, who will contact EMD if additional clarification is necessary.

2.1.1 Key Definitions

- **Environment.** Surroundings in which an organization operates, including air, water, land, natural resources, flora, fauna, humans, and their interrelation.
- **Environmental Aspect.** A characteristic of a practice that can cause, in normal operation or upset mode, an impact to an environmental or other resource. Each practice may have several aspects.
- **Environmental Impact.** An effect of a practice's aspect on an environmental or other resource. Each practice may have several impacts.
- **Environmental Resources.** Sensitive environmental receptors (e.g., air, water, natural resources) or cultural or historic assets at the Installation, in the surrounding community, within the ecosystem or beyond, that can be impacted by the operation of practices.
- **Practice.** A unit process that supports a military mission and can impact environmental resources. (It is the ability to impact an environmental resource that is key to defining a practice. However, practices may also impact other resources.)
- **Practice Owner.** Person(s) responsible for control of practices. EMS procedures use the term *practice owner* when assignment of more specific responsibilities is left to the owning organizations.

2.1.2 Key Concepts

- **Environmental Management System (EMS).** The part of the overall management system that includes organizational structure, planning activities, responsibilities, practices, procedures, processes, and resources for developing, implementing, achieving, reviewing, and maintaining the Environmental Policy.
- **Environmental Policy.** Statement by the organization of its intentions and principles in relation to the overall environmental performance, which provides a framework for action and for the setting of environmental objectives and targets.

2.2 OVERVIEW OF REQUIREMENTS

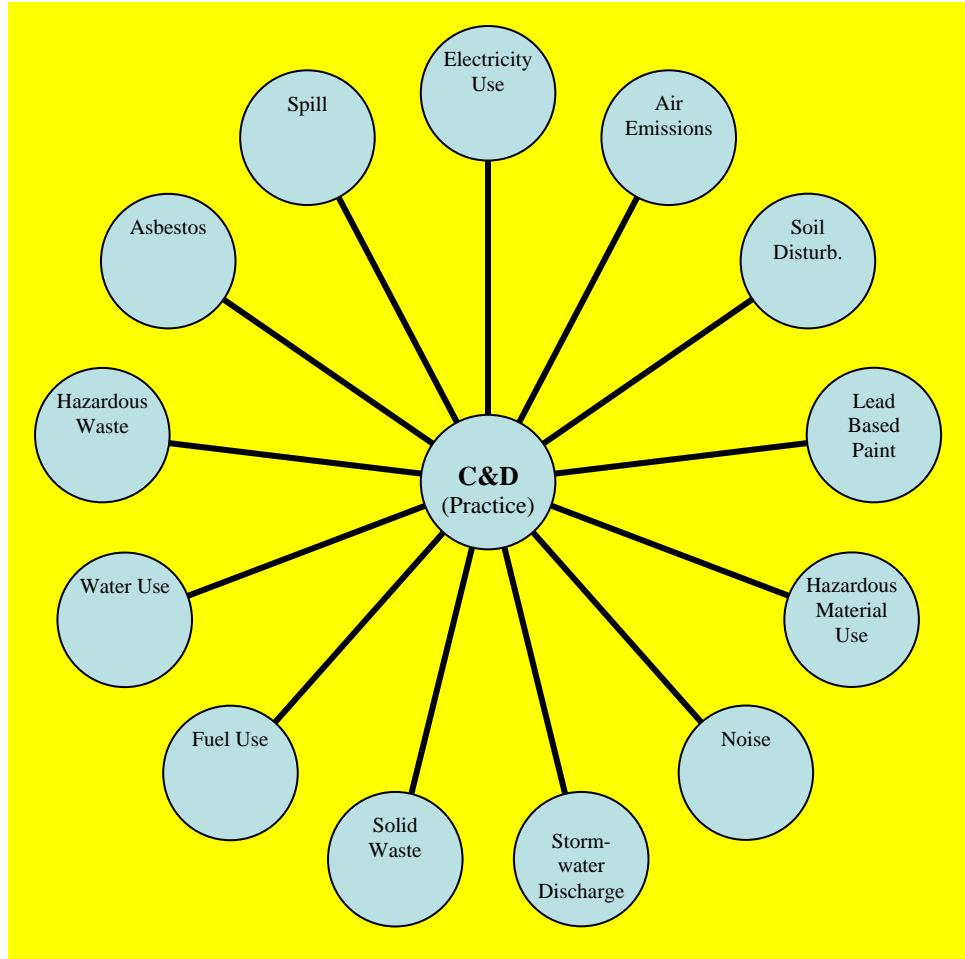
Contractors must be aware of, and adhere to, all regulations and requirements concerning EMS, including the following:

- **Executive Order 13423, Strengthening Federal Environmental, Energy, and Transportation Management.** Requires implementation of an EMS at all appropriate organizational levels.

2.3 ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)

An EMS is a systematic way of continually implementing environmental requirements and evaluating performance. The foundation of the Installation's EMS is based on the activities, or practices, conducted at the installation. One "systematic" component of the EMS is identifying all practices, or actions, executed aboard the Installation that have potential environmental aspects and impacts. Each practice at the installation, such as construction/demolition, wastewater treatment, or groundskeeping, has one or many environmental aspects. An aspect of a practice is a characteristic that can cause an impact to an environmental or other resource, such as water use. These environmental aspects can then result in an impact (e.g., depletion of natural resources) on an environmental or other resource. This relationship between practices and aspects for the practice of construction and demolition (C&D) activities is illustrated in the following simplified figure:

It is expected that contractors understand that the activities performed on base can interact with the environment and have the potential to impact the environment.



2.4 EMS RESPONSIBILITIES

It is expected that contractors understand that the activities (e.g., practices) performed on Installation can interact with the environment (e.g., environmental aspects) and have the potential to impact the environment. Therefore, it is expected that contractors will do the following:

- Review the Contractor Environmental Guide.
- Be aware of the Environmental Policy.
- Conduct activities in a manner to avoid and/or minimize impacts to the environment by complying with all applicable Federal, state, and local environmental regulations and Base Orders.
- Be familiar with spill procedures.
- Report all environmental emergencies and spills.

- Report any environmental problems or concerns promptly and notify the ROICC or Contract Representative.
- Respond to data collection efforts upon request.

2.5 CONTRACTOR ENVIRONMENTAL GUIDE AND EMS

The Contractor Environmental Guide comprises sections that are categorized based on the type of environmental requirements routinely encountered by contractors at the Installation. The following matrix relates the practices that contractors generally execute aboard the Installation to the contents of this guide. The matrix is provided to assist contractors in narrowing down specific requirements that may apply to on-site activities.

MCB CAMP LEJEUNE PRACTICES	Env. Emergency Response/ Spill Response, Section 3.0	HM/HW, Section 4.0	Unforeseen Site Conditions, Section 5.0	Asbestos, Section 6.0	Lead Based Paint, Section 7.0	Stormwater, Section 8.0	Solid Waste, Recycling, and P2, Section 9.0	Training, Section 10.0	Cultural Resources, Section 11.0	Permitting, Section 12.0	Air Quality, Section 13.0	Natural Resources, Section 14.0
	Applicable To All Practices Conducted Aboard MCB Camp Lejeune			Applicable To All Practices Conducted Aboard MCB Camp Lejeune				Applicable To All Practices Conducted Aboard MCB Camp Lejeune				
Battery Replacement							●					
Building Maintenance–General	●			●			●					
Building Operation–General	●						●					
Catch Basin Cleaning						●						
Construction/Demolition				●	●	●	●		●	●		●
Controlled Burn Operations											●	●
Degreasing		●									●	
Engine Operation and Maintenance	●	●									●	
Equipment Calibration	●	●										
Equipment Disposal							●					
Equipment Operation and Maintenance	●			●								
Erosion Control						●				●		●
Fuel Storage–Containers	●	●				●						
Fueling	●	●										
Grinding												
HM Storage	●	●			●	●						
HM Transportation	●	●			●							
HW Generation	●	●					●			●		
HW Satellite Accumulation Area	●	●					●			●		
Land Clearing						●	●		●	●		●
Landscaping						●						
Material Storage Handling	●						●					
Mowing						●						
Outfall Cleaning						●						
Packaging/Unpackaging							●					
Paint Removal					●						●	
Painting	●										●	
Painting Preparation	●											
Parts Replacement				●								
PCB Disposal	●											
Pesticide/Herbicide Application	●									●		
Range Residue Clearance						●				●		

MCB Camp Lejeune Practices	Emergency Response/ Spill Response, Chapter 3.0	HM/HW, Chapter 4.0	Unforeseen Site Conditions, Chapter 5.0	Asbestos, Chapter 6.0	Lead Based Paint, Chapter 7.0	Stormwater, Chapter 8.0	Recycling and Pollution Prevention, Chapter 9.0	Training, Chapter 10.0	Cultural Resources, Chapter 11.0	Permitting, Chapter 12.0	Air Quality, Chapter 13.0	Natural Resources, Chapter 14.0		
Refrigerant Replacement	Applicable To All Practices Conducted Aboard MCB Camp Lejeune	●	Applicable To All Practices Conducted Aboard MCB Camp Lejeune								●			
Riparian Buffer Maintenance							●						●	
Rock Crushing Operations								●	●					
Runoff Sedimentation Basins								●			●			
Sediment Traps								●						
Soil Excavation/Grading								●		●			●	
Solid Waste Recycling Collection/Transportation									●			●		
Storage Tank Cleaning and Maintenance		●										●		
Stormwater Collection/Conveyance System								●				●		
Stormwater Engineering Controls Operation and Maintenance								●				●		
Stump/Brush Removal								●	●					●
Vehicle Operation									●					
Vehicle Parking								●						
Vehicle/Equipment Fluid Change	●													

3.0 ENVIRONMENTAL EMERGENCY RESPONSE/SPILL RESPONSE

The purpose of emergency planning is to control, contain, and remove releases of materials while minimizing impacts to human health and the environment. Contractors operating aboard the Installation must be aware of, and adhere to, environmental emergency response procedures and notification requirements to minimize detrimental effects from inadvertent releases.

For procedures relating to emergencies caused by unforeseen site conditions, please refer to Section 5.0 in this guide. For other types of non-environmental emergencies, always call 911.

3.1 KEY DEFINITIONS AND CONCEPTS

The following key definitions and concepts are associated with environmental emergency response and spill response requirements. If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative, who will contact the appropriate environmental office if additional clarification is necessary.

3.1.1 Key Definitions

- **Berm.** A mound used to prevent the spread of a contaminated area.
- **Non-Petroleum Oil.** Oil products that may include, but are not limited to, synthetic oils such as silicone fluids and tung oils, wood-derivative oils such as resin/rosin oils, animal fats and oil, and edible and inedible seed oils from plants.
- **POL.** Petroleum, Oil, and Lubricant products that may include, but are not limited to, any petroleum-based products such as gasoline, diesel fuel, jet fuel, engine oil, gear oil, lube oil, and lubricant products such as hydraulic brake fluid, automatic transmission fluid (ATF), and grease.
- **Release.** The uncontrolled loss of a hazardous material from its storage vessel, to include POLs. All releases are required to be reported to the Fire and Emergency Services Division. Releases of POLs that occur within an enclosed and contained maintenance facility are not subject to this reporting requirement provided they do not have the potential to impact the environment.

If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative, who will contact EMD if additional clarification is necessary.

3.1.2 Key Concepts

- **Environmental Emergency Response Contacts:**

If you spill:	Call:	Follow-up:
Hazardous waste	911	Spill Report
Unknown materials	911	Spill Report
Hazardous materials	911	Spill Report

- **Spill Follow-Up.** Contractors have containment and cleanup responsibilities following a spill.

3.1.3 Environmental Management System

All practices associated with Emergency Response/Spill Response are listed in Section 2 of this Handbook. The following is a list of potential impacts associated with these practices.

- Air Quality Degradation
- Community Relations/Public Perception Impact
- Depletion of Landfill Space
- Depletion of Resources
- Electricity Consumption
- Fuel Consumption
- Groundwater Quality Degradation
- Historic/Cultural Resource Disturbance
- Other Natural Resource Disturbance
- Personnel Exposure
- Potable Water Quality Degradation
- Real Property/Private Property Damage
- Soil Compaction
- Soil Erosion
- Soil Quality Degradation
- Surface Water Quality Degradation
- Water Consumption
- Wetlands Disturbance
- Wildlife Species/Habitat Disturbance

3.2 OVERVIEW OF REQUIREMENTS

Contractors operating aboard the Installation must be aware of, and adhere to, all applicable regulations and requirements regarding emergency response and spill procedures, including the following:

- **Clean Air Act (CAA) of 1970, Section 112r.** Specifies emergency planning where potential exists for catastrophic release of hazardous air pollutants.
- **Clean Water Act (CWA) of 1972.** Establishes the basic structure for regulating discharges of pollutants into the Waters of the United States.
- **Comprehensive Environmental Response, Compensation, and Liability (CERCLA) Act of 1980.** Authorizes federal response to any release or threatened release of hazardous substance into the environment. This act defines hazardous substances (HS) by reference to substances that are listed or designated under other environmental statutes.
- **Emergency Planning and Community Right-to-Know Act of 1986, Section 304.** Establishes requirements for the reporting of a release to ensure a quick response by local emergency responders. Notification requirements apply to two chemical lists: the Extremely Hazardous Substances (EHS) list and CERCLA HS list. The “List of Lists” provides comprehensive identification of EHSs and HSs.
- **NC General Statute Chapter 143, Article 21A – Oil Pollution and Hazardous Substances Control.** Prohibits pollution by oil, oil products, oil by-products, and other hazardous substances into the land and the waters over which the State has jurisdiction. The statute establishes specific requirements for reporting a release to the State and supports and complements applicable provisions of the Federal Water Pollution Control Act.
- **Oil Pollution Act (OPA) of 1990.** Addresses oil storage at facilities and emphasizes preparedness and response activities. This act prohibits the harmful discharge of oil and hazardous substances into Waters of the United States.
- **Resource Conservation and Recovery Act of 1976 Subtitle C.** Establishes a system for controlling hazardous waste from the time it is generated, transported, treated, stored, and/or disposed of, or from “cradle to grave.”

3.3 Spill Notification

The Installation Integrated Contingency Plan (ICP) provides general information for any type of response actions needed for spills aboard the Installation. Contractors must develop a Unit Level Contingency Plan that addresses spill response for their specific sites and potential spill types (e.g., chemical; sewer; POL; and non-petroleum oils). This plan must be maintained onsite and be available for review upon request.

In the event of a spill, contact your ROICC or Contract Representative after contacting emergency response. They will contact EMD to obtain a spill report form. Return the completed form to EMD (Fax # (910) 451-3471) and to your ROICC or Contract Representative. A copy of the spill reporting form is included as Attachment 3-1. The following information must be provided when reporting a spill to 911:

- Your name and phone number
- Location of spill (building, number, street)
- Number and type of injuries, if any
- Type and amount of spilled material
- Source of the spill (container, vehicle, etc.)
- Action being taken, if any, to control the spill
- Estimated time of spill

Do not wait to report a spill if all of the required information is not immediately available.

3.4 Follow-Up

Should surface runoff be contaminated, the contractor will, under the advisement of the Fire and Emergency Services Division or EMD, construct a temporary berm or containment area. Contaminated surface water will be removed in accordance with all safety and environmental requirements for the Installation. The Resource Conservation and Recovery Section (RCRS) within EMD ((910) 451-1482) will be notified and will provide concurrence for temporary containment areas and removal of contaminated runoff.

If solid or hazardous waste was generated as the result of a spill, refer to Sections 4.0 and 9.0 of this guide for disposal requirements.

Contractors must develop a Unit Level Contingency Plan that addresses spill response for their specific sites and potential spill types.

Attachment 3-1

Spill Reporting Form

** For EMD Personnel Only.
Fill out all the blanks except for #18.

SPILL REPORTING FORM

CALL RECEIVED BY: _____ RESPONDED BY: _____

SUBJ: _____

1. DATE: _____ TIME: _____

2. SOURCE: _____

(Include Serial Number of equipment if available).

3. LOCATION BUILDING: _____

4. Did Fire Dept. Respond? _____ Name of Responder: _____

5. UNIT/AGENCY: _____ POC: _____

6. ESTIMATED AMOUNT: _____ GALLONS -- QUARTS -- PINTS (Circle One)

7. TYPE OF SUBSTANCE: _____

8. SAMPLES TAKEN: _____

9. SLICK DESCRIPTION: (NONE) OR _____

10. ACTION TAKEN: _____

11. ON SCENE WEATHER: _____

12. OIL SPILL MOVEMENT: (NONE) OR _____

13. DAMAGE: (NONE) OR _____

14. POTENTIAL DANGER: (NONE) OR _____

15. CAUSE OF SPILL: _____

16. PARTIES PERFORMING SPILL REMOVAL: _____

17. ASSISTANCE REQUIRED: NO ADDITIONAL OR _____

** 18. TELEPHONE REPORT WAS MADE TO NRC—TIME _____ DATE _____
CONFIRMATION NUMBER IS _____. TELEPHONE REPORT WAS MADE TO
NC DIVISION OF EMERGENCY—TIME _____ DATE _____, POC IS _____.

POINT OF CONTACT IS MR JOHN HAMILTON, ENVIRONMENTAL COMPLIANCE
BRANCH, ENVIRONMENTAL MANAGEMENT DIVISION, INSTALLATION AND
ENVIRONMENT DEPARTMENT, AT (910) 451-1482.

4.0 HAZARDOUS MATERIALS/HAZARDOUS WASTE MANAGEMENT

All persons on a Marine Corps installation are subject to compliance with Federal and state regulations and permit conditions addressing the proper management of both hazardous materials and hazardous waste.

Mishandling these wastes and materials may result in violation notices, fines, and/or penalties. The U.S. Environmental Protection Agency (USEPA) regulates hazardous wastes through the Resource Conservation and Recovery Act (RCRA), which provides specific regulatory definitions for hazardous waste and its management. RCRA governs all hazardous waste from the point of generation to the point of final disposal. This includes hazardous waste generated by contractors aboard the Installation. Hazardous materials, including those used by contractors aboard the Installation, are regulated by the Emergency Planning and Community Right-to-Know Act (EPCRA). Additionally, the North Carolina Department of Environment and Natural Resources (NCDENR) has issued more stringent rules and regulations governing hazardous materials and hazardous waste management that also apply to contractors.

4.1 KEY DEFINITIONS AND CONCEPTS

The following key definitions and concepts are associated with hazardous materials, hazardous wastes, and their management. If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative, who will contact the appropriate environmental office if additional clarification is necessary.

4.1.1 Key Definitions

- **Hazardous Material (HM).** A chemical compound, or combination of compounds, posing or capable of posing a significant risk to public health, safety, or the environment as a result of its quantity, concentration, or physical/chemical/infectious properties.
- **Hazardous Waste (HW).** A solid waste, or combination of solid wastes, which because of quantity, concentration, or physical, chemical, or infectious characteristics may:

If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative.

-
- Cause, or significantly contribute to, an increase in mortality or an increase in serious irreversible, or incapacitating reversible illness, or
 - Pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed.
- **Manifest.** A document that allows all parties involved in hazardous waste management (e.g., generators, transporters, disposal facilities, USEPA, state agencies) to track the movement of hazardous waste from the point of generation to the point of ultimate treatment, storage, or disposal.
 - **Material Safety Data Sheet (MSDS).** A document that provides information about (1) the potential health effects of exposure to chemicals or other potentially dangerous substances and (2) safe working procedures for users to adhere to when handling that chemical or substance.
 - **Non-RCRA-Regulated Waste.** A waste that is not regulated or is exempt from regulation under RCRA hazardous waste requirements but has other regulatory requirements for proper management.
 - **Satellite Accumulation Area (SAA).** A HW generation point at which waste may be accumulated until the HW storage container is full. A filled container must be transferred within 72 hours to an approved 90-day site or long-term HW storage facility. An EMD authorization for an SAA must be obtained and posted at the site. EMD authorization will establish individual limits for each SAA. No SAA authorizations will exceed 55 gallons of HW or 1 quart of acutely HW. Per Installation policy, storage of HW in a SAA should not exceed 365 days even if the container is not full.
 - **Universal Waste (UW).** Universal waste regulations streamline hazardous waste management standards for batteries, pesticides, mercury-containing equipment, and fluorescent lamps. The regulations govern the collection and management of these widely generated wastes, thus facilitating environmentally sound collection and proper recycling or treatment. In North Carolina, batteries,

thermostats, obsolete agricultural pesticides, and fluorescent lamps may be managed under the UW Rule. UW must be transferred off-site within one (1) year of the date when the material was first identified as waste.

- **Used Oil.** Any oil that has been refined from crude oil or synthetic oil and, as a result of use, storage, or handling, has become unsuitable for its original purpose due to the presence of impurities or loss of original properties. Used oil may be suitable for further use and is economically recyclable, therefore is managed as a separate category of material.

4.1.2 Key Concepts

None.

4.1.3 Environmental Management System

Practices, or activities, associated with hazardous materials and hazardous waste management includes the following:

- Building maintenance—general
- Building operation—general
- Degreasing
- Engine operation and maintenance
- Equipment calibration
- Equipment operation and maintenance
- Fuel storage—containers
- Fueling
- HM storage
- HM transportation
- HW satellite accumulation area
- Painting
- Painting preparation
- Polychlorinated biphenyl (PCB) disposal
- Pesticide/herbicide application
- Refrigerant replacement
- Storage tank cleaning and maintenance
- Vehicle/equipment fluid change

The potential impacts of these activities on the environment include depletion of the hazardous waste landfill; depletion of non-renewable resources; and degradation of soil quality.

4.2 OVERVIEW OF REQUIREMENTS

Contractors operating aboard MCB Lejeune and MCAS New River must be aware of, and adhere to, all applicable regulations and requirements regarding hazardous materials and hazardous waste, including the following:

- **Base Order (BO) 5090.9, Hazardous Material/Waste Management/Air Station Order (ASO) 5090.2, Environmental Compliance and Protection Program for MCAS New River.** Establishes procedures and general responsibilities for the disposal of hazardous material and hazardous waste under environmental permits and authorizations.
- **Emergency Planning and Community Right-to-Know Act (EPCRA).** Establishes requirements regarding emergency planning and the reporting of hazardous chemical storage and usage.
- **Resource Conservation and Recovery Act (RCRA) of 1976.** Establishes standards for generators and transporters of hazardous waste that will ensure the following: proper recordkeeping and reporting; use of manifest system; use of appropriate labels and containers; and proper management of hazardous waste transfer, storage, and disposal facilities.
- **40 CFR Subchapter I (Parts 260–299), Solid Wastes.** Federal regulations promulgated under the 1976 RCRA that regulate hazardous waste management, generators, transporters, and owners or operators of treatment, storage, or disposal facilities. North Carolina has adopted the Federal hazardous waste rules by reference.

The Installation is a large quantity generator of hazardous waste. Therefore, all hazardous waste generated aboard MCB Camp Lejeune must meet the regulatory requirements of this generator designation.

Both MCB Camp Lejeune and MCAS New River maintain Hazardous Waste Management Plans that outline the specific requirements for

managing hazardous materials and hazardous wastes each Base. This section presents key points from these documents.

The contractor is responsible for ensuring that any used hazardous materials generated during work aboard MCB Camp Lejeune are properly managed and turned in weekly on Wednesday from 1300 - 1500 hours to the EMD Consolidation Center, Bldg. S-962 on Michael Road. For work aboard MCAS New River, hazardous materials can be turned at the Environmental Affairs Department (EAD) Hazardous Waste warehouse, Bldg AS-4225, located on Canal Street. This includes universal waste, used oil, petroleum-contaminated materials, regulated hazardous waste, and non-RCRA-regulated waste. Environmental personnel will provide oversight to verify compliance with applicable Federal and state laws governing the generation and handling of these materials.

Depending on the type of project, contractors may be required to submit a Hazardous Waste Management Plan to the ROICC or the Contract Representative prior to beginning work. Additionally, a Contractor Hazardous Material Inventory Log and corresponding MSDSs for all materials to be used aboard either Base during the execution of the contract may be required by the Contracting Officer. EMD/EAD will use the MSDSs to help contractors establish their Hazardous Material Storage and Satellite Accumulation Areas.

Contractors may be required to submit a Hazardous Waste Management Plan to the ROICC or the Contract Representative prior to beginning work.

4.3 HAZARDOUS MATERIALS REQUIREMENTS

If a project uses hazardous materials:

- Reduce/reuse/recycle when possible; meet contract requirements for recycling.
- Segregate incompatible materials. Consult your MSDS or EMD if you are unsure of a material's compatibility. Some **examples of incompatible materials** likely to be used by contractors at the Installation are:
 - **Corrosives** (e.g., batteries, stripping and cleaning compounds containing acids or bases) **and Flammables** (e.g., fuels, oils, paints, and adhesives);

- **Corrosives** (e.g., batteries, stripping and cleaning compounds containing acids or bases) **and Oxidizers** (e.g., bleach); and
- **Oxidizers** (e.g., bleach) **and Flammables** (e.g., fuels, oils).

Do not store large quantities of materials. Keep on hand only what can be used.

Stop work immediately if a project unearths a hazardous material (such as munitions or ordnance) and report the situation to the ROICC or Contract Representative.

- Keep flammable materials in flammable storage lockers.
- Do not store large quantities of materials. Keep on hand only what can be used.
- Do not dump any hazardous material into floor drains, sinks, oil-water separators, or storm drains, or onto the ground
- Store containers that hold 55 gallons or more (including in-use electrical generators and portable equipment) in proper secondary containment. Containment must be inspected on a weekly basis; all inspections and drainage events must be documented.
- Maintain MSDSs and appropriate spill control/cleanup materials on-site at all times.
- Provide HAZMAT storage and usage information for regulatory reporting to the appropriate environmental office upon request.
- Stop work immediately if a project unearths a hazardous material (such as munitions or ordnance) and report the situation to the ROICC or Contract Representative.
- Do not leave hazardous materials on-site once the contract is completed. Remove from Installation property or turn in all full, partially full, and empty hazardous material containers to the Resource Conservation and Recovery Section (RCRS) at Bldg. S-962 on Michael Road (MCBCL) or EAD at Bldg AS-4225 on Canal Street (MCASNR) upon completion of the contract.

4.4 UNIVERSAL WASTE REQUIREMENTS

NCDENR allows thermostats, obsolete agricultural pesticides, lamps, and certain types of batteries to be managed as universal waste (UW). UW has less stringent requirements for storage, transport, and collection, but must

still comply with full hazardous waste requirements for final recycling, treatment, or disposal. UW requirements are outlined in 40 CFR 273.

All UW must be properly containerized, stored, and labeled at the time the waste is first generated. Containers/areas accumulating UW must be labeled as follows:

- Words: *UNIVERSAL WASTE*.
- Content: Noun name found on the specific Hazardous Waste Profile Sheet (DRMS Form 1930) available from EMD (e.g., *batteries, fluorescent lamps, pesticides, mercury-containing equipment*).
- Accumulation Start Date (ASD): The ASD must be marked on the subject container the moment a UW item is placed into the container. Storage of UW cannot exceed 365 days.
- Number of Containers: The number of containers marked reflects the total number of containers disposed of within the current document (i.e., 1 of 1, etc.).

RCRS or EAD personnel will assist contractors in establishing each UW accumulation area. Key points to follow:

- The containers must be under the control of the contractor generating the waste and must be closed at all times except when adding waste.
- Per Installation policy, UW containers/areas must be inspected weekly using the Weekly Hazardous Waste (HW) Site Inspection Form included as Attachment 4-1 or 4-2. Written records noting discrepancies as well as corrective actions must be maintained onsite for a period of three years. Copies of inspection reports should be provided to the ROICC or Contract Representative.
- When the ASD reaches one year or when the container is full, the waste generator has 72 hours (3 days) to move the UW into the permitted storage area at Bldg. S-962 on Michael Road (MCBCL) or to Bldg AS-4225 on Canal Street (MCASNR). Coordinate with the appropriate environmental office for pickup (MCBCL – (910) 451-1482; MCASNR – (910) 449-5997/6143) when the drum is full or the contract is finished.

The appropriate environmental office must be notified before any hazardous waste is generated on projects managed by the ROICC or the FSC.

4.5 HAZARDOUS WASTE REQUIREMENTS

The appropriate environmental office must be notified before any hazardous waste is generated on projects managed by the ROICC or the Facilities Support Contracts (FSC). If you are uncertain about whether a waste meets the definition of a hazardous waste, have your ROICC or Contract Representative contact RCRS or EAD. Installation personnel must approve all regulated waste and hazardous waste storage locations.

If a project generates hazardous waste:

- Minimize generation through waste minimization and pollution prevention techniques.
- Have your ROICC or Contract Representative contact RCRS or EAD if you are unsure about how to manage a waste. Do not mix waste types (e.g., used oil rags and solvent rags).
- Have your ROICC or Contract Representative contact RCRS or EAD for turn-in procedures as wastes are generated.
- Do not dump any hazardous waste into floor drains, sinks, oil-water separators, or storm drains, or onto the ground. Do not place hazardous waste into general trash dumpsters.
- Ensure that hazardous waste drums are properly labeled and lids are secured (wrench tight).
- Ensure that SAAs are managed properly and storage limits are not exceeded; have your ROICC or Contract Representative consult with RCRS or EAD prior to creating a new SAA.

4.5.1 Storage

All hazardous waste must be properly containerized, stored, and labeled at the time the waste is first generated. Hazardous waste must be stored in containers that meet applicable specifications of the U.S. Department of Transportation (DOT). Hazardous waste labels, as required by the USEPA and the NCDENR, must contain the following information:

- Words: *HAZARDOUS WASTE*.

-
- Content: Noun name found on the specific Hazardous Waste Profile Sheet (DRMS Form 1930) provided by RCRS or EAD.
 - Accumulation Start Date (ASD): For HW accumulated in an SAA, the ASD will be affixed once the container is filled or at the one-year anniversary, whichever comes first.
 - Number of Containers: Reflects the total number of containers (i.e., 1 of 1, etc.).

Any HW generated by contractors must be stored in a SAA. RCRS or EAD will assist contractors in establishing each SAA. A summary of procedures follows:

- The generator of hazardous waste may accumulate as much as 55 gallons of a hazardous waste stream (or less than one quart of acutely hazardous waste) in a container at or near the point of generation.
- The containers must be under the control of the contractor generating the waste and must be kept closed (wrench tight) at all times except when adding waste.
- Hazardous waste containers must be inspected weekly using the Weekly Hazardous Waste (HW) Site Inspection Form included as Attachment 4-1 or 4-2. Written records noting discrepancies as well as corrective actions must be maintained for a period of three years. Copies of inspection reports should be provided to the ROICC or Contract Representative.
- The generating contractor should monitor the level of waste in the SAA container and shall coordinate turn-in to RCRS or EAD prior to it becoming full. If the SAA container should become full, the generating contractor has 72 hours (3 days) to move the hazardous waste to the permitted storage area at Bldg. S-962 on Michael Road (MCBCL) or Bldg AS-4225 on Canal Street (MCASNR). Storage of HW in a SAA should not exceed 365 days even if the container is not full.

4.5.2 Manifesting and Disposal

Disposal of hazardous waste generated by contractors must be coordinated with the Installation. Hazardous and universal waste generated aboard MCB Camp Lejeune and MCAS New River must be transported off-base by a permitted hazardous waste transporter and must include a hazardous waste manifest. These procedures must be followed:

- The MCB Camp Lejeune or MCAS New River USEPA ID number is used for disposal of all contractor-generated hazardous waste.
- Only personnel from the Installation who have been designated in writing by the Commanding Officer can sign the hazardous waste manifest. Your ROICC or Contract Representative should contact RCRS at (910) 451-1482 (MCBCL) or EAD at (910) 449-5997 (MCASNR) regarding manifesting regulated and non-regulated wastes off-site.
- Under NO circumstances can a contractor or ROICC or Contract Representative sign a hazardous waste manifest or use another USEPA ID number for wastes generated at Installation.

Only personnel from EMD who have been designated in writing by the MCB Camp Lejeune Commanding Officer can sign the hazardous waste manifest.

4.6 NON-RCRA-REGULATED WASTE REQUIREMENTS

Non-RCRA-regulated wastes include used oil and oil filters, used antifreeze, contaminated wipes, discarded electronic equipment, and batteries not managed as universal waste.

4.6.1 Used Oil and Oil Filters

Used motor oil itself is *not* regulated as a hazardous waste in North Carolina if it is recycled or burned for energy recovery. If used oil is not recycled, the generator must determine prior to disposal whether it is a hazardous waste. Used oil must be collected in drums marked “Used Oil.” If the Used Oil storage container has a volume of 55 gallons or more, it must be stored in secondary containment. Coordinate with RCRS at (910) 451-1482 (MCBCL) or EAD at (910) 449-5997 (MCASNR) for pickup when the drum is full or the contract is finished.

- Do not dump used oil into drains, sinks, or trash containers, or onto the ground.
- Do not store used oil in open buckets or drip pans, damaged or rusted containers, or containers that cannot be fully closed.
- Do not mix used oil with other waste materials.

Used oil filters are not regulated as hazardous waste in North Carolina as long as they are not mixed with listed hazardous wastes. To qualify for this exclusion, the following conditions must be met:

- Used oil filters must be gravity hot-drained by puncturing the filter anti-drain back valve or filter dome and hot draining into a “Used Oil” storage drum. “Hot-drained” means that the oil filter is drained at a temperature that approximates the temperature at which the engine operates. All used oil filters will be hot-drained for a minimum of 24 hours before turn-in to RCRS at Bldg. S-962 on Michael Road (MCBCL) or EAD at Bldg AS-4225 on Canal Street (MCASNR).
- Any incidental spillage that occurs must be cleaned up with Dry Sweep, rags, or “oil socks.”
- Drained used oil filters must be collected in a container that is in good condition and is labeled with the words “Drained Used Oil Filters.”
- No other waste streams should be deposited in containers collecting used oil filters for disposal.
- Drained used oil filters will be turned into RCRS at Bldg. S-962 on Michael Road on a weekly basis on Wednesday from 1300 to 1500 (MCBCL) or to EAD at Bldg AS-4225 on Canal Street (MCASNR).

4.6.2 Used Antifreeze

Used antifreeze is considered a hazardous waste because of its toxicity unless it is recycled or placed in an approved storage area. Used antifreeze will be containerized in spill proof containers and turned in at RCRS on a weekly basis at Bldg. S-962 on Michael Road, for recycling. For used

antifreeze generated aboard MCAS New River, contact EAD at (910) 449-5997 for turn-in instructions.

4.6.3 Petroleum-Contaminated Wipes/Oily Rags

Petroleum-contaminated wipes and oily rags are to be managed as non-regulated waste. Follow these procedures:

- Store oil-contaminated wipes and oily rags in metal containers because of their flammability/combustibility to protect them from the weather.
- Do not throw these non-regulated waste items into solid waste dumpsters or garbage cans.
- Turn petroleum-contaminated wipes and oily rags that are not on a red rag contract into RCRS at Bldg. S-962 on Michael Road on a weekly basis on Wednesday from 1300 to 1500 (MCBCL) hour or to EAD at Bldg AS-4225 on Canal Street (MCASNR).

4.6.4 Used Electronic Equipment

Used electronic equipment usually contains lead solder or polychlorinated biphenyl (PCB) oils (i.e., light ballast). These items will be turned in as they are generated. Have your ROICC or Contract Representative contact RCRS (MCBL) at (910) 451-1482 or EAD (MCASNR) at (910) 449-5997 for proper handling and turn-in procedures.

4.6.5 New and Used Batteries (Not Regulated as Universal Waste)

- Store compatible batteries together (i.e., lithium batteries should be stored with other lithium batteries).
- Store batteries off the ground to prevent them from coming into contact with water.
- Store lead-acid batteries away from an open flame.
- Place rechargeable batteries in plastic bags before storing them with other rechargeable batteries.
- Do not dispose of batteries unless authorized.

- Have your ROICC or Contract Representative contact RCRS at (910) 451-1482 or EAD at (910) 449-5997 for proper handling and turn-in procedures.

Attachment 4-1

**Weekly Hazardous Waste (HW) Site Inspection Form
MCB Camp Lejeune**

MCB Camp Lejeune Weekly Hazardous Waste (HW) Site Inspection
 Universal Waste (UW)/Satellite Accumulation Area (SAA)

Bldg Number/location of HW Site: _____

Unit Evaluated: _____ Evaluation Date: ____/____/____

Evaluation By (Site Manager): _____ Evaluation Time: _____

QUESTION	YES	NO	Location of Discrepancy <i>and</i> Proposed Corrective Action
1. Is housekeeping maintained in acceptable manner?			
2. Is any HW present at site?			
3. Are HW containers properly marked?			
4. Are HW containers in serviceable condition			
5. Are container bungs, caps, openings properly secured?			
6. Is unit spill plan/activation prominently posted?			
7. Is 911 spill response sign posted?			
8. Are " Danger-Unauthorized Personnel Keep Out " signs posted so they may be seen from any approach?			
9. Are " No Smoking " signs posted?			
10. Does the site have emergency communication system or two man rule in effect? If the two man rule is implemented is there a sign with the legend " Two Man Rule in Effect " posted?			
11. Are properly charged fire extinguishers as well as eye wash stations present and are they inspected at least monthly?			
12. Is the post indicator valve in good operating condition and secured in the closed position, are there any structural defects such as cracked concrete?			
13. Is the proper spill response equipment readily available?			
14. Is the site designated, recognizable, and is the EMD Authorization posted within the site as to be visible to personnel placing waste into the container? (SAA site only)			
15. Are all hazardous wastes properly segregated and stored in the designated site?			
16. Are there any hazardous materials being stored in the Satellite Accumulation Area or < 90 day storage site?			

Attachment 4-2

**Weekly Hazardous Waste (HW) Site Inspection Form
MCAS New River**

Weekly Hazardous Waste Storage
Area Inspection Form

Squadron: _____ Inspector: _____

Date: _____ Signature: _____

Question Yes No Corrective Actions or N/A

1. Is the HW container located at or near the point of generation?			
2. Is the HW container DOT approved?			
3. Is the HW container marked correctly with the words Hazardous Waste, correct noun name of contents, NSN'S and unit designator?			
4. Is the HW container closed and wrench tight when not adding to the container?			
5. If a funnel is left in place, does that funnel have a plug or ball valve to be considered closed or secured?			
6. Is the HW container in good condition? (no excessive rust or dents in critical areas, seals are in place, no bulging or collapsing and no signs of spillage or leakage)			
7. Is the Spill Contingency Plan posted and in plain view?			
8. Is the SAA Site approval letter from EAD posted at the SAA site?			
9. Is the SAA Site limited to Authorized Personnel only?			
10. Is the HW container below the proper ullage for a liquid to expand? (4 inches from the top)			
11. Are SAA HW containers moved to the 90-Day Site within 72 hours when filled to the proper ullage or weight capacity of the container?			
12. (90 Day-Site only) Are all palletized waste streams correctly marked with Hazardous Waste or Universal Waste, noun name of the waste, NSN and unit designator on the pallet or wall of the waste structure?			
13. (90 Day-Site only) Are all HW containers turned into DRMO prior to the 90 th day since the ASD?			
14. Are there adequate spill response supplies readily available for use in case of spill or leakage?			
15. Is there a means of emergency communications between storage facilities and working spaces?			
16. Is the SAA site or 90 Day-Site in a good state of police?			

5.0 UNFORESEEN SITE CONDITIONS

Marine Corps Base (MCB) Camp Lejeune was placed on the U.S. Environmental Protection Agency's (USEPA's) National Priorities List (NPL) effective November 4, 1989. To ensure the protection of human health and the environment, a proactive Installation Restoration Program has been established and is in the process of assessing and remediating various sites on the Installation. Numerous investigations have been performed on the Installation to ensure that all contaminated sites have been found, but additional contaminated areas may still exist. As a contractor, it is your responsibility to notify the ROICC or Contract Representative of any unforeseen site conditions you encounter while on the Installation. It is recommended that any contractors performing intrusive activities on the Installation be properly trained in accordance with the Occupational Safety and Health Act (OSHA) standards as written in 29 CFR 1910.120(e). If intrusive activities are planned in known contaminated areas, all required environmental training should be completed *prior* to working at MCB Camp Lejeune. Copies of training records should be available upon request by federal or state regulators.

5.1 KEY DEFINITIONS AND CONCEPTS

The following key definitions and concepts are associated with unforeseen site conditions. If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative, who will contact the appropriate environmental office if additional clarification is necessary.

5.1.1 Key Definitions

- **National Priorities List (NPL).** Lists the sites of national priority among the known releases or threatened releases of hazardous substances, pollutants, or contaminants.
- **Unforeseen Site Condition.** A potentially hazardous, unanticipated site condition encountered on a job site.

5.1.2 Key Concepts

- **Notification.** Contractors must notify the ROICC or Contract Representative of any unforeseen site conditions.

If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative.

- **Response.** Contractors must stop working and evacuate work areas in the event unforeseen site contaminants are suspected.

5.2 OVERVIEW OF REQUIREMENTS

Contractors operating aboard the Installation must be aware of, and adhere to, all applicable regulations and requirements regarding unforeseen site conditions.

- **Comprehensive Environmental Response, Compensation, and Liability (CERCLA) Act of 1980 and Superfund Amendments & Reauthorization Act (SARA) of 1986.** Establishes the nation's hazardous waste site cleanup program.

5.3 UNFORESEEN SITE CONDITION PROCEDURES

5.3.1 Petroleum, Oil, and Lubricants (POL)

The most frequent condition encountered that requires EMD assistance is the presence of a petroleum, oil, or lubricant odor while excavating. If you notice an odor, take the following action:

If you notice an odor, stop work and immediately clear the area of all personnel to a safe distance upwind of the suspected area.

- Stop work.
- Immediately clear the area of all personnel to a safe distance upwind of the suspected area.
- Call the Fire and Emergency Services Division (911) immediately if personnel are affected or injured by the suspected contaminant.
- Call the Fire and Emergency Services Division to properly secure the area.
- Notify the ROICC or Contract Representative so that the EMD Spill Response Team will be contacted to determine the appropriate course of action.

Please note that while staged and awaiting sampling results and proper disposal, the contaminated soil is to be placed on and covered with plastic. [Note: Per the Resource Conservation and Recovery Act, the North Carolina Department of Environment and Natural Resources does not allow contaminated soils to be reintroduced into excavations].

5.3.2 Munitions and Ordnance

Stop work immediately if a project unearths a hazardous material (such as munitions or an ordnance item) and report the situation to the ROICC or Contract Representative.

For other emergency response procedures, please refer to Section 3.0 of this guide.

Stop work immediately if a project unearths a hazardous material (such as munitions or an ordnance item) and report the situation to the ROICC or Contract Representative.

6.0 ASBESTOS

Contractors working aboard the Installation must follow Federal and state regulations for the proper notifications and management of asbestos associated with demolition and renovation projects, as well as Installation requirements.

6.1 KEY DEFINITIONS AND CONCEPTS

The following key definitions and concepts are associated with asbestos and its management. If you have any questions or concerns about the information in this section, please consult with the ROICC or your Contract Representative, who will contact the appropriate environmental office if additional clarification is necessary.

6.1.1 Key Definitions

- **Asbestos.** A group of natural minerals that separate into strong, very fine fibers that are heat resistant and extremely durable.
- **Asbestos-Containing Material (ACM).** Any material containing more than one (1) percent asbestos, per 29 CFR 1101.
- **Category I Nonfriable ACM.** Asbestos-containing packings, gaskets, resilient floor covering, and asphalt roofing products containing more than one percent asbestos, per 40 CFR 61.
- **Category II Nonfriable ACM.** Any material, excluding Category I nonfriable ACM, containing more than one (1) percent asbestos that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure, per 40 CFR 61.
- **Demolition.** The removal of any load-bearing walls or structure.
- **Friable.** Any ACM that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure (may include damaged ACM that was previously identified as nonfriable), per 40 CFR 763.
- **Glove Bag.** A sealed compartment with attached inner gloves that is used for the handling of ACM.

If you have any questions or concerns about the information in this section, please consult with the ROICC or your Contract Representative.

- **Presumed Asbestos-Containing Material (PACM).** Thermal system insulation and surfacing material found in buildings constructed no later than 1980, per 29 CFR 1926.
- **Regulated Asbestos-Containing Material (RACM).** Includes friable ACM, Category I nonfriable ACM that has become friable, Category I nonfriable ACM that has been sanded, ground, cut, etc., and Category II nonfriable ACM that has a high probability of becoming crumbled, pulverized, or reduced to powder during demolition or renovation, per 40 CFR 61.
- **Renovation.** Altering a facility or its components in any way, including the stripping or removal of RACM, per 40 CFR 61.

6.1.2 Key Concepts

- **Demolition Notification.** North Carolina law requires notification for all demolitions, regardless of whether asbestos is present, 10 working days prior to starting demolition.
- **Disposal.** ACM waste can be accepted at the MCB Camp Lejeune Sanitary Landfill. Work with the ROICC or your Contract Representative to coordinate the disposal through the MCBCL Landfill office at (910) 451-2946.
- **Removal Requirements.** Permits for asbestos removal or demolition must be obtained when RACM present exceeds 160 linear feet, 260 square feet, or 35 cubic feet. Additionally, proper work practice procedures must be followed during demolition or renovation operations.
- **Renovation Notification.** If RACM is present within a structure, North Carolina law requires notification of renovation 10 working days prior to starting renovation.

6.1.3 Environmental Management System

Practices, or activities, associated with asbestos management include the following:

- Building maintenance—general
- Construction/demolition

- Equipment operation and maintenance
- Parts replacement

The potential impacts of these activities on the environment include soil contamination and degradation of water quality, air quality, and quality of life.

6.2 OVERVIEW OF REQUIREMENTS

Contractors operating aboard the Installation must be aware of, and adhere to, all applicable regulations and requirements regarding ACM, including the following:

- **Asbestos Hazard and Emergency Response Act (AHERA), 1986.** AHERA was written primarily to provide officials in schools, grades K-12, with rules and guidance for the management of asbestos-containing materials.
- **Asbestos School Hazard Abatement Reauthorization Act (ASHERA), 1992.** This act extended AHERA regulations to cover public and commercial buildings
- **National Emission Standards for Hazardous Air Pollutants (NESHAP), Subpart A, General Provisions, and Subpart M, Asbestos, 40 CFR 61.** Includes standards for asbestos demolition and renovation, disposal, and administrative requirements.
- **Naval Facilities Guide Specifications and Engineering Control of Asbestos Materials.** Covers the requirements for safety procedures and requirements for the demolition, removal, encapsulation, and disposal of asbestos-containing materials.
- **North Carolina Asbestos Hazard Management Program, NC General Statutes Chapter 130A, Article 19; 10A NCAC 41C .0601–.0608 and .0611.** Incorporates 40 CFR Part 763 and 29 CFR 1926.1101 by reference and outlines criteria for asbestos exposures in public areas, accreditation of persons conducting asbestos management activities, and asbestos permitting and fee requirements.

- **Safety and Health Regulations for Construction, Asbestos, 29 CFR 1926.1101.** Regulates asbestos exposure in construction activities.

6.3 RESPONSIBILITIES BEFORE A DEMOLITION OR RENOVATION PROJECT

Prior to starting a demolition or renovation project, contractors must:

- Know whether ACM or PACM is present in the buildings involved in the project,
- Complete the necessary notifications,
- Understand what actions to take if ACM or PACM is unexpectedly encountered during project execution, and
- Know how to properly dispose of ACM.

6.3.1 Identification of ACM and PACM

Contract documents will identify the presence of ACM and PACM. Contact your ROICC or Contract Representative with questions regarding the presence of ACM or PACM as identified in these documents.

6.3.2 Notification

To maintain accurate files and records, the ROICC or Contract Representative is required to notify the EMD Asbestos Program Manager, who is part of the Installations and Environment Department, of all work involving asbestos removals, including glove bag projects.

A demolition/renovation notification form DHHS 3768 must be submitted to the NC Health Hazards Control Unit (NCHHCU) 10 working days in advance of demolition activities, regardless of whether asbestos is present. This form must be posted on-site during the entire duration of the project. Have your ROICC or Contract Representative contact the Asbestos Program Manager with questions or concerns about requirements for notification of demolition or renovation.

The ROICC or Contract Representative is required to notify Camp Lejeune’s Asbestos Program Manager of all work involving asbestos removals, including glove bag projects.

A demolition/renovation notification form DHHS 3768 must be submitted to the NCHHCU 10 working days in advance of demolition activities, regardless of whether asbestos is present.

6.3.3 Removal

If ACM is present, it must be removed before the area is disturbed during renovation or demolition activities (except in certain rare instances).

Certification and handling requirements for asbestos removal are provided in 10A NCAC 41C and the Asbestos NESHAP. Refer to these regulations for detailed requirements.

6.3.4 Training

North Carolina regulations require that all persons who perform asbestos management activities in the State of North Carolina must be accredited by the NCHHCU under the appropriate accreditation category (i.e. Building Inspector, Project Supervisor, Abatement Worker). Training documentation should be available upon request.

6.4 RESPONSIBILITIES DURING A DEMOLITION OR RENOVATION PROJECT

North Carolina regulations require that Form DHHS 3768, *Asbestos Permit Application and Notification for Demolition and Renovation*, be posted on-site during all permitted projects. Contractors must post this form when the project will remove the following: 35 cubic feet, 160 square feet, or 260 linear feet of RACM or asbestos that might become regulated as a result of handling. The form must also be posted for nonscheduled asbestos removal that will exceed these numbers in a calendar year.

During a renovation or demolition project, if the contractor suspects the presence of additional ACM other than those materials identified in contract documents, the contractor must immediately report the suspected area to the ROICC or Contract Representative. Before proceeding, the facility must be inspected by a person who has been trained and accredited in North Carolina as an asbestos building inspector by the NCHHCU. The individual performing the asbestos survey will coordinate with the ROICC or Contract Representative throughout the process. A legible copy of the building inspection report must be provided to the NCHHCU prior to each demolition and upon request for renovations; a building inspection report will be acceptable only if the inspection was performed during the three

**Form DHHS 3768
must be posted
on-site during all
permitted
projects.**

**During a renovation
or demolition
project, if the
contractor suspects
additional ACM, the
contractor must
immediately report
the suspected area
to the ROICC or
Contract
Representative.**

years before the demolition. A copy of the report should also be forwarded to the Asbestos Program Manager.

For glove bag project requirements, please refer to 29 CFR 1926.1101 for specific work procedures.

6.5 DISPOSAL OF ACM WASTE

Contractors can dispose of ACM waste at the MCB Camp Lejeune Sanitary Landfill after first coordinating with the MCBCL Landfill office, through their ROICC or Contract Representative. The contractor must provide the MCBCL Landfill with Form DHHS 3787, *North Carolina Health Hazards Control Unit's Asbestos Waste Shipment Record*. The form must be submitted to NCHHCU for all permitted asbestos removal projects by the contractor.

7.0 LEAD-BASED PAINT

The improper removal of lead-based paint (LBP) may result in the production of paint chips and dust, which may contaminate a structure inside and out. The North Carolina Department of Health and Human Services (NCDHHS) regulations require any person who performs an inspection, risk assessment, or abatement to be certified. NCDHHS also requires a person who conducts an abatement of a child-occupied facility or target housing to obtain a permit for the abatement.

7.1 KEY DEFINITIONS AND CONCEPTS

The following key definitions and concepts are associated with LBP activities. If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative, who will contact the appropriate environmental office if additional clarification is necessary.

7.1.1 Key Definitions

- **Abatement.** The permanent elimination of lead-based paint hazards.
- **Demolition.** The removal of any load-bearing walls or structure.
- **Inspection.** A surface-by-surface investigation to determine the presence of lead-based paint and a report explaining the results of the investigation.
- **Lead-Based Paint (LBP).** Surface coatings that contain lead in amounts equal to or in excess of 1.0 milligram per square centimeter, or more than 0.5 percent by weight, per 40 CFR 745.
- **Lead-Containing Paint.** Surface coatings that contain lead in any amount greater than the laboratory reporting limit but less than 1.0 milligram per square centimeter, or less than 0.5 percent by weight, per 29 CFR 1926.62 and 29 CFR 1910.1025; also contained in 40 CFR Part 745 Subpart L, and have been adopted by the State of North Carolina under NC General Statute Chapter 130A, Article 19A.

If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative.

- **Renovation.** Alteration of a facility or its components in any way.

7.1.2 Key Concepts

- **Disposal.** Analysis is required to determine proper disposal of waste (nonhazardous or hazardous). A Toxic Characteristic and Leaching Process analysis must be conducted to determine whether lead levels have exceeded 5 parts per million, which is the RCRA level for hazardous waste determination.
- **Lead-Based Paint Survey.** A lead-based paint survey is required prior to the disturbance of painted surfaces to determine whether the paint meets the criteria of a lead-based paint.
- **Training.** Lead-based paint training requirements set forth by the Occupational Safety and Health Administration (OSHA) are to be followed by personnel involved in all lead-based paint removal activities. MCBCL Base Safety tracks this training for contract staff, as the Safety Office houses the Lead Program Manager.

7.1.3 Environmental Management System

Practices, or activities, associated with LBP include the following:

- Construction/demolition
- Hazardous material storage
- Hazardous material transportation
- Paint removal

The potential impacts of these activities on the environment include the potential degradation of soil, water, and air environments, and the potential exposure of Installation occupants. Camp Lejeune still contains living quarters that have lead-based paint on the inside of the structures.

7.2 OVERVIEW OF REQUIREMENTS

Contractors operating aboard the Installation must be aware of, and adhere to, all applicable regulations and requirements regarding LBP activities, including the following:

- **Naval Facilities Engineering Service Center, Facilities Management Guide for Asbestos and Lead.** Ensures the protection of workers, building occupants, and the environment.

- **10A NCAC 41C .0800, Lead-Based Paint Hazard Management Program.** Requires (1) all individuals and firms involved in LBP activities to be certified and (2) all LBP activities to be carried out in accordance with 40 CFR 745.
- **29 CFR 1926, Safety and Health Regulations for Construction.** Contains OSHA requirements for construction activities where workers may have contact with lead.
- **40 CFR Part 745, Lead-Based Paint Poisoning Prevention in Certain Residential Structures.** Ensures that (1) lead-based paint abatement professionals, including workers, supervisors, inspectors, risk assessors, and project designers, are well trained in conducting LBP activities and (2) inspections for the identification of LBP, risk assessments for the evaluation of LBP hazards, and abatements for the permanent elimination of LBP hazards are conducted safely, effectively, and reliably by requiring certification of professionals.

7.3 RESPONSIBILITIES BEFORE RENOVATION OR DEMOLITION

Prior to any renovation or demolition aboard the Installation that involves the disturbance of painted surfaces, a LBP survey must be completed by a certified inspector, retained through the ROICC or Public Works (PW) offices. Certain projects will use PW staff to conduct the sampling and other projects will use contracted personnel. Buildings constructed prior to 1978 are assumed to contain LBP; therefore, no LBP survey is necessary. The LBP survey (through sampling and analysis) will determine whether painted surfaces meet the criteria of LBP (lead content equal to or greater than 1.0 milligram per square centimeter as measured by X-ray fluorescence (XRF) or lab analysis, or 0.5 percent by weight). For contracts where LBP is to be removed prior to demolition or renovation, the associated Naval Facilities Guide Specifications and contract documents must be implemented.

Buildings constructed prior to 1978 are assumed to contain LBP.

7.4 PERMITS

Contractors must obtain Lead Removal permits from NCDHHS when lead paint is removed from targeted housing (child-occupied facilities and housing built prior to 1978).

If the LBP survey determines that LBP will be abated as part of a renovation or demolition project, analytical samples must be taken to determine whether the material is hazardous.

7.5 DISPOSAL

If the LBP survey determines that LBP will be abated as part of a renovation or demolition project, analytical samples must be taken by the contractor to determine whether the material is hazardous. Usually a Toxic Characteristic Leaching Process (TCLP) sample is collected from a “representative” sample of the material removed. The laboratory conducting the sample analysis must be accredited by the Environmental Lead Laboratory Accreditation Program (ELLAP). A list of these accredited labs is available by contacting (703) 849-8888.

If the LBP is removed from the underlying building material, then the paint is the waste stream. If the LBP is removed with the building material, then both materials are considered the waste stream.

If the lead content is below hazardous waste (HW) regulatory disposal levels, consult with your ROICC or Contract Representative to determine whether your contract allows for the disposal material in the MCB Camp Lejeune Sanitary Landfill.

If the abated LBP is above HW regulatory levels, refer to Section 4.0 of this guide for information on HW management and disposal requirements.

7.6 TRAINING

Before the project begins, workers who are subject to exposure of lead during abatement or removal activities must be trained according to the OSHA regulation in 29 CFR 1926.62 concerning lead exposure in construction. The contractor is responsible for providing this training.

8.0 STORMWATER

There are three types of stormwater discharge that contractors for the Installation must address if they plan on disturbing land: industrial, construction, and post-construction stormwater runoff. The general requirements for each area as they apply to contractors are discussed in the following subsections.

8.1 KEY DEFINITIONS AND CONCEPTS

The following key definitions and concepts are associated with stormwater. If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative, who will contact the appropriate environmental office if additional clarification is necessary.

8.1.1 Key Definitions

- **Best Management Practices (BMPs).** Schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of Waters of the United States. BMPs can include treatment requirements, operational procedures, and practices to control site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. BMPs may also denote structural and nonstructural stormwater treatment devices and measures.
- **Erosion and Sedimentation Control Plan.** Any plan, amended plan, or revision to an approved plan submitted to the North Carolina Division of Land Resources or delegated authority in accordance with North Carolina General Statute 113A-57. Erosion and Sedimentation Control Plans show the devices and practices that will retain sediment generated by the land-disturbing activity within the boundaries of the tract during construction and upon development of the tract.
 - **Land Disturbance.** Areas that are subject to clearing, excavating, grading, stockpiling earth materials, and placement/removal of earth material.
- **Nonpoint Source Discharge.** All discharges from stormwater runoff that cannot be attributed to a discernible, confined, and discrete conveyance.

If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative.

- **Point Source Discharge.** Any discernible, confined, and discrete conveyance, including but specifically not limited to, any pipe, ditch, channel, tunnel conduit, well, discrete fissure, container, rolling stock, or concentrated animal feeding operation from which pollutants are or may be discharged to Waters of the State.
- **Stormwater.** Stormwater runoff, snow melt runoff, and surface runoff and drainage, per 40 CFR 122.
- **Stormwater Associated with Construction Activities.** The discharge of stormwater from construction activities including clearing, grading, and excavating that result in a land disturbance of equal to or greater than 1 acre, per 40 CFR 122.
- **Stormwater Associated with Industrial Activities.** The discharge from any conveyance that is used for collecting and conveying stormwater and that is directly related to manufacturing, processing, or raw materials storage areas from an applicable industrial plant or activity, per 40 CFR 122.

8.1.2 Key Concepts

- **Operational Requirements.** Equipment, discharge, and material use requirements that apply to all construction and industrial activities.
- **Permit Requirements.** Land-disturbing projects may be subject to a variety of permit requirements to protect surface water quality from both construction and post-construction stormwater runoff. In the applicable areas of the Installation, a State Stormwater Management Permit and coverage under the Construction General Permit may be required.
- **Post-Construction.** The management of stormwater generated on a stable, established site after the construction process is complete. The State Stormwater Management Program sets forth requirements for post-construction stormwater runoff control.

8.1.3 Environmental Management System

Practices, or activities, associated with stormwater include the following:

- Catch basin cleaning
- Construction/demolition

- Erosion control
- Fuel storage–containers
- Hazardous material storage
- Land clearing
- Landscaping
- Mowing
- Outfall cleaning
- Range residue clearance
- Riparian buffer maintenance
- Runoff sedimentation basins
- Sediment traps
- Soil excavation/grading/grubbing
- Stormwater collection/conveyance system
- Stormwater engineering controls operation and maintenance
- Stump/brush removal
- Vehicle parking

The potential impacts of these activities on the environment include degradation of water quality and damage to public & private property due to flooding.

8.2 OVERVIEW OF REQUIREMENTS

Contractors operating aboard the Installation must be aware of, and adhere to, all applicable regulations and requirements regarding potential stormwater contamination, including the following.

- **40 CFR 122, National Pollutant Discharge Elimination System.** Requires permits for the discharge of pollutants from any point source into Waters of the United States.
- **15 NCAC 02H. 0100, Point Source Discharges to the Surface Waters.** Requires permits for control of sources of water pollution by providing the requirements and procedures for application and issuance of state NPDES permits for discharge from an outlet, point source, disposal system discharging to the surface waters of the state, and for the construction and operations of treatment works with such a discharge.
- **15A NCAC Chapter 4.** Requires all persons conducting land-disturbing activity to take all reasonable measures to protect

all public and private property from damage caused by the release of sediments from the activity. The primary tool used to accomplish the objective is the development of an Erosion and Sedimentation Control Plan. The plan must

- Identify critical areas,
 - Limit exposure areas,
 - Limit time of exposure,
 - Control surface water,
 - Control sedimentation, and
 - Manage stormwater runoff.
- **15A NCAC 02H. 1000 Stormwater Management.** The State Stormwater Management Program requires all persons conducting land-disturbing activities that (1) require a Coastal Area Management Act (CAMA) Major Development Permit or an Erosion and Sedimentation Control Plan, and (2) are located within coastal counties or drain to specific classifications of water bodies, to protect surface waters and highly productive aquatic resources from the adverse impacts of uncontrolled high-density development or the potential failure of stormwater control measures. To receive permit approval, projects must limit the density of development, reduce the use of conventional collection systems in favor of vegetative systems, and incorporate post-construction, structural BMPs.

Any project involving land-disturbing activities aboard the Installation has been reviewed by the Installation’s NEPA Review Board prior to the onset of work.

8.3 Prior to Site Work

8.3.1 Notifications

Any project involving land-disturbing activities aboard the Installation has been reviewed by the Installation’s National Environmental Policy Act (NEPA) Review Board prior to the onset of work. Documentation of this review should have been provided to your ROICC or Contract Representative and may include mandatory conditions affecting the construction/implementation of the project. Consult with your ROICC or Contract Representative to obtain or review any NEPA documentation associated with the project in your contract.

8.3.2 Stormwater Phase I Permit

Discharges of industrial stormwater have the potential to contain contaminants from industrial activity. This type of discharge is defined

and regulated in 40 CFR 122, the USEPA final rule regarding National Pollutant Discharge Elimination System (NPDES) stormwater permitting.

Daily industrial operations discharging stormwater aboard MCB Camp Lejeune and MCAS New River are covered under NPDES Permit NCS000290.

8.3.3 Project-Specific Permits

Contractors are responsible for preparing all project-specific stormwater permit applications and related plans and for coordinating the permit review schedule with the ROICC or Contract Representative. For projects located outside of Public-Private Venture (PPV) housing, MCB Camp Lejeune is the responsible party for all project-specific stormwater permits. (All permit-required plans and applications must go through internal approval before being submitted to the appropriate state agency.) The permit review schedule should allow adequate time for internal review prior to state submission deadlines. For housing-related projects located outside of the jurisdiction of MCB Camp Lejeune, stormwater compliance should be coordinated with the appropriate PPV contractor.

For construction activities that disturb one acre or more of land, permit coverage is required under the North Carolina General Permit No. NCG010000 (General Permit). To obtain coverage under the General Permit, three copies of a proposed Erosion and Sedimentation Control Plan must be prepared and submitted to the NCDENR Sedimentation Control Commission (or to an approved local program) at least 30 days prior to beginning construction activity. Another copy of the plan will be kept on file at the job site. **Coverage under the permit becomes effective upon issuance of a plan approval. No land-disturbing activities may take place prior to receiving plan approval.** The approved plan is considered a requirement or condition of the General Permit; deviation from the approved plan will constitute a violation of the terms and conditions of the permit unless prior approval for the deviations has been obtained.

A State Stormwater Management Permit, issued in accordance with 15A NCAC 02H. 1000, is required for all development activities that require a CAMA Major Development Permit or an Erosion and Sedimentation Control Plan and that meet any of the following criteria:

- Development within the 20 coastal counties

Contractors are responsible for preparing all project-specific stormwater permit applications and related plans and for coordinating the permit review schedule with the ROICC or Contract Representative.

All permit-required plans and applications must go through internal approval before being submitted to the appropriate state agency.

A State Stormwater Management Permit is required for all activities that will disturb one acre or more of land.

- Development that drains to an Outstanding Resource Water (ORW)
- Development within one mile of and draining to a High Quality Water (HQW)

Because the Installation is located in a coastal county, any project that disturbs greater than one acre of land (hence requiring coverage under the General Permit for construction activity) will also require a State Stormwater Management Permit. A State Stormwater Management Permit Application must be submitted and filed with the NCDENR, Division of Water Quality, following completion of the construction plans and specifications and prior to commencement of construction activities. Copies of this form are available at the NCDENR website: <http://h2o.enr.state.nc.us/su/Forms_Documents.htm#sswmp>. The State Stormwater Management Permits typically specify design standards for conveyance systems and structural BMPs, a schedule of compliance, and general conditions to which the permittee must adhere.

8.4 Responsibilities During Site Work

The contractor is responsible for maintaining the quality of the stormwater runoff and preventing pollution of stormwater at the construction/job site. The job site may be inspected by Installation environmental personnel to ensure compliance with the Installation Stormwater Pollution Prevention Plan and applicable permits. The following requirements apply to all projects occurring at the Installation that have the potential to impact water quality:

- Any changes to the project area that do not comply with the approved Erosion and Sedimentation Control Plan, alter the approved post-construction stormwater conveyance system, or could otherwise significantly change the nature or increase the quantity of pollutants discharged should be immediately communicated to the ROICC or Contract Representative.
- Equipment utilized during the project activity must be operated and maintained in such a manner as to prevent the potential or actual pollution of the surface or ground waters of the state.
- All permitted erosion and sedimentation control projects will be inspected by the contractor at least once every seven calendar days

(unless discharges to a 303(d)-Listed water body are occurring) and within 24 hours after any storm event greater than 0.5 inch of rain per 24-hour period, as required by the North Carolina General Permit No. NCG010000 (General Permit). Inspection results shall be maintained by the designated contractor throughout the duration of the active construction project.

- Fuels, lubricants, coolants, hydraulic fluids, or any other petroleum products shall not be discharged onto the ground, into surface waters, or down storm drains (to include leaking vehicles, heavy equipment, pumps and/or structurally deficient containers of hazardous materials).
- Spent fluids shall be disposed of in a manner so as not to enter surface, ground waters of the state, or storm drains. Disposal of spent fluids is outlined in Section 4.0.
- Implement spill prevention measures, clean up all spills immediately, and follow spill reporting requirements presented in Section 3.0. Any spilled fluids shall be cleaned up to the extent practicable and disposed of in a manner so as not to allow their entry into the water, surface or ground, of the state. Please refer to Section 3.0 for emergency and spill response procedures.
- Herbicide, pesticide, and fertilizer usage during construction activity shall be consistent with the Federal Insecticide, Fungicide, and Rodenticide Act and shall be in accordance with label restrictions. Please refer to Section 4.0 for additional information on Hazardous Material/Hazardous Waste Management.
- Particular care must be used when storing materials outside. Materials and equipment stored outside that could potentially affect the quality of stormwater runoff include, but are not limited to, garbage dumpsters, vehicles, miscellaneous metals, wood products, and empty storage drums. If there is any question about whether an outdoor storage practice is acceptable, contact the ROICC or Contract Representative.
- Use good-housekeeping practices to maintain work areas in a clean and orderly manner, paying particular attention to those areas that may contribute pollutants to stormwater.

9.0 SOLID WASTE, RECYCLING, AND POLLUTION PREVENTION

The Installation has a proactive pollution prevention (P2) and recycling program. Contractors should minimize the amount of solid waste requiring disposal in a landfill. This section addresses solid waste, including both municipal solid waste (MSW) and construction and demolition (C&D) waste. Hazardous materials and hazardous waste are discussed in Section 4.0 of this guide. Contractors are required to comply with all Federal, state, and local laws and regulations for proper disposal and recycling of all solid wastes.

9.1 KEY DEFINITIONS AND CONCEPTS

The following key definitions and concepts are associated with solid waste, recycling, and pollution prevention. If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative, who will contact the appropriate environmental office if additional clarification is necessary.

9.1.1 Key Definitions

- **Construction and Demolition (C&D) Debris.** Materials generated during the construction, renovation, and demolition of buildings, roads, and bridges. C&D debris often contains bulky, heavy materials that include concrete, wood (from buildings), asphalt (from roads and roofing shingles), gypsum (the main component of drywall), etc.
- **Green Procurement (GP).** The purchase of environmentally preferable products and services in accordance with Federally mandated “green” procurement preference programs. GP is intended to protect the environment and reduce energy consumption.
- **Pollution Prevention (P2).** Reducing the amount of a hazardous substance or pollutant entering waste streams or otherwise released to the environment prior to recycling, treatment, or disposal.
- **Recycling.** A series of activities that includes collecting, sorting and processing recyclables into raw materials, and manufacturing raw

Contractors should minimize the amount of solid waste requiring disposal in a landfill.

If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative.

materials into new products per the US Environmental Protection Agency (USEPA).

- **Solid Waste.** Any solid, semisolid, liquid, or contained gaseous materials discarded, including garbage, construction debris, commercial refuse, sludge from water supply or waste treatment plants or from air pollution control facilities, and other discarded materials, per the Resource Conservation and Recovery Act (RCRA) of 1976.

9.1.2 Key Concepts

- **Pollution Prevention/Green Procurement.** Pollution prevention and green procurement practices are strongly encouraged for Installation contractors.
- **Recycling.** Recycling is required on the Installation. The MCBCL Recycling Center accepts specified recyclables.
- **Solid Waste.** The location for disposal of solid waste will be in accordance with contract specifications (off-base or MCBCL Landfill). Data related to off-base disposal (to include C&D waste) must be provided to the ROICC or Contract Representative on a monthly basis.

9.1.3 Environmental Management System

Practices, or activities, associated with solid waste, recycling, and pollution prevention, include the following:

- Battery replacement
- Building maintenance—general
- Building operation—general
- Construction/demolition
- Equipment disposal
- Hazardous waste recycling
- Land clearing
- Material storage handling
- Packaging/unpackaging
- Rock crushing operations
- Solid waste recycling collection/transportation
- Stump/brush removal

- Vehicle operation

The potential impacts of these activities on the environment include soil degradation, surface water quality degradation, depletion of landfill space, and depletion of nonrenewable resources.

9.2 OVERVIEW OF REQUIREMENTS

Contractors operating aboard the Installation must be aware of, and adhere to, all applicable regulations and requirements regarding solid waste disposal, recycling, and pollution prevention, including the following:

- **Base Order (BO) 5090.4, Solid Waste Reduction – Qualified Recycling Program (QRP).** Provides guidance for solid waste reduction, pollution prevention, and management of recyclable materials.
- **BO 11350.2D, Refuse Disposal Procedures.** Establishes procedures for the separation, collection, and disposal of refuse and the disposal of waste wood products.
- **Pollution Prevention Act (PPA) of 1990 (42 U.S.C. 13101 *et seq.*).** Establishes the national policy that "pollution should be prevented or reduced at the source whenever feasible," and establishes the following hierarchy: source reduction, recycling, treatment, and disposal.
- **Resource Conservation and Recovery Act (RCRA) of 1976.** Governs the disposal of solid waste and establishes Federal waste disposal standards and requirements for state and regional authorities. The objectives of Subtitle D are to assist in developing and encouraging methods for the disposal of solid waste that are environmentally sound and that maximize the utilization of valuable resources recoverable from solid waste.
- **Solid Waste Disposal Act (SWDA) of 1965.** Requires Federal facilities to comply with all Federal, state, interstate, and local requirements concerning the disposal and management of solid wastes.

At a minimum, the following actions are required by all contractors:

1. Prior to performing work that will or may generate solid waste at the Installation, all contractors must provide their ROICC or Contract

Representative with a copy of their Solid Waste Disposal Permit unless MCBCL's landfill is being utilized for disposal. Recycling is encouraged and can be coordinated with the ROICC or Contract Representative and the Landfill Manager.

2. Provide the weights of ALL wastes, both solid and C&D that are either disposed of or recycled to the ROICC or Contract Representative with a copy to the Landfill Manager. This requirement does not apply in instances where the Landfill/Recycling facility picks up or accepts materials directly from the contractor. If contractors are transporting waste off-site for disposal, it is mandatory that they track the material weight and provide that information to their ROICC or Contract Representative.

9.3 SOLID WASTE REQUIREMENTS

Contractors producing solid waste on the Installation are required to take these steps:

- Pick up solid waste and place it in covered containers that are regularly emptied.
- Prevent contamination of the site and the surrounding areas when handling and disposing of waste.
- Leave the project site clean upon completion of a project.

9.3.1 MCBCL Landfill Acceptable Waste Streams

The MCBCL Landfill accepts certain types of solid waste under the conditions specified in Table 9-1. MCBCL Landfill hours of operation are 0800 to 1530, Monday through Friday. Contractors must have a construction pass and a copy of the face of the related contract to enter the MCBCL Landfill and dispose of waste. Contractors must also contact the Landfill Operator prior to unloading refuse. Each material must be separated into different loads.

Table 9-1. MCBCL Landfill Requirements

Waste Category ^a	Example	Requirements
Mixed Debris	Sheetrock, plaster, ceramic tiles	<ul style="list-style-type: none"> • Items may be mixed together
Painted Masonry and Concrete	Concrete, block, brick	<ul style="list-style-type: none"> • Separate from other items • Lead-painted or mastic-contaminated masonry or concrete must be separated from unpainted concrete products • Remove reinforcement wire and rebar flushed with exposed surfaces
Unpainted Masonry and Concrete	Concrete, block, brick	<ul style="list-style-type: none"> • Separate from other items • Remove reinforcement wire and rebar flushed with exposed surfaces
Nonrecyclable Cardboard	N/A	<ul style="list-style-type: none"> • Dispose of cardboard only if the MCBCL Recycling Center has rejected the cardboard
Nonrecyclable Wood Pallets	N/A	<ul style="list-style-type: none"> • Dispose of pallets only if the MCBCL Recycling Center has rejected the pallets
Treated Wood	Piling, power poles	<ul style="list-style-type: none"> • Separate from other items
Untreated/Unpainted Wood	Lumber, stumps, limbs	<ul style="list-style-type: none"> • Separate from other items
Organic Matter	Leaves, grass clippings	<ul style="list-style-type: none"> • Separate from other items • No bags or containers are allowed
Fiberglass Tanks	N/A	<ul style="list-style-type: none"> • Clean tanks before delivering to the landfill

^a Metals are not accepted at the landfill and must be removed from each waste category prior to disposal. Metal construction debris should be disposed of at the DRMO. Disposal requirements set forth in BO 11350.2D should be followed.

9.4 RECYCLING REQUIREMENTS

The Installation Recycling program is managed by the MCBCL Landfill, with assistance from the EMD. The MCBCL Landfill plays a vital role in the Installation's effort to reduce the amount of solid waste requiring disposal. Reducing solid waste saves money and helps to protect the environment by conserving natural resources. Additionally, Marine Corps facilities are mandated to recycle.

9.4.1 MCBCL Recycling Center

The MCBCL Recycling Center, Bldg. 982, is co-located with the landfill on Piney Green Road. Normal working hours are Monday through Friday, 0730–1530. All materials can be brought to the Recycling Center. For details, have your ROICC or Contract Representative contact the Recycling Center for details at (910) 451-2946. The following types and categories of materials are accepted for recycling at the Recycling Center:

- Wood pallets
- White Paper (mixed flat or shredded)
- Newspaper
- Magazines
- Military publications (binders removed)
- Phone books
- Plastic and glass (containers or bottles)
- Toner cartridges

The following types and categories of materials are accepted for recycling but must be delivered to the Defense Reutilization and Marketing Office (DRMO) at Lot 203:

- Scrap metal
- Steel (high temperature, corrosion resistant)
- Brass (includes spent/fired munitions)
- Copper and copper wire
- Aluminum (plate, sheet, scrap) and aluminum cans

Special arrangements can be made for other materials (C&D debris) or larger volumes of commonly recycled materials from events such as

construction and deconstruction. Regulations set forth in BO 11350.2D must be followed.

9.4.2 Other Recyclables

- **Asphalt Pavement.** Asphalt must be removed and delivered to an asphalt recycling facility. Contractors must provide a record of the total tons of asphalt recycled and the corporate name and location of the recycling facility to their ROICC or Contract Representative, with a copy to the Landfill Manager.
- **Empty Metal Paint Cans.** Empty metal paint cans shall be taken to Bldg. S-962 for recycling. All HM cans or HM containers that are generated from MCBCL or Marine Expeditionary Force contracts will be turned into Bldg. S-962 on Michael Rd. on the scheduled contractor turn-in day. Have your ROICC or Contract Representative contact EMD at (910) 451-1482 for more information. Any waste generated from this process must be managed appropriately.
- **Other Metals.** Other metals must be taken to the DRMO disposal area in Lot 201.
- **Red Rags Recycling.** A basewide program is in place to supply and launder shop rags through an off-site contractor, Aramark, in Savannah, Georgia. Almost all work centers on the Installation use this “Red-Rags” service wherein clean rags are supplied by the contractor and picked up after use. The rags are then laundered off-site and returned. This has reduced rag/POL-contaminated non-regulated waste by over 85 percent.
- **Universal Waste.** See Section 4.0 of this guide for management procedures.
- **Unused Hazardous Materials.** These materials can be turned into Bldg. 908 HM Free Issue point on Michael Rd. Have your ROICC or Contract Representative contact the Free Issue Point at (910) 451-1718.
- **White Rags Recycling.** Analogous to the red rags program, white rags have recently been introduced into painting operations at MCB Camp Lejeune. An off-site contractor, Aramark, in Savannah, Georgia, launders used rags. The white rags have no dye in the cloth

that can interfere with painting operations. Laundering the white rags reduces disposal of paint-related waste.

9.5 POLLUTION PREVENTION AND GREEN PROCUREMENT

MCB Camp Lejeune is subject to green procurement (GP) requirements. GP implements environmentally protective principles in the procurement arena and includes preferential use of the following:

- Recovered materials products
- Biobased products
- Water and energy efficient products
- Alternatives to ozone depleting substances
- Electronics meeting Electronic Produce Environmental Assessment Tool standards
- Products that do not contain toxic chemicals, hazardous substances, and other pollutants targeted for reduction and elimination by the Department of Defense
- Alternative fuel use/increased fuel efficiency
- Environmentally preferable purchasing practices

Contractors are encouraged to employ GP practices whenever feasible.

10.0 TRAINING

It is the contractor's responsibility to ensure that every employee has the required training to perform his or her duties in compliance with Federal, state, and local regulatory requirements.

To minimize the environmental impact of operations occurring on the Installation, all civilian and military personnel, including contractors, are required to receive both Environmental Management System (EMS) and general environmental awareness training at the level necessary for their job function. The training presentation provided as Attachment A satisfies these training requirements.

NOTE It is the contractor's responsibility to know and comply with Federal, state, and local regulations. Installation environmental personnel, upon request from the ROICC or Contract Representative, will assist contractors with compliance issues; however, the primary burden of regulatory identification, familiarity, and compliance lies with the contractor. This training *does not* replace any required regulatory environmental training (i.e., asbestos abatement worker training) as per contract requirements. Any required environmental training should be completed *prior* to working at MCB Camp Lejeune. Copies of training records should be available upon request by federal or state regulators.

10.1 KEY DEFINITIONS AND CONCEPTS

The following key definitions and concepts are associated with contractor training requirements. If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative, who will contact the appropriate environmental office if additional clarification is necessary.

10.1.1 Key Definitions

None.

10.1.2 Key Concepts

- **Comprehensive Environmental Training and Education Program (CETEP).** The Marine Corps training program designed to ensure that high-quality, efficient, and effective environmental

To minimize the environmental impact of operations aboard the Installation, all contractors are required to receive both EMS and general environmental awareness training at the level necessary for their job function.

If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative.

training, education, and information are provided at all levels of the Marine Corps.

- **Environmental Management System (EMS).** The part of the overall management system that includes organizational structure, planning activities, responsibilities, practices, procedures, processes, and resources for developing, implementing, achieving, reviewing, and maintaining the Environmental Policy.
- **EMS Training.** Instruction that is designed to ensure that military and civilian personnel, including contractors and vendors, become familiar with the Installation's EMS and how it functions
- **General Environmental Awareness Training.** Instruction that is designed to ensure that Installation personnel, including contractors and vendors, become familiar with the MCB Camp Lejeune and MCAS New River environmental policies and programs for regulatory compliance, natural resource conservation, pollution prevention, and environmental protection. General EMS and Environmental Awareness Training for Contractors and Vendors is required for all contractors working aboard the Installation. The training presentation is included as Attachment A. Documentation of receipt of this training should be maintained by the contractor and be available upon request.

10.2 OVERVIEW OF REQUIREMENTS

Contractors operating aboard the Installation must be aware of, and adhere to, all applicable regulations and requirements concerning training, including the following:

- **Executive Order 13423, Strengthening Federal Environmental, Energy, and Transportation Management.** Requires implementation of an EMS at all appropriate organizational levels.

10.3 REQUIRED TRAINING

10.3.1 General Environmental Awareness

In accordance with Department of Defense (DoD) instructions and Marine Corps Orders (MCO), the Installation has implemented a Comprehensive Environmental Training and Education Program (CETEP). A major

component of the CETEP is to provide general environmental awareness training to all individuals associated with the installation, including contractors and vendors. Attachment A is provided to contractors and their employees performing work aboard the Installation to utilize for general environmental awareness training.

10.3.2 Environmental Management System (EMS)

In addition to CETEP requirements, the Installation has implemented a basewide EMS per Executive Order 13423, *Strengthening Federal Environmental, Energy, and Transportation Management*, and DoD and Marine Corps EMS policy. The EMS highlights the fact that the authority and principal responsibility for controlling environmental impacts belong to those commands, units, offices, and personnel (including contractors and vendors) whose activities have the potential to impact the environment. Attachment A is provided to contractors and their employees performing work aboard the Installation to utilize for EMS Training.

10.3.3 Recordkeeping

All training records, including other applicable environmental training, should be maintained on-site by the contractor for review upon request.

Attachment A is provided to contractors and their employees performing work aboard the Installation to utilize for EMS and general environmental awareness training.

11.0 CULTURAL RESOURCES

The Installation enjoys a rich history, and remnants of our past can be found throughout the installation. As contractors, it is your responsibility to notify the Resident Officer in Charge of Construction (ROICC) or your Contract Representative immediately if you encounter suspected archaeological sites, artifacts, or human remains during your activities.

11.1 KEY DEFINITIONS AND CONCEPTS

The following key definitions and concepts are associated with cultural resource management. If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative, who will contact the appropriate environmental office if additional clarification is necessary.

11.1.1 Key Definitions

- **Archaeological Resource.** Any material remains of human life or activities that are at least 100 years old and are capable of providing scientific or human understanding of past human behavior and cultural adaptation, including the site on which the remains are located. Examples include structures, tools, debris, organic waste, human remains, artistic representations, and shipwrecks.
- **Cultural Resource.** A generic term commonly used to include buildings, structures, districts, sites, and objects of significance in history, architecture, archaeology, engineering, or culture per MCO P5090.2A.
- **Historic Resource.** Any prehistoric or historic district, site, building, structure, or object significant in United States history, architecture, archaeology, engineering, or culture and included, or eligible for listing, the National Register of Historic Places (NRHP) per the National Historic Preservation Act (NHPA) of 1966 and MCO P5090.2A.

11.1.2 Key Concepts

- **Notification.** Contractors must notify the ROICC or Contract Representative if any cultural resources are encountered.

If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative.

- **Policy.** It is DoD policy to preserve significant historic and archaeological resources.

11.1.3 Environmental Management System

Practices, or activities, associated with cultural resources include the following:

- Construction/demolition
- Land clearing
- Soil excavation/grading
- Stump/brush removal

The potential impacts of these activities on the environment include damage to cultural resources and degradation of soil quality.

11.2 OVERVIEW OF REQUIREMENTS

It is DoD policy to integrate the archeological and historic preservation requirements of applicable laws with the planning and management of activities under DoD control; to minimize expenditures through judicious application of options available in complying with applicable laws; and to encourage practical, economically feasible rehabilitation and adaptive use of significant historical resources.

Contractors operating aboard the Installation must be aware of, and adhere to, all applicable regulations and requirements regarding cultural resources, including the following:

- **Archaeological and Historic Preservation Act of 1974 (16 U.S.C. 469 *et seq.*).** Amends the Reservoir Salvage Act to extend its provisions beyond the construction of dams to any terrain alteration resulting from any Federal construction project or Federally licensed project, activity, or program.
- **ARPA of 1979 (16 U.S.C. 470 (aa) *et seq.*** Requires Federal land managers to issue permits for the excavation or removal of artifacts from lands under their jurisdiction. The Act requires that relevant Native American tribes be notified of permit issuance if significant religious or cultural sites will be affected. It prohibits the excavation, damage, alteration, or defacement of an archaeological site unless permitted by the Federal land manager.

- **DoD Directive 4710.1, Archaeological and Historic Resources Management.** Provides policy for the management of archaeological and historic resources on land and in water under DoD control.
- **Executive Order (EO) 11593, May 13, 1971.** Requires all Federal agencies to administer cultural properties under their control. Agencies are required to direct their policies, plans, and programs so that significant sites and structures are preserved.
- **Historic Sites, Buildings, and Antiquities Act of 1935 (Public Law 74-292, 16 U.S.C. 461 *et seq.*).** States that it is Federal policy to preserve historic and prehistoric properties of national significance.
- **National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321 *et seq.*).** States that it is Federal policy to preserve important historic, cultural, and natural aspects of our national heritage and that it is a requirement to consider environmental concerns during project planning and execution.
- **National Historic Preservation Act (NHPA) of 1966 (16 U.S.C. 470 *et seq.*).** Establishes historic preservation as a national policy and requires Federal agencies undertaking actions that may affect NRHP-eligible historic properties to consult with state historic preservation offices and the Advisory Council on Historic Preservation. Section 110 of the Act requires Federal agencies to inventory, evaluate, identify, and protect cultural resources that are determined eligible for listing in the NRHP.
- **Public Buildings Cooperative Use Act of 1976 (Public Law 94-541).** Encourages adaptive reuse of historic buildings as administrative facilities for Federal agencies.

11.3 PROCEDURES

All contractors are expected to follow these procedures:

- Notify the ROICC or Contract Representative immediately if suspected archaeological sites, artifacts, or human remains are encountered during your activities.

Notify the ROICC or Contract Representative immediately if suspected archaeological sites, artifacts, or human remains are encountered during your activities.

- Stop work in the immediate area of the discovery until directed by the ROICC or Contract Representative to resume work.
- Be particularly aware of your surroundings when working in a designated historic area. A summary of key cultural, archaeological, and historic areas/sites is available at the following website:
<http://www.lejeune.usmc.mil/EMD/CULTURAL/HOME.htm>

Remember, the Government retains ownership and control over historical and archaeological resources.

12.0 PERMITTING

Contractors operating aboard the Installation must ensure that all relevant environmental permits are obtained before work commences on-site. Contractors must work with their ROICC or Contract Representative to determine permitting responsibilities prior to beginning work. Contractors must adhere to all permit conditions. Examples of environmentally related permits are provided in Section 12.3.

12.1 KEY DEFINITIONS AND CONCEPTS

The following key definitions and concepts are associated with contractor permitting requirements. If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative, who will contact the appropriate environmental office if additional clarification is necessary.

12.1.1 Key Definitions

- **SA Waters.** Surface water that is suitable for recreation and for commercial shellfish harvesting.

12.1.2 Key Concepts

- **Permits.** Prior to beginning work aboard the Installation, consult applicable permit requirements and ensure that they are met before work begins. Copies of all applicable permits/authorizations should be retained onsite for the life of the project.

12.2 OVERVIEW OF REQUIREMENTS

Please refer to the individual sections of this Guide for applicable permitting regulations and requirements that relate to each environmental medium. Many permits have specific timetables for submittal prior to project initiation. Contractors must consult the permit requirements and ensure that the permits are obtained in the required time frame.

12.3 PROJECT PERMITS AND APPROVALS

Prior to work being awarded, the Installation-associated action proponent should have had an environmental review by the Installation's National

If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative.

The NCDENR website (<http://www.enr.state.nc.us>) is a useful reference for determining required permits and obtaining necessary forms.

Environmental Policy Act (NEPA) Section to comply with the NEPA of 1969. The outcome of this review would have been in the form of a Decision Memorandum (DM) or an Environmental Assessment (EA). Contractors must refer to their contract and the requirements outlined in the NEPA documentation for specific permitting requirements. EMD Program Managers are available for guidance; however, if the contractor is tasked with preparing permit applications, the contractor is expected to have the necessary capability and expertise required to complete the submittals in accordance with the guidance provided by the regulatory agency that issues the permit. In addition, EMD must be provided with copies of all permits submitted to the North Carolina Department of Environment and Natural Resources (NCDENR). In some cases, EMD must submit the permit application. Please direct questions to your ROICC or Contract Representative.

Examples of permits that may be required are discussed in applicable sections of this Guide. The following list of permits is not meant to be all inclusive. Please be aware that other permits not listed in this section may be required. The NCDENR website (<http://www.enr.state.nc.us>) is a useful reference for determining required permits and obtaining necessary forms. In addition, any inspection and/or data collection required by the permits must be retained on site for review upon request.

12.3.1 Stormwater (Section 8.0)

- **National Pollutant Discharge Elimination System (NPDES) Stormwater Discharge Permit for Construction Activities (also referred to as General Permit No. NCG010000).** Required for all land-disturbing activities (LDA) that exceed one (1) acre; also requires an accompanying Erosion and Sedimentation Control Plan.
- **High-Density Stormwater Permit.** Required when the (1) LDA exceeds one (1) acre and impervious surfaces are greater than or equal to 25 percent of the total project area adjacent to non-SA waters or greater than or equal to 12 percent of the total project area adjacent to SA water; OR (2) total development exceeds 10,000 square feet of impervious surface.

- **Low-Density Stormwater Permit.** Required when the LDA exceeds one (1) acre and impervious surfaces are less than 25 percent when adjacent to non-SA waters or less than 12% when adjacent to SA waters.

12.3.2 Asbestos (Section 6.0)

- **Asbestos Permit Application and Notification for Demolition/Renovation.** DHHS Form 3768, available at the following website:
<http://www.epi.state.nc.us/epi/asbestos/ahmp.html>

12.3.3 Air Quality (Section 13.0)

- **Clean Air Act Title V Construction and Operation Permit.** Required for the construction of the following types of emission sources:
 - Boilers
 - Generators
 - Engine Test Stands
 - Surface Coating/Painting Operations
 - Refrigerant Operations (e.g., Chillers)
 - Chemical or Mechanical Depainting, Abrasive Blasting, Grinding, or Other Surface Preparation Activities
 - Fuel Storage and Fuel Dispensing
 - Woodworking Shops
 - Welding Shops
 - Bulk Chemical or Flammables Storage
 - Open Burning
 - Fire Training
 - Rock Crushing or other dust-causing activities

EMD must submit all permit applications directly to the North Carolina Division of Air Quality.

12.3.4 Wetlands (Section 14.0)

- Contractors working aboard the Installation will not perform any work in Waters of the United States or wetlands without an approved permit (even if the work is temporary). Unavoidable impacts to wetlands or waters of the U.S. will require coordination and written approval from the US Army Corps of Engineers for a Section 404 Clean Water Act Permit (Individual or applicable Nationwide Permit), the NC Division of Water Quality for a Section 401 Clean Water Act, Water Quality certification, and the NC Division of Coastal Management for a Federal Consistency Determination. Failure to acquire written authorization for impacts to wetlands and/or waters of the U.S. may result in significant project delays or design modifications. The action proponent must coordinate with Land and Conservation Resources Section, ECON at (910) 451-5063/7235 during project design to ensure Clean Water Act permitting issues are addressed at the earliest opportunity.

12.3.5 Drinking Water/Wastewater

- **Approval of Engineering Plans and Specifications for Water Supply Systems.** Applicant submits engineering plans and specifications at least 30 days prior to the date upon which the Authorization to Construct is desired. Must have Authorization to Construct prior to onset of work.
- **Wastewater Extension Permit.** NCDENR Form FTA 02/03 – Rev. 3 04/05. Applicant submitting Form FTA 02/03 should plan accordingly and allow the State approximately 90 days to issue the permit. Permit must be in hand prior to onset of work.

13.0 AIR QUALITY

The Air Quality Program is responsible for ensuring that the Installation complies with all applicable Federal and state air quality regulations. Your ROICC or Contract Representative can provide a copy of Base Order 5090.6, Air Quality Management, which has additional information.

13.1 KEY DEFINITIONS AND CONCEPTS

The following key definitions and concepts are associated with air quality. If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative, who will contact the appropriate environmental office if additional clarification is necessary.

If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative.

13.1.1 Key Definitions

- **Ozone-Depleting Substance (ODS).** Chemicals, such as certain refrigerants, that cause depletion of the stratospheric ozone layer.
- **Title V Permit.** Permit issued under the Clean Air Act Amendments (CAAA) for all major sources of air pollution. All emission sources at the Installation must be listed on the permit.

13.1.2 Key Concepts

- **Emission Sources.** Please have your ROICC or Contract Representative check with the EMD before beginning any emitting activity to determine whether any recordkeeping requirements apply.
- **Permitted Sources.** Ensure that construction permits are in place prior to beginning construction.

13.1.3 Environmental Management System

Practices, or activities, associated with air quality include the following:

- Controlled burn operations
- Degreasing
- Engine operation and maintenance
- Paint removal
- Painting

- Refrigerant replacement

The potential impacts of these activities on the environment include degradation of air quality, degradation of quality of life, and depletion of nonrenewable resources.

13.2 OVERVIEW OF REQUIREMENTS

Contractors operating aboard the Installation must be aware of, and adhere to, all applicable regulations and requirements regarding air quality, including the following:

- **Clean Air Act Amendments of 1990.** Protect human health and clean air resources by establishing standards and regulations for the control of air pollutants.
- **Title V Permit.** Outlines the requirements that the Installation must follow to ensure air quality compliance.
- **Base Order (BO) 5090.6, Air Quality Management.** Implements policies and procedures at the Installation level that all personnel must follow in order to demonstrate compliance with the Title V Permit and USMC requirements.
- **Base Bulletin (BBul) 6280, Open Burning of Vegetative Debris.** Outlines procedures for conducting open burning in accordance with state regulations and Installation procedures.

A permit is required prior to the construction of any emission source. Timely submittal of the permit application is required to obtain the permit prior to commencing construction.

13.3 PERMIT REQUIREMENTS

The Installation has a single permit, the Clean Air Act Title V Construction and Operating Permit, that includes all stationary air emission sources located at the facility; therefore, all permit application submittals to the North Carolina Division of Air Quality (NCDAQ) must be coordinated through the EMD. NCDAQ will review and process the application then issue a permit to construct and operate or to modify the emission source(s). A permit is required prior to the construction of any emission source. Timely submittal of the permit application is required to obtain the final permit prior to commencing construction. The most common types of emission sources at the Installation are as follows:

- Boilers
- Generators
- Engine Test Stands
- Surface Coating/Painting Operations
- Depainting (Chemical or Mechanical), Abrasive Blasting, or Other Surface Preparation Activities
- Fuel Storage and Fuel Dispensing
- Grinding
- Woodworking
- Welding
- Refrigerant Recovery and Recycling Operations or other Ozone-Depleting Substances (e.g., Halon fire extinguishing, cleaning agents)
- Bulk Chemical and Flammable Materials Storage

13.4 ADDITIONAL ACTIVITIES OF CONCERN

Other activities that do not necessarily require modification to the Title V Permit, but that must be coordinated with or tracked by EMD or the State Division of Air Quality, include:

- **Use of Refrigerants and other ODS.** Includes installation, removal, replacement, conversion, or service of chillers and other refrigerant-containing equipment.
- **Open Burning (e.g., right-of-way clearing, storm debris burning).** Only vegetative debris may be burned (i.e., NO paper products, trash, treated lumber, shingles, or other synthetic materials). Any plans to conduct open burning activities at the facility must be communicated to EMD and the Fire and Emergency Services Division. Your ROICC or Contract Representative can provide a copy of Base Bulletin 6280, which contains a summary of the Installation's open burning requirements. Any open burning activities that will take place within 1,000 feet of an occupied dwelling require a waiver and approval from occupants and NCDAQ. A waiver form can be downloaded at this site: http://daq.state.nc.us/enf/openburn/openburn_1000ft.pdf
Five designated sites have been permitted for storing and/or burning storm debris. They are located in the following areas: Mainside on

Sawmill Road, Courthouse Bay, Camp Johnson, Camp Geiger, and MCAS New River. Only storm debris can be accumulated at these sites. EMD must notify the Division of Air Quality if the Installation intends to burn the storm debris at one of these sites. Contact your ROICC or Contract Representative for more information.

- **Fire training outside of designated fire training pits.** State approval is required to conduct fire training outside of the designated fire training pits. First, complete the Notification of Open Burning for the Training of Firefighting Personnel form. The form is available at the following site:
http://daq.state.nc.us/enf/openburn/ob_firetrain.pdf

An accredited North Carolina Asbestos Inspector must inspect any structure to be burned to ensure that it is free from asbestos before the training exercise. Turn in the completed form to EMD for submittal to NCDAQ and the Division of Public Health, Health Hazards Control Unit.

- **Dust-causing activities (e.g., rock crushing).** Wet suppression is required during the entire dust-causing operation. Ensure that an adequate water supply is available, and coordinate with the Fire and Emergency Services Division if access to a fire hydrant is necessary.

14.0 NATURAL RESOURCES

The Installation has stewardship and recovery responsibilities over the natural resources located on the installation. These responsibilities are regulated under numerous laws described in this section. The Installation ensures compliance with these laws through an interdisciplinary process of review and coordination of all activities occurring on the installation. Contractors performing work on the Installation are responsible for complying with conditions and measures imposed on their work as a result of this process; these responsibilities include preserving the natural resources within the project boundaries and outside the limits of permanent work, restoring work sites to an equivalent or improved condition on completion of work, and confining construction activities to within the limits of the work indicated or specified. The contractor is advised that the Installation is subject to strict compliance with Federal, State, and Local wildlife laws and regulations. The contractor must not disturb wildlife (birds, nesting birds, mammals, reptiles, amphibians, and fish) or the native habitat adjacent to the project area except when indicated or specified.

14.1 KEY DEFINITIONS AND CONCEPTS

The following key definitions and concepts are associated with natural resources management. If you have any questions or concerns about the information in this section or require assistance regarding any wildlife matters (snakes, nesting birds, nuisance wildlife) on the site or within the project area, please consult with your ROICC or Contract Representative, who will contact Environmental Conservation Branch (ECON) at 910-451-7235 (during working hours) or 910-451-7235 (after working hours).

If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative.

14.1.1 Key Definitions

- **Natural Resource.** Soil, water, air, plants, and animals, according to the Natural Resources Conservation Service.

- **Threatened or Endangered Species.** Federally listed plants and animals that are likely to become either endangered or extinct in the foreseeable future.
- **Wetland.** An area that is regularly saturated by surface water or groundwater and contains vegetation that is adapted for life in saturated soil conditions per the United States Environmental Protection Agency (USEPA).

14.1.2 Key Concepts

- **National Environmental Policy Act (NEPA) of 1969.** Contractors must obtain and review any NEPA documentation associated with their projects.
- **Threatened and Endangered Species.** Specific requirements regarding protected areas on the Installation apply to contractor activities.
- **Timber.** Contractors must ensure that the ROICC or Contract Representative notify the Forest Management Program prior to conducting site work. Timber will not be released to contractors without the approval of the Forest Management Program.
- **Wetlands.** Any work in Installation waters or wetlands requires a permit prior to the start of an activity.

14.1.3 Environmental Management System

Practices, or activities, associated with natural resources include the following:

- Construction/demolition
- Controlled burn operations
- Erosion control
- Land clearing
- Riparian buffer maintenance
- Soil excavation/grading
- Stump/brush removal

The potential impacts of these activities on the environment include air emissions, sedimentation, eutrophication of surface waters, degradation of

habitat, impacts to marine mammals, damage to commercial and noncommercial timber, impacts to endangered species and cultural resources, and degradation of soil quality.

14.2 OVERVIEW OF REQUIREMENTS

Contractors operating aboard the Installation must be aware of, and adhere to, all applicable regulations and requirements regarding natural resources, including the following:

- **BO 5090.11, Protected Species Program.** Sets forth regulations and establishes responsibilities to ensure conservation of threatened and endangered species and species at risk aboard MCB Camp Lejeune.
- **Clean Water Act (CWA) of 1972.** Establishes the basic structure for regulating discharges of pollutants into the Waters of the United States.
- **Marine Corps Order (MCO) P5090.2A, Environmental Compliance and Protection Manual.** Provides guidance and instruction to installations to ensure the protection, conservation, and management of watersheds, wetlands, natural landscapes, soils, forests, fish and wildlife, and other natural resources as vital Marine Corps assets.
- **NEPA of 1969 (42 U.S.C. 4321 *et seq.*).** Requires Federal agencies, including the Marine Corps, to consider the environmental impacts of projects before the decision maker proceeds with the implementation. All projects that support military training, major and minor military construction, maintenance, and natural resources management actions are reviewed for potential environmental impacts.
- **BO 11000.1D, Environmental Impact Review Procedures.** Implements the NEPA of 1969 and NEPA policy and guidance in Chapter 12 of MCO P5090.2A.
- **Rivers and Harbors Act of 1899.** Prohibits the excavation, filling, or alteration of the course, condition, or capacity of any port, harbor, or channel without prior approval from the Chief of Engineers.

14.3 National Environmental Policy Act (NEPA)

Staff specialists from various Installation departments participate in the NEPA process, which coordinates the review of projects and documents environmental impacts (or lack thereof) for projects before implementation.

The documentation of this review process occasionally includes mandatory conditions affecting design and construction/implementation of the project. The documentation, when completed, is provided to the action proponent, who is expected to provide it to his or her ROICC or Contract Representative.

Consult with your ROICC or Contract Representative to obtain or review any NEPA documentation associated with the project in your contract.

The documentation marks the end of the NEPA review process; it does not constitute approval for the proponent of the action to implement the action. Some contracts may include stipulations from the NEPA document that must be implemented prior to the onset of work to prevent environmental impacts and violations of Federal or state rules and regulations. Stipulations could include: replacing monitoring wells if damages occur from contractor operations; stopping work if contamination is encountered; notification that a wetlands permit is required; seasonal restrictions, etc.

14.4 Timber

Potential timber resources are identified during the NEPA process. The contractor is responsible for advising the ROICC or Contract Representative to notify the Forest Management Program at (910) 451-7223 prior to beginning site work. Additionally, the ROICC or Contract Representative and/or contractor is required to notify the Forest Management Program in the event the contract has been amended with modifications to the site location.

The Forest Management Program maintains first right of refusal for all timber products on construction projects and will determine whether the government will harvest the timber or release it to the contractor. The government retains exclusive rights for all forest products on construction projects. If the government elects to harvest the timber, only merchantable

Consult with your ROICC or Contract Representative to obtain or review any NEPA documentation associated with the project in your contract.

The contractor is responsible for advising the ROICC or Contract Representative to notify the Forest Management Program at (910) 451-7223 prior to beginning site work.

timber will be removed. Per MCO P5090.2A, Chapter 11, “Forest products will not be given away, abandoned, carelessly destroyed, used to offset costs of contracts, or traded for products, supplies, or services.”

Contractors must adhere to the following requirements when performing site work that may impact timber resources:

- Do not remove, cut, deface, injure, or destroy trees or shrubs, without authorization from the ROICC or Contract Representative.
- Do not fasten or attach ropes, cables, or guys to existing nearby trees for anchorages without authorization from the ROICC or Contract Representative. (In such cases that these actions are authorized, the contractor shall be responsible for any resultant damage.)
- Protect existing trees that are to remain in place and that may be injured, bruised, defaced, or otherwise damaged by construction operations.
- With the ROICC or Contract Representative’s approval, use approved methods of excavation to remove trees with 30 percent or more of their root systems destroyed.
- With the ROICC or Contract Representative’s approval, remove trees and other landscape features scarred or damaged by equipment operations, and replace with equivalent, undamaged trees and landscape features.

Please refer to Section 9.0 for disposal information for land-clearing debris.

14.5 Threatened and Endangered Species

With the exception of improved roadways, entry into a threatened or endangered species site or shorebird nesting area marked with signs and/or white paint is prohibited without written permission from Installation personnel. BO 5090.11 lists threatened and endangered species residing on Installation. The following restrictions apply on the Installation unless written permission is received from Installation personnel:

Protect existing trees that are to remain in place and that may be injured, bruised, defaced, or otherwise damaged by construction operations.

Entry into a threatened or endangered species site or shorebird nesting area marked with signs and/or white paint is prohibited without written permission from Installation personnel.

- Work on Onslow Beach or Brown's Island is not permitted between 1 April and 31 October. Traffic on the beaches should be limited to below the high tide line.
- Vehicles and lighting are prohibited on the beaches overnight between 1 May and 31 October.
- Construction activities are prohibited within 1500 feet of a bald eagle's nest (JD Training area).
- Cutting or damaging of pine trees is not permitted.
- Alteration of hydrology through excavation, ditching, etc., is prohibited.
- Fish and wildlife must not be disturbed.
- Water flows may not be altered; the native habitat adjacent to the project and critical to the survival of fish and wildlife may not be significantly disturbed, except as indicated or specified.

14.6 Wetlands

14.6.1 Avoidance

In accordance with MCO P5090.2A, all facilities and operational actions must avoid, to the maximum degree feasible, wetlands destruction or degradation regardless of wetland size or legal necessity for a permit. Prior to the onset of construction, coordination with the Land and Conservation Resources Section of EMD should have taken place during project design to ensure Clean Water Act permitting issues are addressed by the contractor at the earliest opportunity. Contractors must incorporate avoidance and minimization measures in order to comply with the national policy to permit no overall net loss of wetlands.¹ Any proposed action significantly affecting wetlands must be coordinated with the Commanding Officer of MCB Camp Lejeune.

The contractor must ensure that construction of all buildings, facilities and related amenities, including earthwork, grading, landscaping, drainage,

¹ Contractor must meet concept design criteria while incorporating avoidance and minimization measures to protect wetlands, streams and Waters of the United States.

Contractors must incorporate avoidance and minimization measures in order to comply with the national policy to permit no overall net loss of wetlands.

stormwater management, parking lot and paved roadway, sidewalks, site excavation, sanitary sewer system extensions, and domestic water extensions, avoids, to the maximum degree feasible, wetlands destruction or degradation.

Identified and mapped boundaries of legally defined wetlands on all Marine Corps lands within the project area will be distributed to the ROICC or Contract Representative for use (if available) and shall be included in all design products including drawings, plans, and figures.

14.6.2 Permits

All unavoidable potential impacts to wetlands or Waters of the United States require prior coordination as described in this section. Failure to acquire written authorization for impacts to wetlands and/or Waters of the United States may result in significant project delays or design modifications.

No discharge of fill material, mechanized land clearing, or any other activity is allowed in jurisdictional wetlands or Waters of the United States without the proper approvals. The contractor may be responsible for obtaining the following permits (including pre-permit coordination, preparation, and submission of all permit applications after review and concurrence by the Installation) and complying with all regulations and requirements stipulated by the State of North Carolina as conditions upon issuance of the permits:

- United States Army Corps of Engineers (USACE), Section 404 Permit (Individual or applicable Nationwide Permit); Clean Water Act (CWA) of 1977, as Amended (Public Law 95-217, 33 U. S. C. 1251 et seq.)
- North Carolina Division of Water Quality (NCDWQ), Section 401 Water Quality Certification – (15A NCAC 02H) N.C. Department of Environment and Natural Resources (NCDENR); Clean Water Act (CWA) of 1977, as Amended (Public Law 95-217, 33 U. S. C. 1251 et seq.)

If work in wetlands is required, be sure you know who is responsible for obtaining permits, and what the terms and conditions of the permits require.

- North Carolina Division of Coastal Management (NCDCM), Federal Consistency Determination (15A NCAC 07) NCDENR; Coastal Zone Management Act (CZMA) of 1972 (16 U. S. C. 1451 et seq.)

Two types of activities generally require a permit from the USACE:

- **Activities within navigable waters.** Activities such as dredging, constructing docks and bulkheads, and placing navigation aides require review under Section 10 of the Rivers and Harbors Act of 1899 to ensure that they will not cause an obstruction to navigation.
- **Activities in wetlands and Waters of the United States** (regulated by Section 404 of the CWA of 1972). A major aspect of the regulatory program under Section 404 of the CWA is determining which areas qualify for protection as wetlands. Contractors should contact the USACE, the NCDWQ, or the NCDCM if there is any question about whether performing any activities could impact wetlands.

Contractors working on the Installation will not perform any work in Waters of the United States or wetlands without an approved permit (even if the work is temporary).

Contractors working on the Installation will not perform any work in Waters of the United States or wetlands without an approved permit (even if the work is temporary). Examples of temporary discharges include dewatering of dredged material prior to final disposal and temporary fills for access roadways, cofferdams, storage, and work areas.

14.6.3 Impacts

Any disturbance to the soil or substrate (bottom material) of a wetland or water body, including a stream bed, is an impact and may adversely affect the hydrology of an area. Discharges of fill material generally include the following, without limitation:

- Placement of fill material that is necessary for the construction of any structure or impoundment requiring rock, sand, dirt, or other material for its construction; site-development fills for recreational, industrial, commercial, residential, and other uses; and causeways or road fills
- Dams and dikes
- Artificial islands

- Property protection or reclamation devices such as riprap, groins, seawalls, breakwaters, revetments, and beach nourishment
- Levees
- Fill for intake and outfall pipes and subaqueous utility lines
- Fill associated with the creation of ponds
- Any other work involving the discharge of fill or dredged material

14.6.4 Mitigation

Any facility requirement that cannot be sited to avoid wetlands must be designed to minimize wetlands degradation and must include compensatory mitigation as required by wetland regulatory agencies in all phases of project planning, programming, and budgeting.

The contractor may be required to develop on-site mitigation, consisting of wetland/stream restoration or creation for all unavoidable wetland and stream impacts whenever possible and feasible. Use of Marine Corps lands and lands of other entities may be permissible for mitigation purposes for Marine Corps projects when consistent with USEPA and USACE guidelines or permit provisions. Land within the project area suitable for establishment of wetlands mitigation may be evaluated by the contractor and used for mitigation where compatible with mission requirements and approved by the Commanding Officer. Proposals for permanent resource areas must be approved by the Assistant Secretary of the Navy (Installations and Environment) or his/her designee.

Off-site mitigation should be proposed only if there is no other reasonable compensatory mitigation alternative.

14.7 Temporary Construction

Traces of temporary construction facilities, such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other signs of construction, should be removed.

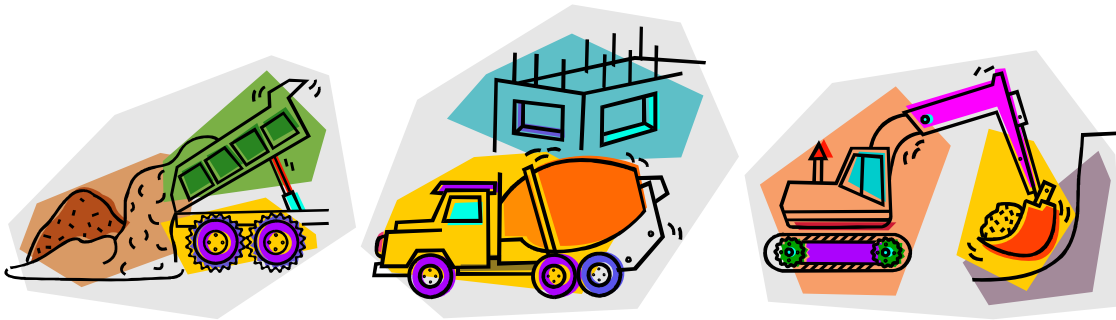
Temporary roads, parking areas, and similar temporarily used areas should be graded to conform to surrounding contours.

The contractor may be required to develop on-site mitigation consisting of wetland/stream restoration or creation for all unavoidable wetland and stream impacts whenever possible and feasible.

General EMS & Environmental Awareness Training for Contractors & Vendors



Attachment (1)



**MCB Camp Lejeune, NC/
MCAS New River**



**General EMS and
Environmental Awareness
Training
for
Contractors and Vendors**

Revised: April 2008





Disclaimer

- This training does not replace any required regulatory environmental training as per your contract
 - Required environmental training should be completed *prior* to working aboard the Installation
 - Training records should be available for review upon request





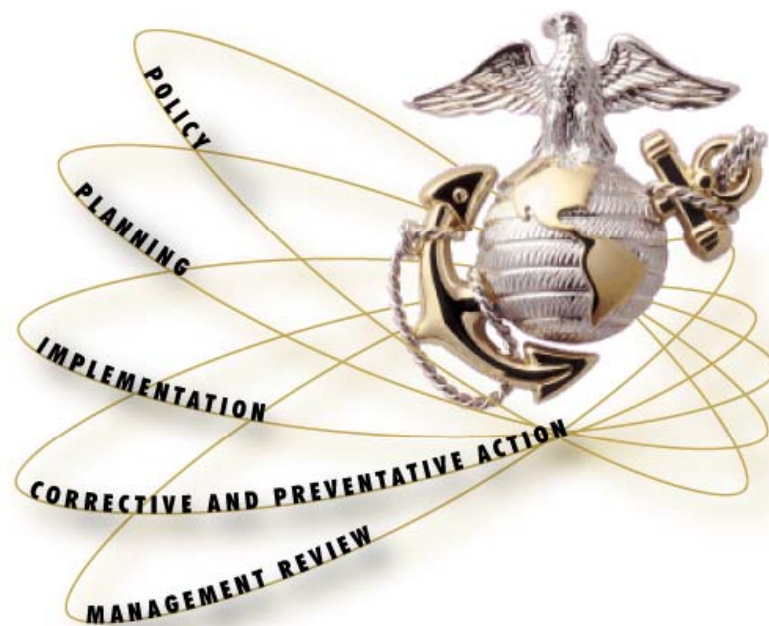
Training Overview

- EMS and the Environmental Policy
- Environmental Management Division
- General Environmental Awareness
- Spill Response Basics
- Summary





EMS and the Environmental Policy





What is an EMS?

- MCB Camp Lejeune and MCAS New River have implemented an Environmental Management System (EMS) that is founded on the principles of our respective **Environmental Policy**.
- The purpose of the EMS is to sustain and enhance mission readiness and access to training areas through effective and efficient environmental management.
- The EMS emphasizes that the authority and principal responsibility for controlling environmental impacts belong to those commands, units, offices, and personnel, *including contractors and vendors*, whose activities have the potential to impact the environment.





Why have an EMS?

“To sustain our operations and training capabilities, and to safeguard land-use availability, will comply with environmental laws and conserve the natural and cultural resources with which it has been entrusted.”

Excerpt from the Commanding Officer’s Environmental Policy Statement





What YOU Need to Know

- The Installation has an EMS
- These three goals are the foundation of our **Environmental Policy**:
 1. **Comply** with relevant environmental laws and regulations
 2. **Prevent pollution**
 3. **Continually improve** our EMS





YOUR EMS Responsibilities

- Be aware of the Environmental Policy
- Be familiar with spill procedures
- Keep your eyes open for potential problems
- Report any environmental problems or concerns promptly and notify your ROICC or Contract Representative
- Utilize this training for your workers





Environmental Management Division (EMD), MCBCL

Environmental Affairs Department (EAD), MCASNR





EMD/EAD can help!

- The appropriate environmental office works with your ROICC or Contract Representative to ensure:
 - Proper management of waste
 - Compliance with regulations
 - Required environmental plans are developed and followed, if applicable
 - Required environmental training material is provided for contractor use





What Does EMD/EAD Do for You?



- If you have EMS or environmentally related questions, contact your ROICC or Contract Representative who will then work with EMD & EAD to determine how to proceed





Remember...

ALL environmental program requirements are applicable to **ALL** contractors and vendors working aboard the Installation!





General Environmental Awareness





Water Quality

- **Construction/demolition and other projects can result in:**

- Stormwater pollution
- Erosion and sedimentation



- **If a project could impact water quality:**

- Don't dispose of oil, chemicals, or any other material/debris down storm drains
- Keep sediment, leaves, and construction debris away from storm drains (use barriers)
- Sediment Erosion Control Plans are required for sites when more than 1 acre will be disturbed





Used Oil

■ Oil handling/changing operations can result in:

- Spills
- Waste
- Groundwater, stormwater, or soil contamination



■ If a project involves the use of oil:

- Perform maintenance in paved, designated areas
- Recycle used oil, oil filters, and other fluids...don't dump down storm drain or dispose of in the trash
- Clean up spills immediately and properly!





Air Quality

If a project could impact air quality:

- Prior to beginning operations, have your ROICC or Contract Representative contact the Installation Air Quality Program representative for applicable Federal and state permitting requirements
- Follow all permit requirements, including material usage recordkeeping for Title V permit sources
- Notify your ROICC or Contract Representative before bringing new equipment on site
- Notify your ROICC or Contract Representative before modifying an existing permitted source (including physical changes and material changes). Examples of permitted sources include boilers, generators, fuel tanks, and welding/soldering operations





Hazardous Waste Management

- **Hazardous waste generation can result in:**

- Consumption of natural resources
- Increased Regulatory Burden

- **If a project generates hazardous waste:**

- Reduce/Minimize the generation of hazardous waste
- Contact your ROICC or Contract Representative if unsure how to manage a waste
- Don't put hazardous wastes into general trash dumpsters
- Ensure satellite accumulation areas (SAA) are managed properly
 - Notify your ROICC or Contract Representative prior to creating a new SAA!
- Ensure hazardous waste drums are labeled and lids are secured





Hazardous Materials

- **If a project requires the use hazardous material (HAZMAT):**
 - Keep flammable materials in HAZMAT lockers
 - Don't store large quantities – keep on hand only what you will use
 - Maintain MSDSs for each material on-site
 - Place materials stored outside in secondary containment to prevent spill/reduce releases
 - Stop work if you unearth a hazardous material (i.e., ordnance) and report to your ROICC or Contract Representative





PCB and Asbestos

- **If a project generates or involves the removal of PCB or asbestos:**

- Manage and handle PCB and asbestos only if you are properly trained



- Manage PCB and asbestos in proper containers with appropriate labeling





Solid Waste Management

- **Solid waste generation can result in:**
 - Consumption of natural resources
 - Decreased landfill space
- **If a project generates regulated or solid waste:**
 - Reduce/Reuse/Recycle when possible; meet contract requirements for recycling
 - Contact your ROICC or Contract Representative if unsure how to manage a waste
 - Don't put unauthorized wastes into general trash dumpsters – Recyclable products should be placed in appropriate containers & not co-mingled with solid waste
 - Don't use government-owned dumpsters for your contractor waste and debris





Good Housekeeping

■ Poor housekeeping can result in:

- Fines, termination of contract
- Environmental contamination, spills
- Injuries



■ Maintain good housekeeping:

- **DO** store flammable materials in HAZMAT lockers
- **DO** ensure containers are labeled and lids are secured
- **DO** keep stormwater drains clear of debris
- **DO** clean up work sites at the end of *each* day
- **DO** clean up spills immediately and properly
- **DO** clean up work area after job completion
- **DON'T** pour material down storm or floor drains
- **DON'T** stockpile waste – put it where it belongs!





Spill Response Basics





If You Have or See a Spill...

Call 911





Natural Resources – Threatened & Endangered Species

- The Installation is currently home to nine federally listed endangered species: red-cockaded woodpecker (RCW), green sea turtle, loggerhead sea turtle), rough-leaved loosestrife, seabeach amaranth, piping plover, American alligator, and American bald eagle and Hirst's panic grass.



- The following restrictions apply:
 - Construction activities are restricted within 1500 ft of a bald eagle's nest
 - Vehicles & lighting are prohibited on the beaches overnight = 1 May -31 Oct
 - Cutting or damaging pine trees in not permitted
 - Fish & wildlife must not be disturbed





Natural Resources – Wetlands

- The US Army Corps of Engineers defines a wetland as " areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions."
- No discharge of fill material, mechanized land clearing, or any other activity is allowed in jurisdictional wetlands or Waters of the United States without the proper approvals.
- Permits will be required





Natural Resources – Timber

There are over 127,000 acres of forested land aboard the Installation

- The MCBCL Forest Management Program has 1st right of refusal for all timber products on construction projects
 - The following restrictions apply:



- Do not cut or deface trees w/o authorization
- Protect existing trees that are to remain in place
- Do not fasten or attach ropes or cables to existing nearby trees for anchorages w/o authorization





Cultural Resources

The Installation manages a variety of historic and prehistoric archaeological sites, as well as historic structures.

- **IF YOU FIND A BONE, BOTTLE OR PIECE OF POTTERY THAT YOU THINK MIGHT HAVE ARCHAEOLOGICAL OR HISTORIC INTEREST, DON'T PICK IT UP. IF YOU FIND ANY OF THESE THINGS, MARK THE AREA & NOTIFY THE BASE ARCHAEOLOGIST, EMD AT 451-5063.**





Summary





Summary

- MCB Camp Lejeune and MCAS New River protect, preserve, and enhance their natural resources through their EMS and Environmental Policies
 - **We comply** with relevant environmental laws and regulations
 - **We prevent pollution**
 - **We continually improve** the EMS
- **YOU** are responsible for complying with applicable environmental requirements too
- If you aren't sure what to do...**ASK!**
 - Your ROICC or Contract Representative and EMD/EAD are here to help





Remember...

Consult the *Contractor Environmental Guide* for more detailed information pertaining to environmental requirements applicable to the work you do.

If you have any questions or concerns about the information in this training, please consult with your ROICC or Contract Representative, who will contact the appropriate environmental office if additional clarification is necessary.



SECTION 01 58 00

PROJECT IDENTIFICATION

01/07

PART 1 GENERAL

1.1 PROJECT SIGN

Within 15 days after the commencement of work, provide one project identification sign at the location designated. Construct the sign using exterior grade plywood, preservative-treated lumber, and galvanized hardware.

1.2 PROJECT IDENTIFICATION SIGNBOARD

A project identification signboard shall be provided. The signboard shall be provided at a conspicuous location on the job site where directed by the Contracting Officer. Construct signboard in accordance with project identification signboard plates for regional LANTNAVFACENGCOM logo.

- a. The field of the sign shall consist of on 4 by 8 foot sheet of grade B-B medium density overlaid exterior plywood.
- b. Lumber shall be B or Better Southern pine, pressure-preservative treated with penetachlorophenol. Nails shall be aluminum or galvanized steel.
- c. The entire signboard and supports shall be given one coat of exterior alkyd primer and two coats of exterior alkyd enamel paint. The lettering and sign work shall be performed by a skilled sign painter using paint known in the trade as bulletin colors. The colors, lettering sizes, and lettering styles shall be as indicated.
- d. The high gloss acrylic gold enamel paint used as background for the Department of the Navy - Atlantic Division, Naval Facilities Engineering Command applied sticker shall be spray applied automotive quality paint. The 18 inch diameter applied sticker shall be a silkscreened image in the design indicated, painted on a 2 millimeter transparent polyester film. The weather resistant, self adhering film shall be rated for a minimum of 2 year exterior vertical exposure and be mounted to sign with pressure sensitive, permanent acrylic adhesive. Shop cut sticker to round shape and provide pull-off protection sheets for both sides of sticker for shipping.
- e. Sign paint colors (numbers listed below for color identification only)
 - (1) Blue = Benjamin Moore Paints No. 826.
 - (2) White = Benjamin Moore Paints No. 873.
 - (3) Gold = Dupont No. B8014, Metallic gold.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 01 59 00

TEMPORARY TRAILERS FOR DISPLACED TENANTS

04/94

PART 1 GENERAL

1.1 SUBMITTALS

Submit the following.

SD-02 Shop Drawings

- a. Foundation/pier plan
- b. Underpinning

SD-03 Product Data

Trailer Manufacturer's Literature

1.2 SCHEDULING THE WORK

The Contractor shall provide and install double-wide office trailer(s) as specified on the project plans and as indicated herein complete and ready for occupancy, 75 days after contract award.

1.2.1 Upon Request or After Completion

Upon request by the Contracting Officer or after completion of all work, the Contractor shall have three weeks to remove the trailer(s), including all utility services, steps, foundations, and other associated materials. The grounds shall be restored to the original condition. Repair to original condition any damage to grassed or paved areas caused by mobile building or by anchoring.

PART 2 PRODUCTS

2.1 TRAILER

Trailer shall conform to the following minimum requirements:

- a. Size: double-wide trailer(s) of minimum size 24 feet by 50 feet each.
- b. Floor Covering: Floor shall be vinyl composition tile.

2.1.1 Construction Requirements

Each trailer shall be structurally sound, weathertight enclosures for residential use. Conform to the minimum requirements.

- a. 2 inch X 4 inch wall construction
- b. 2 inch X 6 inch floor joists with 5/8-inch plywood decking

- c. R-11 insulation in floor and walls
- d. R-14 insulation in ceiling
- e. Two entry doors with locks and three keys per lock.
- f. Windows with operable sash
- g. Interior materials shall be sheet type materials, pre-finished or painted; exterior material shall be weather resistant.
- h. Provide consistent color scheme on interior and exterior as approved by the Contracting Officer.
- i. Steps and Landing: Durable nonslip materials such as checkered plate metal, treated wood or concrete stairs and landing. Landing at trailer level of size adequate for person to stand on landing and open the door. Railing on both sides of steps and two sides of landing. Provide handicap accessible pathway to be designed by the Contracting Officer, including sidewalks and ramps
- j. Skirting: Skirting shall be vinyl. Skirting shall be installed after all utility and telecommunications work is complete.
- k. Foundation and Underpinning: Provide masonry foundation and underpinning to comply with the manufacturer's requirements and to provide vertical and lateral stability for the soil conditions present and for the basic wind velocity applicable to the site as specified in the applicable codes. The foundation and underpinning systems shall be designed by a North Carolina Licensed Professional Engineer.

2.1.2 Mechanical and Electrical Minimum Requirements

- a. Central HVAC as required to maintain interior conditions between 72 - 78 degrees F DB and 40 - 60% RH. With exterior conditions between 23 degrees F DB (winter) and 90 degrees F DB and 79 degrees F WB (summer). Outside air shall be introduced at the rate of 0.125 CMB/SF of conditioned space.
- b. Toilet Exhaust Air System: Provide 25 CPM exhaust for each toilet room. Switch with the toilet light.
- c. 300 amp - 8 circuit panel
- d. 120 volt lighting, ceiling mounted
- e. 120 volt duplex wall receptacles spaced 6 feet o.c. on interior walls.
- f. Exterior light at entrance doors
- g. The Government will supply and install telephones in accordance with Section 27 10 00, BUILDING TELECOMMUNICATIONS CABLING SYSTEM..
- H. Tele/Comm Faceplates: Tele/Comm faceplates shall be provided with every electrical outlet.

2.1.3 Water, Sewer and Electrical Connections

Provide domestic water, domestic sewer, and electrical systems as specified on the project plans complete and ready for use.

2.2 FIRE EXTINGUISHER

Provide appropriate type and wall mount on interior adjacent to exterior door.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Foundation

Provide foundation for trailer(s); conform to applicable codes.

3.2 INSTALLATION

Install trailer(s); provide full skirting and anchoring for 130 mph wind zone; conform to applicable codes. Connect indicated utilities.

3.2.1 Steps and Landing

Provide two sets of steps and landing for each mobile building. Provide one handicap accessible ramp for one trailer as designated by the Contracting Officer.

3.2.2 Plumbing and Electrical Hook-Up

Provide complete plumbing and electrical hookup to mobile buildings. Supply all necessary parts and connections and conform to all applicable codes.

3.2.3 Damages

Government will not be responsible for damage to trailers from installation of phones, moving furniture, minor modification and normal wear and tear.

-- End of Section --

SECTION 01 62 35

RECYCLED / RECOVERED MATERIALS

07/06

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 247

Comprehensive Procurement Guideline for
Products Containing Recovered Materials

1.2 OBJECTIVES

Government procurement policy is to acquire, in a cost effective manner, items containing the highest percentage of recycled and recovered materials practicable consistent with maintaining a satisfactory level of competition without adversely affecting performance requirements or exposing suppliers' employees to undue hazards from the recovered materials. The Environmental Protection Agency (EPA) has designated certain items which must contain a specified percent range of recovered or recycled materials. EPA designated products specified in this contract comply with the stated policy and with the EPA guidelines. The Contractor shall make all reasonable efforts to use recycled and recovered materials in providing the EPA designated products and in otherwise utilizing recycled and recovered materials in the execution of the work.

1.3 EPA DESIGNATED ITEMS INCORPORATED IN THE WORK

Various sections of the specifications contain requirements for materials that have been designated by EPA as being products which are or can be made with recovered or recycled materials. These items, when incorporated into the work under this contract, shall contain at least the specified percentage of recycled or recovered materials unless adequate justification (non-availability) for non-use is provided. When a designated item is specified as an option to a non-designated item, the designated item requirements apply only if the designated item is used in the work.

1.4 EPA PROPOSED ITEMS INCORPORATED IN THE WORK

Products other than those designated by EPA are still being researched and are being considered for future Comprehensive Procurement Guideline (CPG) designation. It is recommended that these items, when incorporated in the work under this contract, contain the highest practicable percentage of recycled or recovered materials, provided specified requirements are also met.

1.5 EPA LISTED ITEMS USED IN CONDUCT OF THE WORK BUT NOT INCORPORATED IN THE WORK

There are many products listed in 40 CFR 247 which have been designated or proposed by EPA to include recycled or recovered materials that may be used by the Contractor in performing the work but will not be incorporated into the work. These products include office products, temporary traffic control products, and pallets. It is recommended that these non-construction products, when used in the conduct of the work, contain the highest practicable percentage of recycled or recovered materials and that these products be recycled when no longer needed.

-- End of Section --

SECTION 01 77 00

CLOSEOUT PROCEDURES

09/07

PART 1 GENERAL

1.1 SUBMITTALS

Submit the following in accordance with Section 01 33 00, "Submittal Procedures."

SD-10, Operation and Maintenance Data

Equipment/product warranty list

Submit Data Package 1 in accordance with Section 01 78 23, "Operation and Maintenance Data."

SD-11 Closeout Submittals

As-built drawings

GIS Deliverables

Record of materials

Maximo requirements

Equipment/product warranty tag

1.2 PROJECT RECORD DOCUMENTS

As-Built Drawings will be submitted as specified in 1.2.1 along with GIS Deliverables which will be created and submitted within specification in section 1.2.2.

1.2.1 As-Built Drawings

"FAC 5252.236-9310, Record Drawings." In addition to the requirements of FAC 5252.236-9310, the Contractor shall survey the horizontal and vertical location of all new utilities and structures to within 0.1 feet relative to the station datum. All utilities shall be surveyed at each fitting and every 100 LF of run length and at each change of direction. All structures shall be surveyed at corners of buildings. Locations and elevations shall be recorded on the Record Drawings. Submit drawings with QC certification. Submit drawings in AutoCAD format versions 2000 or 2002.

1.2.2 GIS Deliverables

Shall meet the following requirements:

1.2.2.1 Objective

The primary objective of this section is to provide detailed specifications for GIS (Geographic Information Systems) and GPS (Global Positioning

System) technologies that will be utilized in the creation of the geospatial data deliverables for all new Infrastructures and Utility data which is to be used to update Camp Lejeune's Integrated Geographic Information Repository (IGIR) database.

1.2.2.2 Specific Tasks

A. Requirements for GPS collection:

1. Convert design drawings to Polyline geospatial data.

B. Creation of GIS Spatial data

4. Correct Topology will be used for all features. Feature where edges meet should not overlap.

C. Creation of Attribute data

1. The Contractor shall request a copy of Camp Lejeune's GIS data via the project manager. Camp Lejeune's GIS data is continuously being updated and/or changed, therefore it is suggested that the GIS data be routinely requested.

2. Each feature class attributes shall be developed in accordance with the most current layout used by MCB, Camp Lejeune's IGIR data. Any alteration shall be submitted for approval prior to collection of data to I&E's Public Works GIS Data Development Section, Building 1005.

3. Specific attention shall be used with data type, character length, and attribute field name.

4. The Contract shall review Camp Lejeune's current attributes for each feature class and populate the tables in accordance with existing scheme, and collect attributed data as outlined in section G.

5. Use of construction/as-built drawings to obtain attribute data associated with features located in field is acceptable; however, changes in spatial and non-spatial data in the field always supersede planned drawings.

6. In section G reference to Units of Measure, Units and Size Units are defined in Camp Lejeune existing GIS data for specific feature classes.

D. Geographic Data Documentation (METADATA):

1. For each digital file delivered containing geographic information (regardless of format); the Contractor shall provide documentation consistent with the Federal Geographic Data Committee (FGDC) Content Standards for Digital Geospatial Metadata (CSDGM).

2. Data sets derived from GPS data collection efforts shall include metadata to record descriptions of the receiver and other equipment used during collection and processing, base stations used for differential corrections, estimated horizontal and vertical accuracies obtained, and conversion routines used to

translate the data into final geographic data delivery format.

E. Geospatial Data Projection:

1. Geographic data (regardless of format) shall be provided in meters and projected into the Universal Transverse Mercator (UTM) coordinate system.
2. The maps and data shall use UTM Zone 18N, the GRS 1980 spheroid and the North American Datum 1983 (WGS-84).
3. Each data set shall have a projection file if appropriate based on format. The Contracting Officer's Technical Representative, if applicable will determine map or drawing scale.
4. Mapping accuracy for the agreed scales will conform to the American Society for Photogrammetry and Remote Sensing (ASPRS) "Accuracy Standards for Large-Scale Maps", "Interim Accuracy Standards for Large-Scale Maps" (ASPRS, 1991).

F. Geospatial Data Structure:

1. GIS Data Sets - The Contractor should have a working knowledge of the most current version of the Spatial Data Standards for Facilities, Infrastructure and Environment (SDSFIE), also known as the National Committee for Information Technology Standards.

G. Attribute data requirements:

The following attributes shall be collected for each Infrastructure data class:

1. **Infrastructure:** Collect GPS data for all features listed with Sub-Meter accuracy.

A. Structures: CLJN.structure_existing_area

1. GPS Structure and collect the following attributes:
 - a) Subtype ID: Structure, Canopy/Pavilion, Shed, Towers, Carport and Dugouts, etc
 - b) Building ID: Facility Number
 - c) Structure Status: existing structure, portable, etc
 - d) Number of Levels
 - e) Structure Use 2: Populate "Residential" if structure is a residential unit
 - f) Material: Brick, Vinyl, etc.
 - g) Drawing Number
 - h) Drawing Type
 - i) Contract Number
 - j) Date Acquired: Year
 - k) Date Source: Survey Grade GPS, Located in Field, Sub-Meter Grade GPS, Georeferenced Drawing, AutoCAD Drawing

B. Floor Outline: CLJN.building.floor_outline (Polyline)

All new and renovated buildings will be required to have a

"clean floor plan" for each floor that will be delivered in GIS and AutoCAD format. The floor plan will provide the following for each floor; walls, doors, windows, closet, crawlspace, head facility, stairwells, etc.

1. Create feature and update the following attributes:

- a) Building ID: Facility number
- b) Floor Name
- c) Subtype ID: Attic, Main Floor, Second Floor, Basement etc
- d) Drawing Number
- e) Drawing Type
- f) Contract Number
- g) Data Source: Sub-Meter GPS, Survey Grade GPS, Georeferenced Drawing, AutoCAD Drawing

NOTE: Renovated floor plans will include total floor plan for each story.

C. Slabs: CLJN.slab_area

1. GPS and collect the following attributes:

- a) Structure ID: (Facility Number, if applicable)
- b) Feature Description: include type of utility when applicable i.e., Generator, Pad Transformer, etc
- c) Structure Material
- d) Structure Condition
- e) Built Date
- f) Drawing Number
- g) Drawing Type
- h) Contract Number
- i) Data Source: Sub-Meter GPS, Survey Grade GPS, Georeferenced Drawing, AutoCAD Drawing

H. Non-Compliance

1. Failure to following Specific tasks Sections A - G will result in non-acceptance of data deliverable.

1.2.2.3 Submittals

A. Geospatial Data Software Format: Geographic data must be provided in a form that does not require translation, preprocessing, or post processing before being used in the IGIR System. Digital geographic maps and the related data sets shall be delivered in one of the following software formats: Any maps, drawings, figures, sketched, databases, spreadsheets, or text files prepared for this contract shall be provided in both hard copy and digital form. The Contractor shall deliver hard copy paper ANSI E Maps of digital data with structure identifications or numbers, road names and other relevant information displayed and/or labeled in ArcMap and Adobe Portable Document Format (PDF) of final data.

1. PREFERRED: In a personal geodatabase format (Access database file) using ArcGIS 9.1. The personal geodatabase must be importable to an Oracle 10g multi-user geodatabase using ArcSDE 9.1.

2. ALTERNATIVE: In double precision, standard ESRI shapefile format.

1.2.2.4 Geographic Data Review:

1. The digital geographic maps, GPS and related data, and text documents shall be included for review in the draft and final contract submittals.

2. For each review of digital geospatial data deliverables, the Contractor shall provide a technical consultant to meet on-site at Camp Lejeune with the Public Works GIS Specialist and functional area subject matter experts to review the data deliverables on a Windows 2000 compatible system.

3. The data will be analyzed for discrepancies in subject content, correct format in accordance with these specifications, and compatibility with the existing IGIR system.

4. The Contractor shall incorporate review comments to data and text prior to approval of the final submittal.

1.2.2.5 General References:

1. Copies of the SDSFIE may be obtained from the CADD/GIS Technology Center's Internet homepage at <http://tsc.wes.army.mil> or by contacting:

Director, U.S. Army Engineer Waterways Experiment Station
CADD/GIS Technology Center
Attn: CEWES-IM-DA/Smith
3909 Halls Ferry Road
Vicksburg, MS 39180-6199

2. Copies of the ASPRS Accuracy Standards can be obtained on the Internet at <http://www.asprs.org> or by contacting:

American Society for Photogrammetry and Remote Sensing
5410 Grosvenor Lane, Suite 210
Bethesda, MD 20814-2160

3. Copies of the FGDC metadata standard can be obtained on the Internet at <http://www.fgdc.gov> or by contacting:

FGDC Secretariat
c/o U.S. Geological Survey
590 National Center
Reston, Virginia 22092
703) 648-5514

1.2.2.6 Ownership

All digital working and final files, to include raw GPS data files, final hard-copy products, source data acquired for this project, and related materials, including that furnished by the Government, shall become the property of Marine Corps Base, Camp Lejeune and will not be issued, distributed, or published by the Contractor.

1.2.2.7 Milestones and Meetings

The Consultant shall comply with the schedule submittal dates presented in the following table. Each Phase of large projects will follow the schedule submittal. All meetings will be held with a GIS Specialist present from Camp Lejeune's I&E, Public Works GIS Section.

Schedule Date (No later than)	Submittal Date
Kick off meeting	Before GPS/GIS Work Commence
10-15% completion	Review GIS Data/Comments
50% completion	Review GIS Data/Comments
100 % completion (Draft)	Review GIS Data/Comments
20 Days After Receipt of Comments	Final Product Due

1.2.3 As-Built Record of Materials

Furnish a record of materials.

Where several manufacturers' brands, types, or classes of the item listed have been used in the project, designate specific areas where each item was used. Designations shall be keyed to the areas and spaces depicted on the contract drawing. Furnish the record of materials used in the following format:

MATERIALS DESIGNATION	SPECIFICATION	MANUFACTURER	MATERIALS USED (MANUFACTURER'S DESIGNATION)	WHERE USED
_____	_____	_____	_____	_____

1.2.4 Maximo Requirements

Submit maximo requirements as specified in Section 23 03 00 and 26 00 00.

1.3 EQUIPMENT/PRODUCT WARRANTIES

1.3.1 Equipment/Product Warranty List

Furnish to the Contracting Officer a bound and indexed notebook containing written warranties for equipment/products that have extended warranties (warranty periods exceeding the standard one-year warranty) furnished under the contract, and prepare a complete listing of such equipment/products. The equipment/products list shall state the specification section applicable to the equipment/product, duration of the warranty therefore, start date of the warranty, ending date of the warranty, and the point of contact for fulfillment of the warranty. The warranty period shall begin on the same date as project acceptance and shall continue for the full product warranty period. Execute the full list and deliver to the Contracting Officer prior to final acceptance of the facility.

1.3.2 Equipment Warranty Tags and Guarantor's Local Representative

Furnish with each warranty the name, address, and telephone number of the guarantor's representative nearest to the location where the equipment and appliances are installed. The guarantor's representative, upon request of the station representative, shall honor the warranty during the warranty period, and shall provide the services prescribed by the terms of the warranty. At the time of installation, tag each item of warranted

equipment with a durable, oil- and water-resistant tag approved by the Contracting Officer. Attach tag with copper wire and spray with a clear silicone waterproof coating. Leave the date of acceptance and QC's signature blank until project is accepted for beneficial occupancy. Tag shall show the following information:

EQUIPMENT/PRODUCT WARRANTY TAG

Type of Equipment/Product _____
Warranty Period _____ From _____ To _____
Contract No. _____
Inspector's Signature _____ Date Accepted _____

Construction Contractor:
Name: _____
Address: _____
Telephone: _____

Warranty Contact: _____
Name: _____
Address: _____
Telephone: _____

STATION PERSONNEL TO PERFORM ONLY OPERATIONAL MAINTENANCE

1.4 CLEANUP

Leave premises "broom clean." Clean interior and exterior glass surfaces exposed to view; remove temporary labels, stains and foreign substances; polish transparent and glossy surfaces; vacuum carpeted and soft surfaces. Clean equipment and fixtures to a sanitary condition. Clean filters of operating equipment. Clean debris from roofs, gutters, downspouts and drainage systems. Sweep paved areas and rake clean landscaped areas. Remove waste and surplus materials, rubbish and construction facilities from the site.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 01 78 23

OPERATION AND MAINTENANCE DATA

07/06

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM E 1971

(1998; R 2005) Stewardship for the
Cleaning of Commercial and Institutional
Buildings

1.2 SUBMISSION OF OPERATION AND MAINTENANCE DATA

Submit Operation and Maintenance (O&M) Data specifically applicable to this contract and a complete and concise depiction of the provided equipment, product, or system, stressing and enhancing the importance of system interactions, troubleshooting, and long-term preventative maintenance and operation. The subcontractors shall compile and prepare data and deliver to the Contractor prior to the training of Government personnel. The Contractor shall compile and prepare aggregate O&M data including clarifying and updating the original sequences of operation to as-built conditions. Organize and present information in sufficient detail to clearly explain O&M requirements at the system, equipment, component, and subassembly level. Include an index preceding each submittal. Submit in accordance with this section and Section 01 33 00 SUBMITTAL PROCEDURES.

1.2.1 Package Quality

Documents must be fully legible. Poor quality copies and material with hole punches obliterating the text or drawings will not be accepted.

1.2.2 Package Content

Data package content shall be as shown in the paragraph titled "Schedule of Operation and Maintenance Data Packages." Comply with the data package requirements specified in the individual technical sections, including the content of the packages and addressing each product, component, and system designated for data package submission, except as follows. Commissioned items without a specified data package requirement in the individual technical sections shall use Data Package 3 4 5. Commissioned items with a Data Package 1 or 2 requirement shall use instead Data Package 3 4 5.

1.2.3 Changes to Submittals

Manufacturer-originated changes or revisions to submitted data shall be furnished by the Contractor if a component of an item is so affected subsequent to acceptance of the O&M Data. Changes, additions, or revisions required by the Contracting Officer for final acceptance of submitted data,

shall be submitted by the Contractor within 30 calendar days of the notification of this change requirement.

1.2.4 O&M Database

Develop a database from the O&M manuals that contains the information required to start a preventative maintenance program.

1.3 TYPES OF INFORMATION REQUIRED IN O&M DATA PACKAGES

1.3.1 Operating Instructions

Include specific instructions, procedures, and illustrations for the following phases of operation for the installed model and features of each system:

1.3.1.1 Safety Precautions

List personnel hazards and equipment or product safety precautions for all operating conditions.

1.3.1.2 Operator Prestart

Include procedures required to install, set up, and prepare each system for use.

1.3.1.3 Startup, Shutdown, and Post-Shutdown Procedures

Provide narrative description for Startup, Shutdown and Post-shutdown operating procedures including the control sequence for each procedure.

1.3.1.4 Normal Operations

Provide narrative description of Normal Operating Procedures. Include Control Diagrams with data to explain operation and control of systems and specific equipment.

1.3.1.5 Emergency Operations

Include Emergency Procedures for equipment malfunctions to permit a short period of continued operation or to shut down the equipment to prevent further damage to systems and equipment. Include Emergency Shutdown Instructions for fire, explosion, spills, or other foreseeable contingencies. Provide guidance and procedures for emergency operation of all utility systems including required valve positions, valve locations and zones or portions of systems controlled.

1.3.1.6 Operator Service Requirements

Include instructions for services to be performed by the operator such as lubrication, adjustment, inspection, and recording gage readings.

1.3.1.7 Environmental Conditions

Include a list of Environmental Conditions (temperature, humidity, and other relevant data) that are best suited for the operation of each product, component or system. Describe conditions under which the item equipment should not be allowed to run.

1.3.2 Preventive Maintenance

Include the following information for preventive and scheduled maintenance to minimize corrective maintenance and repair for the installed model and features of each system. Include potential environmental and indoor air quality impacts of recommended maintenance procedures and materials.

1.3.2.1 Lubrication Data

Include preventative maintenance lubrication data, in addition to instructions for lubrication provided under paragraph titled "Operator Service Requirements":

- a. A table showing recommended lubricants for specific temperature ranges and applications.
- b. Charts with a schematic diagram of the equipment showing lubrication points, recommended types and grades of lubricants, and capacities.
- c. A Lubrication Schedule showing service interval frequency.

1.3.2.2 Preventive Maintenance Plan and Schedule

Include manufacturer's schedule for routine preventive maintenance, inspections, tests and adjustments required to ensure proper and economical operation and to minimize corrective maintenance. Provide manufacturer's projection of preventive maintenance work-hours on a daily, weekly, monthly, and annual basis including craft requirements by type of craft. For periodic calibrations, provide manufacturer's specified frequency and procedures for each separate operation.

1.3.2.3 Cleaning Recommendations

Provide environmentally preferable cleaning recommendations in accordance with ASTM E 1971.

1.3.3 Corrective Maintenance (Repair)

Include manufacturer's recommended procedures and instructions for correcting problems and making repairs for the installed model and features of each system. Include potential environmental and indoor air quality impacts of recommended maintenance procedures and materials.

1.3.3.1 Troubleshooting Guides and Diagnostic Techniques

Include step-by-step procedures to promptly isolate the cause of typical malfunctions. Describe clearly why the checkout is performed and what conditions are to be sought. Identify tests or inspections and test equipment required to determine whether parts and equipment may be reused or require replacement.

1.3.3.2 Wiring Diagrams and Control Diagrams

Wiring diagrams and control diagrams shall be point-to-point drawings of wiring and control circuits including factory-field interfaces. Provide a complete and accurate depiction of the actual job specific wiring and control work. On diagrams, number electrical and electronic wiring and pneumatic control tubing and the terminals for each type, identically to

actual installation configuration and numbering.

1.3.3.3 Maintenance and Repair Procedures

Include instructions and a list of tools required to repair or restore the product or equipment to proper condition or operating standards.

1.3.3.4 Removal and Replacement Instructions

Include step-by-step procedures and a list required tools and supplies for removal, replacement, disassembly, and assembly of components, assemblies, subassemblies, accessories, and attachments. Provide tolerances, dimensions, settings and adjustments required. Instructions shall include a combination of text and illustrations.

1.3.3.5 Spare Parts and Supply Lists

Include lists of spare parts and supplies required for maintenance and repair to ensure continued service or operation without unreasonable delays. Special consideration is required for facilities at remote locations. List spare parts and supplies that have a long lead-time to obtain.

1.3.4 Corrective Maintenance Work-Hours

Include manufacturer's projection of corrective maintenance work-hours including requirements by type of craft. Corrective maintenance that requires completion or participation of the equipment manufacturer shall be identified and tabulated separately.

1.3.5 Appendices

Provide information required below and information not specified in the preceding paragraphs but pertinent to the maintenance or operation of the product or equipment. Include the following:

1.3.5.1 Product Submittal Data

Provide a copy of all SD-03 Product Data submittals required in the applicable technical sections.

1.3.5.2 Manufacturer's Instructions

Provide a copy of all SD-08 Manufacturer's Instructions submittals required in the applicable technical sections.

1.3.5.3 O&M Submittal Data

Provide a copy of all SD-10 Operation and Maintenance Data submittals required in the applicable technical sections.

1.3.5.4 Parts Identification

Provide identification and coverage for all parts of each component, assembly, subassembly, and accessory of the end items subject to replacement. Include special hardware requirements, such as requirement to use high-strength bolts and nuts. Identify parts by make, model, serial number, and source of supply to allow reordering without further identification. Provide clear and legible illustrations, drawings, and

exploded views to enable easy identification of the items. When illustrations omit the part numbers and description, both the illustrations and separate listing shall show the index, reference, or key number that will cross-reference the illustrated part to the listed part. Parts shown in the listings shall be grouped by components, assemblies, and subassemblies in accordance with the manufacturer's standard practice. Parts data may cover more than one model or series of equipment, components, assemblies, subassemblies, attachments, or accessories, such as typically shown in a master parts catalog

1.3.5.5 Warranty Information

List and explain the various warranties and clearly identify the servicing and technical precautions prescribed by the manufacturers or contract documents in order to keep warranties in force. Include warranty information for primary components such as the compressor of air conditioning system.

1.3.5.6 Personnel Training Requirements

Provide information available from the manufacturers that is needed for use in training designated personnel to properly operate and maintain the equipment and systems.

1.3.5.7 Testing Equipment and Special Tool Information

Include information on test equipment required to perform specified tests and on special tools needed for the operation, maintenance, and repair of components.

1.3.5.8 Testing and Performance Data

Include completed prefunctional checklists, functional performance test forms, and monitoring reports. Include recommended schedule for retesting and blank test forms.

1.3.5.9 Contractor Information

Provide a list that includes the name, address, and telephone number of the General Contractor and each Subcontractor who installed the product or equipment, or system. For each item, also provide the name address and telephone number of the manufacturer's representative and service organization that can provide replacements most convenient to the project site. Provide the name, address, and telephone number of the product, equipment, and system manufacturers.

1.4 TYPES OF INFORMATION REQUIRED IN CONTROLS O&M DATA PACKAGES

Include Data Package 5 and the following for control systems:

- a. Narrative description on how to perform and apply all functions, features, modes, and other operations, including unoccupied operation, seasonal changeover, manual operation, and alarms. Include detailed technical manual for programming and customizing control loops and algorithms.
- b. Full as-built sequence of operations.
- c. Copies of all checkout tests and calibrations performed by the

Contractor (not Cx tests).

d. Full points list. A listing of rooms shall be provided with the following information for each room:

- (1) Floor
- (2) Room number
- (3) Room name
- (4) Air handler unit ID
- (5) Reference drawing number
- (6) Air terminal unit tag ID
- (7) Heating and/or cooling valve tag ID
- (8) Minimum cfm
- (9) Maximum cfm

e. Full print out of all schedules and set points after testing and acceptance of the system.

f. Full as-built print out of software program.

g. Electronic copy on disk or CD of the entire program for this facility.

h. Marking of all system sensors and thermostats on the as-built floor plan and mechanical drawings with their control system designations.

1.5 SCHEDULE OF OPERATION AND MAINTENANCE DATA PACKAGES

Furnish the O&M data packages specified in individual technical sections. The required information for each O&M data package is as follows:

1.5.1 Data Package 1

- a. Safety precautions
- b. Cleaning recommendations
- c. Maintenance and repair procedures
- d. Warranty information
- e. Contractor information
- f. Spare parts and supply list

1.5.2 Data Package 2

- a. Safety precautions
- b. Normal operations

- c. Environmental conditions
- d. Lubrication data
- e. Preventive maintenance plan and schedule
- f. Cleaning recommendations
- g. Maintenance and repair procedures
- h. Removal and replacement instructions
- i. Spare parts and supply list
- j. Parts identification
- k. Warranty information
- l. Contractor information

1.5.3 Data Package 3

- a. Safety precautions
- b. Operator prestart
- c. Startup, shutdown, and post-shutdown procedures
- d. Normal operations
- e. Emergency operations
- f. Environmental conditions
- g. Lubrication data
- h. Preventive maintenance plan and schedule
- i. Cleaning recommendations
- j. Troubleshooting guides and diagnostic techniques
- k. Wiring diagrams and control diagrams
- l. Maintenance and repair procedures
- m. Removal and replacement instructions
- n. Spare parts and supply list
- o. Product submittal data
- p. O&M submittal data
- q. Parts identification
- r. Warranty information
- s. Testing equipment and special tool information

- t. Testing and performance data
- u. Contractor information

1.5.4 Data Package 4

- a. Safety precautions
- b. Operator prestart
- c. Startup, shutdown, and post-shutdown procedures
- d. Normal operations
- e. Emergency operations
- f. Operator service requirements
- g. Environmental conditions
- h. Lubrication data
- i. Preventive maintenance plan and schedule
- j. Cleaning recommendations
- k. Troubleshooting guides and diagnostic techniques
- l. Wiring diagrams and control diagrams
- m. Maintenance and repair procedures
- n. Removal and replacement instructions
- o. Spare parts and supply list
- p. Corrective maintenance man-hours
- q. Product submittal data
- r. O&M submittal data
- s. Parts identification
- t. Warranty information
- u. Personnel training requirements
- v. Testing equipment and special tool information
- w. Testing and performance data
- x. Contractor information

1.5.5 Data Package 5

- a. Safety precautions

- b. Operator prestart
- c. Start-up, shutdown, and post-shutdown procedures
- d. Normal operations
- e. Environmental conditions
- f. Preventive maintenance plan and schedule
- g. Troubleshooting guides and diagnostic techniques
- h. Wiring and control diagrams
- i. Maintenance and repair procedures
- j. Removal and replacement instructions
- k. Spare parts and supply list
- l. Product submittal data
- m. Manufacturer's instructions
- n. O&M submittal data
- o. Parts identification
- p. Testing equipment and special tool information
- q. Warranty information
- r. Testing and performance data
- s. Contractor information

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 02 41 00

DEMOLITION

10/06

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE (AHRI)

ARI Guideline K (2005) Containers for Recovered
Fluorocarbon Refrigerants

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A10.6 (1990; R 1998) Safety Requirements for
Demolition Operations

CARPET AND RUG INSTITUTE (CRI)

CRI 104 (2002) Standard for Installation
Specification of Commercial Carpet

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1 (2008) Safety and Health Requirements
Manual

U.S. DEFENSE LOGISTICS AGENCY (DLA)

DLA 4145.25 (June 2000) Storage and Handling of
Liquefied and Gaseous Compressed Gases and
Their Full and Empty Cylinders

U.S. DEPARTMENT OF DEFENSE (DOD)

DOD 4000.25-1-M (2000) Requisitioning and Issue Procedures

MIL-STD-129 (Rev P) Military Marking for Shipment and
Storage

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 61-SUBPART M National Emission Standard for Asbestos

40 CFR 82 Protection of Stratospheric Ozone

49 CFR 173.301 Shipment of Compressed Gases in Cylinders
and Spherical Pressure Vessels

1.2 GENERAL REQUIREMENTS

Do not begin demolition or deconstruction until authorization is received from the Contracting Officer. The work of this section is to be performed in a manner that maximizes salvage and recycling of materials. Remove rubbish and debris from the station daily; do not allow accumulations inside or outside the building. The work includes demolition, salvage of identified items and materials, and removal of resulting rubbish and debris. Remove rubbish and debris from Government property daily, unless otherwise directed. Store materials that cannot be removed daily in areas specified by the Contracting Officer. In the interest of occupational safety and health, perform the work in accordance with EM 385-1-1, Section 23, Demolition, and other applicable Sections.

1.3 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Existing Conditions

SD-07 Certificates

Demolition Plan Notifications

Proposed salvage, demolition, and removal procedures for approval before work is started.

SD-11 Closeout Submittals

Receipts

Receipts or bills of lading, as specified.

1.4 REGULATORY AND SAFETY REQUIREMENTS

Comply with federal, state, and local hauling and disposal regulations. In addition to the requirements of the "Contract Clauses," conform to the safety requirements contained in ANSI A10.6.

1.4.1 Notifications

1.4.1.1 General Requirements

Furnish timely notification of demolition and renovation projects to Federal, State, regional, and local authorities in accordance with 40 CFR 61-SUBPART M. Notify the State's environmental protection agency local air pollution control district/agency and the Contracting Officer in writing 10 working days prior to the commencement of work in accordance with 40 CFR 61-SUBPART M.

1.4.2 Receipts

Submit a shipping receipt or bill of lading for all containers of ozone depleting substance (ODS) shipped to the Defense Depot, Richmond, Virginia.

1.5 DUST AND DEBRIS CONTROL

Prevent the spread of dust and debris and avoid the creation of a nuisance or hazard in the surrounding area. Do not use water if it results in hazardous or objectionable conditions such as, but not limited to, ice, flooding, or pollution. Vacuum and dust the work area daily.

1.6 PROTECTION

1.6.1 Existing Conditions Documentation

Before beginning any demolition or deconstruction work, survey the site and examine the drawings and specifications to determine the extent of the work. Record existing conditions in the presence of the Contracting Officer showing the condition of structures and other facilities adjacent to areas of alteration or removal. Photographs sized 4 inch will be acceptable as a record of existing conditions. Include in the record the elevation of the top of foundation walls, finish floor elevations, possible conflicting electrical conduits, plumbing lines, alarms systems, the location and extent of existing cracks and other damage and description of surface conditions that exist prior to before starting work. It is the Contractor's responsibility to verify and document all required outages which will be required during the course of work, and to note these outages on the record document.

1.6.2 Items to Remain in Place

Take necessary precautions to avoid damage to existing items to remain in place, to be reused, or to remain the property of the Government. Repair or replace damaged items as approved by the Contracting Officer. Coordinate the work of this section with all other work indicated. Construct and maintain shoring, bracing, and supports as required. Ensure that structural elements are not overloaded. Increase structural supports or add new supports as may be required as a result of any cutting, removal, or demolition work performed under this contract. Do not overload structural elements. Provide new supports and reinforcement for existing construction weakened by demolition, deconstruction, or removal work. Repairs, reinforcement, or structural replacement require approval by the Contracting Officer prior to performing such work.

1.6.3 Existing Construction Limits and Protection

Do not disturb existing construction beyond the extent indicated or necessary for installation of new construction. Provide temporary shoring and bracing for support of building components to prevent settlement or other movement. Provide protective measures to control accumulation and migration of dust and dirt in all work areas. Remove snow, dust, dirt, and debris from work areas daily.

1.6.4 Weather Protection

For portions of the building to remain, protect building interior and materials and equipment from the weather at all times. Where removal of existing roofing is necessary to accomplish work, have materials and workmen ready to provide adequate and temporary covering of exposed areas.

1.6.5 Trees

Protect trees within the project site which might be damaged during

demolition and which are indicated to be left in place by a 6 foot high fence. Erect and secure fence a minimum of 5 feet from the trunk of individual trees or follow the outer perimeter of branches or clumps of trees. Replace any tree designated to remain that is damaged during the work under this contract with like-kind or as approved by the Contracting Officer.

1.6.6 Utility Service

Maintain existing utilities indicated to stay in service and protect against damage during demolition and deconstruction operations. Prior to start of work, utilities serving each area of alteration or removal will be shut off by the Government and disconnected and sealed by the Contractor.

1.6.7 Facilities

Protect electrical and mechanical services and utilities. Where removal of existing utilities and pavement is specified or indicated, provide approved barricades, temporary covering of exposed areas, and temporary services or connections for electrical and mechanical utilities. Floors, roofs, walls, columns, pilasters, and other structural components that are designed and constructed to stand without lateral support or shoring, and are determined to be in stable condition, must remain standing without additional bracing, shoring, or lateral support until demolished or deconstructed, unless directed otherwise by the Contracting Officer. Ensure that no elements determined to be unstable are left unsupported and place and secure bracing, shoring, or lateral supports as may be required as a result of any cutting, removal, deconstruction, or demolition work performed under this contract.

1.6.8 Protection of Personnel

Before, during and after the demolition work the Contractor shall continuously evaluate the condition of the structure being demolished and take immediate action to protect all personnel working in and around the project site. No area, section, or component of floors, roofs, walls, columns, pilasters, or other structural element will be allowed to be left standing without sufficient bracing, shoring, or lateral support to prevent collapse or failure while workmen remove debris or perform other work in the immediate area.

1.7 BURNING

The use of burning at the project site for the disposal of refuse and debris will not be permitted.

1.8 RELOCATIONS

Perform the removal and reinstallation of relocated items as indicated with workmen skilled in the trades involved. Items to be relocated which are damaged by the Contractor shall be repaired or replaced with new undamaged items as approved by the Contracting Officer.

1.9 REQUIRED DATA

Prepare a [Demolition Plan](#). Include in the plan procedures for careful removal and disposition of materials specified to be salvaged, coordination with other work in progress, a disconnection schedule of utility services, a detailed description of methods and equipment to be used for each

operation and of the sequence of operations. Identify components and materials to be salvaged for reuse or recycling with reference to paragraph Existing Facilities to be Removed. Append tracking forms for all removed materials indicating type, quantities, condition, destination, and end use. Coordinate with Waste Management Plan. Include statements affirming Contractor inspection of the existing roof deck and its suitability to perform as a safe working platform or if inspection reveals a safety hazard to workers, state provisions for securing the safety of the workers throughout the performance of the work. Provide procedures for safe conduct of the work in accordance with EM 385-1-1. Plan shall be approved by Contracting Officer prior to work beginning.

1.10 ENVIRONMENTAL PROTECTION

Comply with the Environmental Protection Agency requirements specified.

1.11 USE OF EXPLOSIVES

Use of explosives will not be permitted.

PART 2 PRODUCTS

PART 3 EXECUTION

3.1 EXISTING FACILITIES TO BE REMOVED

Inspect and evaluate existing structures on site for reuse. Existing construction scheduled to be removed for reuse shall be disassembled. Dismantled and removed materials are to be separated, set aside, and prepared as specified, and stored or delivered to a collection point for reuse, remanufacture, recycling, or other disposal, as specified. Materials shall be designated for reuse on site whenever possible.

3.1.1 Utilities and Related Equipment

3.1.1.1 General Requirements

Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by the Contracting Officer. Do not interrupt existing utilities serving facilities occupied and used by the Government except when approved in writing and then only after temporary utility services have been approved and provided. Do not begin demolition or deconstruction work until all utility disconnections have been made. Shut off and cap utilities for future use, as indicated.

3.1.1.2 Disconnecting Existing Utilities

Remove existing utilities, as indicated and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the Contracting Officer. When utility lines are encountered that are not indicated on the drawings, the Contracting Officer shall be notified prior to further work in that area.

3.1.1.3 Paving and Slabs

Remove concrete and asphaltic concrete paving and slabs including aggregate base as indicated to a depth of 16 inches below new finish grade. Provide neat sawcuts at limits of pavement removal as indicated.

3.1.2 Roofing

Remove existing roof system and associated components in their entirety down to existing roof deck. Remove roofing system and insulation without damaging the roof deck. Sequence work to minimize building exposure between demolition and new roof materials installation.

3.1.2.1 Temporary Roofing

Install temporary roofing and flashing as necessary to maintain a watertight condition throughout the course of the work. Remove temporary work prior to installation of permanent roof system materials unless approved otherwise by the Contracting Officer. Make provisions for worker safety during demolition, deconstruction, and installation of new materials as described in paragraphs entitled "Statements" and "Regulatory and Safety Requirements."

3.1.2.2 Reroofing

When removing the existing roofing system from the roof deck, remove only as much roofing as can be recovered by the end of the work day, unless approved otherwise by the Contracting Officer. Do not attempt to open the roof covering system in threatening weather. Reseal all openings prior to suspension of work the same day.

3.1.3 Masonry

Sawcut and remove masonry so as to prevent damage to surfaces to remain, and to facilitate the installation of new work.

3.1.4 Miscellaneous Metal

Salvage shop-fabricated items such as access doors and frames, steel gratings, metal ladders, wire mesh partitions, metal railings, metal windows and similar items as whole units. Salvage light-gage and cold-formed metal framing, such as steel studs, steel trusses, metal gutters, roofing and siding, metal toilet partitions, toilet accessories and similar items. Scrap metal shall become the Contractor's property. Recycle scrap metal as part of demolition operations. Provide separate containers to collect scrap metal and transport to a scrap metal collection or recycling facility, in accordance with the Waste Management Plan.

3.1.5 Carpet

Remove existing carpet for reclamation in accordance with manufacturer recommendations and as follows. Remove used carpet in large pieces, roll tightly, and pack neatly in a container. Remove adhesive according to recommendations of the Carpet and Rug Institute (CRI). Adhesive removal solvents shall comply with CRI 104. Recycle removed carpet cushion.

3.1.6 Acoustic Ceiling Tile

Remove, neatly stack, and recycle acoustic ceiling tiles. Recycling may be available with manufacturer. Otherwise, priority shall be given to a local recycling organization.

3.1.7 Patching

Where removals leave holes and damaged surfaces exposed in the finished

work, patch and repair these holes and damaged surfaces to match adjacent finished surfaces, using on-site materials when available. Where new work is to be applied to existing surfaces, perform removals and patching in a manner to produce surfaces suitable for receiving new work. Finished surfaces of patched area shall be flush with the adjacent existing surface and shall match the existing adjacent surface as closely as possible as to texture and finish. Patching shall be as specified and indicated, and shall include:

- a. Concrete and Masonry: Completely fill holes and depressions, caused by previous physical damage or left as a result of removals in existing masonry walls to remain, with an approved masonry patching material, applied in accordance with the manufacturer's printed instructions.

3.1.8 Air Conditioning Equipment

Remove air conditioning, refrigeration, and other equipment containing refrigerants without releasing chlorofluorocarbon refrigerants to the atmosphere in accordance with the Clean Air Act Amendment of 1990. Recover all refrigerants prior to removing air conditioning, refrigeration, and other equipment containing refrigerants and dispose of in accordance with the paragraph entitled "Disposal of Ozone Depleting Substance (ODS)." Turn in salvaged Class I ODS refrigerants as specified in paragraph, "Salvaged Materials and Equipment."

3.1.9 Cylinders and Canisters

Remove all fire suppression system cylinders and canisters and dispose of in accordance with the paragraph entitled "Disposal of Ozone Depleting Substance (ODS)."

3.1.10 Locksets on Swinging Doors

The Contractor shall remove all locksets from all swinging doors indicated to be removed and disposed of. Deliver the locksets and related items to a designated location for receipt by the Contracting Officer after removal.

3.1.11 Mechanical Equipment and Fixtures

Disconnect mechanical hardware at the nearest connection to existing services to remain, unless otherwise noted. Mechanical equipment and fixtures must be disconnected at fittings. Remove service valves attached to the unit. Salvage each item of equipment and fixtures as a whole unit; listed, indexed, tagged, and stored. Salvage each unit with its normal operating auxiliary equipment. Transport salvaged equipment and fixtures, including motors and machines, to a designated on station storage area as directed by the Contracting Officer. Do not remove equipment until approved.

3.1.11.1 Preparation for Storage

Remove water, dirt, dust, and foreign matter from units; tanks, piping and fixtures shall be drained; interiors, if previously used to store flammable, explosive, or other dangerous liquids, must be steam cleaned. Seal openings with caps, plates, or plugs. Secure motors attached by flexible connections to the unit. Change lubricating systems with the proper oil or grease.

3.1.11.2 Piping

Disconnect piping at unions, flanges and valves, and fittings as required to reduce the pipe into straight lengths for practical storage. Store salvaged piping according to size and type. If the piping that remains can become pressurized due to upstream valve failure, end caps, blind flanges, or other types of plugs or fittings with a pressure gage and bleed valve shall be attached to the open end of the pipe to ensure positive leak control. Carefully dismantle piping that previously contained gas, gasoline, oil, or other dangerous fluids, with precautions taken to prevent injury to persons and property. Store piping outdoors until all fumes and residues are removed. Box prefabricated supports, hangers, plates, valves, and specialty items according to size and type. Wrap sprinkler heads individually in plastic bags before boxing. Classify piping not designated for salvage, or not reusable, as scrap metal.

3.1.11.3 Ducts

Classify removed duct work as scrap metal.

3.1.11.4 Fixtures, Motors and Machines

Remove and salvage fixtures, motors and machines associated with plumbing, heating, air conditioning, refrigeration, and other mechanical system installations. Salvage, box and store auxiliary units and accessories with the main motor and machines. Tag salvaged items for identification, storage, and protection from damage. Classify non-porcelain broken, damaged, or otherwise unserviceable units and not caused to be broken, damaged, or otherwise unserviceable as debris and disposed of by the Contractor.

3.1.12 Electrical Equipment and Fixtures

Salvage motors, motor controllers, and operating and control equipment that are attached to the driven equipment. Salvage wiring systems and components. Box loose items and tag for identification. Disconnect primary, secondary, control, communication, and signal circuits at the point of attachment to their distribution system.

3.1.12.1 Fixtures

Remove and salvage electrical fixtures. Salvage unprotected glassware from the fixture and salvage separately. Salvage incandescent, mercury-vapor, and fluorescent lamps and fluorescent ballasts manufactured prior to 1978, boxed and tagged for identification, and protected from breakage.

3.1.12.2 Electrical Devices

Remove and salvage switches, switchgear, transformers, conductors including wire and nonmetallic sheathed and flexible armored cable, regulators, meters, instruments, plates, circuit breakers, panelboards, outlet boxes, and similar items. Box and tag these items for identification according to type and size.

3.1.12.3 Wiring Ducts or Troughs

Remove and salvage wiring ducts or troughs. Dismantle plug-in ducts and wiring troughs into unit lengths. Remove plug-in or disconnecting devices from the busway and store separately.

3.1.12.4 Conduit and Miscellaneous Items

Salvage conduit except where embedded in concrete or masonry. Consider corroded, bent, or damaged conduit as scrap metal. Sort straight and undamaged lengths of conduit according to size and type. Classify supports, knobs, tubes, cleats, and straps as debris to be removed and disposed.

3.1.13 Items With Unique/Regulated Disposal Requirements

Remove and dispose of items with unique or regulated disposal requirements in the manner dictated by law or in the most environmentally responsible manner.

3.2 DISPOSITION OF MATERIAL

3.2.1 Title to Materials

Except for salvaged items specified in related Sections, and for materials or equipment scheduled for salvage, all materials and equipment removed and not reused or salvaged, shall become the property of the Contractor and shall be removed from Government property. Title to materials resulting from demolition, and materials and equipment to be removed, is vested in the Contractor upon approval by the Contracting Officer of the Contractor's demolition and removal procedures, and authorization by the Contracting Officer to begin demolition. The Government will not be responsible for the condition or loss of, or damage to, such property after contract award. Showing for sale or selling materials and equipment on site is prohibited.

3.2.2 Reuse of Materials and Equipment

Remove and store materials and equipment indicated to be reused or relocated to prevent damage, and reinstall as the work progresses.

3.2.3 Disposal of Ozone Depleting Substance (ODS)

Class I and Class II ODS are defined in Section, 602(a) and (b), of The Clean Air Act. Prevent discharge of Class I and Class II ODS to the atmosphere. Place recovered ODS in cylinders meeting [ARI Guideline K](#) suitable for the type ODS (filled to no more than 80 percent capacity) and provide appropriate labeling. Recovered ODS shall be removed from Government property and disposed of in accordance with [40 CFR 82](#). Products, equipment and appliances containing ODS in a sealed, self-contained system (e.g. residential refrigerators and window air conditioners) shall be disposed of in accordance with [40 CFR 82](#).

3.2.3.1 Special Instructions

No more than one type of ODS is permitted in each container. A warning/hazardous label shall be applied to the containers in accordance with Department of Transportation regulations. All cylinders including but not limited to fire extinguishers, spheres, or canisters containing an ODS shall have a tag with the following information:

- a. Activity name and unit identification code
- b. Activity point of contact and phone number

- c. Type of ODS and pounds of ODS contained
- d. Date of shipment
- e. Naval stock number (for information, call (804) 279-4525).

3.2.3.2 Fire Suppression Containers

Deactivate fire suppression system cylinders and canisters with electrical charges or initiators prior to shipment. Also, safety caps must be used to cover exposed actuation mechanisms and discharge ports on these special cylinders.

3.2.4 Transportation Guidance

Ship all ODS containers in accordance with MIL-STD-129, DLA 4145.25 (also referenced one of the following: Army Regulation 700-68, Naval Supply Instruction 4440.128C, Marine Corps Order 10330.2C, and Air Force Regulation 67-12), 49 CFR 173.301, and DOD 4000.25-1-M.

3.3 CLEANUP

Remove debris and rubbish from basement and similar excavations. Remove and transport the in a manner that prevents spillage on streets or adjacent areas. Apply local regulations regarding hauling and disposal.

3.4 DISPOSAL OF REMOVED MATERIALS

3.4.1 Regulation of Removed Materials

Dispose of debris, rubbish, scrap, and other nonsalvageable materials resulting from removal operations with all applicable federal, state and local regulations as contractually specified by removing from Marine Corps Base, Camp Lejeune. Removed materials shall not be stored on the project site.

3.4.2 Burning on Government Property

Burning of materials removed from demolished structures will not be permitted on Government property.

3.4.3 Removal from Government Property

Transport waste materials removed from demolished and deconstructed structures, except waste soil, from Government property for legal disposal. Dispose of waste soil as directed.

3.5 REUSE OF SALVAGED ITEMS

Recondition salvaged materials and equipment designated for reuse before installation. Replace items damaged during removal and salvage operations or restore them as necessary to usable condition.

-- End of Section --

SECTION 02 50 00

WORK UTILIZING SECTIONS REFERENCING NCDOT HWY SPECS & STANDARDS

01/07

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ASTM INTERNATIONAL (ASTM)

- ASTM D 698 (2000ae1) Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/cu. ft. (600 kN-m/cu. m.))
- ASTM D 1188 (1989) Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens
- ASTM D 1556 (2000) Density and Unit Weight of Soil in Place by the Sand-Cone Method
- ASTM D 2726 (2000) Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Saturated Surface-Dry Specimens
- ASTM D 2922 (2004) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
- ASTM D 3017 (2004) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION (NCDOT)

- NCDOT (2006) Standard Specifications for Roads and Structures

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00, "Submittal Procedures".

SD-03 Product Data

- Pavement mix
- Tack coat
- Prime coat
- Culvert pipe

Stone

SD-05 Design Data

Job-mix formula

SD-07 Certificates

Asphalt Removal Recycling Establishment - Location, Name, Address of Operator, and Telephone Number

1.2.1 Job-Mix Formula

Submit the mix design, including mixing temperature, for approval. The mix design shall include a certified laboratory analysis of mix composition with marshall stability value, void content, and flow. After mix design approval, job mixes shall conform to the range of tolerances specified in NCDOT. An identical mix design previously approved within the past 12 months by the Atlantic Division, Naval Facilities Engineering Command, may be used without further approval, provided that copies of the previous approval are submitted. Obtain acknowledgement of receipt prior to bituminous concrete placement. Submit additional data regarding materials if the source of the materials changes.

1.3 GENERAL REQUIREMENTS

All "Section" references refer to NCDOT, Standard Specifications for Roads and Structures. In all references

- a. The articles entitled "Method of Measurement", "Basis of Payment" and "Acceptance of Bituminous Materials" will not apply.
- b. All references to "Engineer" shall mean "Contracting Officer".
- c. All work shall conform to NCDOT, Roadway Standards.

1.4 ASPHALT/BITUMINOUS PAVEMENT MATERIAL OPTION

The Contractor has the option to provide either of the following pavement materials:

- a. Asphalt/Bituminous Mix with recycled aggregate material

Mix shall contain recycled/reclaimed asphalt material not to exceed 25 percent by weight of the total aggregate material. Mix design shall conform to Section 611 and the Sections for the Type of material specified. The submittal shall clearly state:

Recycled Asphalt Cement	Viscosity
New Asphalt Cement	Grade
Recycling Agent(s), if any	Properties
Mix Composition	Percentage of Each Component

- or -

- b. Asphalt/Bituminous Mix conforming to NCDOT Section 610 and the Sections for the Type of material specified.

1.5 RECYCLED ASPHALT MATERIAL

Mix may contain a maximum of 25 percent by weight of the total aggregate material, reclaimed asphalt pavement (RAP). Mix design shall meet the requirements for the type of bituminous concrete specified. Clearly state the viscosity of reclaimed asphalt cement, grade of new asphalt cement, properties of recycled agent if used, and percentage of each in the mix. Combine asphalts and recycling agents to achieve a viscosity of 2000 plus or minus 400 poises at 140 degrees F. Furnish a new job mix formula for each change in percentage of RAP material used.

PART 2 PRODUCTS

2.1 PRIME COAT

Work and materials shall conform to NCDOT Section 600.

2.2 TACK COAT

Work and materials shall conform to NCDOT Section 605.

2.3 ASPHALTIC CONCRETE BASE COURSE

Shall conform to NCDOT Type B-25.0B, in accordance with Section 610.

2.4 ASPHALT CONCRETE INTERMEDIATE COURSE

Shall conform to NCDOT Type I-19.0B in accordance with Section 610.

2.5 ASPHALTIC CONCRETE SURFACE COURSE

Shall conform to NCDOT Type SF-9.5A, in accordance with Section 610.

2.6 AGGREGATE

2.6.1 Aggregate Base Course

Work and materials shall conform to NCDOT Section 1005 and 1010, standard size ABC.

2.6.2 Stone

Work and materials shall conform to NCDOT Section 1005 and 1010, standard size 57.

2.7 CONCRETE APPURTENANCES

2.7.1 Curb and Gutter, Concrete Gutter, Concrete Flumes, Concrete Valley Gutter

Work and materials shall conform to NCDOT Section 846, 3000 psi.

2.7.2 Sidewalks and Ramps

Work and materials shall conform to NCDOT Section 848, 3000 psi.

2.8 CULVERT PIPE

Work and materials shall conform to NCDOT Section 1032, for size and

material as specified.

2.9 ADJUSTMENT OF CATCH BASINS, MANHOLES, DROP INLETS, METER BOXES, AND VALVE BOXES

Work, including materials and installation shall conform to NCDOT Section 858. The top shall be set level with the new surface. The existing basin shall be cleaned out before the grating is reset.

2.10 RIP RAP

Work and materials shall conform to NCDOT Section 876, quarry run plain rip rap, Class B.

2.11 MINOR DRAINAGE STRUCTURES AND CONVERSION OF DRAINAGE STRUCTURES

Work and materials shall conform to Section 840 and Section 859.

2.12 CONSTRUCTION EQUIPMENT

2.12.1 Mixing Plant

Shall conform to the requirements of NCDOT Section 610-5.

2.12.2 Spreading and Finishing Equipment

Shall be the electronic-screed type and shall be capable of spreading the bituminous mixtures to a uniform density, striking a smooth surface true to cross section and producing a finish surface of the specified evenness. Electronic-screed type equipment will not be required on stone base course overlaying.

2.12.3 Compacting Equipment

Shall include a tandem roller.

2.13 FENCE RESET

Work and materials conform to NCDOT Section 867.

2.14 SILT FENCE

Work and materials conform to NCDOT Section 1605.

2.15 SIGNAGE

Work and materials conform to NCDOT Division 9.

PART 3 EXECUTION

3.1 CONSTRUCTION METHODS

Work shall conform to the NCDOT Standard Specifications sections referenced herein before and to the following:

3.2 ASPHALT CONCRETE PAVEMENT AND PATCHWORK

3.2.1 Stone Base Course Placement

Begin spreading base material at the point nearest the source of supply. Permit traffic and hauling over the base, Fill ruts formed by traffic and reroll. After base course placement, continue machining and rolling until surface is smooth, compacted, well boded, and true to the designed cross section. Compact to 100 percent **ASTM D 698** maximum dry density. Maintain the base smooth and true to grade and cross section until bituminous concrete placement.

3.2.2 Cleaning

Before commencing the operations on any portion of the work, the surface of the existing pavement and any new base course shall be thoroughly cleaned of all foreign matter including grass by mechanical means if feasible.

3.2.3 Patchwork

All asphalt surfacing and loose stone base course shall be removed. Stone base course materials removed shall be replaced with a new stone base course and asphaltic concrete mixture. The patchwork shall be accomplished in advance of placing the surface course, and the surface course placed continuously over the entire area.

3.2.4 Placing of the Asphaltic Concrete

Shall be as nearly continuous as possible. The rollers shall pass over the unprotected end of the mixture only when laying is discontinued for sufficient time to permit the mixture to cool, in which case, a joint shall be made by cutting back the surface course to expose a granular surface for its full depth to bond with the fresh mixture. When laying is resumed, the exposed edge shall be coated with hot asphaltic cement and the fresh mixture raked against the joint, thoroughly tamped with hot tamps and rolled. Repaint striping to match existing. Paints shall be permanent retro reflective type conforming to **NCDOT** Section 1087.

3.2.5 Finished Surfaces

Shall be uniform in texture and appearance and free from cracks and creases. The finished surface shall vary not more than 1/8-inch when the test for smoothness is performed with a 10-foot straightedge. The finished thickness shall be not less than the specified thickness minus 1/8-inch. Where the irregularity of the surface or the deficiency in depth is more than the specified tolerances, the defective work shall be removed and replaced with new material, as directed, without additional cost to the Government.

3.2.6 Featheredges

Accomplish featheredging by raking out the larger aggregate as necessary and sloping the pavement uniformly throughout the featheredge to create a smooth transition. Unless indicated otherwise, featheredge transition shall be 10 feet.

3.2.7 Bituminous Materials and/or Mixtures

Shall not be produced or placed when weather is rainy or foggy, or when the

air temperature is less than 40 degrees Fahrenheit in the shade away from artificial heat.

3.2.8 Protection of Pavement

After final rolling, no vehicular traffic of any kind shall be permitted on the pavement until it has cooled and hardened.

3.3 FIELD QUALITY CONTROL

3.3.1 Sampling

Provide new materials where samples are taken. Take the number and size of samples required to perform the following tests.

3.3.1.1 Asphaltic Concrete Sampling

- a. Job Mix: Take one initial sample and one sample for every 400 tons or fraction thereof.
- b. Thickness: Take one sample for every 500 square yards or fraction thereof.
- c. Density: One field test for every 1000 square yards or fraction thereof, and one laboratory test for the project. Provide minimum 4-inch diameter cores if nuclear testing is not used.

3.3.1.2 Stone Base Course Sampling

- a. Thickness: Take one sample for every 500 square yards or fraction thereof.
- b. Density: One field test for every 1000 square yards or fraction thereof, and one laboratory test for the project.

3.3.2 Testing

Provide for each sample.

3.3.2.1 Bituminous Concrete Testing

- a. Job Mix: Determine gradation and bitumen content.
- b. Thickness: Maximum allowable deficiency shall be 1/4 inch less than the indicated thickness. Average thickness shall be as indicated.
- c. Density, In Place: ASTM D 2922 and ASTM D 3017; cored sample ASTM D 1188 or ASTM D 2726/

3.3.2.2 Stone Base Course Testing

- a. Thickness: Maximum allowable deficiency shall be 1/2 inch less than the indicated thickness. Average thickness shall be as indicated.
- b. Density: ASTM D 1556 or ASTM D 2922 and ASTM D 3017.

-- End of Section --

SECTION 02 82 16

REMOVAL AND DISPOSAL OF ASBESTOS MATERIALS
(CAMP LEJEUNE COMPLEX)

01/01

PART 1 GENERAL

1.1 APPLICABLE NORTH CAROLINA LAW

North Carolina State General Statutes and Regulation under Title 15 N.C. Administrative Chapter 2D .0525 and 10NCAC 7C .0601 through .0607 apply to all work under this Contract.

1.1.1 NCDHHS Asbestos Accreditation

All personnel involved in asbestos removal shall be currently accredited for asbestos removal by NCDHHS. An application for accreditation may be requested from the State of North Carolina, Department of Environment, Health, and Natural Resources, Asbestos Branch, 1912 Mail Service Center, Raleigh, NC, 27699-1912, telephone (919) 707-5950. Out of State accreditation will not be accepted.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z88.2 (1992) Respiratory Protection

ASTM INTERNATIONAL (ASTM)

ASTM C 732 (1995) Aging Effects of Artificial Weathering on Latex Sealants

ASTM D 1331 (1989; R 1995) Surface and Interfacial Tension of Solutions of Surface-Active Agents

ASTM E 84 (2008a) Standard Test Method for Surface Burning Characteristics of Building Materials

ASTM E 96 (2005) Standard Test Methods for Water Vapor Transmission of Materials

ASTM E 119 (1998) Fire Tests of Building Construction and Materials

ASTM E 736 (1992) Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members

ASTM E 1368 (1997) Visual Inspection of Asbestos Abatement Projects

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.103 Respiratory Protection

29 CFR 1926.59 Hazard Communication

29 CFR 1926.1101 Asbestos

40 CFR 61, SUBPART A General Provisions

40 CFR 61, SUBPART M National Emission Standard for Asbestos

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 560/5-85-024 (1985) Guidance for Controlling Asbestos Containing Materials in Buildings

EPA SW-846 (Rev O; Updates I, II, IIA, IIB, and III) Test Methods for Evaluating Solid Waste (Vol IA, IB, IC, and II)

UNDERWRITERS LABORATORIES (UL)

UL 586 (1996; Rev thru Aug 1999) High-Efficiency, Particulate, Air Filter Units

1.3 DEFINITIONS

1.3.1 ACM

Asbestos Containing Materials.

1.3.2 Action Level

An airborne concentration of asbestos fibers, in the breathing zone of a worker equaling 0.1 fibers per cubic centimeter of air calculated as an 8-hour time weighted average.

1.3.3 Amended Water

Water containing a wetting agent or surfactant with a surface tension of 29 dynes per square centimeter when tested in accordance with ASTM D 1331.

1.3.4 Area Sampling

Sampling of asbestos fiber concentrations within the asbestos control area and outside the asbestos control area which approximates the concentrations of asbestos in the theoretical breathing zone but is not actually collected in the breathing zone of an employee.

1.3.5 Asbestos

The term asbestos includes chrysotile, amosite, crocidolite, tremolite, anthophyllite, and actinolite and any of these minerals that has been chemically treated or altered. Materials are considered to contain asbestos if the asbestos content is at least one percent of the material by

area.

1.3.6 Asbestos Control Area

That area where asbestos removal operations are performed which is isolated by physical boundaries which assist in the prevention of the uncontrolled release of asbestos dust, fibers, or debris. Two examples of an asbestos control area are: a full containment and a "glovebag."

1.3.7 Asbestos Fibers

Those fibers having an aspect ratio of at least 3:1 and longer than 5 micrometers as determined by National Institute for Occupational Safety and Health (NIOSH) Method 7400.

1.3.8 Asbestos Permissible Exposure Limit

0.1 fibers per cubic centimeter of air as an 8-hour time weighted average as defined by 29 CFR 1926.1101 or other federal legislation having legal jurisdiction for the protection of workers health.

1.3.9 Background

Normal airborne asbestos concentration in an area similar to the asbestos abatement area but in an uncontaminated (with asbestos) state.

1.3.10 Contractor

The Contractor is that individual, or entity under contract to the Navy to perform the herein listed work.

1.3.11 Encapsulants

Specific materials in various forms used to chemically entrap asbestos fibers in various configurations to prevent these fibers from becoming airborne. There are four types of encapsulants as follows which must comply with performance requirements as specified herein.

- a. Removal Encapsulant (can be used as a wetting agent)
- b. Bridging Encapsulant (used to provide a tough, durable surface coating to asbestos containing material)
- c. Penetrating Encapsulant (used to penetrate the asbestos containing material down to substrate, encapsulating all asbestos fibers)
- d. Lock-Down Encapsulant (used to seal off or "lock-down" minute asbestos fibers left on surfaces from which asbestos containing material has been removed)

1.3.12 Friable Asbestos Material

Material that contains more than one percent asbestos by area and that can be crumbled, pulverized, or reduced to powder by hand pressure when dry.

1.3.13 Full Containment

Those engineering control techniques described in 29 CFR 1926.1101 for major asbestos removal, renovation and demolition operations.

1.3.14 Glovebag Technique

Those asbestos removal and control techniques put forth in [29 CFR 1926.1101](#).

1.3.15 HEPA Filter Equipment

High efficiency particulate air HEPA filtered vacuum and/or exhaust ventilation equipment with a filter system capable of collecting and retaining asbestos fibers. Filters shall retain 99.97 percent of particles 0.3 microns or larger as indicated in [UL 586](#).

1.3.16 Navy Industrial Hygienist (NIH)

That industrial hygienist employed by the Navy to monitor, sample, and/or inspect the work separate from the original construction contract. The NIH can be either a Federal civil servant or a private consultant as determined by the Navy. In some instances the NIH shall perform assigned duties vicariously through a trained subordinate but only with the specific consent of the Contracting Officer.

1.3.17 Nonfriable Asbestos Material

Material that contains asbestos in which the fibers have been temporarily locked in by a bonding agent, coating, binder, or other material so that the asbestos is well bound and will not normally release asbestos fibers during any appropriate use, handling, storage or transportation. It is understood that asbestos fibers will be released under other conditions such as demolition or removal.

1.3.18 Personal Sampling

Air sampling to determine asbestos fiber concentrations within the breathing zone of a specific employee, performed in accordance with [29 CFR 1926.1101](#).

1.3.19 Supervising Air Monitor (SAM)

That supervising air monitor hired by the Contractor to perform the herein listed industrial hygiene tasks. In some instances, the SAM can perform this role vicariously through a trained subordinate, but only with the specific consent of the Contracting Officer.

1.3.20 TEM

Refers to Transmission Electron Microscopy

1.3.21 Time Weighted Average (TWA)

The TWA is an 8-hour time weighted average airborne concentration of asbestos fibers. At least three full shift samples per person are required to establish that person's TWA exposure.

1.3.22 Wetting Agent

That specific agent used to reduce airborne asbestos levels by physically bonding asbestos fibers to material to be removed. An equivalent wetting agent must have a surface tension of at least 29 dynes per square centimeter as tested in accordance with [ASTM D 1331](#).

1.4 REQUIREMENTS

1.4.1 Description of Work

The work covered by this section includes the handling of asbestos containing materials which are encountered during repair, construction and demolition projects and describes some of the resultant procedures and equipment required to protect workers and occupants of the building or area, or both, from contact with airborne asbestos fibers. The work also includes the disposal of the generated asbestos containing materials. The asbestos work includes the demolition and removal as shown on the plans.

1.4.2 N. C. Department of Health and Human Services (NCDHHS)

Obtain necessary permits in conjunction with asbestos removal, hauling, and disposition, and furnish timely notification of such actions required by federal, state, regional, and local authorities. Notify the NCDHHS and the Contracting Officer in writing 10 days prior to the commencement of work. Submit a copy of the permit to the Contracting Officer.

1.4.2.1 NCDHHS mailing address is:

N. C. Department of Health and Human Services
Health Hazard Control Unit
1912 Mail Service Center
Raleigh, NC 27699-1912

1.4.2.2 Changes in Work

Changes in Work which affect items on the attached form shall be covered by an amended form submitted to the same address.

1.4.3 Safety and Health Compliance

In addition to detailed requirements of this specification, comply with those applicable laws, ordinances, criteria, rules, and regulations of federal, state, regional, and local authorities regarding handling, storing, transporting, and disposing of asbestos waste materials. Comply with the applicable requirements of the current issue of [29 CFR 1926.1101](#), [40 CFR 61, SUBPART A](#), [40 CFR 61, SUBPART M](#). Submit matters of interpretation of standards to the appropriate administrative agency for resolution before starting the work. Where the requirements of this specification, applicable laws, rules, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirement as defined by the Contracting Officer shall apply.

1.4.4 Respiratory Protection Program

Establish and implement a respirator program as required by [ANSI Z88.2](#) and [29 CFR 1910.103](#).

1.4.5 Supervising Air Monitor (SAM)

Conduct personal area/environmental air sampling and training under the direction of a North Carolina accredited supervising air monitor. For the purpose of this contract, the Contractor shall retain the services of a SAM to perform the Contractor's industrial hygiene tasks.

1.5 SUBMITTALS

Submit 4 copies of the following in accordance with Section 01 33 00, "Submittal Procedures."

SD-06 Test Reports

Air sampling results

Pressure differential recordings for local exhaust system

Clearance sampling

SD-07 Certificates

Asbestos hazard abatement plan (Abatement Design)

SD-11 Closeout Submittals

Asbestos Waste Shipment Record (DEHNR 3787)

Daily log

North Carolina permit

Modifications to the North Carolina permit

Asbestos Inspection Reporting Form

1.5.1 Asbestos Hazard Abatement Plan (NC Abatement Design)

An asbestos abatement design shall be prepared by an accredited abatement designer for each individually permitted removal of more than 3000 square feet (281 square meters), 1500 linear feet (462 meters) or 656 cubic feet (18 cubic meters), of regulated asbestos containing materials. The plan shall be prepared, signed, and sealed, including accreditation number and date, by an accredited abatement designer. The respirator program and air monitoring strategies portion of this plan shall be prepared by the supervising air monitor. Such plan shall include but not be limited to the precise personal protective equipment to be used, the location of asbestos control areas including clean and dirty areas, buffer zones, showers, storage areas, change rooms, removal method, interface of trades involved in the construction, sequencing of asbestos related work, disposal plan, type of wetting agent and asbestos sealer to be used, locations of local exhaust equipment, planned air monitoring strategies, and a detailed description of the method to be employed in order to control pollution. The plan shall also include (both fire and medical emergency) response plans. The Contractor and designer shall meet with the Contracting Officer prior to beginning work, to discuss in detail the asbestos plan, including work procedures and safety precautions. The plan will be enforced as if an addition to the specification. Any changes required in the specification as a result of the plan shall be identified specifically in the plan. The plan shall comply with all federal and state requirements and this specification, and shall serve as the North Carolina Abatement Design. Submit a courtesy copy of plan to the Contracting Officer.

1.5.2 Air Sampling Results

Complete fiber counting and provide results to the SAM for review within 16

hours. Notify the Contracting Officer immediately of any airborne levels of asbestos fibers in excess of the acceptable limits. Submit sampling results to the Contracting Officer and the affected Contractor employees within 3 working days, signed by the employee performing air sampling, the employee that analyzed the sample, and the SAM.

1.5.3 Pressure Differential Recordings for Local Exhaust System

Provide a local exhaust system that creates a negative pressure of at least 0.02 inches of water relative to the pressure external of the enclosure and operate it continuously, 24 hours a day, until the enclosure of the asbestos control area is removed. Provide continuous 24-hour per day monitoring of the pressure differential with a pressure differential automatic recording instrument. Submit pressure differential recordings for each work day to the SAM for review and to the Contracting Officer within 24 hours from the end of each work day. Notify the Contractor and the Contracting Officer immediately of any variance in the pressure differential which could cause adjacent unsealed areas to have asbestos fiber concentrations in excess of 0.01 fibers per cubic centimeter or background whichever is higher. In no circumstance shall levels exceed 0.1 fibers per cubic centimeter.

1.5.4 Asbestos Waste Shipment Record (DEHHS)

Record and report, to the Contracting Officer, the amount of asbestos containing material removed and released for disposal. Deliver the report for the previous day at the beginning of each day shift with amounts of material removed during the previous day reported in linear feet or square feet as described initially in this specification and in cubic feet for the amount of asbestos containing material released for disposal. Use "Asbestos Waste Shipment Record (DEHNR 3787) for this report.

1.5.5 Daily Log

A daily log documenting work practices, sample locations, and all other asbestos related job conditions shall be maintained, by the testing lab and be available for Government examination throughout the course of work. At the completion of testing, a copy of this log shall be immediately delivered to the Government.

1.5.6 North Carolina Permit

Submit one copy of the North Carolina Permit before beginning abatement activities.

1.5.7 Modifications to the North Carolina Permit

Submit a copy of all permit modifications to the Contracting Officer. These must be received before they become effective. The Contractor is responsible for proper permit modification notification to the State. Modifications may be delivered to the Contracts Office or transmitted by facsimile to (910) 411-5899.

1.5.8 Asbestos Inspection Reporting Form

This Asbestos Inspection Reporting Form is included at the end of this section and shows the homogeneous areas involved with this project. The Contractor shall mark the line "confirmed ACM from this HA:" as either "Abated" or "Managed in Place." Abated shall be defined as removed. If an

HA is partially abated, approximate the percentaged of asbestos removed and mark in the comments area. Provide any other descriptive data, such as rooms/areas removed or rooms/areas where asbestos not removed. The intent of this requirement is to report "as built" conditions. The Contractor is not required to perform any additional asbestos surveys or inspections as a result of this paragraph.

1.6 PRE-ABATEMENT MEETING

The Contractor and designer shall meet with the Contracting Officer prior to beginning work, to discuss in detail the asbestos plan, including work procedures and safety precautions.

1.7 ASBESTOS INSPECTION REPORTING FORM AND ASBESTOS SAMPLE REPORTING FORM

These two forms are included at the end of this section for informational purposes. They do not define or modify the scope of work.

PART 2 PRODUCTS

2.1 ENCAPSULANTS

Shall conform to current USEPA requirements, shall contain no toxic or hazardous substances as defined in 29 CFR 1926.59, and shall conform to the following performance requirements.

2.1.1 Removal Encapsulants

<u>Requirement</u>	<u>Test Standard</u>
Flame Spread - 25, Smoke Emission - 50	ASTM E 84
Life Expectancy - 20 years	ASTM C 732, Accelerated Aging Test
Permeability - Minimum 0.4 perms	ASTM E 96

2.1.2 Lock-down Encapsulant

<u>Requirement</u>	<u>Test Standard</u>
Flame Spread - 25, Smoke Emission - 50	ASTM E 84
Life Expectancy - 20 years	ASTM C 732 Accelerated Aging Test
Permeability - Minimum 0.4 perms	ASTM E 96
Fire Resistance - Negligible affect on fire resistance rating over 3 hour test (Tested with fireproofing over encapsulant applied directly to steel member)	ASTM E 119
Bond Strength - 100 pounds of force/foot (Tests compatibility with	ASTM E 736

RequirementTest Standard

cementitious and fibrous
fire-proofing)

2.1.3 Plastic Sheet

Plastic sheet, polyethylene, 6 mil minimum thickness, unless otherwise specified, in sizes to minimize the frequency of joints.

2.1.4 Tape

Capable of sealing joints of adjacent sheets or plastic sheets and for attachment of plastic sheet to finished or unfinished surfaces of dissimilar materials and capable of adhering under dry and wet conditions, including use of amended water.

PART 3 EXECUTION

3.1 DISPOSAL SITE

Base Sanitary Landfill shall be used for disposal of all asbestos waste. The Base Sanitary Landfill is approved and is available for use by the Contractor providing the following requirements are satisfied:

- a. The Contracting Officer must be informed at least five working days in advance of the anticipated delivery date of the asbestos material to the Landfill. On larger projects, the notification should be accompanied by a cubic yard estimate of the anticipated volume, updated weekly if the disposal period extends for more than one week. The Government will be responsible for digging the trenches and covering the debris at the end of the working day. Debris will not be accepted before 8:00 AM or after 10:00 AM, except in an emergency situation.
- b. Asbestos will be accepted only if double bagged in heavy-duty plastic bags which are clearly marked "Asbestos." If a Contractor desires to handle the asbestos in a manner other than double-bagged, written application, along with a description of the proposed deviation, must be submitted to the ROICC for approval.
- c. Asbestos insulated piping with the asbestos insulation intact will be accepted if the following requirements are met:
 1. The pipe is cut in eight foot or shorter lengths
 2. Each section of pipe is double wrapped, sealed, and labeled as asbestos.
 3. All pipe is palletized on a 7/8-inch, 4- by 8-foot sheet of plywood. The whole pallet is banded with a minimum of three 1-inch wide metal bands with the coupling on top and wrapped with 6-mil plastic. The pallet is not higher than 3-inches.
- d. All asbestos, except palletized pipe will be off loaded and placed in the trench pipe hand.
- e. Asbestos disposal is restricted to one designated location in the

Landfill and the landfill operators must be informed of and direct each delivery. Asbestos shall be disposed of from 0800 to 1000 hours daily, except holidays and weekends. Trucks hauling asbestos must be properly covered with tarpaulins or equivalent. Trucks not covered properly must be parked until the Contracting Officer approves corrective actions.

- f. The Contractor will ensure asbestos contaminated material delivered to the Base Sanitary Landfill contain no free liquids. Free liquids are defined as material which fails the EPA SW-846 free liquids test.

3.2 EQUIPMENT

Make available to the Contracting Officer or the Contracting Officer's Representative, two complete sets of personal protective equipment as required herein for entry to the asbestos control area at all times for inspection of the asbestos control area. Provide equivalent training to the Contracting Officer or a designated representative as provided to Contractor employees in the use of the required personal protective equipment. Provide manufacturer's certificate of compliance for all equipment required to contain airborne asbestos fibers.

3.2.1 Respirators

Comply with 29 CFR 1926.1101.

3.3 WORK PROCEDURE

Remove in accordance with state regulations.

3.3.1 Furnishings

Furniture and equipment will be removed from the area of work by the Government before asbestos work begins.

3.3.2 Pipe Insulation

Pipe may be removed with the asbestos insulation in place by wrapping the entire length of pipe and associated insulation with double thickness 6 mil plastic secured with duct tape. Cut insulation and piping simultaneously into lengths suitable for transportation to disposal area, but no greater than 8 feet in length. Continuously wet the cutting site during the process. As soon as a length of pipe is completely cut loose, cover exposed ends with double thickness 6 mil plastic secured with duct tape. If the pipe is to remain in service, the removed pipe must be replaced in accordance with this Specification, with a pipe of the same size that is removed.

3.3.2.1 Attic Insulation

In those buildings indicated on the drawings, attic insulation consisting of any combination of blown-in or batt fiberglass or rockwool material, has been contaminated with asbestos materials, and is to be removed as contaminated asbestos material. The insulation material shall be wet with a fine mist of amended water. The material shall be placed immediately in double thickness 6 mil plastic bags for disposal as asbestos waste.

3.3.3 Air Sampling

in accordance with 29 CFR 1926.1101 and as specified herein. Sampling performed in accordance with 29 CFR 1926.1101 shall be performed by the SAM. Sampling performed for environmental and quality control reasons shall be performed by the SAM. Unless otherwise specified, use NIOSH Method 7400 for sampling and analysis. Monitoring may be duplicated by the Government at the discretion of the Contracting Officer. If the air sampling results obtained by the Government differ from those results obtained by the Contractor, the Government results shall prevail.

3.3.3.1 Sampling Prior to Asbestos Work

Provide area air sampling and establish the baseline one day prior to the masking and sealing operations for each removal site. Establish the background by performing area sampling in similar but uncontaminated sites in the building.

3.3.3.2 Sampling During Asbestos Work

The SAM shall provide personal and area sampling as indicated in 29 CFR 1926.1101 and governing environmental regulations. Thereafter, provided the same type of work is being performed, provide area sampling at least once every work shift close to the work inside the containment, outside the clean room entrance to the containment, and at the exhaust opening of the local exhaust system. Also, where an enclosure is not provided, conduct area monitoring of airborne asbestos fibers during the work shift at the designated limits of the asbestos work area at such frequency as recommended by the SAM and conduct personal samples of each worker engaged in asbestos handling (removal, disposal, transport and other associated work). If the quantity of airborne asbestos fibers monitored at the breathing zone of the workers or designated limits at any time exceeds background or 0.01 fibers per cubic centimeter whichever is lesser, stop work, evacuate personnel in adjacent areas or provide personnel with approved protective equipment at the discretion of the Contracting Officer. This sampling may be duplicated by the government at the discretion of the Contracting Officer. If the air sampling results obtained by the government differ from those obtained by the Contractor, the government results shall prevail. If adjacent areas are contaminated as determined by the Contracting Officer, clean the contaminated areas, monitor, and visually inspect the area as specified herein. If sampling outside the containment shows airborne levels have exceeded background or 0.01 fibers per cubic centimeter, whichever is greater, stop all work, correct the condition(s) causing the increase, and notify the Contracting Officer immediately. In areas where the construction of a containment is not required, after initial TWAs are established and provided the same type of work is being performed, provide sampling at the designated limits of the asbestos work area at such frequency as recommended by the SAM. Where glovebag methods are used, perform personal and area air sampling at locations and frequencies that will accurately characterize the evolving airborne asbestos levels.

3.3.3.3 Sampling After Final Clean-Up (Clearance Sampling)

Provide area sampling of asbestos fibers using aggressive air sampling techniques as defined in the EPA 560/5-85-024 and establish an air borne asbestos concentration of less than 0.01 fibers per cubic centimeter 70 structures per square millimeter after final clean-up but before removal of the containment or the asbestos work control area. After final cleanup and

the asbestos control area is dry but prior to clearance sampling, the SAM shall perform a visual inspection, in accordance with [ASTM E 1368](#), to insure that the asbestos control and work area is free of any accumulations of dirt, dust, or debris.

3.3.4 Lock Down

Prior to removal of plastic barriers and after pre-clearance clean up of gross contamination, a visual inspection by the SAM, of all areas affected by the removal of the asbestos contaminated materials for any visible fibers, shall be conducted and approved by the SAM. A post removal (lock down) encapsulant shall then be spray applied to ceiling, walls, floors and other areas exposed in the removal area. The exposed area shall include but not be limited to plastic barriers, furnishings and articles to be discarded as well as dirty change room, air locks for bag removal and decon chambers.

3.3.5 Site Inspection

While performing asbestos removal work, the Contractor shall be subject to on-site inspection by the Contracting Officer who may be assisted by or represented by safety or industrial hygiene personnel. If the work is found to be in violation of this specification, the Contracting Officer or his representative will issue a stop work order to be in effect immediately and until the violation is resolved. Standby time required to resolve the violation shall be at the Contractor's expense.

3.4 CLEAN-UP AND DISPOSAL

3.4.1 Housekeeping

Essential parts of asbestos dust control are housekeeping and clean-up procedures. Maintain surfaces of the asbestos control area free of accumulations of asbestos fibers. Give meticulous attention to restricting the spread of dust and debris; keep waste from being distributed over the general area. Use HEPA filtered vacuum cleaners. Do not blow down the space with compressed air. When asbestos removal is complete, all asbestos waste is removed from the work-site, final clean-up is completed, and final air sampling results are reported, the SAM will certify the area as safe and the Contracting Officer will approve the abatement completion, before the signs can be removed. After final clean-up and acceptable airborne concentrations are attained but before the HEPA unit is turned off and the containment removed, remove all pre-filters on the building HVAC system and provide new pre-filters. Dispose of filters as asbestos-contaminated materials. Reestablish HVAC mechanical, and electrical systems in proper work ing order. The Contracting Officer will visually inspect all surfaces within the containment for residual material or accumulated dust or debris. The Contractor shall re-clean all areas showing dust or residual materials. If re-cleaning is required, air sample and establish an acceptable asbestos airborne concentration after re-cleaning. The SAM will provide written certification that the work area is safe within all standards as referenced within this contract before unrestricted entry is permitted. The Government shall have the option to perform monitoring to certify the areas are safe before entry is permitted.

3.4.2 Title to Materials

All materials resulting from demolition work, except as specified otherwise, shall become the property of the Contractor and shall be

disposed of as specified in applicable local, state, and Federal regulations and herein.

3.4.3 Disposal of Asbestos

3.4.3.1 Procedure for Disposal

Collect asbestos waste, asbestos contaminated water, scrap, debris, bags, containers, equipment, and asbestos contaminated clothing which may produce airborne concentrations of asbestos fibers and place in sealed fiberproof, waterproof, non-returnable containers (e.g. double plastic bags 6 mils thick, cartons, drums or cans). Wastes within the containers must be wetted to insure the security of the material in case of container breaching. Affix a warning and Department of Transportation (DOT) label to each bag or use at least 6 mil thick bags with the approved warnings and DOT labeling preprinted on the bag. For temporary storage, store sealed impermeable bags in asbestos waste drums or skids. An area for interim storage of asbestos waste-containing drums or skids will be assigned by the Contracting Officer or his authorized representative. Procedure for hauling and disposal shall comply with 40 CFR 61, SUBPART M, state, regional, and local standards. Sealed plastic bags may be dumped from drums into the burial site unless the bags have been broken or damaged. Damaged bags shall remain in the drum and the entire contaminated drum shall be buried. Uncontaminated drums may be recycled. Workers unloading the sealed drums shall wear appropriate respirators and personal protective equipment when handling asbestos materials at the disposal site.

3.4.3.2 Disposal Material Shall Contain No Free Liquid

The Contractor will ensure asbestos contaminated material delivered to the Base Sanitary Landfill contain no free liquids. Free liquids are defined as material which fails the EPA SW-846 Free Liquids Test.

-- End of Section --

Asbestos Inspection Reporting Form

Required under contractual agreement with Marine Corps Base, Camp Lejeune

Instructions: Supply the following information by filling in the blanks or selecting (checking) appropriate boxes.

General Information

Building Number	_____	Date of Activity	_____
Contractor Name	_____	Contract Number	_____
Inspector Name	_____	Inspector Accreditation Number	_____
Public Works POC	_____		

Inspection Information

Homogeneous Area (HA) ID Number: _____

(for additional HAs, please use Continuation Sheets)

Homogeneous Description:	Homogeneous Location:

ACM Type: Surfacing Material Thermal System Insulation Miscellaneous

Friability: High Moderate Low Non

Estimated Quantity of ACM: _____ Sq Feet Linear Feet Other _____

Damage Designation: Localized Distributed

Potential for Contact: Low Moderate High
(by building occupants)

Influence of Vibration: Low Moderate High

Influence of Air Erosion: Low Moderate High

Overall Potential for Disturbance: Low Moderate High

Percent Damage _____ %

Number of Samples Collected: _____
(NOTE: Sample Results Entered on the Asbestos Sample Reporting Forms)

Laboratory Sampling Analysis Method: Polarized Light Microscopy (AHERA Recommendation)
 Other _____

Confirmed ACM from this HA: Abated or Managed in Place

Inspection Activity Resulting From: Total Renovation Demolition
 Partial Renovation (Please Describe)

Comments:

Asbestos Sample Reporting Form

Instructions: Supply the following information by filling in the blanks or checking the appropriate box. An example entry is provided to illustrate a correct response.

Bldg No.	HA No.	Sample No.	Date	Description of Material Sampled	Location of Material Sampled	CHR ¹ %	AMO ¹ %	CRO ¹ %	Other ² %	Positive ³	Comments
Example	1	1	5/1/1996	Ceiling Tile 1'x1', white	ISMD Storage	ND	ND	ND		<input type="checkbox"/>	
										<input type="checkbox"/>	
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										<input type="checkbox"/>	

¹Percent of chrysotile (chr), amosite (amo), and crocidolite (cro). If no amount was detected, then "ND" should be entered under the appropriate column.

²Comments describing other suspect mineral types.

³Indication of positive for asbestos (this box is checked where no quantitative results exist, but records indicate that the sample is positive for asbestos).

Homogeneous Area (HA) Continuation Form

Provide the following information for each additional HA

HA ID Number: _____ Bldg Number: _____	HA ID Number: _____ Bldg Number: _____
HA Description:	HA Location:
ACM Type: <input type="checkbox"/> Surfacing Material <input type="checkbox"/> Thermal System Insulation <input type="checkbox"/> Miscellaneous Friability: <input type="checkbox"/> High <input type="checkbox"/> Moderate <input type="checkbox"/> Low <input type="checkbox"/> Non Est Qty of ACM: _____ <input type="checkbox"/> Sq Ft <input type="checkbox"/> LF <input type="checkbox"/> Other _____ Damage Designation: <input type="checkbox"/> Localized <input type="checkbox"/> Distributed Potential for Contact: <input type="checkbox"/> Low <input type="checkbox"/> Moderate <input type="checkbox"/> High Influence of Vibration: <input type="checkbox"/> Low <input type="checkbox"/> Moderate <input type="checkbox"/> High Influence of Air Erosion: <input type="checkbox"/> Low <input type="checkbox"/> Moderate <input type="checkbox"/> High Overall Potential for Disturbance: <input type="checkbox"/> Low <input type="checkbox"/> Moderate <input type="checkbox"/> High Percent Damage: _____ % No. of Samples Collected: _____ Laboratory Sampling analysis Method: <input type="checkbox"/> PLM <input type="checkbox"/> Other _____ Confirmed ACM from this HA: <input type="checkbox"/> Abated or <input type="checkbox"/> Managed in Place Inspection Activity Resulting From: <input type="checkbox"/> Demolition <input type="checkbox"/> Total Renovation <input type="checkbox"/> Partial Renovation (please describe)	ACM Type: <input type="checkbox"/> Surfacing Material <input type="checkbox"/> Thermal System Insulation <input type="checkbox"/> Miscellaneous Friability: <input type="checkbox"/> High <input type="checkbox"/> Moderate <input type="checkbox"/> Low <input type="checkbox"/> Non Est Qty of ACM: _____ <input type="checkbox"/> Sq Ft <input type="checkbox"/> LF <input type="checkbox"/> Other _____ Damage Designation: <input type="checkbox"/> Localized <input type="checkbox"/> Distributed Potential for Contact: <input type="checkbox"/> Low <input type="checkbox"/> Moderate <input type="checkbox"/> High Influence of Vibration: <input type="checkbox"/> Low <input type="checkbox"/> Moderate <input type="checkbox"/> High Influence of Air Erosion: <input type="checkbox"/> Low <input type="checkbox"/> Moderate <input type="checkbox"/> High Overall Potential for Disturbance: <input type="checkbox"/> Low <input type="checkbox"/> Moderate <input type="checkbox"/> High Percent Damage: _____ % No. of Samples Collected: _____ Laboratory Sampling analysis Method: <input type="checkbox"/> PLM <input type="checkbox"/> Other _____ Confirmed ACM from this HA: <input type="checkbox"/> Abated or <input type="checkbox"/> Managed in Place Inspection Activity Resulting From: <input type="checkbox"/> Demolition <input type="checkbox"/> Total Renovation <input type="checkbox"/> Partial Renovation (please describe)
Comments:	Comments:

Asbestos Sample Reporting Continuation Form

Provide the following information for each additional asbestos sample.

Bldg No.	HA No.	Sample No.	Date	Description of Material Sampled	Location of Material Sampled	CHR ¹ %	AMO ¹ %	CRO ¹ %	Other ² %	Positive ³	Comments
										<input type="checkbox"/>	
										<input type="checkbox"/>	
										<input type="checkbox"/>	
										<input type="checkbox"/>	
										<input type="checkbox"/>	
										<input type="checkbox"/>	
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										<input type="checkbox"/>	
										<input type="checkbox"/>	
										<input type="checkbox"/>	

¹Percent of chrysotile (chr), amosite (amo), and crocidolite (cro). If no amount was detected, then "ND" should be entered under the appropriate column.

²Comments describing other suspect mineral types.

³Indication of positive for asbestos (this box is checked where no quantitative results exist, but records indicate that the sample is positive for asbestos).

SECTION 02 82 30

RE-ESTABLISHING VEGETATION

01/07

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

The work covered by this section consists of preparing seedbeds; furnishing and placing limestone, fertilizer, and seed; compacting seedbeds; furnishing, placing, and securing mulch; mowing; and other operations necessary for the permanent establishment of grasses.

Seeding and mulching shall be performed on all earth areas disturbed by construction. The Contractor shall adapt his operations to variations in weather or soil conditions as necessary for the successful establishment and growth.

The quantity of mowing to be performed will be affected by the actual conditions which occur during the construction of the project. The quantity of mowing may be increased, decreased, or eliminated entirely at the direction of the Contracting Officer. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

PART 2 PRODUCTS

2.1 FERTILIZER

The quality of all fertilizer and all operations in connection with the furnishing of this material shall comply with the requirements of the North Carolina Fertilizer Law and with the rules and regulations, adopted by the North Carolina Board of Agriculture in accordance with the provisions of said law, in effect at the time of sampling. Fertilizer shall be 10-10-10. Dry fertilizer shall have been manufactured from cured stock. Liquid fertilizer shall be stored and cared for after manufacture in a manner that will prevent loss of plant food values.

2.2 LIMESTONE

The quality of all limestone and all operations in connection with the furnishing of this material shall comply with the requirements of the North Carolina Lime Law and with the rules and regulations adopted by the North Carolina Board of. Limestone shall be agricultural grade ground Dolomitic limestone. All limestone shall contain not less than 90 percent calcium carbonate equivalents. Dolomitic limestone shall contain not less than 10 percent of magnesium. Dolomitic limestone shall be so graded that at least 90 percent will pass through a U.S. Standard 20 mesh screen, and at least 35 percent will pass through a U.S. Standard 100 mesh screen.

2.3 SEED

The quality of all seed and all operations in connection with the furnishing of this material shall comply with the requirements of the North Carolina Seed Law and with the rules and regulations adopted by the North

Carolina Board of Agriculture. Seed shall have been approved by the North Carolina Department of Agriculture before being sown. No seed will be accepted with a date of test more than 8 months prior to the date of sowing, excluding the month in which the test was completed. Seed mix by weight shall be **as specified on the plans**.

2.4 MULCH FOR EROSION CONTROL

Mulch for erosion control shall consist of grain straw or other acceptable material, and shall have been approved by the Contracting Officer before being used. All mulch shall be reasonably free from mature seed bearing stalks, roots, or bulblets. Material for holding mulch in place shall be asphalt or other approved binding material.

2.5 MATTING FOR EROSION CONTROL

2.5.1 General

Matting for erosion control shall be or excelsior matting. Other acceptable material manufactured especially for erosion control may be used when approved by the Contracting Officer in writing before being used. Matting for erosion control shall not be dyed, bleached, or otherwise treated in a manner that will result in toxicity to vegetation.

2.5.2 **Erosion Control** Matting

Matting shall consist of a machine produced mat of curled wood excelsior a minimum of 47 inches in width. The mat shall weigh **1.6** pounds per square yard with a tolerance of plus or minus 10 percent. At least 80 percent of the individual fibers shall be 6 inches or more in length. The fibers shall be evenly distributed over the entire area of the blanket. One side of the excelsior matting shall be covered with an extruded plastic mesh. The mesh size for the plastic mesh shall be a maximum of 1 inch x 1 inch.

2.6.3 Wire Staples

Staples shall be machine made of No. 11 gage new steel wire formed into a "U" shape. The size when formed shall be not less than 6 inches in length with a throat of not less than 1 inch in width.

2.6 WATER

Water used in the planting or care of vegetation shall meet the requirements of Class C fresh waters as defined in 15 NAC 2B.0200.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

The work shall be performed immediately upon completion of earthwork areas. No exception will be made to this requirement unless otherwise permitted in writing by the Contracting Officer. Upon failure or neglect on the part of the Contractor to coordinate his grading with seeding and mulching operations and diligently pursue the control of erosion and siltation, the Contracting Officer may suspend the Contractor's operations until such time as the work is coordinated in a manner acceptable to the Contracting Officer.

3.2 SEEDBED PREPARATION

The Contractor shall cut and satisfactorily dispose of weeds or other unacceptable growth on the areas to be seeded. The soil shall then be scarified or otherwise loosened to a depth of not less than 3 inches except as otherwise provided below or otherwise directed by the Contracting Officer. Clods shall be broken and the top 2 to 3 inches of soil shall be worked into an acceptable seedbed by the use of soil pulverizers, drags, or harrows; or by other methods approved by the Contracting Officer. All rock and debris 3 inches or larger shall be removed prior to the application of seed and fertilizer. On cut slopes that are 2:1 and steeper, both the depth of preparation and the degree of smoothness of the seedbed may be reduced as permitted by the Contracting Officer, but in all cases the slope surface shall be scarified, grooved, trenched, or punctured so as to provide pockets, ridges, or trenches in which the seeding materials can lodge. On cut slopes that are either 2:1 or steeper, the Contracting Officer may permit the preparation of a partial or complete seedbed during the initial grading of the slope. If at the time of final seeding and mulching operations such initial preparation is still in a condition acceptable to the Contracting Officer, additional seedbed preparation may be reduced or eliminated. Seedbed preparation within 2 feet of the edge of any pavement shall be limited to a depth of 2 to 3 inches. The preparation of seedbeds shall not be done when the soil is frozen, extremely wet, or when the Contracting Officer determines that it is an otherwise unfavorable working condition.

3.3 LIMESTONE AND FERTILIZER

Limestone may be applied as a part of the seedbed preparation, provided it is immediately worked into the soil. If not so applied, limestone and fertilizer shall be distributed uniformly over the prepared seedbed and then harrowed, raked, or otherwise thoroughly worked into the seedbed. Apply fertilizer at the rate **as specified on the plans**. Apply lime at the rate **as specified on the plans**. Application equipment for liquid fertilizer, other than a hydraulic seeder, shall be calibrated to ensure that the required rate of fertilizer is applied uniformly.

3.4 SEEDING

Seed shall be distributed uniformly over the seedbed at the rate **as specified on the plans**. Seed shall be harrowed, dragged, raked, or otherwise worked so as to cover the seed with a layer of soil. The depth of covering shall be 1/4 inch. When a hydraulic seeder is used for application of seed and fertilizer, the seed shall not remain in water containing fertilizer for more than 30 minutes prior to application unless otherwise permitted by the Contracting Officer. Immediately after seed has been properly covered the seedbed shall be compacted in the manner and degree approved by the Contracting Officer.

3.5 MULCHING

All seeded areas shall be mulched. Grain straw or excelsior mat may be used as mulch at any time of the year. Mulch shall be applied within 24 hours after completion of seeding unless otherwise permitted by the Contracting Officer. Care shall be exercised to prevent displacement of soil or seed or other damage to the seeded area during the mulching operations. Mulch shall be uniformly spread by hand or by approved mechanical spreaders or blowers which will provide an acceptable application. An acceptable application will be that which will allow some

sunlight to penetrate and air to circulate but also partially shade the ground, reduce erosion, and conserve soil moisture. Mulch shall be held in place by applying a sufficient amount of asphalt or other approved binding material to assure that the mulch is properly held in place. The rate and method of application of binding material shall meet the approval of the Contracting Officer. Where the binding material is not applied directly with the mulch it shall be applied immediately following the mulch application. During the application of binding material, adequate precautions shall be taken to prevent damage to vehicles, structures, guardrails, and devices. Areas where seeding and mulching have been performed shall be maintained in a satisfactory condition until final acceptance of the project. Maintenance shall include mowing at the location and times directed by the Contracting Officer. Areas of damage or failure due to any cause shall be corrected by being repaired or by being completely redone as may be directed by the Contracting Officer. Excelsior matting shall be installed on all seeded slopes greater than 3:1 (h:v). Install the matting per the manufacturer's printed instructions.

-- End of Section --

SECTION 02 82 33.12

PREPARATION OF SURFACES COATED WITH CONTAMINATED PAINT

08/98

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z9.2 (1979; R 1991) Fundamentals Governing the Design and Operation of Local Exhaust Systems

ANSI Z88.2 (1992) Respiratory Protection

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1926.55 Gases, Vapors, Fumes, Dusts, and Mists

29 CFR 1926.57 Ventilation

29 CFR 1926.59 Hazard Communication

29 CFR 1926.62 Lead

29 CFR 1926.103 Respiratory Protection

40 CFR 258 Disposal of Hazardous Materials

40 CFR 261 Identification and Listing of Hazardous Waste

UNDERWRITERS LABORATORIES (UL)

UL 586 (1996; Rev thru Aug 1999) High-Efficiency, Particulate, Air Filter Units

1.2 DEFINITIONS

1.2.1 Action Level

Employee exposure, without regard to use of respirators, to an airborne concentration of lead of 30 micrograms per cubic meter of air averaged over an 8-hour period. As used in this section, "30 micrograms per cubic meter of air" refers to the action level.

1.2.2 Area Monitoring

Sampling of lead concentrations within the lead control area and inside the physical boundaries which is representative of the airborne lead

concentrations which may reach the breathing zone of personnel potentially exposed to lead.

1.2.3 Physical Boundary

Area physically roped or partitioned off around an enclosed lead control area to limit unauthorized entry of personnel. As used in this section, "inside boundary" shall mean the same as "outside lead control area."

1.2.4 Certified Industrial Hygienist (CIH)

As used in this section, refers to an Industrial Hygienist employed by the Contractor and is certified by the American Board of Industrial Hygiene in comprehensive practice.

1.2.5 Change Rooms and Shower Facilities

Rooms within the designated physical boundary around the lead control area equipped with separate storage facilities for clean protective work clothing and equipment and for street clothes which prevent cross-contamination.

1.2.6 Decontamination Room

Room for removal of contaminated personal protective equipment (PPE).

1.2.7 Eight-Hour Time Weighted Average (TWA)

Airborne concentration of lead averaged over an 8-hour workday to which an employee is exposed.

1.2.8 High Efficiency Particulate Air HEPA Filter Equipment

HEPA filtered vacuuming equipment with a [UL 586](#) filter system capable of collecting and retaining lead-contaminated paint dust. A high efficiency particulate filter means 99.97 percent efficient against 0.3 micron size particles.

1.2.9 Lead

Metallic lead, inorganic lead compounds, and organic lead soaps. Excluded from this definition are other organic lead compounds.

1.2.10 Lead Control Area

An enclosed area or structure with full containment to prevent the spread of lead dust, paint chips, or debris of lead-contaminated paint removal operations. The lead control area is isolated by physical boundaries to prevent unauthorized entry of personnel.

1.2.11 Lead Permissible Exposure Limit (PEL)

Fifty micrograms per cubic meter of air as an 8-hour time weighted average as determined by [29 CFR 1926.62](#). If an employee is exposed for more than 8 hours in a work day, the PEL shall be determined by the following formula:

$$\text{PEL (micrograms/cubic meter of air)} = 400/\text{No. hrs worked per day}$$

1.2.12 Personal Monitoring

Sampling of lead concentrations within the breathing zone of an employee to determine the 8-hour time weighted average concentration in accordance with 29 CFR 1926.62. Samples shall be representative of the employee's work tasks. Breathing zone shall be considered an area within a hemisphere, forward of the shoulders, with a radius of 6 to 9 inches and the center at the nose or mouth of an employee.

1.3 QUALITY ASSURANCE

1.3.1 Medical Examinations

Before exposure to lead-contaminated dust, provide workers with a comprehensive medical examination as required by 29 CFR 1926.59. The examination will not be required if adequate records show that employees have been examined as required by 29 CFR 1926.59 within the last year.

1.3.1.1 Medical Records

Maintain complete and accurate medical records of employees for a period of at least 40 years or for the duration of employment plus 20 years, whichever is longer.

1.3.2 CIH Responsibilities

- a. Certify training.
- b. Review and approve materials coated with lead-contaminated paint Removal Work Plan for conformance to the applicable referenced standards.
- c. Inspect lead-contaminated paint removal work for conformance with the approved plan.
- d. Direct monitoring.
- e. Ensure work is performed in strict accordance with specifications at all times.
- f. Ensure hazardous exposure to personnel and to the environment are adequately controlled at all times.
- g. Review and approve "Hazardous Waste Management Plan."

1.3.3 Training

Train each employee performing paint removal, disposal, and air sampling operations prior to the time of initial job assignment, in accordance with 29 CFR 1926.62.

1.3.3.1 Training Certification

Submit certificates signed and dated by the CIH and by each employee stating that the employee has received training.

1.3.4 Respiratory Protection Program

- a. Furnish each employee required to wear a negative pressure

respirator or other appropriate type with a respirator fit test at the time of initial fitting and at least every 6 months thereafter as required by 29 CFR 1926.62.

- b. Establish and implement a respiratory protection program as required by ANSI Z88.2, 29 CFR 1926.103, 29 CFR 1926.62, and 29 CFR 1926.55.

1.3.5 Hazard Communication Program

Establish and implement a Hazard Communication Program as required by 29 CFR 1926.59.

1.3.6 Hazardous Waste Management

The Hazardous Waste Management plan shall comply with applicable requirements of federal, state, and local hazardous waste regulations and address:

- a. Identification of hazardous wastes associated with the work.
- b. Estimated quantities of wastes to be generated and disposed of.
- c. Names and qualifications of each contractor that will be transporting, storing, treating, and disposing of the wastes consisting of lead chips and/or dust not intact lead-coated materials. Include the facility location and a 24-hour point of contact. Furnish two copies of EPA and state hazardous waste permits and EPA Identification numbers.
- d. Names and qualifications (experience and training) of personnel who will be working on-site with hazardous wastes.
- e. List of waste handling equipment to be used in performing the work, to include cleaning, volume reduction, and transport equipment.
- f. Spill prevention, containment, and cleanup contingency measures to be implemented.
- g. Work plan and schedule for waste containment, removal and disposal. Wastes shall be cleaned up and containerized daily.
- h. Cost for hazardous waste disposal according to this plan.

1.3.7 Safety and Health Compliance

In addition to the detailed requirements of this specification, comply with laws, ordinances, rules, and regulations of federal, state, and local authorities regarding removing, handling, storing, transporting, and disposing of lead waste materials. Comply with the applicable requirements of the current issue of 29 CFR 1926.62. Submit matters regarding interpretation of standards to the Contracting Officer for resolution before starting work. Where specification requirements and the referenced documents vary, the most stringent requirement shall apply.

1.3.8 Pre-Construction Conference

Along with the CIH, meet with the Contracting Officer to discuss in detail

the materials coated with lead-contaminated paint removal work plan, including work procedures and precautions for the work plan.

1.4 SUBMITTALS

Submit the following in accordance with Section 01 33 00, "Submittal Procedures."

SD-03 Product Data

Vacuum filters

Respirators

SD-06 Test Reports

Monitoring Results

SD-07 Certificates

Qualifications of CIH

Testing laboratory qualifications

Rental equipment notification

Preparation of Surfaces Coated with Lead-Contaminated Paint Work Plan with CIH approval (signature, date, and certification number)

Respiratory protection program

Hazard communication program

EPA approved hazardous waste treatment or disposal facility for lead disposal

Hazardous waste management plan

Vacuum filters

SD-11 Closeout Submittals

Completed and signed hazardous waste manifest from treatment or disposal facility

Certification of medical examinations

Employee training certification

1.4.1 Qualifications of CIH

Submit name, address, and telephone number of the CIH selected to perform responsibilities in paragraph entitled "CIH Responsibilities." Provide previous experience of the CIH. Submit proper documentation that the Industrial Hygienist is certified by the American Board of Industrial Hygiene in comprehensive practice, including certification number and date of certification/recertification.

1.4.2 Testing Laboratory

Submit the name, address, and telephone number of the testing laboratory selected to perform the monitoring, testing, and reporting of airborne concentrations of lead. Provide proper documentation that persons performing the analysis have been judged proficient by successful participation within the last year in the National Institute for Occupational Safety and Health (NIOSH) Proficiency Analytical Testing (PAT) Program. The laboratory shall be accredited by the American Industrial Hygiene Association (AIHA). Provide AIHA documentation along with date of accreditation/reaccreditation.

1.4.3 Preparation of Surfaces Coated with Lead-Contaminated Paint Work Plan

Submit a detailed job-specific plan of the work procedures to be used in the preparation of surfaces coated with lead-contaminated paint. The plan shall include a sketch showing the location, size, and details of lead control areas, location and details of decontamination rooms, change rooms, shower facilities, and mechanical ventilation system. Include in the plan, eating, drinking, smoking and restroom procedures, interface of trades, sequencing of lead related work, collected wastewater and paint debris disposal plan, air sampling plan, respirators, protective equipment, and a detailed description of the method of containment of the operation to ensure that airborne lead concentrations of 30 micrograms per cubic meter of air are not exceeded outside of the lead control area. Include air sampling, training and strategy, sampling methodology, frequency, duration of sampling, and qualifications of air monitoring personnel in the air sampling portion of the plan.

1.4.4 Air Monitoring

Submit [monitoring results](#) to the Contracting Officer within 3 working days, signed by the testing laboratory employee performing the air monitoring, the employee that analyzed the sample, and the CIH.

1.5 EQUIPMENT

Furnish the Contracting Officer with two complete sets of personal protective equipment daily, as required herein, for entry into and inspection of the removal work within the lead controlled area. Personal protective equipment shall include fitted respirators and disposable whole body covering, including appropriate foot, head, and hand protection. PPE shall remain the property of the Contractor.

1.5.1 Respirators

Furnish appropriate respirators approved by the NIOSH, Department of Health and Human Services, for use in atmospheres containing lead dust. Respirators shall comply with the requirements of [29 CFR 1926.62](#).

1.5.2 Special Protective Clothing

Furnish personnel who will be exposed to lead-contaminated dust with appropriate disposable protective whole body clothing, head covering, gloves, and foot coverings. Furnish appropriate disposable plastic or rubber gloves to protect hands. Reduce the level of protection only after obtaining approval from the CIH.

1.5.3 Rental Equipment Notification

If rental equipment is to be used during lead-contaminated paint handling and disposal, notify the rental agency in writing concerning the intended use of the equipment. Furnish a copy of the written notification to the Contracting Officer.

1.5.4 Vacuum Filters

UL 586 labeled HEPA filters.

PART 2 PRODUCTS

2.1 PAINT PREPARATION PRODUCTS

Submit applicable Material Safety Data Sheets for Surface Preparation products used. Use the least toxic product.

PART 3 EXECUTION

3.1 PROTECTION

3.1.1 Notification

Notify the Contracting Officer 20 days prior to the start of any surface preparation work.

3.1.2 RESERVED

3.1.3 Protection of Existing Work to Remain

Perform surface preparation work without damage or contamination of adjacent areas. Where existing work is damaged or contaminated, restore work to its original condition or better.

3.1.4 Boundary Requirements

Provide physical boundaries around the lead control area by roping off the area or providing curtains, portable partitions or other enclosures to ensure that airborne concentrations of lead will not reach 30 micrograms per cubic meter of air outside of the lead control area.

3.1.5 Furnishings

The Contractor shall cover all Government furniture and equipment located in the work area before lead-contaminated paint surface preparation work begins.

3.1.6 Heating, Ventilating and Air Conditioning (HVAC) Systems

Shut down, lock out, and isolate HVAC systems that supply, exhaust, or pass through the lead control areas. Seal intake and exhaust vents in the lead control area with 6-mil plastic sheet and tape. Seal seams in HVAC components that pass through the lead control area.

3.1.7 Change Room and Shower Facilities

Provide clean change rooms and shower facilities within the physical boundary around the designated lead control area in accordance with

requirements of 29 CFR 1926.62.

3.1.8 Mechanical Ventilation System

- a. Use adequate ventilation to control personnel exposure to lead in accordance with 29 CFR 1926.57.
- b. To the extent feasible, use local exhaust ventilation connected to HEPA filters or other collection systems, approved by the industrial hygienist. Local exhaust ventilation systems shall be designed, constructed, installed, and maintained in accordance with ANSI Z9.2.

3.1.9 Personnel Protection

Personnel shall wear and use protective clothing and equipment as specified herein. Eating, smoking, or drinking is not permitted in the lead control area. No one will be permitted in the lead control area unless they have been given appropriate training and protective equipment.

3.1.10 Warning Signs

Provide warning signs at approaches to lead control areas. Locate signs at such a distance that personnel may read the sign and take the necessary precautions before entering the area. Signs shall comply with the requirements of 29 CFR 1926.62.

3.2 WORK PROCEDURES

The work shall include removal of materials coated with lead containing paint. Remove dirt, dust, rust, caulking, splinters, loose particles, grease, oil, disintegrated coatings, mildew, mold, and other substances deleterious to coating performance. Sand, spackle, and treat defects to render them smooth. Defects are defined as scratches, nicks, cracks, gouges, spills, alligating, previous runs, chalking, and irregularities due to partial peeling of previous coatings. Sand edges of adjacent soundly-adhered existing coatings so they are tapered as smooth as practical. On interior surfaces, edges may be filled smooth with joint compound in lieu of sanding. The Contractor is advised of these conditions and shall be responsible for compliance with all EPA, Federal, State and Local Requirements.

3.2.1 Personnel Exiting Procedures

Whenever personnel exit the lead-controlled area, they shall perform the following procedures and shall not leave the work place wearing any clothing or equipment worn during the work day:

- a. Vacuum themselves off.
- b. Remove protective clothing in the decontamination room, and place them in an approved impermeable disposal bag.
- c. Shower.
- d. Change to clean clothes prior to leaving the physical boundary designated around the lead-contaminated job site.

3.2.2 Monitoring

Monitoring of airborne concentrations of lead shall be in accordance with 29 CFR 1926.62 and as specified herein. Air monitoring, testing, and reporting shall be performed by a CIH or an Industrial Hygiene (IH) Technician who is under the direction of the CIH.

- a. The CIH or the IH Technician under the direction of the CIH shall be on the jobsite directing the monitoring, and inspecting the lead-contaminated paint removal work to ensure that the requirements of the Contract have been satisfied during the entire removal of materials coated with lead-contaminated paint operation.
- b. Take personal air monitoring samples on employees who are anticipated to have the greatest risk of exposure as determined by the CIH. In addition, take air monitoring samples on at least 25 percent of the work crew or a minimum of two employees, whichever is greater, during each work shift.
- c. Submit results of air monitoring samples, signed by the CIH, within 72 hours after the air samples are taken. Notify the Contracting Officer immediately of exposure to lead at or in excess of the action level of 30 micrograms per cubic meter of air outside of the lead control area.

3.2.2.1 Monitoring During Surface Preparation Work

Perform personal and area monitoring during the surface preparation operation. Sufficient area monitoring shall be conducted at the physical boundary to ensure unprotected personnel are not exposed above 30 micrograms per cubic meter of air at all times. If the outside boundary lead levels are at or exceed 30 micrograms per cubic meter of air, work shall be stopped and the CIH shall immediately correct the condition(s) causing the increased levels and notify the Contracting Officer immediately. The CIH shall review the sampling data collected on that day to determine if condition(s) requires any further change in work methods. Removal work shall resume when approval is given by the CIH. The Contractor shall control the lead level outside of the work boundary to less than 30 micrograms per cubic meter of air at all times. As a minimum, conduct area monitoring daily on each shift in which lead paint removal operations are performed in areas immediately adjacent to the lead control area. For outdoor operations, at least one sample on each shift shall be taken on the downwind side of the lead control area. If adjacent areas are contaminated, clean and visually inspect contaminated areas. The CIH shall certify that the area has been cleaned of lead contamination.

3.3 CLEANUP AND DISPOSAL

3.3.1 Cleanup

Maintain surfaces of the lead control area free of accumulations of paint chips and dust. Restrict the spread of dust and debris; keep waste from being distributed over the work area. Do not dry sweep or use compressed air to clean up the area. At the end of each shift and when the surface preparation operation has been completed, clean the area of visible lead paint contamination by vacuuming with a HEPA filtered vacuum cleaner and wet mopping the area.

3.3.2 Certification

The CIH shall certify in writing that the inside and outside the lead control area aggressive air monitoring samples are less than 30 micrograms per cubic meter of air, the respiratory protection for the employees was adequate, the work procedures were performed in accordance with 29 CFR 1926.62, and that there were no visible accumulations of lead-contaminated paint and dust on the worksite. Do not remove the lead control area or roped-off boundary and warning signs prior to the Contracting Officer's receipt of the CIH's certification. Reclean areas showing dust or residual paint chips.

3.3.3 Disposal

Dispose of removed materials and associated waste in compliance with Environmental Protection Agency (EPA), Federal, State, and Local requirements and the approved work plans for removal and disposal.

- a. Materials (except metals) coated with lead-contaminated paint which is well adhered shall be disposed of in the Base Sanitary Landfill, provided all Base and Landfill requirements are complied with. Comply with the land disposal restriction notification requirements of 40 CFR 258.
- b. All debris, paint chips, and dust will be considered a hazardous waste. Dispose of this material off Base in an approved hazardous waste facility.

3.3.4 Testing of Lead-Contaminated Paint Residue

Test lead-contaminated paint residue and debris in accordance with 40 CFR 261 for hazardous waste. A composite sample of dust and debris collected after removal is complete must be tested for lead using EPA Protocol Total Characteristic Leachate Procedure (TCLP) Test. If the results are less than five parts per million, the debris shall be disposed in the Base Sanitary Landfill. If the results are equal to or greater than five parts per million, the debris shall be disposed in an approved hazardous waste facility.

3.4 PAYMENT FOR HAZARDOUS WASTE

Payment for disposal of hazardous waste shall not be made until a signed copy of the manifest from the disposal facility certifying the amount of hazardous waste delivered is returned and a copy is furnished to the Government.

-- End of Section --

SECTION 02 82 33.13

REMOVAL AND DISPOSAL OF MATERIALS COATED WITH LEAD-CONTAINING PAINT

08/98

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z9.2 (1979; R 1991) Fundamentals Governing the Design and Operation of Local Exhaust Systems

ANSI Z88.2 (1992) Respiratory Protection

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1926.55 Gases, Vapors, Fumes, Dusts, and Mists

29 CFR 1926.57 Ventilation

29 CFR 1926.59 Hazard Communication

29 CFR 1926.62 Lead

29 CFR 1926.103 Respiratory Protection

40 CFR 258 Disposal of Hazardous Materials

40 CFR 261 Identification and Listing of Hazardous Waste

UNDERWRITERS LABORATORIES (UL)

UL 586 (1996; Rev thru Aug 1999) High-Efficiency, Particulate, Air Filter Units

1.2 DEFINITIONS

1.2.1 Action Level

Employee exposure, without regard to use of respirators, to an airborne concentration of lead of 30 micrograms per cubic meter of air averaged over an 8-hour period. As used in this section, "30 micrograms per cubic meter of air" refers to the action level.

1.2.2 Area Monitoring

Sampling of lead concentrations within the lead control area and inside the physical boundaries which is representative of the airborne lead

concentrations which may reach the breathing zone of personnel potentially exposed to lead.

1.2.3 Physical Boundary

Area physically roped or partitioned off around an enclosed lead control area to limit unauthorized entry of personnel. As used in this section, "inside boundary" shall mean the same as "outside lead control area."

1.2.4 Certified Industrial Hygienist (CIH)

As used in this section, refers to an Industrial Hygienist employed by the Contractor and is certified by the American Board of Industrial Hygiene in comprehensive practice.

1.2.5 Change Rooms and Shower Facilities

Rooms within the designated physical boundary around the lead control area equipped with separate storage facilities for clean protective work clothing and equipment and for street clothes which prevent cross-contamination.

1.2.6 Decontamination Room

Room for removal of contaminated personal protective equipment (PPE).

1.2.7 Eight-Hour Time Weighted Average (TWA)

Airborne concentration of lead averaged over an 8-hour workday to which an employee is exposed.

1.2.8 High Efficiency Particulate Air (HEPA) Filter Equipment

HEPA filtered vacuuming equipment with a UL 586 filter system capable of collecting and retaining lead-contaminated paint dust. A high efficiency particulate filter means 99.97 percent efficient against 0.3 micron size particles.

1.2.9 Lead

Metallic lead, inorganic lead compounds, and organic lead soaps. Excluded from this definition are other organic lead compounds.

1.2.10 Lead Control Area

An enclosed area or structure with full containment to prevent the spread of lead dust, paint chips, or debris of lead-containing paint removal operations. The lead control area is isolated by physical boundaries to prevent unauthorized entry of personnel.

1.2.11 Lead Permissible Exposure Limit (PEL)

Fifty micrograms per cubic meter of air as an 8-hour time weighted average as determined by 29 CFR 1926.62. If an employee is exposed for more than 8 hours in a work day, the PEL shall be determined by the following formula:

$$\text{PEL (micrograms/cubic meter of air)} = 400/\text{No. hrs worked per day}$$

1.2.12 Personal Monitoring

Sampling of lead concentrations within the breathing zone of an employee to determine the 8-hour time weighted average concentration in accordance with 29 CFR 1926.62. Samples shall be representative of the employee's work tasks. Breathing zone shall be considered an area within a hemisphere, forward of the shoulders, with a radius of 6 to 9 inches and the center at the nose or mouth of an employee.

1.3 QUALITY ASSURANCE

1.3.1 Medical Examinations

Before exposure to lead-contaminated dust, provide workers with a comprehensive medical examination as required by 29 CFR 1926.59. The examination will not be required if adequate records show that employees have been examined as required by 29 CFR 1926.59 within the last year.

1.3.1.1 Medical Records

Maintain complete and accurate medical records of employees for a period of at least 40 years or for the duration of employment plus 20 years, whichever is longer.

1.3.2 CIH Responsibilities

- a. Certify training.
- b. Review and approve materials coated with lead-containing paint Removal Work Plan for conformance to the applicable referenced standards.
- c. Inspect lead-containing paint removal work for conformance with the approved plan.
- d. Direct monitoring.
- e. Ensure work is performed in strict accordance with specifications at all times.
- f. Ensure hazardous exposure to personnel and to the environment are adequately controlled at all times.

1.3.3 Training

Train each employee performing paint removal, disposal, and air sampling operations prior to the time of initial job assignment, in accordance with 29 CFR 1926.62.

1.3.3.1 Training Certification

Submit certificates signed and dated by the CIH and by each employee stating that the employee has received training.

1.3.4 Respiratory Protection Program

- a. Furnish each employee required to wear a negative pressure respirator or other appropriate type with a respirator fit test at the time of initial fitting and at least every 6 months thereafter

as required by 29 CFR 1926.62.

- b. Establish and implement a respiratory protection program as required by ANSI Z88.2, 29 CFR 1926.103, 29 CFR 1926.62, and 29 CFR 1926.55.

1.3.5 Hazard Communication Program

Establish and implement a Hazard Communication Program as required by 29 CFR 1926.59.

1.3.6 Hazardous Waste Management

The Hazardous Waste Management plan shall comply with applicable requirements of federal, state, and local hazardous waste regulations and address:

- a. Identification of hazardous wastes associated with the work.
- b. Estimated quantities of wastes to be generated and disposed of.
- c. Names and qualifications of each contractor that will be transporting, storing, treating, and disposing of the wastes consisting of lead chips and/or dust not intact lead-coated materials. Include the facility location and a 24-hour point of contact. Furnish two copies of EPA and state hazardous waste permits and EPA Identification numbers.
- d. Names and qualifications (experience and training) of personnel who will be working on-site with hazardous wastes.
- e. List of waste handling equipment to be used in performing the work, to include cleaning, volume reduction, and transport equipment.
- f. Spill prevention, containment, and cleanup contingency measures to be implemented.
- g. Work plan and schedule for waste containment, removal and disposal. Wastes shall be cleaned up and containerized daily.
- h. Cost for hazardous waste disposal according to this plan.

1.3.7 Safety and Health Compliance

In addition to the detailed requirements of this specification, comply with laws, ordinances, rules, and regulations of federal, state, and local authorities regarding removing, handling, storing, transporting, and disposing of lead waste materials. Comply with the applicable requirements of the current issue of 29 CFR 1926.62. Submit matters regarding interpretation of standards to the Contracting Officer for resolution before starting work. Where specification requirements and the referenced documents vary, the most stringent requirement shall apply.

1.3.8 Pre-Construction Conference

Along with the CIH, meet with the Contracting Officer to discuss in detail the materials coated with lead-containing paint removal work plan, including work procedures and precautions for the work plan.

1.4 SUBMITTALS

Submit the following in accordance with Section 01 33 00, "Submittal Procedures

SD-03 Product Data

Vacuum filters

Respirators

SD-06 Test Reports

Monitoring Results

SD-07 Certificates

Qualifications of CIH

Testing laboratory qualifications

Materials coated with lead-containing paint removal work plan

Rental equipment notification

CIH approval of work plan (signature, date, and certification number)

Respiratory protection program

Hazard communication program

EPA approved hazardous waste treatment or disposal facility for lead disposal

Hazardous waste management plan

Vacuum filters

SD-11 Closeout Submittals

Completed and signed hazardous waste manifest from treatment or disposal facility

Certification of medical examinations

Employee training certification

1.4.1 Qualifications of CIH

Submit name, address, and telephone number of the CIH selected to perform responsibilities in paragraph entitled "CIH Responsibilities." Provide previous experience of the CIH. Submit proper documentation that the Industrial Hygienist is certified by the American Board of Industrial Hygiene in comprehensive practice, including certification number and date of certification/recertification.

1.4.2 Testing Laboratory

Submit the name, address, and telephone number of the testing laboratory selected to perform the monitoring, testing, and reporting of airborne concentrations of lead. Provide proper documentation that persons performing the analysis have been judged proficient by successful participation within the last year in the National Institute for Occupational Safety and Health (NIOSH) Proficiency Analytical Testing (PAT) Program. The laboratory shall be accredited by the American Industrial Hygiene Association AIHA. Provide AIHA documentation along with date of accreditation/reaccreditation.

1.4.3 Materials Coated with Lead-Containing Paint Removal Work Plan

Submit a detailed job-specific plan of the work procedures to be used in the removal of materials coated with lead-containing paint. The plan shall include a sketch showing the location, size, and details of lead control areas, location and details of decontamination rooms, change rooms, shower facilities, and mechanical ventilation system. Include in the plan, eating, drinking, smoking and restroom procedures, interface of trades, sequencing of lead related work, collected wastewater and paint debris disposal plan, air sampling plan, respirators, protective equipment, and a detailed description of the method of containment of the operation to ensure that airborne lead concentrations of 30 micrograms per cubic meter of air are not exceeded outside of the lead control area. Include air sampling, training and strategy, sampling methodology, frequency, duration of sampling, and qualifications of air monitoring personnel in the air sampling portion of the plan.

1.4.4 Air Monitoring

Submit [monitoring results](#) to the Contracting Officer within 3 working days, signed by the testing laboratory employee performing the air monitoring, the employee that analyzed the sample, and the CIH.

1.5 REMOVAL

1.5.1 Title to Materials

Materials resulting from demolition work, except as specified otherwise, shall become the property of the Contractor and shall be disposed of in accordance with Section [02 41 00](#), "Demolition," except as specified herein.

1.6 EQUIPMENT

Furnish the Contracting Officer with two complete sets of personal protective equipment daily, as required herein, for entry into and inspection of the removal work within the lead controlled area. Personal protective equipment shall include fitted respirators and disposable whole body covering, including appropriate foot, head, and hand protection. PPE shall remain the property of the Contractor.

1.6.1 Respirators

Furnish appropriate respirators approved by the NIOSH, Department of Health and Human Services, for use in atmospheres containing lead dust. Respirators shall comply with the requirements of [29 CFR 1926.62](#) and [29 CFR 1926.103](#).

1.6.2 Special Protective Clothing

Furnish personnel who will be exposed to lead-contaminated dust with appropriate disposable protective whole body clothing, head covering, gloves, and foot coverings. Furnish appropriate disposable plastic or rubber gloves to protect hands. Reduce the level of protection only after obtaining approval from the CIH.

1.6.3 Rental Equipment Notification

If rental equipment is to be used during lead-containing paint handling and disposal, notify the rental agency in writing concerning the intended use of the equipment. Furnish a copy of the written notification to the Contracting Officer.

1.6.4 Vacuum Filters

UL 586 labeled HEPA filters.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 PROTECTION

3.1.1 Notification

Notify the Contracting Officer 20 days prior to the start of any removal work.

3.1.2 Lead Control Area Requirements

- a. Establish a lead control area by completely enclosing with containment screens the area or structure where materials coated with lead-containing paint removal operations will be performed.

or

- a. Contain removal operations by the use of a negative pressure full containment system with at least one change room and with HEPA filtered exhaust.

3.1.3 Protection of Existing Work to Remain

Perform removal work without damage or contamination of adjacent areas. Where existing work is damaged or contaminated, restore work to its original condition or better.

3.1.4 Boundary Requirements

Provide physical boundaries around the lead control area by roping off the area or providing curtains, portable partitions or other enclosures to ensure that airborne concentrations of lead will not reach 30 micrograms per cubic meter of air outside of the lead control area.

3.1.5 Furnishings

The Government will remove furniture and equipment from the work area before lead-containing paint removal work begins.

3.1.6 Heating, Ventilating and Air Conditioning HVAC Systems

Shut down, lock out, and isolate HVAC systems that supply, exhaust, or pass through the lead control areas. Seal intake and exhaust vents in the lead control area with 6-mil plastic sheet and tape. Seal seams in HVAC components that pass through the lead control area.

3.1.7 Change Room and Shower Facilities

Provide clean change rooms and shower facilities within the physical boundary around the designated lead control area in accordance with requirements of [29 CFR 1926.62](#).

3.1.8 Mechanical Ventilation System

- a. Use adequate ventilation to control personnel exposure to lead in accordance with [29 CFR 1926.57](#).
- b. To the extent feasible, use fixed local exhaust ventilation connected to HEPA filters or other collection systems, approved by the industrial hygienist. Local exhaust ventilation systems shall be designed, constructed, installed, and maintained in accordance with [ANSI Z9.2](#).

3.1.9 Personnel Protection

Personnel shall wear and use protective clothing and equipment as specified herein. Eating, smoking, or drinking is not permitted in the lead control area. No one will be permitted in the lead control area unless they have been given appropriate training and protective equipment.

3.1.10 Warning Signs

Provide warning signs at approaches to lead control areas. Locate signs at such a distance that personnel may read the sign and take the necessary precautions before entering the area. Signs shall comply with the requirements of [29 CFR 1926.62](#).

3.2 WORK PROCEDURES

The work shall include removal of materials coated with lead containing paint. Materials shall be removed with coating adhered and intact. No sanding, sandblasting or other procedures which may cause lead containing particles to become airborne shall be used for demolition. The Contractor is advised of these conditions and shall be responsible for compliance with all EPA, Federal, State and Local Requirements.

3.2.1 Painted Cabinets, Wood Trim, Drywall, Windows, and Doors

Remove all painted cabinets, wood trim, drywall, windows, and doors with coating intact. Perform removal of materials coated with lead-containing paint in accordance with approved procedures. Use procedures and equipment required to limit occupational environmental exposure to lead when materials coated with lead-containing paint are removed in accordance with

29 CFR 1926.62, except as specified herein.

3.2.2 Personnel Exiting Procedures

Whenever personnel exit the lead-controlled area, they shall perform the following procedures and shall not leave the work place wearing any clothing or equipment worn during the work day:

- a. Vacuum themselves off.
- b. Remove protective clothing in the decontamination room, and place them in an approved impermeable disposal bag.
- c. Shower.
- d. Change to clean clothes prior to leaving the physical boundary designated around the lead-contaminated job site.

3.2.3 Monitoring

Monitoring of airborne concentrations of lead shall be in accordance with 29 CFR 1926.62 and as specified herein. Air monitoring, testing, and reporting shall be performed by a CIH or an Industrial Hygiene (IH) Technician who is under the direction of the CIH.

- a. The CIH or the IH Technician under the direction of the CIH shall be on the jobsite directing the monitoring, and inspecting the lead-containing paint removal work to ensure that the requirements of the Contract have been satisfied during the entire removal of materials coated with lead-containing paint operation.
- b. Take personal air monitoring samples on employees who are anticipated to have the greatest risk of exposure as determined by the CIH. In addition, take air monitoring samples on at least 25 percent of the work crew or a minimum of two employees, whichever is greater, during each work shift.
- c. Submit results of air monitoring samples, signed by the CIH, within 72 hours after the air samples are taken. Notify the Contracting Officer immediately of exposure to lead at or in excess of the action level of 30 micrograms per cubic meter of air outside of the lead control area.

3.2.3.1 Monitoring During Removal Work

Perform personal and area monitoring during the entire removal operation. Sufficient area monitoring shall be conducted at the physical boundary to ensure unprotected personnel are not exposed above 30 micrograms per cubic meter of air at all times. If the outside boundary lead levels are at or exceed 30 micrograms per cubic meter of air, work shall be stopped and the CIH shall immediately correct the condition(s) causing the increased levels and notify the Contracting Officer immediately. The CIH shall review the sampling data collected on that day to determine if condition(s) requires any further change in work methods. Removal work shall resume when approval is given by the CIH. The Contractor shall control the lead level outside of the work boundary to less than 30 micrograms per cubic meter of air at all times. As a minimum, conduct area monitoring daily on each shift in which lead paint removal operations are performed in areas immediately adjacent to the lead control area. For outdoor operations, at

least one sample on each shift shall be taken on the downwind side of the lead control area. If adjacent areas are contaminated, clean and visually inspect contaminated areas. The CIH shall certify that the area has been cleaned of lead contamination.

3.3 MATERIALS COATED WITH LEAD-CONTAINING PAINT REMOVAL

Manual or power sanding of interior and exterior surfaces is not permitted. Remove materials coated with lead containing paint within the areas designated on the drawings. Take whatever precautions are necessary to minimize damage to the underlying substrate or adjacent surfaces to remain.

3.4 CLEANUP AND DISPOSAL

3.4.1 Cleanup

Maintain surfaces of the lead control area free of accumulations of paint chips and dust. Restrict the spread of dust and debris; keep waste from being distributed over the work area. Do not dry sweep or use compressed air to clean up the area. At the end of each shift and when the paint removal operation has been completed, clean the area of visible lead paint contamination by vacuuming with a HEPA filtered vacuum cleaner and wet mopping the area.

3.4.2 Certification

The CIH shall certify in writing that the inside and outside the lead control area air monitoring samples are less than 30 micrograms per cubic meter of air, the respiratory protection for the employees was adequate, the work procedures were performed in accordance with 29 CFR 1926.62, and that there were no visible accumulations of lead-contaminated paint and dust on the worksite. Do not remove the lead control area or roped-off boundary and warning signs prior to the Contracting Officer's receipt of the CIH's certification. Reclean areas showing dust or residual paint chips.

3.4.3 Testing of Lead-Containing Paint Residue

Test lead containing paint residue in accordance with 40 CFR 261 for hazardous waste. A composite sample of dust and debris collected after removal is complete must be tested for lead using EPA protocol Total Characteristic Leachate Procedure (TCLP) Test. If the results of that test are less than five parts per million (PPM), it may be disposed of at the Base Landfill. If the results are greater than five PPM, it will be considered a hazardous waste and disposed of accordingly.

3.4.4 Disposal

Dispose of removed materials and associated waste in compliance with Environmental Protection Agency EPA, Federal, State, and Local requirements and the approved work plans for removal and disposal.

- a. Materials (except metals) coated with lead-containing paint which is well adhered shall be disposed of in the Base Sanitary Landfill, provided all Base and Landfill requirements are complied with. Comply with the land disposal restriction notification requirements of 40 CFR 258.

- b. All debris, paint chips, and dust may be considered a hazardous waste. Dispose of this material if TCLP = 5ppm off Base in an approved hazardous waste facility.

-- End of Section --

SECTION 02 84 16

HANDLING OF LIGHTING BALLASTS AND LAMPS CONTAINING PCBs AND MERCURY

04/06

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

- 29 CFR 1910.1000 Air Contaminants
- 40 CFR 260 Hazardous Waste Management System: General
- 40 CFR 261 Identification and Listing of Hazardous Waste
- 40 CFR 262 Generators of Hazardous Waste
- 40 CFR 263 Transporters of Hazardous Waste
- 40 CFR 264 Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
- 40 CFR 265 Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
- 40 CFR 268 Land Disposal Restrictions
- 40 CFR 270 EPA Administered Permit Programs: The Hazardous Waste Permit Program
- 40 CFR 273 Standards For Universal Waste Management
- 40 CFR 761 Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions
- 49 CFR 178 Specifications for Packagings

1.2 REQUIREMENTS

Removal and disposal of PCB containing lighting ballasts and associated mercury-containing lamps. Contractor may encounter leaking PCB ballasts.

1.3 DEFINITIONS

1.3.1 Certified Industrial Hygienist (CIH)

A industrial hygienist hired by the contractor shall be certified by the

American Board of Industrial Hygiene.

1.3.2 Leak

Leak or leaking means any instance in which a PCB article, PCB container, or PCB equipment has any PCBs on any portion of its external surface.

1.3.3 Lamps

Lamp, also referred to as "universal waste lamp", is defined as the bulb or tube portion of an electric lighting device. A lamp is specifically designed to produce radiant energy, most often in the ultraviolet, visible, and infra-red regions of the electromagnetic spectrum. Examples of common universal waste electric lamps include, but are not limited to, fluorescent, high intensity discharge, neon, mercury vapor, high pressure sodium, and metal halide lamps.

1.3.4 Polychlorinated Biphenyls (PCBs)

PCBs as used in this specification shall mean the same as PCBs, PCB containing lighting ballast, and PCB container, as defined in 40 CFR 761, Section 3, Definitions.

1.3.5 Spill

Spill means both intentional and unintentional spills, leaks, and other uncontrolled discharges when the release results in any quantity of PCBs running off or about to run off the external surface of the equipment or other PCB source, as well as the contamination resulting from those releases.

1.3.6 Universal Waste

Universal Waste means any of the following hazardous wastes that are managed under the universal waste requirements 40 CFR 273:

- (1) Batteries as described in Sec. 273.2 of this chapter;
- (2) Pesticides as described in Sec. 273.3 of this chapter;
- (3) Thermostats as described in Sec. 273.4 of this chapter; and
- (4) Lamps as described in Sec. 273.5 of this chapter.

1.4 QUALITY ASSURANCE

1.4.1 Regulatory Requirements

Perform PCB related work in accordance with 40 CFR 761 Perform mercury-containing lamps storage and transport in accordance with 40 CFR 261, 40 CFR 264, 40 CFR 265, 40 CFR 273.

1.4.2 Training

Certified industrial hygienist (CIH) shall instruct and certify the training of all persons involved in the removal of PCB containing lighting ballasts and mercury-containing lamps. The instruction shall include: The dangers of PCB and mercury exposure, decontamination, safe work practices, and applicable OSHA and EPA regulations. The CIH shall review and approve the PCB and Mercury-Containing Lamp Removal Work Plans.

1.4.3 Regulation Documents

Maintain at all times one copy each at the office and one copy each in view at the job site of 29 CFR 1910.1000, 40 CFR 260, 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 265, 40 CFR 268, 40 CFR 270, 40 CFR 273 and of the Contractor removal work plan and disposal plan for PCB and for associated mercury-containing lamps.

1.5 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-07 Certificates

Qualifications of CIH

Training Certification

PCB and Lamp Removal Work Plan

PCB and Lamp Disposal Plan

SD-11 Closeout Submittals

Transporter certification of notification to EPA of their PCB waste activities and EPA ID numbers

Certification of Decontamination

Certificate of Disposal and/or recycling. Submit to the Government before application for payment within 30 days of the date that the disposal of the PCB and mercury-containing lamp waste identified on the manifest was completed.

DD Form 1348-1

1.6 ENVIRONMENTAL REQUIREMENTS

Use special clothing:

- a. Disposable gloves (polyethylene)
- b. Eye protection
- c. PPE as required by CIH

1.7 SCHEDULING

Notify the Contracting Officer 20 days prior to the start of PCB and mercury-containing lamp removal work.

1.8 QUALITY ASSURANCE

1.8.1 Qualifications of CIH

Submit the name, address, and telephone number of the Industrial Hygienist selected to perform the duties in paragraph entitled "Certified Industrial Hygienist." Submit training certification that the Industrial Hygienist is

certified, including certification number and date of certification or re certification.

1.8.2 PCB and Lamp Removal Work Plan

Submit a job-specific plan within 20 calendar days after award of contract of the work procedures to be used in the removal, packaging, and storage of PCB-containing lighting ballasts and associated mercury-containing lamps. Include in the plan: Requirements for Personal Protective Equipment (PPE), spill cleanup procedures and equipment, eating, smoking and restroom procedures. The plan shall be approved and signed by the Certified Industrial Hygienist. Obtain approval of the plan by the Contracting Officer prior to the start of PCB and/or lamp removal work.

1.8.3 PCB and Lamp Disposal Plan

Submit a PCB and lamp Disposal Plan with 45 calendar days after award of contract. The PCB and Lamp Disposal Plan shall comply with applicable requirements of federal, state, and local PCB and Universal waste regulations and address:

- a. Estimated quantities of wastes to be generated, disposed of, and recycled.
- b. Names and qualifications of each Contractor that will be transporting, storing, treating, and disposing of the wastes. Include the facility location. Furnish two copies of EPA and state PCB and mercury-containing lamp waste permit applications and EPA identification numbers, as required.
- c. Names and qualifications (experience and training) of personnel who will be working on-site with PCB and mercury-containing lamp wastes.
- d. Spill prevention, containment, and cleanup contingency measures to be implemented.
- e. Work plan and schedule for PCB and mercury-containing lamp waste removal, containment, storage, transportation, disposal and or recycling. Wastes shall be cleaned up and containerize daily.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 WORK PROCEDURE

Furnish labor, materials, services, and equipment necessary for the removal of PCB containing lighting ballasts, associated mercury-containing fluorescent lamps, and high intensity discharge (HID) lamps in accordance with local, state, or federal regulations. Do not expose PCBs to open flames or other high temperature sources since toxic decomposition by-products may be produced. Do not break mercury containing fluorescent lamps or high intensity discharge lamps.

3.1.1 Work Operations

Ensure that work operations or processes involving PCB or PCB-contaminated materials are conducted in accordance with 40 CFR 761, 40 CFR 262 40 CFR 263, and the applicable requirements of this section, including but not limited to:

- a. Obtaining suitable PCB and mercury-containing lamp storage sites.
- b. Notifying Contracting Officer prior to commencing the operation.
- c. Reporting leaks and spills to the Contracting Officer.
- d. Cleaning up spills.
- e. Inspecting PCB and PCB-contaminated items and waste containers for leaks and forwarding copies of inspection reports to the Contracting Officer.
- f. Maintaining inspection, inventory and spill records.

3.2 PCB SPILL CLEANUP REQUIREMENTS

3.2.1 PCB Spills

Immediately report to the Contracting Officer any PCB spills.

3.2.2 PCB Spill Control Area

Rope off an area around the edges of a PCB leak or spill and post a "PCB Spill Authorized Personnel Only" caution sign. Immediately transfer leaking items to a drip pan or other container.

3.2.3 PCB Spill Cleanup

40 CFR 761, subpart G. Initiate cleanup of spills as soon as possible, but no later than 24 hours of its discovery. Mop up the liquid with rags or other conventional absorbent. The spent absorbent shall be properly contained and disposed of as solid PCB waste.

3.2.4 Records and Certification

Document the cleanup with records of decontamination in accordance with 40 CFR 761, Section 125, Requirements for PCB Spill Cleanup. Provide test results of cleanup and [certification of decontamination](#).

3.3 REMOVAL

3.3.1 Ballasts

As ballast are removed from the lighting fixture, inspect label on ballast. Ballasts without a "No PCB" label shall be assumed to contain PCBs and containerized and disposed of as required under paragraphs STORAGE FOR DISPOSAL and DISPOSAL. If there are less than 1600 "No PCB" labeled lighting ballasts dispose of them as normal demolition debris.

3.3.2 Lighting Lamps

Remove lighting tubes/lamps from the lighting fixture and carefully place

(unbroken) into appropriate containers (original transport boxes or equivalent). In the event of a lighting tube/lamp breaking, sweep and place waste in double plastic taped bags and dispose of as universal waste as specified herein.

3.4 STORAGE FOR DISPOSAL

3.4.1 Storage Containers for PCBs

49 CFR 178. Store PCB in containers approved by DOT for PCB.

3.4.2 Storage Containers for lamps

Store mercury containing lamps in appropriate DOT containers. The boxes shall be stored and labeled for transport in accordance with 40 CFR 273.

3.4.3 Labeling of Waste Containers

Label with the following:

- a. Date the item was placed in storage and the name of the cognizant activity/building.
- b. "Caution Contains PCB," conforming to 40 CFR 761, CFR Subpart C. Affix labels to PCB waste containers.
- c. Label mercury-containing lamp waste in accordance with 40 CFR 273. Affix labels to all lighting waste containers.

3.5 DISPOSAL

Dispose of off Government property in accordance with EPA, DOT, and local regulations at a permitted site.

3.5.1 Identification Number

Federal regulations 40 CFR 761, and 40 CFR 263 require that generators, transporters, commercial storers, and disposers of PCB waste possess U.S. EPA identification numbers. The contractor shall verify that the activity has a U.S. EPA generator identification number for use on the Uniform Hazardous Waste manifest. If not, the contractor shall advise the activity that it must file and obtain an I.D. number with EPA prior to commencement of removal work. For mercury containing lamp removal, Federal regulations 40 CFR 273 require that large quantity handlers of Universal waste (LQHUW) must provide notification of universal waste management to the appropriate EPA Region (or state director in authorized states), obtain an EPA identification number, and retain for three years records of off-site shipments of universal waste. The contractor shall verify that the activity has a U.S. EPA generator identification number for use on the Universal Waste manifest. If not, the contractor shall advise the activity that it must file and obtain an I.D. number with EPA prior to commencement of removal work.

3.5.2 Transporter Certification

Comply with disposal and transportation requirements outlined in 40 CFR 761 and 40 CFR 263. Before transporting the PCB waste, sign and date the manifest acknowledging acceptance of the PCB waste from the Government. Return a signed copy to the Government before leaving the job site. Ensure

that the manifest accompanies the PCB waste at all times. Submit transporter certification of notification to EPA of their PCB waste activities (EPA Form 7710-53).

3.5.2.1 Certificate of Disposal and/or Recycling

40 CFR 761. Certificate for the PCBs and PCB items disposed shall include:

- a. The identity of the disposal and or recycling facility, by name, address, and EPA identification number.
- b. The identity of the PCB waste affected by the Certificate of Disposal including reference to the manifest number for the shipment.
- c. A statement certifying the fact of disposal and or recycling of the identified PCB waste, including the date(s) of disposal, and identifying the disposal process used.
- d. A certification as defined in 40 CFR 761.

3.5.3 Disposal by the Government

Comply with disposal and transportation requirements outlined in 40 CFR 761 and 40 CFR 263. Load and haul PCBs to the storage site at as directed by the contracting officer, operated by the Defense Reutilization and marketing Officer (DRMO). If the primary site is filled to capacity, contact the Contracting Officer.

3.5.3.1 Delivery

Contact DRMO at least 5 working days in advance to make arrangements for delivery of PCB to the storage site.

3.5.3.2 DD Form 1348-1

Prepare DD Form 1348-1 Turn-in Document (TID), which will accompany the PCB to the storage site. Ensure that a responsible person from the activity that owns the PCB signs the DD Form 1348-1.

-- End of Section --

SECTION 03 30 50

CAST-IN-PLACE CONCRETE

01/07

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI INTERNATIONAL (ACI)

- ACI 301 (1999) Standard Specifications for Structural Concrete
- ACI 305R (1999) Hot Weather Concreting
- ACI 306R (1988) Cold Weather Concreting

ASTM INTERNATIONAL (ASTM)

- ASTM A 185 (2002) Steel Welded Wire Reinforcement, Plain, for Concrete
- ASTM A 615/A 615M (2008b) Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
- ASTM C 33 (2003) Concrete Aggregates
- ASTM C 94/C94M (2000) Ready-Mixed Concrete
- ASTM C 143/C143M (2000) Slump of Hydraulic Cement Concrete
- ASTM C 156 (1998) Water Retention by Concrete Curing Methods
- ASTM D 1140 (2000) Amount of Material in Soils Finer than the No. 200 (75-micrometer) Sieve

PART 2 PRODUCTS

2.1 CONCRETE

ASTM C 94/C94M, a minimum strength of 4000 psi at 28 days and slump between 2 and 4 inches ASTM C 143/C143M.

2.2 CURING MATERIALS

ACI 301.

2.3 CONCRETE AGGREGATE

ASTM C 33, fine aggregate grading with a maximum of 3 percent by weight passing ASTM D 1140, No. 200 sieve, or coarse aggregate Size 57, 67, or 7.

2.4 REINFORCING STEEL

ASTM A 615/A 615M, Grade 60.

2.5 WELDED-WIRE FABRIC FOR CONCRETE REINFORCEMENT

ASTM A 185.

2.6 VAPOR BARRIER

Shall be polyethylene sheeting of natural color with a nominal thickness of 10 mils. The loss of moisture when determined in accordance with ASTM C 156 shall not exceed 0.055 gram per square centimeter of surface.

PART 3 EXECUTION

3.1 FILL

Under the areas to receive concrete shall be compacted to 95% density.

3.2 WORKMANSHIP

The surface immediately under concrete installed on grade shall be wetted as directed immediately before the concrete is placed.

3.3 CURING

Curing concrete shall conform to ACI 301.

3.4 CONCRETE FINISHES

Concrete shall be given a floated finish.

3.5 HOT WEATHER CONCRETE WORK

ACI 305R.

3.6 COLD WEATHER CONCRETE WORK

ACI 306R.

-- End of Section --

SECTION 04 20 00

MASONRY

02/09

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ACI INTERNATIONAL (ACI)

ACI 530/530.1 (2008) Building Code Requirements and Specification for Masonry Structures; Containing Building Code Requirements for Masonry Structures, Specification for Masonry Structures and Companion Commentaries

ASTM INTERNATIONAL (ASTM)

ASTM A 153/A 153M (2005) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

ASTM A 167 (1999; R 2004) Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

ASTM A 615/A 615M (2008b) Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

ASTM A 641/A 641M (2003) Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire

ASTM A 82/A 82M (2007) Standard Specification for Steel Wire, Plain, for Concrete Reinforcement

ASTM B 370 (2003) Standard Specification for Copper Sheet and Strip for Building Construction

ASTM C 1019 (2008a) Standard Test Method for Sampling and Testing Grout

ASTM C 1072 (2006) Standard Test Method for Measurement of Masonry Flexural Bond Strength

ASTM C 129 (2006) Standard Specification for Nonloadbearing Concrete Masonry Units

ASTM C 144	(2004) Standard Specification for Aggregate for Masonry Mortar
ASTM C 150	(2007) Standard Specification for Portland Cement
ASTM C 207	(2006) Standard Specification for Hydrated Lime for Masonry Purposes
ASTM C 216	(2007a) Facing Brick (Solid Masonry Units Made from Clay or Shale)
ASTM C 270	(2008a) Standard Specification for Mortar for Unit Masonry
ASTM C 476	(2008) Standard Specification for Grout for Masonry
ASTM C 494/C 494M	(2008a) Standard Specification for Chemical Admixtures for Concrete
ASTM C 55	(2006e1) Concrete Brick
ASTM C 641	(2007) Staining Materials in Lightweight Concrete Aggregates
ASTM C 67	(2008) Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile
ASTM C 780	(2008) Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
ASTM C 90	(2008) Loadbearing Concrete Masonry Units
ASTM C 91	(2005) Masonry Cement
ASTM C 94/C 94M	(2007) Standard Specification for Ready-Mixed Concrete
ASTM C 989	(2006) Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars

1.2 SYSTEM DESCRIPTION

1.2.1 Design Requirements

1.2.1.1 Unit Strength Method

Compute compressive strength of masonry system "Unit Strength Method," [ACI 530/530.1](#). Submit calculations and certifications of unit and mortar strength.

1.2.1.2 Masonry Strength

Determine masonry strength in accordance with [ACI 530/530.1](#); submit test reports on three prisms as specified in [ACI 530/530.1](#). The cost of testing shall be paid by the Contractor.

1.2.2 Additional Requirements

- a. Provide bracing and scaffolding necessary for masonry work. Design bracing to resist wind pressure as required by local code.

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Clay or Shale Brick
Concrete Masonry Units (CMU)
Cement
Insulation
Flashing

Manufacturer's descriptive data

Cold Weather Installation

Cold weather construction procedures.

SD-04 Samples

Clay or Shale Brick

Color samples of three stretcher units and one unit for each type of special shape. Units shall show the full range of color and texture. Submit sample of colored mortar with applicable masonry unit.

Portable Panel

One panel of clay or shale brick, 2 by 2 feet, containing approximately 24 brick facings to establish range of color and texture.

SD-05 Design Data

Unit Strength Method

Calculations and certifications of masonry unit and mortar strength.

SD-06 Test Reports

Efflorescence Test
Masonry Cement

Test reports from an approved independent laboratory. Test reports on a previously tested material shall be certified as the same as that proposed for use in this project.

SD-07 Certificates

Clay or Shale Brick

Concrete Brick
Concrete Masonry Units (CMU)
Anchors, Ties, and Bar Positioners
Expansion-Joint Materials
Joint Reinforcement
Reinforcing Steel Bars and Rods
Masonry Cement
Insulation
Admixtures for Masonry Mortar
Admixtures for Grout

Certificates of compliance stating that the materials meet the specified requirements.

SD-08 Manufacturer's Instructions

Masonry Cement

When masonry cement is used, submit the manufacturer's printed instructions on proportions of water and aggregates and on mixing to obtain the type of mortar required.

1.4 QUALITY ASSURANCE

1.4.1 Appearance

Manufacture bricks at one time and from the same batch. Blend all brick to produce a uniform appearance when installed. An observable "banding" or "layering" of colors or textures caused by improperly mixed brick is unacceptable.

1.4.2 Sample Masonry Panels

After material samples are approved and prior to starting masonry work, construct a [portable panel](#) of clay or shale brick and sample masonry panels for each type and color of masonry required. At least 48 hours prior to constructing the sample panel or panels, submit written notification to the Contracting Officer. Sample panels shall not be built in, or as part of the structure, but shall be located where directed.

1.4.2.1 Configuration

Panels shall be L-shaped or otherwise configured to represent all of the wall elements. Panels shall be of the size necessary to demonstrate the acceptable level of workmanship for each type of masonry represented on the project. The minimum size of a straight panel or a leg of an L-shaped panel shall be [8 feet](#) long by [4 feet](#) high.

1.4.2.2 Composition

Panels shall show full color range, texture, and bond pattern of the masonry work. The Contractor's method for mortar joint tooling; grouting of reinforced vertical cores, collar joints, bond beams, and lintels; positioning, securing, and lapping of reinforcing steel; positioning and lapping of joint reinforcement (including prefabricated corners); and cleaning of masonry work shall be demonstrated during the construction of the panels. Installation or application procedures for anchors, wall ties, [CMU control joints](#), [brick expansion joints](#), [insulation](#), flashing, [brick soldier](#), [row lock courses](#) and [weep holes](#) shall be shown in the sample

panels. Panels that represent reinforced masonry shall contain a 2 by 2 foot opening placed at least 2 feet above the panel base and 2 feet away from all free edges, corners, and control joints. Required reinforcing shall be provided around this opening as well as at wall corners and control joints.

1.4.2.3 Construction Method

Where anchored veneer walls are required, demonstrate and receive approval for the method of construction; i.e., either bring up the two wythes together or separately, with the insulation and appropriate ties placed within the specified tolerances across the cavity. Temporary provisions shall be demonstrated to preclude mortar or grout droppings in the cavity and to provide a clear open air space of the dimensions shown on the drawings. Where masonry is to be grouted, demonstrate and receive approval on the method that will be used to bring up the masonry wythes; support the reinforcing bars; and grout cells, bond beams, lintels, and collar joints using the requirements specified herein. If sealer is specified to be applied to the masonry units, sealer shall be applied to the sample panels. Panels shall be built on a properly designed concrete foundation.

1.4.2.4 Usage

The completed panels shall be used as the standard of workmanship for the type of masonry represented. Masonry work shall not commence until the sample panel for that type of masonry construction has been completed and approved. Panels shall be protected from the weather and construction operations until the masonry work has been completed and approved. After completion of the work, the sample panels, including all foundation concrete, shall become the property of the Contractor and shall be removed from the construction site.

1.5 DELIVERY, HANDLING, AND STORAGE

Materials shall be delivered, handled, stored, and protected to avoid chipping, breakage, and contact with soil or contaminating material. Store and prepare materials in already disturbed areas to minimize project site disturbance and size of project site.

1.5.1 Masonry Units

Cover and protect moisture-controlled concrete masonry units and cementitious materials from precipitation. Conform to all handling and storage requirements of ASTM C 90. Prefabricated lintels shall be marked on top sides to show either the lintel schedule number or the number and size of top and bottom bars.

1.5.2 Reinforcement, Anchors, and Ties

Steel reinforcing bars, coated anchors, ties, and joint reinforcement shall be stored above the ground. Steel reinforcing bars and uncoated ties shall be free of loose mill scale and rust.

1.5.3 Cementitious Materials, Sand and Aggregates

Cementitious and other packaged materials shall be delivered in unopened containers, plainly marked and labeled with manufacturers' names and brands. Cementitious material shall be stored in dry, weathertight enclosures or be completely covered. Cement shall be handled in a manner

that will prevent the inclusion of foreign materials and damage by water or dampness. Sand and aggregates shall be stored in a manner to prevent contamination or segregation.

1.6 PROJECT/SITE CONDITIONS

Conform to [ACI 530/530.1](#) for hot and cold weather masonry erection.

1.6.1 Hot Weather Installtion

Take the following precautions if masonry is erected when the ambient air temperature is more than [99 degrees F](#) in the shade and the relative humidity is less than 50 percent or the ambient air temperature exceeds [90 degrees F](#) and the wind velocity is more than [8 mph](#). All masonry materials shall be shaded from direct sunlight; mortar beds shall be spread no more than [4 feet](#) ahead of masonry; masonry units shall be set within one minute of spreading mortar; and after erection, masonry shall be protected from direct exposure to wind and sun for 48 hours.

1.6.2 Cold Weather Installation

Before erecting masonry when ambient temperature or mean daily air temperature falls below [40 degrees F](#) or temperature of masonry units is below [40 degrees F](#), submit a written statement of proposed cold weather construction procedures for approval.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

The source of materials which will affect the appearance of the finished work shall not be changed after the work has started except with Contracting Officer's approval.

2.2 CLAY OR SHALE BRICK

Color range and texture of clay or shale brick shall be as indicated and shall conform to the approved sample. Brick shall be tested for efflorescence. Clay or shale brick units shall be delivered factory-blended to provide a uniform appearance and color range in the completed wall.

2.2.1 Solid Clay or Shale Brick

Solid clay or shale brick shall conform to [ASTM C 216](#), Type FBX. Brick size shall be modular and the nominal size of the brick used shall be 3-5/8 inches thick, 2-1/4 inches high, and 8 inches long (nominal).

2.3 CONCRETE BRICK

Concrete brick shall conform to [ASTM C 55](#), Grade N. Concrete brick may be used where necessary for filling out in concrete masonry unit construction.

2.4 CONCRETE MASONRY UNITS (CMU)

Cement shall have a low alkali content and be of one brand. Units shall be of modular dimensions and air, water, or steam cured. Exposed surfaces of units shall be smooth and of uniform texture.

a. Hollow Load-Bearing Units: **ASTM C 90**, made with lightweight aggregate. Provide load-bearing units for exterior walls, foundation walls, load-bearing walls, and shear walls.

b. Hollow Non-Load-Bearing Units: **ASTM C 129**, made with lightweight aggregate. Load-bearing units may be provided in lieu of non-load-bearing units.

c. Solid Load-Bearing Units: **ASTM C 90**, lightweight units. Provide solid units for masonry bearing under structural framing members as indicated.

2.4.1 Aggregates

Lightweight aggregates and blends of lightweight and heavier aggregates in proportions used in producing the units, shall comply with the following requirements when tested for stain-producing iron compounds in accordance with **ASTM C 641**: by visual classification method, the iron stain deposited on the filter paper shall not exceed the "light stain" classification. Use industrial waste by-products (air-cooled slag, cinders, or bottom ash), ground waste glass and concrete, granulated slag, and expanded slag in aggregates. Slag shall comply with **ASTM C 989**; Grade 80.

2.4.2 Kinds and Shapes

Units shall be modular in size and shall include closer, jamb, header, lintel, and bond beam units and special shapes and sizes to complete the work as indicated. Units used in exposed masonry surfaces in any one building shall have a uniform fine to medium texture and a uniform color.

2.5 MORTAR FOR STRUCTURAL MASONRY

ASTM C 270, Type S. Test in accordance with **ASTM C 780**. Use Type I portland cement. Do not use admixtures containing chlorides. When structural reinforcement is incorporated, maximum air-content shall be 12 percent in cement-lime mortar and 18 percent in masonry cement mortar.

2.6 MASONRY MORTAR

Type S mortar shall conform to **ASTM C 270**. Mortar Type S shall conform to the proportion specification of **ASTM C 270** except Type S cement-lime mortar proportions shall be 1 part cement, 1/2 part lime and 4-1/2 parts aggregate. Verification of masonry cement performance shall be based on **ASTM C 780** and **ASTM C 1072**. Pointing mortar in showers and kitchens shall contain ammonium stearate, or aluminum tri-stearate, or calcium stearate in an amount equal to 3 percent by weight of cement used. Cement shall have a low alkali content and be of one brand. Aggregates shall be from one source.

2.6.1 Admixtures for Masonry Mortar

In cold weather, a non-chloride based accelerating admixture may be used subject to approval. Accelerating admixture shall be non-corrosive, shall contain less than 0.2 percent chlorides, and shall conform to **ASTM C 494/C 494M**, Type C.

2.6.2 Hydrated Lime and Alternates

Hydrated lime shall conform to **ASTM C 207**, Type S.

2.6.3 Cement

Portland cement shall conform to [ASTM C 150](#), Type I. [Masonry cement](#) shall conform to [ASTM C 91](#), Type S. Containers shall bear complete instructions for proportioning and mixing to obtain the required types of mortar. Incorporate to the maximum extent, without conflicting with other requirements of this section, up to 40 percent fly ash, up to 70 percent slag, up to 10 percent cenospheres, and up to 10 percent silica fume.

2.6.4 Sand and Water

Sand shall conform to [ASTM C 144](#). Water shall be clean, potable, and free from substances which could adversely affect the mortar.

2.7 GROUT AND READY-MIXED GROUT

Grout shall conform to [ASTM C 476](#), fine. Cement used in grout shall have a low alkali content. Grout slump shall be between [8 and 10 inches](#). Minimum grout strength shall be [2000 psi](#) in 28 days, as tested by [ASTM C 1019](#). Grout shall be used subject to the limitations of Table III. Proportions shall not be changed and materials with different physical or chemical characteristics shall not be used in grout for the work unless additional evidence is furnished that the grout meets the specified requirements. Ready-Mixed grout shall conform to [ASTM C 94/C 94M](#).

2.7.1 Admixtures for Grout

In cold weather, a non-chloride based accelerating admixture may be used subject to approval; accelerating admixture shall be non-corrosive, shall contain less than 0.2 percent chlorides, and shall conform to [ASTM C 494/C 494M](#), Type C. In general, air-entrainment, anti-freeze or chloride admixtures shall not be used except as approved by the Contracting Officer.

2.7.2 Grout Barriers

Grout barriers for vertical cores shall consist of fine mesh wire, fiberglass, or expanded metal.

2.8 ANCHORS, TIES, AND BAR POSITIONERS

Anchors and ties shall be fabricated without drips or crimps and shall be zinc-coated in accordance with [ASTM A 153/A 153M](#), Class B-2. Steel wire used for anchors and ties shall be fabricated from steel wire conforming to [ASTM A 82/A 82M](#). Wire ties or anchors in exterior walls shall conform to [ASTM A 641/A 641M](#). Joint reinforcement in interior walls, and in exterior or interior walls exposed to moist environment shall conform to [ASTM A 641/A 641M](#); coordinate with paragraph JOINT REINFORCEMENT below. Anchors and ties shall be sized to provide a minimum of [5/8 inch](#) mortar cover from either face.

2.8.1 Bar Positioners

Bar positioners, used to prevent displacement of reinforcing bars during the course of construction, shall be factory fabricated from 9 gauge steel wire or equivalent, and coated with a hot-dip galvanized finish. Not more than one wire shall cross the cell.

2.9 JOINT REINFORCEMENT

Joint reinforcement shall be factory fabricated from steel wire conforming to [ASTM A 82/A 82M](#), welded construction. Tack welding will not be acceptable in reinforcement used for wall ties. Wire shall have zinc coating conforming to [ASTM A 153/A 153M](#), Class B-2. All wires shall be a minimum of 9 gauge. Reinforcement shall be ladder type design, having one longitudinal wire in the mortar bed of each face shell for hollow units and one wire for solid units. Joint reinforcement shall be placed a minimum of [5/8 inch](#) cover from either face. The distance between crosswires shall not exceed [16 inches](#). Joint reinforcement for straight runs shall be furnished in flat sections not less than [10 feet](#) long. Joint reinforcement shall be provided with factory formed corners and intersections. If approved for use, joint reinforcement may be furnished with adjustable wall tie features.

2.10 REINFORCING STEEL BARS AND RODS

Reinforcing steel bars and rods shall conform to [ASTM A 615/A 615M](#), Grade 60.

2.11 RIGID BOARD-TYPE INSULATION

Provide rigid board-type insulation as specified in [Section 07 21 13 BOARD AND BLOCK INSULATION](#).

2.12 EXPANSION-JOINT MATERIALS

Backer rod and sealant shall be adequate to accommodate joint compression equal to 50 percent of the width of the joint. The backer rod shall be compressible rod stock of polyethylene foam, polyurethane foam, butyl rubber foam, or other flexible, nonabsorptive material as recommended by the sealant manufacturer. Sealant shall conform to [Section 07 92 00 JOINT SEALANTS](#), and shall be penetrating with a maximum volatile organic compound (VOC) content of 600 grams/liter.

2.13 THROUGH WALL FLASHING

Flashing shall be as specified. Provide one of the following types except that the material shall be one which is not adversely affected by dampproofing material.

- a. Copper or Stainless Steel Flashing: Copper, [ASTM B 370](#), minimum [16 ounce](#) weight; stainless steel, [ASTM A 167](#), Type 301, 302, 304, or 316, [0.015 inch](#) thick, No. 2D finish. Provide with factory-fabricated deformations that mechanically bond flashing against horizontal movement in all directions. Deformations shall consist of dimples, diagonal corrugations, or a combination of dimples and transverse corrugations.

PART 3 EXECUTION

3.1 PREPARATION

Prior to start of work, masonry inspector shall verify the applicable conditions as set forth in [ACI 530/530.1](#), inspection. The Contracting Officer will serve as inspector or will select a masonry inspector.

3.1.1 Protection

Ice or snow formed on the masonry bed shall be thawed by the application of heat. Heat shall be applied carefully until the top surface of the masonry is dry to the touch. Sections of masonry deemed frozen and damaged shall be removed before continuing construction of those sections.

- a. Air Temperature 40 to 32 Degrees F. Sand or mixing water shall be heated to produce mortar temperatures between 40 and 120 degrees F
- b. Air Temperature 32 to 25 Degrees F. Sand and mixing water shall be heated to produce mortar temperatures between 40 and 120 degrees F. Temperature of mortar on boards shall be maintained above freezing.
- c. Air Temperature 25 to 20 Degrees F. Sand and mixing water shall be heated to provide mortar temperatures between 40 and 120 degrees F. Temperature of mortar on boards shall be maintained above freezing. Sources of heat shall be used on both sides of walls under construction. Windbreaks shall be employed when wind is in excess of 15 mph.
- d. Air Temperature 20 Degrees F and below. Sand and mixing water shall be heated to provide mortar temperatures between 40 and 120 degrees F. Enclosure and auxiliary heat shall be provided to maintain air temperature above 32 degrees F. Temperature of units when laid shall not be less than 20 degrees F.

3.1.2 Completed Masonry and Masonry Not Being Worked On

- a. Mean daily air temperature 40 to 32 degrees F. Masonry shall be protected from rain or snow for 24 hours by covering with weather-resistive membrane.
- b. Mean daily air temperature 32 to 25 degrees F. Masonry shall be completely covered with weather-resistant membrane for 24 hours.
- c. Mean Daily Air Temperature 25 to 20 degrees F. Masonry shall be completely covered with insulating blankets or equally protected for 24 hours.
- d. Mean Daily Temperature 20 degrees F and Below. Masonry temperature shall be maintained above 32 degrees F for 24 hours by enclosure and supplementary heat, by electric heating blankets, infrared heat lamps, or other approved methods.

3.1.3 Stains

Protect exposed surfaces from mortar and other stains. When mortar joints are tooled, remove mortar from exposed surfaces with fiber brushes and wooden paddles. Protect base of walls from splash stains by covering adjacent ground with sand, sawdust, or polyethylene.

3.1.4 Loads

Do not apply uniform loads for at least 12 hours or concentrated loads for at least 72 hours after masonry is constructed. Provide temporary bracing as required.

3.1.5 Surfaces

Surfaces on which masonry is to be placed shall be cleaned of laitance, dust, dirt, oil, organic matter, or other foreign materials and shall be slightly roughened to provide a surface texture with a depth of at least $1/8$ inch. Sandblasting shall be used, if necessary, to remove laitance from pores and to expose the aggregate.

3.2 LAYING MASONRY UNITS

a. Coordinate masonry work with the work of other trades to accommodate built-in items and to avoid cutting and patching. Masonry units shall be laid in running bond pattern. Facing courses shall be level with back-up courses, unless the use of adjustable ties has been approved in which case the tolerances shall be plus or minus $1/2$ inch. Each unit shall be adjusted to its final position while mortar is still soft and plastic.

b. Units that have been disturbed after the mortar has stiffened shall be removed, cleaned, and relaid with fresh mortar. Air spaces, cavities, chases, expansion joints, and spaces to be grouted shall be kept free from mortar and other debris. Units used in exposed masonry surfaces shall be selected from those having the least amount of chipped edges or other imperfections detracting from the appearance of the finished work. Vertical joints shall be kept plumb.

c. Units being laid and surfaces to receive units shall be free of water film and frost. Solid units shall be laid in a nonfurrowed full bed of mortar. Mortar for veneer wythes shall be beveled and sloped toward the center of the wythe from the cavity side. Units shall be shoved into place so that the vertical joints are tight. Vertical joints of brick and the vertical face shells of concrete masonry units, except where indicated at control, expansion, and isolation joints, shall be completely filled with mortar. Mortar will be permitted to protrude up to $1/2$ inch into the space or cells to be grouted. Means shall be provided to prevent mortar from dropping into the space below.

3.2.1 Forms and Shores

Provide bracing and scaffolding as required. Design bracing to resist wind pressure as required by local codes. Forms and shores shall be sufficiently rigid to prevent deflections which may result in cracking or other damage to supported masonry and sufficiently tight to prevent leakage of mortar and grout. Supporting forms and shores shall not be removed in less than 10 days.

3.2.2 Reinforced Concrete Masonry Units Walls

Where vertical reinforcement occurs, fill cores solid with grout. Lay units in such a manner as to preserve the unobstructed vertical continuity of cores to be filled. Embed the adjacent webs in mortar to prevent leakage of grout. Remove mortar fins protruding from joints before placing grout. Minimum clear dimensions of vertical cores shall be 2 by 3 inches. Position reinforcing accurately as indicated before placing grout. As masonry work progresses, secure vertical reinforcing in place at vertical intervals not to exceed 160 bar diameters. Use puddling rod or vibrator to consolidate the grout. Minimum clear distance between masonry and vertical reinforcement shall be not less than $1/2$ inch. Unless indicated or specified otherwise, form splices by lapping bars not less than 40 bar

diameters and wire tying them together.

3.2.3 Concrete Masonry Units

Units in piers, pilasters, columns, starting courses on footings, solid foundation walls, lintels, and beams, and where cells are to be filled with grout shall be full bedded in mortar under both face shells and webs. Other units shall be full bedded under both face shells. Head joints shall be filled solidly with mortar for a distance in from the face of the unit not less than the thickness of the face shell. Foundation walls below grade shall be grouted solid. Jamb units shall be of the shapes and sizes to conform with wall units. Solid units may be incorporated in the masonry work where necessary to fill out at corners, gable slopes, and elsewhere as approved. Double walls shall be stiffened at wall-mounted plumbing fixtures by use of strap anchors, two above each fixture and two below each fixture, located to avoid pipe runs, and extending from center to center of the double wall. Walls and partitions shall be adequately reinforced for support of wall-hung plumbing fixtures when chair carriers are not specified.

3.2.4 Clay or Shale Brick Units

Brick facing shall be laid with the better face exposed. Brick shall be laid in running bond with each course bonded at corners, unless otherwise indicated. Molded brick shall be laid with the frog side down. Brick that is cored, recessed, or has other deformations may be used in sills, treads, soldier courses, except where deformations will be exposed to view.

3.2.4.1 Wetting of Units

Wetting of clay, shale brick, or hollow brick units having an initial rate of absorption of more than 1 gram per minute per square inch of bed surface shall be in conformance with ASTM C 67. The method of wetting shall ensure that each unit is nearly saturated but surface dry when laid. Test clay or shale brick daily on the job, prior to laying, as follows: Using a wax pencil, draw a circle the size of a quarter on five randomly selected bricks. Apply 20 drops of water with a medicine dropper to the surface within the circle on each brick. If the average time that the water is completely absorbed in the five bricks is less than 1-1/2 minutes, wet bricks represented by the five bricks tested.

3.2.4.2 Solid Units

Bed, head, and collar joints shall be completely filled with mortar.

3.2.4.3 Hollow Units

Hollow units shall be laid as specified for concrete masonry units.

3.2.4.4 Brick-Faced Walls

For brick-faced walls bond the two wythes in every sixth brick course with continuous horizontal joint reinforcement. Provide additional bonding ties spaced not more than 3 feet apart around the perimeter of and within 12 inches of all openings.

- a. Collar Joints: Fill collar joints solid with mortar as each course of brick is laid. Do not disturb units in place.

b. Brick Sills: Lay brick on edge, slope, and project not less than 1/2 inch beyond the face of the wall to form a wash and drip. Fill all joints solidly with mortar and tool.

3.2.4.5 Cavity Walls

Provide a continuous cavity as indicated. Securely tie the two wythes together with horizontal joint reinforcement. Bevel mortar beds away from cavity to prevent projection into cavity when bricks are shoved in place. Keep cavities clear and clean of mortar droppings. Provide weep holes of open head joints spaced 24 inches o.c. wherever the cavity is interrupted at base of wall and vertical obstructions (e.g. lintels). Cavity face of interior wythe shall be dampproofed in accordance with Section 07 11 13 BITUMINOUS DAMPPROOFING.

3.2.5 Tolerances

Masonry shall be laid plumb, true to line, with courses level. Bond pattern shall be kept plumb throughout. Corners shall be square unless noted otherwise. Except for walls constructed of prefaced concrete masonry units, masonry shall be laid within the following tolerances (plus or minus unless otherwise noted):

TABLE II

TOLERANCES

Variation from the plumb in the lines
and surfaces of columns, walls and arises

In adjacent masonry units	1/8 inch
In 10 feet	1/4 inch
In 20 feet	3/8 inch
In 40 feet or more	1/2 inch

Variations from the plumb for external corners,
expansion joints, and other conspicuous lines

In 20 feet	1/4 inch
In 40 feet or more	1/2 inch

Variations from the level for exposed lintels,
sills, parapets, horizontal grooves, and other
conspicuous lines

In 20 feet	1/4 inch
In 40 feet or more	1/2 inch

Variation from level for bed joints and top
surfaces of bearing walls

In 10 feet	1/4 inch
In 40 feet or more	1/2 inch

Variations from horizontal lines

TOLERANCES

In 10 feet	1/4 inch
In 20 feet	3/8 inch
In 40 feet or more	1/2 inch

Variations in cross sectional dimensions of columns and in thickness of walls

Minus	1/4 inch
Plus	1/2 inch

3.2.6 Cutting and Fitting

Full units of the proper size shall be used wherever possible, in lieu of cut units. Cutting and fitting, including that required to accommodate the work of others, shall be done by masonry mechanics using power masonry saws. Concrete masonry units may be wet or dry cut. Wet cut units, before being placed in the work, shall be dried to the same surface-dry appearance as uncut units being laid in the wall. Cut edges shall be clean, true and sharp. Openings in the masonry shall be made carefully so that wall plates, cover plates or escutcheons required by the installation will completely conceal the openings and will have bottoms parallel with the masonry bed joints. Reinforced masonry lintels shall be provided above openings over 12 inches wide for pipes, ducts, cable trays, and other wall penetrations, unless steel sleeves are used.

3.2.7 Jointing

Joints shall be tooled when the mortar is thumbprint hard. Horizontal joints shall be tooled last. Joints shall be brushed to remove all loose and excess mortar. Mortar joints shall be finished as follows:

3.2.7.1 Flush Joints

Joints in concealed masonry surfaces and joints at electrical outlet boxes in wet areas shall be flush cut. Flush cut joints shall be made by cutting off the mortar flush with the face of the wall. Joints in unparged masonry walls below grade shall be pointed tight. Flush joints for architectural units, such as fluted units, shall completely fill both the head and bed joints.

3.2.7.2 Tooled Joints

Joints in exposed exterior and interior masonry surfaces shall be tooled slightly concave. Joints shall be tooled with a jointer slightly larger than the joint width so that complete contact is made along the edges of the unit. Tooling shall be performed so that the mortar is compressed and the joint surface is sealed. Jointer of sufficient length shall be used to obtain a straight and true mortar joint.

3.2.7.3 Door and Window Frame Joints

On the exposed interior side of exterior frames, joints between frames and abutting masonry walls shall be raked to a depth of 3/8 inch. On the exterior side of exterior frames, joints between frames and abutting

masonry walls shall be raked to a depth of 3/8 inch.

3.2.8 Joint Widths

Joint widths shall be as follows:

3.2.8.1 Concrete Masonry Units

Concrete masonry units shall have 3/8 inch joints, except for prefaced concrete masonry units.

3.2.8.2 Brick

Brick joint widths shall be the difference between the actual and nominal dimensions of the brick in either height or length. Brick expansion joint widths shall be as shown.

3.2.9 Embedded Items

Spaces around built-in items shall be filled with mortar. Openings around flush-mount electrical outlet boxes in wet locations shall be pointed with mortar. Anchors, ties, wall plugs, accessories, flashing, pipe sleeves and other items required to be built-in shall be embedded as the masonry work progresses. Anchors, ties and joint reinforcement shall be fully embedded in the mortar. Cells receiving anchor bolts and cells of the first course below bearing plates shall be filled with grout.

3.2.10 Unfinished Work

Unfinished work shall be stepped back for joining with new work. Tothing may be resorted to only when specifically approved. Loose mortar shall be removed and the exposed joints shall be thoroughly cleaned before laying new work.

3.2.11 Masonry Wall Intersections

Each course shall be masonry bonded at corners and elsewhere as shown. Masonry walls shall be anchored or tied together at corners and intersections with bond beam reinforcement and prefabricated corner or tee pieces of joint reinforcement as shown.

3.3 WEEP HOLES

Wherever through-wall flashing occurs, provide weep holes to drain flashing to exterior at acceptable locations as indicated on drawings. Weep holes shall be open head joints at 24 inches o.c. Weep holes shall be provided not more than 24 inches on centers in mortar joints of the exterior wythe above wall flashing, over foundations, bond beams, and any other horizontal interruptions of the cavity. Weep holes shall be perfectly horizontal or slightly canted downward to encourage water drainage outward and not inward. Weep holes shall be kept free of mortar and other obstructions.

3.4 MORTAR MIX

Mortar shall be mixed in a mechanically operated mortar mixer for at least 3 minutes, but not more than 5 minutes. Measurement of ingredients for mortar shall be by volume. Ingredients not in containers, such as sand, shall be accurately measured by the use of measuring boxes. Water shall be mixed with the dry ingredients in sufficient amount to provide a workable

mixture which will adhere to the vertical surfaces of masonry units. Mortar that has stiffened because of loss of water through evaporation shall be retempered by adding water to restore the proper consistency and workability. Mortar that has reached its initial set or that has not been used within 2.5 hours after mixing shall be discarded.

3.5 REINFORCING STEEL

Reinforcement shall be cleaned of loose, flaky rust, scale, grease, mortar, grout, or other coating which might destroy or reduce its bond prior to placing grout. Bars with kinks or bends not shown on the drawings shall not be used. Reinforcement shall be placed prior to grouting. Unless otherwise indicated, vertical wall reinforcement shall extend to within 2 inches of tops of walls.

3.5.1 Positioning Bars

Vertical bars shall be accurately placed within the cells at the positions indicated on the drawings. A minimum clearance of 1/2 inch shall be maintained between the bars and masonry units. Minimum clearance between parallel bars shall be one diameter of the reinforcement. Vertical reinforcing may be held in place using bar positioners located near the ends of each bar and at intermediate intervals of not more than 192 diameters of the reinforcement. Column and pilaster ties shall be wired in position around the vertical steel. Ties shall be in contact with the vertical reinforcement and shall not be placed in horizontal bed joints.

3.5.2 Splices

Bars shall be lapped a minimum of 48 diameters of the reinforcement. Welded or mechanical connections shall develop at least 125 percent of the specified yield strength of the reinforcement.

3.6 JOINT REINFORCEMENT INSTALLATION

Joint reinforcement shall be installed at 16 inches on center or as indicated. Reinforcement shall be lapped not less than 6 inches. Prefabricated sections shall be installed at corners and wall intersections. The longitudinal wires of joint reinforcement shall be placed to provide not less than 5/8 inch cover to either face of the unit.

3.7 PLACING GROUT

Cells containing reinforcing bars shall be filled with grout. Hollow masonry units in walls or partitions supporting plumbing, heating, or other mechanical fixtures, voids at door and window jambs, and other indicated spaces shall be filled solid with grout. Cells under lintel bearings on each side of openings shall be filled solid with grout for full height of openings. Walls below grade, lintels, and bond beams shall be filled solid with grout. Units other than open end units may require grouting each course to preclude voids in the units. Grout not in place within 1-1/2 hours after water is first added to the batch shall be discarded. Sufficient time shall be allowed between grout lifts to preclude displacement or cracking of face shells of masonry units. If blowouts, flowouts, misalignment, or cracking of face shells should occur during construction, the wall shall be torn down and rebuilt.

3.7.1 Vertical Grout Barriers for Fully Grouted Walls

Grout barriers shall be provided not more than 30 feet apart, or as required, to limit the horizontal flow of grout for each pour.

3.7.2 Horizontal Grout Barriers

Grout barriers shall be embedded in mortar below cells of hollow units receiving grout.

3.7.3 Grout Holes and Cleanouts

3.7.3.1 Grout Holes

Grouting holes shall be provided in slabs, spandrel beams, and other in-place overhead construction. Holes shall be located over vertical reinforcing bars or as required to facilitate grout fill in bond beams. Additional openings spaced not more than 16 inches on centers shall be provided where grouting of all hollow unit masonry is indicated. Openings shall not be less than 4 inches in diameter or 3 by 4 inches in horizontal dimensions. Upon completion of grouting operations, grouting holes shall be plugged and finished to match surrounding surfaces.

3.7.3.2 Cleanouts for Hollow Unit Masonry Construction

Cleanout holes shall be provided at the bottom of every pour in cores containing vertical reinforcement when the height of the grout pour exceeds 5 feet. Where all cells are to be grouted, cleanout courses shall be constructed using bond beam units in an inverted position to permit cleaning of all cells. Cleanout holes shall be provided at a maximum spacing of 32 inches where all cells are to be filled with grout. A new series of cleanouts shall be established if grouting operations are stopped for more than 4 hours. Cleanouts shall not be less than 3 by 4 inch openings cut from one face shell. Manufacturer's standard cutout units may be used at the Contractor's option. Cleanout holes shall not be closed until masonry work, reinforcement, and final cleaning of the grout spaces have been completed and inspected. For walls which will be exposed to view, cleanout holes shall be closed in an approved manner to match surrounding masonry.

3.7.3.3 Cleanouts for Solid Unit Masonry Construction

Cleanouts for construction of walls consisting of a grout filled cavity between solid masonry wythes shall be provided at the bottom of every pour by omitting every other masonry unit from one wythe. A new series of cleanouts shall be established if grouting operations are stopped for more than 4 hours. Cleanout holes shall not be plugged until masonry work, reinforcement, and final cleaning of the grout spaces have been completed and inspected. For walls which will be exposed to view, cleanout holes shall be closed in an approved manner to match surrounding masonry.

3.7.4 Grouting Equipment

3.7.4.1 Grout Pumps

Pumping through aluminum tubes will not be permitted. Pumps shall be operated to produce a continuous stream of grout without air pockets, segregation, or contamination. Upon completion of each day's pumping, waste materials and debris shall be removed from the equipment, and

disposed of outside the masonry.

3.7.4.2 Vibrators

Internal vibrators shall maintain a speed of not less than 5,000 impulses per minute when submerged in the grout. At least one spare vibrator shall be maintained at the site at all times. Vibrators shall be applied at uniformly spaced points not further apart than the visible effectiveness of the machine. Duration of vibration shall be limited to time necessary to produce satisfactory consolidation without causing segregation.

3.7.5 Grout Placement

Masonry shall be laid to the top of a pour before placing grout. Grout shall not be placed in two-wythe solid unit masonry cavity until mortar joints have set for at least 3 days during hot weather and 5 days during cold damp weather. Grout shall not be placed in hollow unit masonry until mortar joints have set for at least 24 hours. Grout shall be placed using a hand bucket, concrete hopper, or grout pump to completely fill the grout spaces without segregation of the aggregates. Vibrators shall not be inserted into lower pours that are in a semi-solidified state. The height of grout pours and type of grout used shall be limited by the dimensions of grout spaces as indicated in Table III. Low-lift grout methods may be used on pours up to and including 5 feet in height. High-lift grout methods shall be used on pours exceeding 5 feet in height.

3.7.5.1 Low-Lift Method

Grout shall be placed at a rate that will not cause displacement of the masonry due to hydrostatic pressure of the grout. Mortar protruding more than 1/2 inch into the grout space shall be removed before beginning the grouting operation. Grout pours 12 inches or less in height shall be consolidated by mechanical vibration or by puddling. Grout pours over 12 inches in height shall be consolidated by mechanical vibration and reconsolidated by mechanical vibration after initial water loss and settlement has occurred. Vibrators shall not be inserted into lower pours that are in a semi-solidified state. Low-lift grout shall be used subject to the limitations of Table III.

3.7.5.2 High-Lift Method

Mortar droppings shall be cleaned from the bottom of the grout space and from reinforcing steel. Mortar protruding more than 1/4 inch into the grout space shall be removed by dislodging the projections with a rod or stick as the work progresses. Reinforcing, bolts, and embedded connections shall be rigidly held in position before grouting is started. CMU units shall not be pre-wetted. Grout, from the mixer to the point of deposit in the grout space shall be placed as rapidly as practical by pumping and placing methods which will prevent segregation of the mix and cause a minimum of grout splatter on reinforcing and masonry surfaces not being immediately encased in the grout lift. The individual lifts of grout shall be limited to 4 feet in height. The first lift of grout shall be placed to a uniform height within the pour section and vibrated thoroughly to fill all voids. This first vibration shall follow immediately behind the pouring of the grout using an approved mechanical vibrator. After a waiting period sufficient to permit the grout to become plastic, but before it has taken any set, the succeeding lift shall be poured and vibrated 12 to 18 inches into the preceding lift. If the placing of the succeeding lift is going to be delayed beyond the period of workability of the

preceding, each lift shall be reconsolidated by reworking with a second vibrator as soon as the grout has taken its settlement shrinkage. The waiting, pouring, and reconsolidation steps shall be repeated until the top of the pour is reached. The top lift shall be reconsolidated after the required waiting period. The high-lift grouting of any section of wall between vertical grout barriers shall be completed to the top of a pour in one working day unless a new series of cleanout holes is established and the resulting horizontal construction joint cleaned. High-lift grout shall be used subject to the limitations in Table III.

TABLE III

POUR HEIGHT AND TYPE OF GROUT FOR VARIOUS GROUT SPACE DIMENSIONS

Maximum Grout Pour Height (feet) (4)	Grout Type	Grouting Procedure	Minimum Dimensions of the Total Clear Areas Within Grout Spaces and Cells (in.) (1,2)	
			Multiwythe Masonry (3)	Hollow-unit Masonry
1	Fine	Low Lift	3/4	1-1/2 x 2
5	Fine	Low Lift	2	2 x 3
8	Fine	High Lift	2	2 x 3
12	Fine	High Lift	2-1/2	2-1/2 x 3
24	Fine	High Lift	3	3 x 3
1	Coarse	Low Lift	1-1/2	1-1/2 x 3
5	Coarse	Low Lift	2	2-1/2 x 3
8	Coarse	High Lift	2	3 x 3
12	Coarse	High Lift	2-1/2	3 x 3
24	Coarse	High Lift	3	3 x 4

Notes:

- (1) The actual grout space or cell dimension shall be larger than the sum of the following items:
 - a) The required minimum dimensions of total clear areas given in the table above;
 - b) The width of any mortar projections within the space;
 - c) The horizontal projections of the diameters of the horizontal reinforcing bars within a cross section of the grout space or cell.
- (2) The minimum dimensions of the total clear areas shall be made up of one or more open areas, with at least one area being 3/4 inch or greater in width.
- (3) For grouting spaces between masonry wythes.
- (4) Where only cells of hollow masonry units containing reinforcement are grouted, the maximum height of the pour shall not exceed the distance between horizontal bond beams.

3.8 BOND BEAMS

Bond beams shall be filled with grout and reinforced as indicated on the drawings. Grout barriers shall be installed under bond beam units to retain the grout as required. Reinforcement shall be continuous, including around corners, except through control joints or expansion joints, unless otherwise indicated on the drawings. Where splices are required for

continuity, reinforcement shall be lapped 48 bar diameters. A minimum clearance of 1/2 inch shall be maintained between reinforcement and interior faces of units.

3.9 LINTELS

3.9.1 Masonry Lintels

Construct masonry lintels with lintel units filled solid with grout in all courses and reinforced with a minimum of two No. 4 bars in the bottom course unless otherwise indicated on the drawings. Lintel reinforcement shall extend beyond each side of masonry opening 40 bar diameters or 24 inches, whichever is greater. Reinforcing bars shall be supported in place prior to grouting and shall be located 1/2 inch above the bottom inside surface of the lintel unit.

3.9.2 Steel Lintels

Steel lintels shall have a minimum bearing length of 8 inches unless otherwise indicated on the drawings.

3.10 INSULATION

Anchored veneer walls shall be insulated, where shown, by installing board-type insulation on the cavity side of the inner wythe. Board type insulation shall be applied directly to the masonry or thru-wall flashing with adhesive. Insulation shall be neatly fitted between obstructions without impaling of insulation on ties or anchors. The insulation shall be applied in parallel courses with vertical joints breaking midway over the course below and shall be applied in moderate contact with adjoining units without forcing, and shall be cut to fit neatly against adjoining surfaces.

3.11 POINTING AND CLEANING

After mortar joints have attained their initial set, but prior to hardening, completely remove mortar and grout daubs or splashings from masonry-unit surfaces that will be exposed or painted. Before completion of the work, defects in joints of masonry to be exposed or painted shall be raked out as necessary, filled with mortar, and tooled to match existing joints. Immediately after grout work is completed, scum and stains which have percolated through the masonry work shall be removed using a high pressure stream of water and a stiff bristled brush. Masonry surfaces shall not be cleaned, other than removing excess surface mortar, until mortar in joints has hardened. Masonry surfaces shall be left clean, free of mortar daubs, dirt, stain, and discoloration, including scum from cleaning operations, and with tight mortar joints throughout. Metal tools and metal brushes shall not be used for cleaning.

3.11.1 Dry-Brushing

- a. Exposed concrete masonry unit shall be dry-brushed at the end of each day's work and after any required pointing, using stiff-fiber bristled brushes

3.11.2 Clay or Shale Brick Surfaces

Exposed clay or shale brick masonry surfaces shall be cleaned as necessary to obtain surfaces free of stain, dirt, mortar and grout daubs,

efflorescence, and discoloration or scum from cleaning operations. After cleaning, examine the sample panel of similar material for discoloration or stain as a result of cleaning. If the sample panel is discolored or stained, change the method of cleaning to ensure that the masonry surfaces in the structure will not be adversely affected. The exposed masonry surfaces shall be water-soaked and then cleaned with a solution proportioned 1/2 cup trisodium phosphate and 1/2 cup laundry detergent to one gallon of water or cleaned with a proprietary masonry cleaning agent specifically recommended for the color and texture by the clay products manufacturer. The solution shall be applied with stiff fiber brushes, followed immediately by thorough rinsing with clean water. Proprietary cleaning agents shall be used in conformance with the cleaning product manufacturer's printed recommendations. Efflorescence shall be removed in conformance with the brick manufacturer's recommendations.

3.12 PROTECTION

Protect facing materials against staining. Cover top of walls with nonstaining waterproof covering or membrane when work is not in progress. Covering of the top of the unfinished walls shall continue until the wall is waterproofed with a complete roof or parapet system. Covering shall extend a minimum of 2 feet down on each side of the wall and shall be held securely in place. Before starting or resuming, top surface of masonry in place shall be cleaned of loose mortar and foreign material.

3.13 TEST REPORTS

3.13.1 Efflorescence Test

Test brick, which will be exposed to weathering, for efflorescence. Schedule tests far enough in advance of starting masonry work to permit retesting if necessary. Sampling and testing shall conform to the applicable provisions of ASTM C 67. Units meeting the definition of "effloresced" will be subject to rejection.

-- End of Section --

SECTION 05 40 00

COLD-FORMED METAL FRAMING

04/06

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISI SG02-1 (2001) North American Specification for the Design of Cold-Formed Steel Structural Members

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI SG-973 (2002) Cold-Formed Steel Design Manual

AMERICAN WELDING SOCIETY (AWS)

AWS D1.3 (1998) Structural Welding Code - Sheet Steel

ASTM INTERNATIONAL (ASTM)

ASTM A 123/A 123M (2002) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM A 153/A 153M (2005) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

ASTM A 370 (2005) Mechanical Testing of Steel Products

ASTM A 653/A 653M (2008) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

ASTM B 633 (1998e1) Electrodeposited Coatings of Zinc on Iron and Steel

ASTM C 955 (2003) Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases

ASTM E 329 (2005b) Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

SAE J78

(1998) Steel Self Drilling Tapping Screws

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Steel studs, joists, tracks, bracing, bridging and accessories

SD-07 Certificates

Load-bearing cold-formed metal framing

Mill certificates or test reports from independent testing agency, qualified in accordance with ASTM E 329, showing that the steel sheet used in the manufacture of each cold-formed component complies with the minimum yield strengths and uncoated steel thickness specified. Test reports shall be based on the results of three coupon tests in accordance with ASTM A 370.

Welds

Certified copies of welder qualifications test records showing qualification in accordance with AWS D1.3.

1.3 DELIVERY, STORAGE, AND HANDLING

Deliver materials to job site and store in adequately ventilated, dry locations. Storage area shall permit easy access for inspection and handling. If necessary to store materials outside, stack off the ground, support on a level platform, and protect from the weather as approved. Handle materials to prevent damage. Finish of the framing members shall be maintained at all times, using an approved high zinc dust content, galvanizing repair paint whenever necessary to prevent the formation of rust. Replace damaged items with new, as directed by the Contracting Officer.

1.4 LOAD-BEARING COLD-FORMED METAL FRAMING

Include top and bottom tracks, bracing, fastenings, and other accessories necessary for complete installation. Framing members shall have the structural properties indicated. Where physical structural properties are not indicated, they shall be as necessary to withstand all imposed loads. Design framing in accordance with AISI SG-973. Non-load-bearing metal framing, furring, and ceiling suspension systems are specified in Section 09 22 00 METAL SUPPORT ASSEMBLIES.

PART 2 PRODUCTS

2.1 STEEL STUDS, JOISTS, TRACKS, BRACING, BRIDGING AND ACCESSORIES

Framing components shall comply with ASTM C 955 and the following.

2.1.1 Studs and Joists of 16 Gage (0.0598 Inch) and Heavier

Galvanized steel, ASTM A 653/A 653M, SS Grade 50, G90 with 1-5/8 inch flanges.

2.2 MARKINGS

Studs and track shall have product markings stamped on the web of the section. The markings shall be repeated throughout the length of the member at a maximum spacing of 4 feet on center and shall be legible and easily read. The product marking shall include the following:

- a. An ICBO number.
- b. Manufacturer's identification.
- c. Minimum delivered uncoated steel thickness.
- d. Protective coating designator.
- e. Minimum yield strength.

2.3 CONNECTIONS

Screws for steel-to-steel connections shall be self-drilling tapping in compliance with SAE J78 of the type, size, and location as shown on the drawings. Electroplated screws shall have a Type II coating in accordance with ASTM B 633. Screws, bolts, and anchors shall be hot-dipped galvanized in accordance with ASTM A 123/A 123M or ASTM A 153/A 153M as appropriate. Screws bolts, and anchors shall be hot dipped galvanized in accordance with ASTM A 123/A 123M or ASTM A 153/A 153M as appropriate.

2.4 PLASTIC GROMMETS

Supply plastic grommets, recommended by stud manufacturer, to protect electrical wires. Prevent metal to metal contact for plumbing pipes.

PART 3 EXECUTION

3.1 FASTENING

Fasten framing members together by welding or by using self-drilling or self-tapping screws. Electrodes and screw connections shall be as required and indicated in the design calculations.

3.1.1 Welds

All welding shall be performed in accordance with AWS D1.3, as modified by AISI SG02-1. All welders, welding operations, and welding procedures shall be qualified according to AWS D1.3. All welds shall be cleaned and coated with rust inhibitive galvanizing paint. Do not field weld materials lighter than 18 gage.

3.1.2 Screws

Screws shall be self-drilling self-tapping type, size, and location shown on the drawings. Screw penetration through joined materials shall not be less than three exposed threads. Minimum spacings and edge distances for screws shall be as specified in AISI SG02-1. Screws covered by sheathing

materials shall have low profile heads.

3.2 INSTALLATION

3.2.1 Tracks

Provide accurately aligned runners at top and bottom of partitions. Anchor tracks as indicated in design calculations. Butt weld joints in tracks or splice with stud inserts. Fasteners shall be at least 3 inches from the edge of concrete slabs.

3.2.2 Studs

Cut studs square and set with firm bearing against webs of top and bottom tracks. Position studs vertically in tracks and space as indicated in design. Do not splice studs. Provide at least two studs at jambs of doors and other openings 2 feet wide or larger. Provide jack studs over openings, as necessary, to maintain indicated stud spacing. Provide tripled studs at corners, positioned to receive interior and exterior finishes. Fasten studs to top and bottom tracks by welding or screwing both flanges to the tracks. Framed wall openings shall include headers and supporting components as shown on the drawings. Headers shall be installed in all openings that are larger than the stud spacing in a wall. Provide horizontal bracing in accordance with the design calculations and [AISI SG-973](#), consisting of, as a minimum, runner channel cut to fit between and welded to the studs or hot- or cold-rolled steel channels inserted through cutouts in web of each stud and secured to studs with welded clip angles. Bracing shall be not less than the following:

<u>LOAD</u>	<u>HEIGHT</u>	<u>BRACING</u>
Wind load only	Up to 10 feet Over 10 feet	One row at mid-height Rows 5'-0" o.c. maximum
Axial load	Up to 10 feet Over 10 feet	Two rows at 1/3 points Rows 3'-4" o.c. maximum

3.2.3 Erection Tolerances

- a. Framing members which will be covered by finishes such as wallboard, plaster, or ceramic tile set in a mortar setting bed, shall be within the following limits:
 - (1) Layout of walls and partitions: 1/4 inch from intended position;
 - (2) Plates and runners: 1/4 inch in 8 feet from a straight line;
 - (3) Studs: 1/4 inch in 8 feet out of plumb, not cumulative; and
 - (4) Face of framing members: 1/4 inch in 8 feet from a true plane.
- b. Framing members which will be covered by ceramic tile set in dry-set mortar, latex-portland cement mortar, or organic adhesive shall be within the following limits:
 - (1) Layout of walls and partitions: 1/4 inch from intended position;

- (2) Plates and runners: 1/8 inch in 8 feet from a straight line;
- (3) Studs: 1/8 inch in 8 feet out of plumb, not cumulative; and
- (4) Face of framing members: 1/8 inch in 8 feet from a true plane.

-- End of Section --

SECTION 05 50 13

MISCELLANEOUS METAL FABRICATIONS

08/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ALUMINUM ASSOCIATION (AA)

- AA 46 (1978) Standards for Anodized Architectural Aluminum
- AA DAF-45 (2003) Designation System for Aluminum Finishes

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)

- ASSE/SAFE A10.3 (2006) Operations - Safety Requirements for Powder Actuated Fastening Systems

AMERICAN WELDING SOCIETY (AWS)

- AWS D1.1/D1.1M (2008) Structural Welding Code - Steel

ASME INTERNATIONAL (ASME)

- ASME B18.2.1 (1996; Addenda A 1999; Errata 2003; R 2005) Square and Hex Bolts and Screws (Inch Series)
- ASME B18.2.2 (1987; R 2005) Standard for Square and Hex Nuts
- ASME B18.21.1 (1999; R 2005) Lock Washers (Inch Series)
- ASME B18.22.1 (1965; R 2003) Plain Washers
- ASME B18.6.2 (1998; R 2005) Slotted Head Cap Screws, Square Head Set Screws, and Slotted Headless Set Screws: Inch Series
- ASME B18.6.3 (2003) Machine Screws and Machine Screw Nuts

ASTM INTERNATIONAL (ASTM)

- ASTM A 123/A 123M (2002) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- ASTM A 153/A 153M (2005) Standard Specification for Zinc

	Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 307	(2004) Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
ASTM A 36/A 36M	(2008) Standard Specification for Carbon Structural Steel
ASTM A 47/A 47M	(1999; R 2004) Standard Specification for Steel Sheet, Aluminum-Coated, by the Hot-Dip Process
ASTM A 500/A 500M	(2007) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A 53/A 53M	(2007) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 653/A 653M	(2008) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A 687	(1993) Standard Specification for High-Strength Nonheaded Steel Bolts and Studs
ASTM A 780	(2001; R 2006) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A 924/A 924M	(2008a) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM B 108	(2006) Standard Specification for Aluminum-Alloy Permanent Mold Castings
ASTM B 209	(2004) Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B 221	(2005) Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM B 26/B 26M	(2005) Standard Specification for Aluminum-Alloy Sand Castings
ASTM D 1187	(1997; R 2002e1) Asphalt-Base Emulsions for Use as Protective Coatings for Metal
	MASTER PAINTERS INSTITUTE (MPI)
MPI 79	(Jan 2004) Alkyd Anti-Corrosive Metal Primer

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC SP 3 (2004; E 2004) Power Tool Cleaning

SSPC SP 6 (7) Commercial Blast Cleaning

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Access doors and panels, installation drawings;

SD-03 Product Data

Access doors and panels

1.3 QUALIFICATION OF WELDERS

Qualify welders in accordance with AWS D1.1/D1.1M. Use procedures, materials, and equipment of the type required for the work.

1.4 DELIVERY, STORAGE, AND PROTECTION

Protect from corrosion, deformation, and other types of damage. Store items in an enclosed area free from contact with soil and weather. Remove and replace damaged items with new items.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Structural Carbon Steel

ASTM A 36/A 36M.

2.1.2 Structural Tubing

ASTM A 500/A 500M.

2.1.3 Steel Pipe

ASTM A 53/A 53M, Type E or S, Grade B.

2.1.4 Fittings for Steel Pipe

Standard malleable iron fittings ASTM A 47/A 47M.

2.1.5 Anchor Bolts

ASTM A 307. Where exposed, shall be of the same material, color, and finish as the metal to which applied.

2.1.5.1 Expansion Anchors

Provide sizes as shown on the Drawings.

2.1.5.2 Lag Screws and Bolts

ASME B18.2.1, type and grade best suited for the purpose.

2.1.5.3 Toggle Bolts

ASME B18.2.1.

2.1.5.4 Bolts, Nuts, Studs and Rivets

ASME B18.2.2 and ASTM A 687 or ASTM A 307.

2.1.5.5 Powder Driven Fasteners

Follow safety provisions of ASSE/SAFE A10.3.

2.1.5.6 Screws

ASME B18.2.1, ASME B18.6.2, and ASME B18.6.3.

2.1.5.7 Washers

Provide plain washers to conform to ASME B18.22.1. Provide beveled washers for American Standard beams and channels, square or rectangular, tapered in thickness, and smooth. Provide lock washers to conform to ASME B18.21.1.

2.1.6 Aluminum Alloy Products

Conform to ASTM B 209 for sheet plate, ASTM B 221 for extrusions and ASTM B 26/B 26M or ASTM B 108 for castings, as applicable. Provide aluminum extrusions at least 1/8 inch thick and aluminum plate or sheet at least 0.050 inch thick.

2.2 FABRICATION FINISHES

2.2.1 Galvanizing

Hot-dip galvanize items specified to be zinc-coated, after fabrication where practicable. Galvanizing: ASTM A 123/A 123M, ASTM A 153/A 153M, ASTM A 653/A 653M or ASTM A 924/A 924M, G90, as applicable.

2.2.2 Galvanize

Anchor bolts, grating fasteners, washers, and parts or devices necessary for proper installation, unless indicated otherwise.

2.2.3 Repair of Zinc-Coated Surfaces

Repair damaged surfaces with galvanizing repair method and paint conforming to ASTM A 780 or by application of stick or thick paste material specifically designed for repair of galvanizing, as approved by Contracting Officer. Clean areas to be repaired and remove slag from welds. Heat surfaces to which stick or paste material is applied, with a torch to a temperature sufficient to melt the metallics in stick or paste; spread molten material uniformly over surfaces to be coated and wipe off excess material.

2.2.4 Shop Cleaning and Painting

2.2.4.1 Surface Preparation

Blast clean surfaces in accordance with **SSPC SP 6**. Surfaces that will be exposed in spaces above ceiling or in attic spaces, crawl spaces, furred spaces, and chases may be cleaned in accordance with **SSPC SP 3** in lieu of being blast cleaned. Wash cleaned surfaces which become contaminated with rust, dirt, oil, grease, or other contaminants with solvents until thoroughly clean. Steel to be embedded in concrete shall be free of dirt and grease. Do not paint or galvanize bearing surfaces, including contact surfaces within slip critical joints, but coat with rust preventative applied in the shop.

2.2.4.2 Pretreatment, Priming and Painting

Apply pretreatment, primer, and paint in accordance with manufacturer's printed instructions. On surfaces concealed in the finished construction or not accessible for finish painting, apply an additional prime coat to a minimum dry film thickness of **1.0 mil**. Tint additional prime coat with a small amount of tinting pigment.

2.2.5 Nonferrous Metal Surfaces

Protect by plating, anodic, or organic coatings.

2.2.6 Aluminum Surfaces

2.2.6.1 Surface Condition

Before finishes are applied, remove roll marks, scratches, rolled-in scratches, kinks, stains, pits, orange peel, die marks, structural streaks, and other defects which will affect uniform appearance of finished surfaces.

2.2.6.2 Aluminum Finishes

Unexposed sheet, plate and extrusions may have mill finish as fabricated. Sandblast castings' finish, medium, **AA DAF-45**, or **AA 46**. Unless otherwise specified, provide all other aluminum items with a standard mill finish. Provide a coating thickness not less than that specified for protective and decorative type finishes for items used in interior locations or architectural Class I type finish for items used in exterior locations in **AA DAF-45**. Provide a polished satin finish on items to be anodized.

2.3 ACCESS DOORS AND PANELS

Provide flush type access doors and panels unless otherwise indicated. Fabricate frames for access doors of steel not lighter than **14 gage** with welded joints and anchorage for securing into construction. Provide access doors with a minimum of **14 by 20 inches** and of not lighter than **14 gage** steel, with stiffened edges and welded attachments. Provide access doors hinged to frame and with a flush-face, turn-screw-operated latch. Provide exposed metal surface with a baked enamel finish.

Provide ceiling access panels for terminal air blenders as indicated. Provide pin-tumbler cylinder locks with appropriate cams in lieu of screwdriver-operated latches.

2.12 MISCELLANEOUS PLATES AND SHAPES

Provide for items that do not form a part of the structural steel framework, such as lintels, sill angles, miscellaneous mountings and frames. Provide lintels fabricated from structural steel shapes over openings in masonry walls and partitions as indicated and as required to support wall loads over openings. Provide with connections and fasteners. Construct to have at least 8 inches bearing on masonry at each end.

Provide angles and plates, ASTM A 36/A 36M, for embedment as indicated. Galvanize embedded items exposed to the elements according to ASTM A 123/A 123M.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

Install items at locations indicated, according to manufacturer's instructions. Verify all measurements and take all field measurements necessary before fabrication. Exposed fastenings shall be compatible materials, shall generally match in color and finish, and harmonize with the material to which fastenings are applied. Include materials and parts necessary to complete each item, even though such work is not definitely shown or specified. Poor matching of holes for fasteners shall be cause for rejection. Conceal fastenings where practicable. Thickness of metal and details of assembly and supports shall provide strength and stiffness. Form joints exposed to the weather shall be formed to exclude water. Items listed below require additional procedures.

3.2 WORKMANSHIP

Provide miscellaneous metalwork that is well formed to shape and size, with sharp lines and angles and true curves. Drilling and punching shall produce clean true lines and surfaces. Provide continuous welding along the entire area of contact except where tack welding is permitted. Do not tack weld exposed connections of work in place and ground smooth. Provide a smooth finish on exposed surfaces of work in place and unless otherwise approved, flush exposed riveting. Mill joints where tight fits are required. Corner joints shall be coped or mitered, well formed, and in true alignment. Accurately set work to established lines and elevations and securely fastened in place. Install in accordance with manufacturer's installation instructions and approved drawings, cuts, and details.

3.3 ANCHORAGE, FASTENINGS, AND CONNECTIONS

Provide anchorage where necessary for fastening miscellaneous metal items securely in place. Include for anchorage not otherwise specified or indicated slotted inserts, expansion shields, and powder-driven fasteners, when approved for concrete; toggle bolts and through bolts for masonry; machine and carriage bolts for steel; through bolts, lag bolts, and screws for wood. Do not use wood plugs in any material. Provide non-ferrous attachments for non-ferrous metal. Make exposed fastenings of compatible materials, generally matching in color and finish, to which fastenings are applied. Conceal fastenings where practicable.

3.4 BUILT-IN WORK

Form for anchorage metal work built-in with concrete or masonry, or provide with suitable anchoring devices as indicated or as required. Furnish metal

work in ample time for securing in place as the work progresses.

3.5 WELDING

Perform welding, welding inspection, and corrective welding, in accordance with [AWS D1.1/D1.1M](#). Use continuous welds on all exposed connections. Grind visible welds smooth in the finished installation.

3.6 FINISHES

3.6.1 Dissimilar Materials

Where dissimilar metals are in contact, protect surfaces with a coat conforming to [MPI 79](#) to prevent galvanic or corrosive action. Where aluminum is in contact with concrete, plaster, mortar, masonry, wood, or absorptive materials subject to wetting, protect with [ASTM D 1187](#), asphalt-base emulsion.

3.7 ACCESS PANELS

Install a removable access panel not less than [12 by 12 inches](#) directly below each valve, flow indicator, damper, or air splitter that is located above the ceiling, other than an acoustical ceiling, and that would otherwise not be accessible.

3.17 INSTALLATION OF DOWNSPOUT BOOTS

Secure downspouts to building through integral lips with appropriate fasteners.

-- End of Section --

SECTION 06 10 00

ROUGH CARPENTRY

11/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN FOREST & PAPER ASSOCIATION (AF&PA)

AF&PA T10 (2001) Wood Frame Construction Manual for One- and Two-Family Dwellings

AF&PA T101 (2001) National Design Specification (NDS) for Wood Construction

AMERICAN INSTITUTE OF TIMBER CONSTRUCTION (AITC)

AITC OT-01 (2004) Timber Construction Manual

AMERICAN LUMBER STANDARDS COMMITTEE (ALSC)

ALSC PS 20 (1970) American Softwood Lumber Standard

AMERICAN WOOD PROTECTION ASSOCIATION (AWPA)

AWPA C1 (2003) All Timber Products - Preservative Treatment by Pressure Processes

AWPA C2 (2003) Lumber, Timber, Bridge Ties and Mine Ties - Preservative Treatment by Pressure Processes

AWPA C9 (2003) Plywood - Preservative Treatment by Pressure Processes

AWPA M2 (2001) Standard for Inspection of Treated Wood Products

AWPA M6 (1996) Brands Used on Forest Products

AWPA P18 (2004) Nonpressure Preservatives

AWPA P5 (2005) Standard for Waterborne Preservatives

AWPA T1 (2004; R 2005) Use Category System: Processing and Treatment Standard

AWPA U1 (2004; R 2005) Use Category System: User Specification for Treated Wood

APA - THE ENGINEERED WOOD ASSOCIATION (APA)

APA E30	(2005) Engineered Wood Construction Guide
APA E445S	(2001; R 2002) Performance Standards and Qualification Policy for Structural-Use Panels (APA PRP-108)
APA F405L	(1999) Performance Rated Panels
APA PS 1	(1995) Voluntary Product Standard for Construction and Industrial Plywood
APA PS 2	(2004) Voluntary Product Standard for Wood-Based Structural-Use Panels

ASME INTERNATIONAL (ASME)

ASME B18.2.1	(1996; Addenda A 1999; Errata 2003; R 2005) Square and Hex Bolts and Screws (Inch Series)
ASME B18.2.2	(1987; R 2005) Standard for Square and Hex Nuts
ASME B18.5.2.1M	(2006) Metric Round Head Short Square Neck Bolts
ASME B18.5.2.2M	(1982; R 2005) Metric Round Head Square Neck Bolts
ASME B18.6.1	(1981; R 2008) Wood Screws (Inch Series)

ASTM INTERNATIONAL (ASTM)

ASTM A 307	(2004) Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
ASTM A 653/A 653M	(2008) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A 687	(1993) Standard Specification for High-Strength Nonheaded Steel Bolts and Studs
ASTM D 1435	(2005) Standard Practice for Outdoor Weathering of Plastics
ASTM D 1972	(1997; R 2005) Standard Practice for Generic Marking of Plastic Products
ASTM D 198	(2008) Standard Test Methods of Static Tests of Lumber in Structural Sizes
ASTM D 2344/D 2344M	(2000; R 2006) Standard Test Method for Short-Beam Strength of Polymer Matrix

	Composite Materials and Their Laminates
ASTM D 6108	(2003) Standard Test Method for Compressive Properties of Plastic Lumber and Shapes
ASTM D 6109	(2005) Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastic Lumber and Related Products
ASTM D 6111	(2003) Standard Test Method for Bulk Density and Specific Gravity of Plastic Lumber and Shapes by Displacement
ASTM D 6112	(1997; R 2005) Compressive and Flexural Creep and Creep-Rupture of Plastic Lumber and Shapes
ASTM D 6117	(1997; R 2005) Standard Test Methods for Mechanical Fasteners in Plastic Lumber and Shapes
ASTM D 696	(2008) Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30 degrees C and 30 degrees C With a Vitreous Silica Dilatometer
ASTM F 1667	(2005) Driven Fasteners: Nails, Spikes, and Staples
ASTM F 547	(2006) Nails for Use with Wood and Wood-Base Materials
FM GLOBAL (FM)	
FM DS 1-49	(2000) Perimeter Flashing
INTERNATIONAL CODE COUNCIL (ICC)	
ICC IBC	(2006; Errata 2006; Errata 2007; Supplement 2007; Errata 2007) International Building Code
SOUTHERN PINE INSPECTION BUREAU (SPIB)	
SPIB 1003	(2002) Standard Grading Rules for Southern Pine Lumber
TRUSS PLATE INSTITUTE (TPI)	
TPI HIB	(1991) Commentary and Recommendations for Handling, Installing and Bracing Metal Plate Connected Wood Trusses
U.S. GENERAL SERVICES ADMINISTRATION (GSA)	
CID A-A-1923	(Rev A; Notice 1) Shield, Expansion (Lag, Machine and Externally Threaded Wedge Bolt

Anchors)

CID A-A-1924	(Rev A; Notice 1) Shield, Expansion (Self Drilling Tubular Expansion Shell Bolt Anchors
CID A-A-1925	(Rev A; Notice 1) Shield Expansion (Nail Anchors)
FS FF-B-588	(Rev E) Bolt, Toggle: and Expansion Sleeve, Screw

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Plastic Lumber;

SD-10 Operation and Maintenance Data

Plastic

When not labeled, identify types in Operation and Maintenance Manual.

1.3 DELIVERY AND STORAGE

Deliver materials to the site in an undamaged condition. Store, protect, handle, and install prefabricated structural elements in accordance with manufacturer's instructions and as specified. Store materials off the ground to provide proper ventilation, with drainage to avoid standing water, and protection against ground moisture and dampness. Store materials with a moisture barrier at both the ground level and as a cover forming a well ventilated enclosure. Store wood I-beams and glue-laminated beams and joists on edge. Adhere to requirements for stacking, lifting, bracing, cutting, notching, and special fastening requirements. Remove defective and damaged materials and provide new materials. Store separated reusable wood waste convenient to cutting station and area of work.

1.4 GRADING AND MARKING

1.4.1 Lumber

Mark each piece of framing and board lumber or each bundle of small pieces of lumber with the grade mark of a recognized association or independent inspection agency. Such association or agency shall be certified by the Board of Review, American Lumber Standards Committee, to grade the species used. Surfaces that are to be exposed to view shall not bear grademarks, stamps, or any type of identifying mark.

1.4.2 Plywood

Mark each sheet with the mark of a recognized association or independent inspection agency that maintains continuing control over the quality of the plywood. The mark shall identify the plywood by species group or span rating, exposure durability classification, grade, and compliance with

APA PS 1. Surfaces that are to be exposed to view shall not bear grademarks or other types of identifying marks.

1.4.3 Preservative-Treated Lumber and Plywood

The Contractor shall be responsible for the quality of treated wood products. Each treated piece shall be inspected in accordance with AWPA M2 and permanently marked or branded, by the producer, in accordance with AWPA M6. The Contractor shall provide Contracting Officer's Representative (COR) with the inspection report of an approved independent inspection agency that offered products comply with applicable AWPA Standards. The appropriate Quality Mark on each piece will be accepted, in lieu of inspection reports, as evidence of compliance with applicable AWPA treatment standards.

1.4.4 Plastic Lumber

Label plastic products to be incorporated into the project in accordance with ASTM D 1972, or provide product data indicating polymeric information in the Operation and Maintenance Manual.

- a. Type 1: Polyethylene Terephthalate (PET, PETE).
- b. Type 2: High Density Polyethylene (HDPE).
- c. Type 3: Vinyl (Polyvinyl Chloride or PVC).
- d. Type 4: Low Density Polyethylene (LDPE).
- e. Type 5: Polypropylene (PP).
- f. Type 6: Polystyrene (PS).
- g. Type 7: Other. Use of this code indicates that the package in question is made with a resin other than the six listed above, or is made of more than one resin listed above, and used in a multi-layer combination.

1.5 SIZES AND SURFACING

ALSC PS 20 for dressed sizes of yard and structural lumber. Lumber shall be surfaced four sides. Size references, unless otherwise specified, are nominal sizes, and actual sizes shall be within manufacturing tolerances allowed by the standard under which the product is produced. Other measurements are IP or SI standard.

1.6 MOISTURE CONTENT

Air-dry or kiln-dry lumber. Kiln-dry treated lumber after treatment. Maximum moisture content of wood products shall be as follows at the time of delivery to the job site:

- a. Framing lumber and boards - 19 percent maximum
- b. Materials other than lumber - Moisture content shall be in accordance with standard under which the product is produced

1.7 PRESERVATIVE TREATMENT

Treat wood products with waterborne wood preservatives conforming to AWPA P5. Pressure treatment of wood products shall conform to the requirements of AWPA U1 and AWPA T1. Pressure-treated wood products shall not contain arsenic, chromium, or other agents classified as carcinogenic, probably carcinogenic, or possibly carcinogenic to humans (compounds in Groups 1, 2A, or 2B) by the International Agency for Research on Cancer (IARC), Lyon, France. Pressure-treated wood products shall not exceed the limits of the U.S. EPA's Toxic Characteristic Leaching Procedure (TCLP), and shall not be

classified as hazardous waste. Submit certification from treating plant stating chemicals and process used and net amount of preservatives retained are in conformance with specified standards. Lumber and timber in accordance with **AWPA C1** and **AWPA C2**, and plywood in accordance with **AWPA C1** and **AWPA C9**.

- a. 0.25 pcf intended for above ground use.
- b. All wood shall be air or kiln dried after treatment. Specific treatments shall be verified by the report of an approved independent inspection agency, or the AWPA Quality Mark on each piece. Do not incise surfaces of lumber that will be exposed. Minimize cutting and avoid breathing sawdust. Brush coat areas that are cut or drilled after treatment with either the same preservative used in the treatment or with a 2 percent copper naphthenate solution. Plastic lumber shall not be preservative treated. The following items shall be preservative treated:
 1. Nailers, edge strips, crickets, curbs, and cants for roof decks.

1.7.1 Existing Structures

Use borate, permathrin, or a sodium silicate wood mineralization process to treat wood. Use borate for interior applications only.

1.7.2 New Construction

Use a boron-based preservative conforming to **AWPA P18**, sodium silicate wood mineralization process, or Ammoniacal Copper Quaternary Compound to treat wood. Use boron-based preservatives for above-ground applications only.

1.8 QUALITY ASSURANCE

1.8.1 Plastic Lumber Performance

Plastic lumber intended for use in exterior applications shall have no fading or discoloration and no change in dimensional stability as tested in accordance with **ASTM D 1435** for a period of 5 years.

1.9 ENVIRONMENTAL REQUIREMENTS

During and immediately after installation of treated wood, engineered wood products, and laminated wood products at interior spaces, provide temporary ventilation.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Virgin Lumber

Lumber fabricated from old growth timber is not permitted. Avoid companies who buy, sell, or use old growth timber in their operations, when possible.

2.1.2 Plastic Lumber

2.1.2.1 Cellular PVC Trim Boards

2.1.2.2 Shear Parallel to Length

Maximum 1,000 psi in accordance with ASTM D 2344/D 2344M.

2.1.2.3 Density

ASTM D 6111.

2.1.2.4 Compressive Strength

- a. Secant Modulus: Minimum 70,000 psi in accordance with ASTM D 6108.
- b. Stress at 3% strain: Minimum 1,500 psi in accordance with ASTM D 6108.
- c. Compression Parallel to Grain: Minimum 3,000 psi in accordance with ASTM D 6112.
- d. Compression Perpendicular to Grain: Minimum 1,000 psi in accordance with ASTM D 6112.

2.1.2.5 Flexural Strength

Minimum 2,000 psi in accordance with ASTM D 6109.

2.1.2.6 Tensile Strength

Minimum 1,250 psi in accordance with ASTM D 198.

2.1.2.7 Coefficient of Thermal Expansion

Maximum 0.000080 in/in/degree F in accordance with ASTM D 696.

2.1.2.8 Screw Withdrawal

350 lbs in accordance with ASTM D 6117.

2.1.2.9 Nail Withdrawal

150 lbs in accordance with ASTM D 6117.

2.2 LUMBER

2.2.1 Structural Lumber

Except where a specific grade is indicated or specified, Any of the species and grades listed in AF&PA T101 that have allowable unit stresses in pounds per square inch (psi) not less than 1200 Fb, with 1,200,000 E. Use for joists and rafters and all other members indicated to be stress rated. Design of members and fastenings shall conform to AITC OT-01. Other stress graded or dimensioned items such as blocking, shall be standard or No. 2 grade.

2.2.2 Framing Lumber

Framing lumber such as cant strips, nailing strips, and nailers and board lumber shall be one of the species listed in the table below. Minimum grade of species shall be as listed.

Table of Grades for Framing and Board Lumber

<u>Grading Rules</u>	<u>Species</u>	<u>Framing</u>	<u>Board Lumber</u>
SPIB 1003 standard grading rules	Southern Pine	Standard Light Framing or No. 3 Structural Light Framing (Stud Grade for 2x4 nominal size, 10 feet and shorter)	No. 2 Boards

2.3 PLYWOOD AND STRUCTURAL PANELS

APA PS 1, APA PS 2, APA E445S, and APA F405L respectively.

2.3.1 Plywood

C-D Grade, Exposure 1 durability classification, Span rating of 24/16 or greater.

2.3.2 Roof Sheathing

2.3.2.1 Plywood

C-D Grade, Exposure 1, with an Identification Index of not less than 24/0.

2.4 OTHER MATERIALS

2.4.1 Roof Decking

Roof decking shall be commercial grade with minimum design value of 1100 psi in bending. Decking shall be match existing profile.

2.5 ROUGH HARDWARE

Unless otherwise indicated or specified, rough hardware shall be of the type and size necessary for the project requirements. Sizes, types, and spacing of fastenings of manufactured building materials shall be as recommended by the product manufacturer unless otherwise indicated or specified. Rough hardware exposed to the weather or embedded in or in contact with preservative treated wood, exterior masonry, or concrete walls or slabs shall be zinc-coated.

2.5.1 Bolts, Nuts, Studs, and Rivets

ASME B18.2.1, ASME B18.5.2.1M, ASME B18.5.2.2M, ASME B18.2.2, and ASTM A 687.

2.5.2 Anchor Bolts

ASTM A 307, size as indicated, complete with nuts and washers.

2.5.3 Expansion Shields

CID A-A-1923, CID A-A-1924, and CID A-A-1925. Except as shown otherwise, maximum size of devices shall be 3/8 inch.

2.5.4 Lag Screws and Lag Bolts

ASME B18.2.1.

2.5.5 Toggle Bolts

FS FF-B-588.

2.5.6 Wood Screws

ASME B18.6.1.

2.5.7 Nails

ASTM F 547, size and type best suited for purpose; staples shall be as recommended by the manufacturer of the materials to be joined. For sheathing and subflooring, length of nails shall be sufficient to extend 1 inch into supports. In general, 8-penny or larger nails shall be used for nailing through 1 inch thick lumber and for toe nailing 2 inch thick lumber; 16-penny or larger nails shall be used for nailing through 2 inch thick lumber. Nails used with treated lumber and sheathing shall be galvanized. Nailing shall be in accordance with the recommended nailing schedule contained in AF&PA T10. Where detailed nailing requirements are not specified, nail size and spacing shall be sufficient to develop an adequate strength for the connection. The connection's strength shall be verified against the nail capacity tables in AF&PA T101. Reasonable judgment backed by experience shall ensure that the designed connection will not cause the wood to split. If a load situation exceeds a reasonable limit for nails, a specialized connector shall be used.

2.5.8 Wire Nails

ASTM F 1667.

2.5.9 Joist Hangers

Steel or iron, zinc coated, sized to fit the supported member, of sufficient strength to develop the full strength of the supported member in accordance with ICC IBC, and furnished complete with any special nails required.

2.5.10 Metal Framing Anchors

Construct anchors to the configuration shown using hot dip zinc-coated steel conforming to ASTM A 653/A 653M, G90. Except where otherwise shown, Steel shall be not lighter than 18 gage. Special nails supplied by the manufacturer shall be used for all nailing.

2.5.11 Panel Edge Clips

Extruded aluminum or galvanized steel, H-shaped clips to prevent differential deflection of roof sheathing.

PART 3 EXECUTION

3.1 INSTALLATION

Conform to [AF&PA T10](#) and install in accordance with the [National Association of Home Builders \(NAHB\) Advanced Framing Techniques: Optimum Value Engineering](#), unless otherwise indicated or specified. Select lumber sizes to minimize waste. Fit framing lumber and other rough carpentry, set accurately to the required lines and levels, and secure in place in a rigid manner. [Space plastic lumber boards as necessary to allow for lengthwise expansion and contraction](#). Do not splice framing members between bearing points. Set joists, rafters, and purlins with their crown edge up. Frame members for the passage of pipes, conduits, and ducts. [Provide adequate support as appropriate to the application, climate, and modulus of elasticity of the product](#). Do not cut or bore structural members for the passage of ducts or pipes without approval. Reinforce all members damaged by such cutting or boring by means of specially formed and approved sheet metal or bar steel shapes, or remove and provide new, as approved. Provide as necessary for the proper completion of the work all framing members not indicated or specified. Spiking and nailing not indicated or specified otherwise shall be in accordance with the Nailing Schedule contained in [ICC IBC](#); perform bolting in an approved manner. Spikes, nails, and bolts shall be drawn up tight. [Install plastic lumber with screws or bolts; if nails are used, use ring shank or spiral shank nails](#).

3.1.1 Anchors in Masonry

[Except where indicated otherwise, Embed anchor bolts not less than 15 inches in masonry unit walls and provide each with a nut and a 2 inch diameter washer at bottom end. Fully grout bolts with mortar.](#)

3.1.2 Roof Framing or Rafters

Tops of supports or rafters shall form a true plane. Valley, ridge, and hip members shall be of depth equal to cut on rafters where practicable, but in no case less than depth of rafters and nominally [2 inches](#) thick. Rafters shall be notched and have full and solid bearing on plates. Valleys, hips, and ridges shall be straight and true intersections of roof planes. Necessary crickets and watersheds shall be formed. Rafters, except hip and valley rafters, shall be spiked to ceiling joists with no less than three 8-penny nails [and attached to the wall with metal framing anchors](#). Rafters shall be toe-nailed to ridge, valley, or hip members with at least three 8-penny nails. Rafters shall be braced to prevent movement until permanent bracing, decking or sheathing is installed. Hip and valley rafters shall be secured to wall plates by clip angles. Openings in roof shall be framed with headers and trimmers. Unless otherwise indicated, headers carrying more than two rafters and trimmers supporting headers carrying more than one rafter shall be double. Hip rafters longer than the available lumber shall be butt jointed and scabbed. Valley rafters longer than the available lumber shall be double, with pieces lapped not less than [4 feet](#) and well spiked together. Trussed rafters shall be installed in accordance with [TPI HIB](#). Engineered wood joists shall be installed in accordance with distributor's instructions.

3.1.3 Joists

Provide joists of the sizes and spacing indicated, accurately and in alignment, and of uniform width. Joists shall have full bearing on plates; provide laps over bearing only and spike. Where joists are of insufficient

length to produce a 12 inch lap, butt joists over bearing and provide wood scabs 2 nominal inches thick by depth of joists by 24 inches long or metal straps 1/4 by 1 1/2 inch by not less than 18 inches long nailed to each joist with not less than four 10-penny nails, or approved sheet metal connectors installed in accordance with the manufacturer's recommendations. Provide metal hangers for joists framing into the side of headers, beams, or girders. The minimum joist end bearing shall be 4 inches, and joists built into concrete or masonry shall have a 1/2 inch minimum clearance at the top, end, and sides. For joists approved to be bored for the passage of pipes or conduits, bore through the neutral axis of the joist. Provide steel joist hangers of proper size and type to receive the ends of all framed joists.

3.1.4 Ceiling Joists

Size as indicated and set accurately and in alignment. Toe-nail joists to all plates with not less than three 10-penny nails. Frame openings in ceilings with headers and trimmers.

3.1.5 Metal Framing Anchors

Provide framing anchors at every rafter to fasten rafter to plates against uplift movement and forces as indicated. Anchors shall be punched and formed for nailing so that nails will be stressed in shear only. Nails shall be zinc-coated; drive a nail in each nail hole provided in the anchor.

3.1.6 Plywood and Structural-Use Panel Roof Sheathing

Install with the grain of the outer plies or long dimension at right angles to supports. Stagger end joints and locate over the centerlines of supports. Allow 1/8 inch spacing at panel ends and 1/4 inch at panel edges. Nail panels with 8-penny common nails or 6-penny annular rings or screw-type nails spaced 6 inches o.c. at supported edges and 12 inches o.c. at intermediate bearings. Do not use staples in roof sheathing. Where the support spacing exceeds the maximum span for an unsupported edge, provide adequate blocking, tongue-and-groove edges, or panel edge clips, in accordance with APA E30.

3.1.7 Plastic Lumber

In conjunction with above requirements, follow manufacturer's recommendations for plastic lumber installation, including requirements for structural support, thermal movement, working, fastening, and finishing. Use standard woodworking tools, including carbide tips, coarse saw blades, and routers with aggressive cutters. Follow manufacturer's recommendations for repair by melting.

3.2 MISCELLANEOUS

3.2.1 Wood Roof Nailers, Edge Strips, Crickets, Curbs, and Cants

Provide sizes and configurations indicated or specified and anchored securely to continuous construction.

3.2.1.1 Roof Edge Strips and Nailers

Provide at perimeter of roof, around openings through roof, and where roofs abut walls, curbs, and other vertical surfaces. Except where indicated otherwise, nailers shall be 6 inches wide and the same thickness as the

insulation. Anchor nailers securely to underlying construction. Anchor perimeter nailers in accordance with FM DS 1-49.

3.2.1.2 Crickets, Cants, and Curbs

Provide wood saddles or crickets, cant strips, curbs for scuttles and ventilators, and wood nailers bolted to tops of concrete or masonry curbs as indicated, specified, or necessary and of lumber.

3.2.2 Wood Blocking

Provide proper sizes and shapes at proper locations for the installation and attachment of wood and other finish materials, fixtures, equipment, and items indicated or specified.

3.2.3 Temporary Closures

Provide with hinged doors and padlocks and install during construction at exterior doorways and other ground level openings that are not otherwise closed. Cover windows and other unprotected openings with polyethylene or other approved material, stretched on wood frames. Provide dustproof barrier partitions to isolate areas as directed.

3.2.4 Temporary Centering, Bracing, and Shoring

Provide for the support and protection of masonry work during construction.

-- End of Section --

SECTION 06 20 00

FINISH CARPENTRY

08/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN LUMBER STANDARDS COMMITTEE (ALSC)

ALSC PS 20 (1970) American Softwood Lumber Standard

AMERICAN WOOD PROTECTION ASSOCIATION (AWPA)

AWPA M2 (2001) Standard for Inspection of Treated Wood Products

AWPA P5 (2005) Standard for Waterborne Preservatives

APA - THE ENGINEERED WOOD ASSOCIATION (APA)

APA PS 1 (1995) Voluntary Product Standard for Construction and Industrial Plywood

ARCHITECTURAL WOODWORK INSTITUTE (AWI)

AWI Qual Stds (8th Edition) AWI Quality Standards

ASME INTERNATIONAL (ASME)

ASME B18.2.1 (1996; Addenda A 1999; Errata 2003; R 2005) Square and Hex Bolts and Screws (Inch Series)

ASME B18.2.2 (1987; R 2005) Standard for Square and Hex Nuts

ASME B18.6.1 (1981; R 2008) Wood Screws (Inch Series)

ASTM INTERNATIONAL (ASTM)

ASTM F 547 (2006) Nails for Use with Wood and Wood-Base Materials

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

BHMA A156.9 (2003) Cabinet Hardware

HARDWOOD PLYWOOD AND VENEER ASSOCIATION (HPVA)

HPVA HP-1 (2004) American National Standard for Hardwood and Decorative Plywood

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA LD 3 (2005) Standard for High-Pressure Decorative Laminates

SOUTHERN PINE INSPECTION BUREAU (SPIB)

SPIB 1003 (2002) Standard Grading Rules for Southern Pine Lumber

WESTERN WOOD PRODUCTS ASSOCIATION (WWPA)

WWPA G-5 (1998) Western Lumber Grading Rules

WINDOW AND DOOR MANUFACTURERS ASSOCIATION (WDMA)

WDMA I.S. 4 (2000) Water-Repellent Preservative Non-Pressure Treatment for Millwork

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Drawings

1.3 DETAIL DRAWINGS

The Contractor shall submit detail drawings showing fabricated items and special mill and woodwork items. Drawings shall indicate materials and details of construction, methods of fastening, erection, and installation.

1.4 CERTIFICATES

Provide certificates of grade from the grading agency on graded but unmarked lumber or plywood attesting that materials meet the grade requirements specified herein.

Provide certificates of compliance unless materials bear certification markings or statements.

1.5 DELIVERY, STORAGE, AND HANDLING

Deliver lumber, plywood, trim, and millwork to job site in an undamaged condition. Stack materials to ensure ventilation and drainage. Protect against dampness before and after delivery. Store materials under cover in a well-ventilated enclosure and protect against extreme changes in temperature and humidity. Do not store products in building until wet trade materials are dry.

1.6 QUALITY ASSURANCE

1.6.1 Lumber

Identify each piece or each bundle of lumber, millwork, and trim by the grade mark of a recognized association or independent inspection agency that is certified by the Board of Review, American Lumber Standards Committee, to grade the species.

1.6.2 Plywood

Each sheet of plywood shall bear the mark of a recognized association or independent inspection agency that maintains continuing control over quality of the plywood. Mark shall identify plywood by species group or span rating, and shall show exposure durability classification, grade, and compliance with **APA PS 1**.

PART 2 PRODUCTS

2.1 WOOD

2.1.1 Sizes and Patterns of Wood Products

Yard and board lumber sizes shall conform to **ALSC PS 20**. Provide shaped lumber and millwork in the patterns indicated and standard patterns of the association covering the species. Size references, unless otherwise specified, are nominal sizes, and actual sizes shall be within manufacturing tolerances allowed by the applicable standard.

2.1.2 Trim, Finish, and Frames

Provide species and grades listed for materials to be paint finished. Provide materials that are to be stain, natural, or transparent finished one grade higher than that listed. Provide species indicated for materials to be transparent finished. Run trim, except window stools and aprons with hollow backs.

TABLE OF GRADES FOR WOOD TO RECEIVE PAINT FINISH

<u>Grading Rules</u>	<u>Species</u>	<u>Exterior and Interior Trim, Finish, and Frames</u>
SPIB 1003 grading rules	Southern Pine	C & Btr

2.1.3 Utility Shelving

Utility shelving shall be a suitable species equal to or exceeding requirements of No. 3 Common white fir under **WWPA G-5**, 1 inch thick; or plywood, interior type, Grade A-B, 1/2 inch thick, any species group.

2.1.4 Softwood Plywood

APA PS 1, thicknesses as indicated.

- a. Plywood for Shelving: Interior type, A-B Grade, any species group.
- b. Plywood for Countertops: Exterior type, A-C Grade.

2.1.5 Hardwood Plywood

HPVA HP-1, Type III (Interior), Good (1) hardwood veneer core construction, face veneers of birch, of thickness indicated.

2.2 COUNTER TOPS

2.2.1 Laminated Plastic

NEMA LD 3.

2.2.1.1 Countertop Finish

Grade GP 50 or PF 42, satin finish. Color and pattern shall be as indicated.

2.2.1.2 Backing Sheet

BK 20.

2.2.2 Solid Surface

Manufactured from homogeneous solid sheets for filled plastic resin complying with materials and performance requirements of ANSI Z 124.3, for Type 5 or Type 6, without a precoated finish.

2.3 MOISTURE CONTENT OF WOOD PRODUCTS

Air-dry or kiln-dry lumber. Kiln-dry treated lumber after treatment. Maximum moisture content of wood products at time of delivery to the job site, and when installed, shall be as follows:

- a. Interior Finish Lumber, Trim, and Millwork 1 1/4 Inches Nominal or Less in Thickness: 6 percent on 85 percent of the pieces and 8 percent on remainder.
- b. Exterior Treated and Untreated Finish Lumber and Trim 4 Inches Nominal or Less in Thickness: 19 percent.
- c. Exterior Wood Siding: 15 percent.
- d. Moisture content of other materials shall be in accordance with the applicable standards.

2.4 PRESERVATIVE TREATMENT OF WOOD PRODUCTS

2.4.1 Nonpressure Treatment

Treat woodwork and millwork, such as exterior trim, door trim, and window trim, in accordance with WDMA I.S. 4, with either 2 percent copper naphthenate, 3 percent zinc naphthenate, or 1.8 percent copper-8-quinolinolate. Provide a liberal brushcoat of preservative treatment to field cuts and holes.

2.4.2 Pressure Treatment

Lumber and plywood used on the exterior of buildings or in contact with masonry or concrete shall be treated with water-borne preservative listed in AWPA P5 as applicable, and inspected in accordance with AWPA M2. Identify treatment on each piece of material by the quality mark of an

agency accredited by the Board of Review of the American Lumber Standards Committee. Plywood shall be treated to a reflection level as follows:

2.5 HARDWARE

Provide sizes, types, and spacings of manufactured building materials recommended by the product manufacturer except as otherwise indicated or specified.

2.5.1 Wood Screws

ASME B18.6.1.

2.5.2 Bolts, Nuts, Lag Screws, and Studs

ASME B18.2.1 and ASME B18.2.2.

2.5.3 Nails

Nails shall be the size and type best suited for the purpose and shall conform to ASTM F 547. Nails shall be hot-dip galvanized or aluminum when used on exterior work. For siding, length of nails shall be sufficient to extend 1-1/2 inches into supports, including wood sheathing over framing. Screws for use where nailing is impractical shall be size best suited for purpose.

2.5.4 Adjustable Shelf Standards

BHMA A156.9, Type B04071, with shelf rests Type B04081.

2.5.5 Vertical Slotted Shelf Standards

BHMA A156.9, Type B04102, with shelf brackets Type B04112.

2.6 FABRICATION

2.6.1 Quality Standards (QS)

The terms "Premium," "Custom," and "Economy" refer to the quality grades defined in AWI Qual Stds. Items not specified to be of a specific grade shall be Custom grade. The AWI QS is superseded by all contract document requirements indicated or stated herein.

2.6.2 Countertops

Fabricate with lumber and a core of exterior plywood, glued and screwed to form an integral unit. Bond laminated plastic under pressure to exposed surfaces, using type of glue recommended by plastic manufacturer, and bond a backing sheet under pressure to underside of countertop. Countertop unit shall be covered with NEMA LD 3, Grade PF 42 plastic. Back splash shall be not less than 3 1/2 inches nor more than 4 1/2 inches high.

2.6.3 Cabinets

Wall and base cabinets and vanity cabinets shall be of the same construction and appearances. Fabricate with solid ends and frame fronts, or with frames all around. Frames shall be solid hardwood not less than 3/4 by 1 1/2 inches. Ends, bottom, back, partitions, and doors shall be hardwood plywood. Mortise and tenon, dovetail, or dowel and glue joints to

produce a rigid unit. Cover exposed edges of plywood with hardwood strips. Doors, frames, and solid exposed ends shall be $3/4$ inch thick; bottom, partitions, and framed ends $1/2$ inch minimum; shelves $5/8$ inch minimum; back $1/4$ inch minimum.

2.6.3.1 Cabinet Hardware

BHMA A156.9. Provide cabinet hardware including two self-closing hinges for each door, two side-mounted metal drawer slides for each drawer and pulls for all doors and drawers as follows. Hardware exposed to view shall be **sat**in chromium plated. All cabinet hardware shall comply with the following requirements:

- a. Provide concealed Euro-Style, back mounted hinges with opening to 165 degrees with self-closing feature at less than 90 degrees to its closed position..
- b. Drawer slides shall have a static rating capacity of **100 lbs.** The slides shall have a self closing/stay-closed action, zinc or epoxy coated steel finish, ball bearing rollers, and positive stop with lift out design.
- c. Drawer pulls shall be wire type pulls with center-to-center dimension not less than **3 1/2 inches** and cross sectional diameter of **5/16 inch**. The handle projection shall be not less than **1 5/16 inches**.
- d. Drawer catch shall be heavy duty magnetic catch.

2.6.3.2 Finish

Provide a natural factory finish on wood surfaces after fabrication. Finish shall be fabricator's standard natural finish, except that it shall be equivalent to one coat of sealer and one coat of spar varnish on all surfaces and a second coat of spar varnish on surfaces exposed to view. Sand lightly and wipe clean between coats.

2.6.4 Casework With Transparent Finish (CTF)

2.6.4.1 AWI Quality Grade (CTF)

Custom grade.

2.6.4.2 Construction (CTF)

Details shall conform to reveal overlay **with** exposed face frame design.

2.6.4.3 Exposed Parts

Birch specie, **Rotary** cut.

2.6.4.4 Semi-Exposed Parts

As specified in the **AWI Qual Stds** for the grade selected.

2.6.5 Casework With High Pressure Laminate Finish (CHPL)

2.6.5.1 AWI Quality Grade (CHPL)

Custom grade.

2.6.5.2 Construction (CHPL)

Details shall conform to reveal overlay with exposed face frame design.

2.6.5.3 Exposed Surfaces

High pressure laminate, color as selected from manufacturer's standard finishes.

2.6.5.4 Semi-Exposed Surfaces

As specified in the AWI Qual Stds for the grade selected.

PART 3 EXECUTION

3.1 FINISH WORK

Provide sizes, materials, and designs as indicated and as specified. Apply primer to finish work before installing. Where practicable, shop assemble and finish items of built-up millwork. Joints shall be tight and constructed in a manner to conceal shrinkage. Miter trim and moldings at exterior angles and cope at interior angles and at returns. Material shall show no warp after installation. Install millwork and trim in maximum practical lengths. Fasten finish work with finish nails. Provide blind nailing where practicable. Set face nails for putty stopping.

3.1.1 Exterior Finish Work

Machine-sand exposed flat members and square edges. Machine-finish semi-exposed surfaces. Construct joints to exclude water. In addition to nailing, glue joints of built-up items with waterproof glue as necessary for weather-resistant construction. Provide well distributed end joints in built-up members. Provide shoulder joints in flat work. Hold backs of wide-faced miters together with metal rings and waterproof glue. Fascias and other flat members, unless otherwise indicated, shall be 3/4 inch thick. Provide door and window trim in single lengths. Provide braced, blocked, and rigidly anchored cornices for support and protection of vertical joints. Install soffits in largest practical size. Joints of plywood shall occur over center lines of supports. Fasten soffits with aluminum or stainless steel nails. Back prime all concealed surfaces of exterior trim.

3.1.2 Interior Finish Work

After installation, sand exposed surfaces smooth. Provide window and door trim in single lengths.

3.1.3 Window Stools and Aprons

Provide stools with rabbet over window sill. Provide aprons with returns cut accurately to profile of member.

3.2 SHELVING

One inch nominal thick wood shelf material or 3/4 or 23/32 inch thick plywood shelf material supported substantially with end and intermediate supports and arranged to prevent buckling and sagging. Provide cleats except where hook strips are specified or indicated. Where adjustable shelving is indicated, provide standards and brackets or shelf rests for each shelf. Anchor standards to wall at not more than 2 feet o.c.

3.2.1 Storage Rooms

Provide storage rooms with shelves 11 1/4 inches wide, bottom shelf 18 inches above the floor, top shelf 18 inches below the ceiling, and intermediate shelves approximately 18 inches apart.

3.3 MISCELLANEOUS

3.3.1 Counters

Construct as indicated. Conceal fastenings where practicable, fit counter neatly, install in a rigid and substantial manner, and scribe to adjoining surfaces. Provide counter sections in longest lengths practicable; keep joints in tops to a minimum; and where joints are necessary, provide tight hairline joints drawn up with concealed-type heavy pull-up bolts. Glue joints with water-resistant glue and, in addition, make rigid and substantial with screws, bolts, or other approved fastenings.

3.3.2 Cabinets

Install level, plumb, and tight against adjacent walls. Secure cabinets to walls with concealed toggle bolts, and secure top to cabinet with concealed screws. Make cut-outs for fixtures to templates supplied by fixture manufacturer. Carefully locate cut-outs for pipes so that edges of holes will be covered by escutcheons.

3.3.3 Catwalks in Attic Spaces

Lay boards with one inch spaces between. Stagger end joints, with each joint on a support.

3.4 FASCIAS AND EXTERIOR TRIM

Exposed surfaces and square edges shall be machine sanded, caulked, and constructed to exclude water. Joints of built-up items, in addition to nailing, shall be glued as necessary for weather-resistant construction. End joints in built-up members shall be well distributed. Joints in flat work shall be shouldered. Backs of wide-faced miters shall be held together with metal rings and glue. Fascias and other flat members shall be in maximum practicable lengths. Cornices shall be braced, blocked, and rigidly anchored for support and protection of vertical joints.

3.5 MOLDING AND INTERIOR TRIM

Molding and interior trim shall be installed straight, plumb, level and with closely fitted joints. Exposed surfaces shall be machine sanded at the mill. Molded work shall be coped at returns and interior angles and mitered at external corners. Intersections of flatwork shall be shouldered to ease any inherent changes in plane. Window and door trim shall be provided in single lengths. Blind nailing shall be used to the extent

practicable, and face nailing shall be set and stopped with a nonstaining putty to match the finish applied. Screws shall be used for attachment to metal; setting and stopping of screws shall be of the same quality as required where nails are used.

-- End of Section --

SECTION 07 11 13

BITUMINOUS DAMPPROOFING

04/06

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

- ASTM D 1227 (1995; R 2000) Emulsified Asphalt Used as a Protective Coating for Roofing
- ASTM D 41 (2005) Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing
- ASTM D 4263 (1983; R 2005) Indicating Moisture in Concrete by the Plastic Sheet Method
- ASTM D 4479 (2000) Asphalt Roof Coatings - Asbestos-Free
- ASTM D 449 (2003) Asphalt Used in Dampproofing and Waterproofing

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-07 Certificates

Materials

1.3 DELIVERY AND STORAGE

Deliver materials in sealed containers bearing manufacturer's original labels. Labels shall include date of manufacture, contents of each container, performance standards that apply to the contents and recommended shelf life.

PART 2 PRODUCTS

2.1 ASPHALT

ASTM D 449, Type I or Type II.

2.2 ASPHALT PRIMER

ASTM D 41.

2.3 FIBROUS ASPHALT

ASTM D 4479, Type I for horizontal surfaces, Type II for vertical surfaces.

2.4 EMULSION-BASED ASPHALT DAMPPROOFING

2.4.1 Fibrated Emulsion-Based Asphalt

Fibrated emulsion-based asphalt dampproofing shall be cold-applied type conforming to ASTM D 1227 Type IV, asbestos-free, manufactured of refined asphalt, emulsifiers and selected clay, fibrated with mineral fibers. For spray or brush application, emulsion shall contain a minimum of 59 percent solids by weight, 56 percent solids by volume. For trowel application, emulsion shall contain a minimum of 58 percent solids by weight, 55 percent solids by volume.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

Clean masonry surfaces to receive dampproofing of foreign matter and loose particles. Apply dampproofing to clean dry surfaces. Moisture test in accordance with ASTM D 4263. If test indicates moisture, allow a minimum of 7 additional days after test completion for curing. If moisture still exists, redo test until substrate is dry.

3.2 Protection of Surrounding Areas

Before starting the dampproofing work, the surrounding areas and surfaces shall be protected from spillage and migration of dampproofing material onto other work.

3.3 APPLICATION

Prime surfaces to receive fibrous asphaltic dampproofing unless recommended otherwise by dampproofing materials manufacturer. Apply dampproofing after priming coat is dry, but prior to any deterioration of primed surface, and when ambient temperature is above 40 degrees F.

3.3.1 Surface Priming

Prime surfaces to receive fibrous asphalt dampproofing with asphalt primer. Apply primer when ambient temperature is above 40 degrees F and at rate of approximately one gallon per 100 square feet, fully covering entire surface to be dampproofed.

3.3.2 Cold-Application Method

3.3.2.1 Fibrous Asphalt

Apply two coats of fibrous asphalt to surfaces to be dampproofed. Apply each coat uniformly using not less than one gallon fibrous asphalt per 50 square feet. Apply first coat by brush or spray to provide full bond with primed surface. Brush or spray second coat over thoroughly dry first coat unless recommended otherwise by dampproofing materials manufacturer. Provide finished surface that is of uniform thickness and impervious to moisture. Recoat porous areas.

-- End of Section --

SECTION 07 12 00

BUILT-UP BITUMINOUS WATERPROOFING

04/06

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D 1327	(2004a) Bitumen-Saturated Woven Burlap Fabrics Used in Roofing and Waterproofing
ASTM D 1668	(1997a) Glass Fabrics (Woven and Treated) for Roofing and Waterproofing
ASTM D 173	(2003) Bitumen-Saturated Cotton Fabrics Used in Roofing and Waterproofing
ASTM D 2178	(2004) Asphalt Glass Felt Used in Roofing and Waterproofing
ASTM D 41	(2005) Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing
ASTM D 449	(2003) Asphalt Used in Dampproofing and Waterproofing
ASTM D 4586	(2000) Standard Specification for Asphalt Roof Cement, Asbestos-Free

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00
SUBMITTAL PROCEDURES:

SD-03 Product Data

Prefabricated laminated asphalt waterproofing

Prefabricated copper fabric

Membrane fabric

Reinforcing Fabric

SD-08 Manufacturer's Instructions

Application

1.3 ENVIRONMENTAL CONDITIONS

Apply the primers and waterproofing specified herein when the ambient temperature is above 40 degrees F.

1.4 DELIVERY AND STORAGE

1.4.1 Packaged Materials

Deliver materials in bundles, rolls, and sealed containers bearing the manufacturer's original labels. Asphalt shall be protected from freezing in a weathertight enclosure. Store materials in an enclosed area free from contact with soil and weather, and maintain at not less than 50 degrees F for at least 24 hours before use. Reinforcement fabrics shall be protected from moisture damage and moisture absorption in a weathertight enclosure or shall be stored off the ground on pallets, and covered on top and all sides with breathable-type canvas tarpaulins. Plastic sheets cause condensation buildup and therefore shall not be used to cover waterproofing materials. If material is dated for use or shelf life is indicated on the labels, remove outdated material from the jobsite. Damaged or deteriorated materials shall be removed from project site.

PART 2 PRODUCTS

2.1 BITUMEN

Asphalt; ASTM D 449, Type II.

2.2 BITUMINOUS PLASTIC CEMENT

ASTM D 4586, Type I for asphalt.

2.3 MEMBRANE FABRIC

The following requirements shall apply:

<u>Felt or Fabric Material</u>	<u>Saturant or Impregnant</u>	<u>Specification</u>
Glass (felt) mat	Asphalt	ASTM D 2178, Type III
Reinforcing glass fabric	Asphalt	ASTM D 1668, Type I
Reinforcing cotton fabric	Asphalt	ASTM D 173
Reinforcing woven burlap fabric	Asphalt	ASTM D 1327

2.3.1 Cotton Fabrics

Cotton fabrics shall be woven entirely of cotton conforming with ASTM D 173, thoroughly and uniformly saturated with asphalt.

2.3.2 Woven Burlap Fabrics

Woven burlap fabrics shall be composed of 100 percent jute fiber and two cotton threads at each selvage conforming with ASTM D 1327, thoroughly and uniformly saturated with asphalt. The fabric mesh shall not be completely closed or sealed by the process of saturation. Sufficient porosity shall be maintained to allow successive moppings of the plying asphalt to seep

through. The surface shall not be coated or covered with talc or any other substances that will interfere with the adhesion between fabric and plying asphalt. The fabric surface shall be uniformly smooth and free of irregularities, folds and knots. The finished woven burlap fabrics shall be free of ragged edges, untrue edges, breaks or cracks, and other visible external defects.

2.4 NAILS

Galvanized roofing nails.

2.5 PRIMER

ASTM D 41 for asphalt.

2.6 PREFABRICATED LAMINATED ASPHALT WATERPROOFING

Prefabricated laminated construction consisting of plies of kraft paper bonded by layers of bitumen reinforced with layers of fibrous glass and one layer of polyethylene facing. Material and weight shall be as follows:

- a. One layer polyethylene facing, 30 lbs. ream weight; seven intermediate layers of bituminous-saturated kraft paper
- b. Seven layers of bitumen
- c. Three layers of 20.20 fibrous glass mesh
- d. Bottom "cushion" sheet of crepe kraft paper
- e. Total minimum weight of materials of 0.40 lbs. per square foot
- f. Minimum bituminous content of 75 percent by weight
- g. Permanently pliable and impervious to mildew and other organic attack, including termites and rodents
- h. Puncture resistant and self-sealing.

2.7 PREFABRICATED COPPER FABRIC SHOWER PANS

A factory-fabricated sheet of copper bonded to and between two layers of asphalt-impregnated fiberglass or cotton fabric. Copper sheet shall weigh 7 ounces per square foot.

2.8 WOOD NAILERS

Specified in Section 06 10 00 ROUGH CARPENTRY.

PART 3 EXECUTION

3.1 INSPECTION OF SURFACES

Before starting the work, inspect all surfaces to be waterproofed to determine if in satisfactory condition. Check the location and setting of all embedded items. Place backing and blocking and perimeter framing for recessed items as required by the various trades on the project. Complete conduit, piping, and other required rough-in. Notify the Contracting Officer of serious defects or conditions that will prevent satisfactory

application. Start application after such defects and conditions have been corrected.

3.2 PREPARATION OF SURFACES

Surfaces to be treated shall be clean and dry, smooth and free from deleterious and excess materials and projections. Concrete surfaces shall be properly cured, free of release agents, oil, grease, dirt, laitance, loose material, frost, debris and other contaminants. Thoroughly wet holes, joints, cracks, and voids in concrete with water, and then carefully fill with portland cement mortar, strike flush, and permit to dry. Cut off or grind smooth high spots. Give surfaces to receive asphalt membrane waterproofing a priming coat of asphalt primer. Apply priming coat at a rate not less than **one gallon per 100 square feet**, covering the entire surface to be waterproofed. Allow primer to dry before applying waterproofing.

3.3 APPLICATION

Install waterproofing where indicated. At the Contractor's option, shower pans of prefabricated laminated asphalt waterproofing or prefabricated copper fabric shower pan, as specified herein, may be used instead of bituminous membrane waterproofing. Provide ventilation for enclosed spaces when using bituminous membrane waterproofing.

3.3.1 Prefabricated Pan

Prefabricated Laminated Asphalt Waterproofing or Prefabricated Copper Fabric Shower Pan: Form each shower pan from a single piece of the laminated material without joints and with no opening except for shower drain. Install pan in accordance with the manufacturer's printed instructions.

3.3.2 Protection of Surrounding Areas

Before starting the waterproofing work, the surrounding areas and surfaces shall be protected from spillage and migration of asphalt onto other work. Drains and conductors shall be protected from clogging with asphalt.

3.3.2.1 Fired Kettles

Melt kettles for bitumen shall not be closer than **25 feet** to buildings or combustible materials. Provide minimum of two **20 pound** ABC all-purpose type extinguishers at melting kettle and area of hot material application. Equip kettles with automatic thermostatic control capable of maintaining asphalt temperature. Controls shall be calibrated and maintained in working order for duration of work. Equip kettles with means of agitation to ensure controlled uniform temperature throughout contents to prevent spot heating. Do not heat contents above flash point.ext

3.3.2.2 Heating and Application of Bitumen Coatings

Heat solid bitumen in kettle, equipped with an automatic heating device or control unit for positive control of the specified temperature. Provide an accurate and clearly readable thermometer on all kettles. Heat bitumen to flow freely but not above **375 degrees F**. Apply bitumen over the primer, between each ply and as a top coating at the rate of not less than **20 pounds** of asphalt per **100 square feet** of surface.

3.3.3 Membrane Waterproofing

3.3.3.1 Floor Waterproofing

Primer shall be applied at a rate of 1/2 gallon per 100 square feet. Primer shall not be left in puddles. Primer shall be dry to the touch before application of asphalt. Where slab abuts walls, first reinforcing fabric shall extend 6 inches minimum on slab and 8 inches on wall. At vertical corners, first fabric shall extend minimum 5 inches from corner on each side. Second fabric shall lap the first fabric 2 inches minimum. At floor drains, and elsewhere as indicated, the fabric shall extend into a clamping device, set in a heavy coating of flashing cement, and securely clamped.

3.3.4 Fabric Membrane Reinforcement

Provide fabric membranes to reinforce felts at intersections. Provide reinforcement consisting of two plies of fabric membrane cemented in place and to each other with bituminous plastic cement not less than 1/16 inch thick for each coating. At the intersection of slabs and vertical surfaces, extend the first ply at least 6 inches on the slab and 4 inches up the vertical surface. At intersections of two vertical surfaces, extend the first ply at least 10 inches on each side of the intersection. Place second ply to lap the first by not less than 2 inches.

3.3.5 Flashing Flanges

Prime flashing flanges of the sleeves of pipes and ducts penetrating the waterproofing membrane. Allow primer to dry. Strip flanges in with two fabric membrane collars cemented in place and to each other with bituminous plastic cement. Extend collars 4 and 6 inches, respectively, beyond the edge of the flanges, cover the flanges, and fit the flanges tight against the sleeve. Extend waterproofing connecting with work exposed to the weather back of same, or counter flash to form a watertight connection.

3.3.6 Clamping Devices

At floor drains and elsewhere, as indicated, extend membrane into clamping device set in heavy coating of bituminous plastic cement, and clamp securely.

3.4 FIELD TEST

3.4.1 Test of Membrane Waterproofing

Prior to concealment, plug the drain and cover membrane waterproofing on horizontal surfaces over finished spaces with 3 inches of ponded water for 24 hours to test watertightness. Make careful measurement of the water level at the beginning and end of the 24-hour period. If water level falls, drain the water, and thoroughly dry and inspect the waterproofing membrane. Make repairs or replacement, as directed, and repeat test. Work which conceals membrane waterproofing shall not proceed before approval of test results.

3.5 PROTECTIVE COVERING

3.5.1 Horizontal Surfaces

Place protective covering over membrane immediately after application has

thoroughly dried. Remove protective covering immediately before proceeding with work which will conceal the membrane waterproofing.

3.6 CLEAN-UP

Surfaces of other work which are stained with waterproofing materials shall be cleaned with a cleaner recommended by waterproofing manufacturer.

-- End of Section --

SECTION 07 21 13

BOARD AND BLOCK INSULATION

04/06

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C 203	(1999) Breaking Load and Flexural Properties of Block-Type Thermal Insulation
ASTM C 578	(2008b) Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
ASTM C 930	(1999) Potential Health and Safety Concerns Associated with Thermal Insulation Materials and Accessories
ASTM D 1621	(2004a) Compressive Properties of Rigid Cellular Plastics
ASTM D 2842	(2001) Water Absorption of Rigid Cellular Plastics
ASTM E 136	(2004) Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C
ASTM E 84	(2008a) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E 96	(2005) Standard Test Methods for Water Vapor Transmission of Materials

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 211	(2003) Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances
NFPA 31	(2001) Installation of Oil Burning Equipment
NFPA 54	(2006) National Fuel Gas Code
NFPA 70	(2007; AMD 1 2008) National Electrical Code - 2008 Edition

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00
SUBMITTAL PROCEDURES:

SD-03 Product Data

Block or board insulation

Accessories

SD-08 Manufacturer's Instructions

Block or Board Insulation

Adhesive

1.3 DELIVERY, STORAGE, AND HANDLING

1.3.1 Delivery

Deliver materials to the site in original sealed wrapping bearing manufacturer's name and brand designation, specification number, type, grade, R-value, and class. Store and handle to protect from damage. Do not allow insulation materials to become wet, soiled, crushed, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storing, and protecting of materials before and during installation.

1.3.2 Storage

Inspect materials delivered to the site for damage; unload and store out of weather in manufacturer's original packaging. Store only in dry locations, not subject to open flames or sparks, and easily accessible for inspection and handling.

1.4 SAFETY PRECAUTIONS

1.4.1 Other Safety Considerations

Consider safety concerns and measures as outlined in [ASTM C 930](#).

PART 2 PRODUCTS

2.1 BLOCK OR BOARD INSULATION

Provide only thermal insulating materials recommended by manufacturer for type of application indicated. Provide board or block thermal insulation conforming to the following standards and the physical properties listed below:

- a. Extruded Preformed Cellular Polystyrene: [ASTM C 578](#)

2.1.1 Thermal Resistance

Provide 2 inch thick 24 inch wide boards at the interior locations. For exterior cavity locations provide 1-1/2 inch thick, 16 inch wide.

2.1.2 Fire Protection Requirement

- a. Flame spread index of 5 or less when tested in accordance with [ASTM E 84](#).
- b. Smoke developed index of 165 or less when tested in accordance with [ASTM E 84](#).

2.1.3 Other Material Properties

Provide thermal insulating materials with the following properties:

- a. Rigid cellular plastics: Compressive Resistance at Yield: Not less than 15 pounds per square inch (psi) when measured according to [ASTM D 1621](#).
- b. Flexural strength: Not less than 40 psi when measured according to [ASTM C 203](#).
- c. Water Vapor Permeance: Not more than 1.1 perms or less when measured according to [ASTM E 96](#), desiccant method, in the thickness required to provide the specified thermal resistance, including facings, if any.
- d. Water Absorption: Not more than 0.1 percent by total immersion, by volume, when measured according to [ASTM D 2842](#).

2.1.4 Prohibited Materials

Do not provide materials containing more than one percent of asbestos.

2.2 DAMPPROOFING

2.2.1 Dampproofing for Masonry Cavity Walls

Bituminous material is specified in Section [07 11 13 BITUMINOUS DAMPPROOFING](#).

2.3 ACCESSORIES

2.3.1 Adhesive

As recommended by insulation manufacturer.

2.3.2 Mechanical Fasteners

Corrosion resistant fasteners as recommended by the insulation manufacturer.

PART 3 EXECUTION

3.1 EXISTING CONDITIONS

Before installing insulation, ensure that all areas that will be in contact with the insulation are dry and free of projections which could cause voids, compressed insulation, or punctured vapor retarders. If installing perimeter or under slab insulation, check that the fill is flat, smooth, dry, and well tamped. If moisture or other conditions are found that do not allow the proper installation of the insulation, do not proceed but notify the Contracting Officer of such conditions.

3.2 PREPARATION

3.2.1 Blocking Around Heat Producing Devices

Unless using insulation board that passes [ASTM E 136](#) in addition to the requirements in Part 2, install non-combustible blocking around heat producing devices to provide the following clearances:

- a. Recessed lighting fixtures, including wiring compartments, ballasts, and other heat producing devices, unless certified for installation surrounded by insulation: [3 inches](#) from outside face of fixtures and devices or as required by [NFPA 70](#) and, if insulation is to be placed above fixture or device, [24 inches](#) above fixture.
- b. Masonry chimneys or masonry enclosing a flue: [2 inches](#) from outside face of masonry. Masonry chimneys for medium and high heat operating appliances: Minimum clearances required by [NFPA 211](#).
- c. Vents and vent connectors used for venting products of combustion, flues, and chimneys other than masonry chimneys: minimum clearances as required by [NFPA 211](#).
- d. Gas Fired Appliances: Clearances as required in [NFPA 54](#).
- e. Oil Fired Appliances: Clearances as required in [NFPA 31](#).

Blocking is not required if chimneys or flues are certified by the Manufacturer for use in contact with insulating materials.

3.3 INSTALLATION

3.3.1 Insulation Board

Install and handle insulation in accordance with the manufacturer's installation instructions. Keep material dry and free of extraneous materials. Observe safe work practices.

3.3.2 Electrical Wiring

Do not install insulation in a manner that would sandwich electrical wiring between two layers of insulation.

3.3.3 Cold Climate Requirement

Place insulation to the outside of pipes.

3.3.4 Continuity of Insulation

Butt tightly against adjoining boards, studs, rafters, joists, sill plates, headers and obstructions. Provide continuity and integrity of insulation at corners, wall to ceiling joint, roof, and floor. Avoid creating any thermal bridges or voids.

3.4 INSTALLATION ON WALLS

3.4.1 Installation using Furring Strips

Install insulation between members as recommended by insulation manufacturer.

3.4.2 Installation on Masonry Walls

Apply board directly to masonry with adhesive or fasteners as recommended by the insulation manufacturer. Fit between obstructions without impaling board on ties or anchors. Apply in parallel courses with joints breaking midway over course below. Put ends in moderate contact with adjoining insulation without forcing. Cut and shape as required to fit around wall penetrations, projections or openings to accommodate conduit or other services. Seal around cut-outs with sealant. Install board in wall cavities so that it leaves at least a nominal **one inch** free air space outside of the insulation to allow for cavity drainage.

3.4.3 Adhesive Attachment to Concrete and Masonry Walls

Apply adhesive to wall and completely cover wall with insulation.

-- End of Section --

SECTION 07 21 16

MINERAL FIBER BLANKET INSULATION

04/06

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

- ASTM C 665 (2001e1) Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
- ASTM C 930 (1999) Potential Health and Safety Concerns Associated with Thermal Insulation Materials and Accessories
- ASTM E 136 (2004) Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C
- ASTM E 84 (2008a) Standard Test Method for Surface Burning Characteristics of Building Materials

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

- NFPA 211 (2003) Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances
- NFPA 31 (2001) Installation of Oil Burning Equipment
- NFPA 54 (2006) National Fuel Gas Code
- NFPA 70 (2007; AMD 1 2008) National Electrical Code - 2008 Edition

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

- 29 CFR 1910.134 Respiratory Protection

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Blanket insulation

Accessories

SD-08 Manufacturer's Instructions

Insulation

1.3 DELIVERY, STORAGE, AND HANDLING

1.3.1 Delivery

Deliver materials to site in original sealed wrapping bearing manufacturer's name and brand designation, specification number, type, grade, R-value, and class. Store and handle to protect from damage. Do not allow insulation materials to become wet, soiled, crushed, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storing, and protecting of materials before and during installation.

1.3.2 Storage

Inspect materials delivered to the site for damage; unload and store out of weather in manufacturer's original packaging. Store only in dry locations, not subject to open flames or sparks, and easily accessible for inspection and handling.

1.4 SAFETY PRECAUTIONS

1.4.1 Respirators

Provide installers with dust/mist respirators, training in their use, and protective clothing, all approved by National Institute for Occupational Safety and Health (NIOSH)/Mine Safety and Health Administration (MSHA) in accordance with [29 CFR 1910.134](#).

1.4.2 Smoking

Do not smoke during installation of blanket thermal insulation.

1.4.3 Other Safety Concerns

Consider other safety concerns and measures as outlined in [ASTM C 930](#).

PART 2 PRODUCTS

2.1 BLANKET INSULATION

[ASTM C 665](#), Type I, blankets without membrane coverings, except a flame spread rating of 25 or less and a smoke developed rating of 50 or less when tested in accordance with [ASTM E 84](#).

2.1.1 Thermal Resistance Value (R-VALUE)

As indicated

2.1.2 Recycled Materials

Provide Thermal Insulation containing recycled materials to the extent practicable, provided the material meets all other requirements of this section. The minimum required recycled materials content by weight are:

Rock Wool: 75 percent slag
Fiberglass: 20 to 25 percent glass cullet

2.1.3 Prohibited Materials

Do not provide asbestos-containing materials.

2.2 BLOCKING

Wood, metal, unfaced mineral fiber blankets in accordance with [ASTM C 665](#), Type I, or other approved materials. Use only non-combustible materials meeting the requirements of [ASTM E 136](#) for blocking around chimneys and heat producing devices.

2.3 ACCESSORIES

2.3.1 Mechanical Fasteners

Corrosion resistant fasteners as recommended by the insulation manufacturer.

2.3.2 Wire Mesh

Corrosion resistant and as recommended by the insulation manufacturer.

PART 3 EXECUTION

3.1 EXISTING CONDITIONS

Before installing insulation, ensure that areas that will be in contact with the insulation are dry and free of projections which could cause voids, compressed insulation, or punctured vapor retarders. If moisture or other conditions are found that do not allow the workmanlike installation of the insulation, do not proceed but notify Contracting Officer of such conditions.

3.2 PREPARATION

3.2.1 Blocking Around Heat Producing Devices

Install non-combustible blocking around heat producing devices to provide the following clearances:

- a. Recessed lighting fixtures, including wiring compartments, ballasts, and other heat producing devices, unless these are certified by the manufacturer for installation surrounded by insulation: [3 inches](#) from outside face of fixtures and devices or as required by [NFPA 70](#) and, if insulation is to be placed above fixture or device, [24 inches](#) above fixture.
- b. Masonry chimneys or masonry enclosing a flue: [2 inches](#) from outside face of masonry. Masonry chimneys for medium and high heat operating appliances: Minimum clearances required by [NFPA 211](#).
- c. Vents and vent connectors used for venting the products of combustion, flues, and chimneys other than masonry chimneys: Minimum clearances as required by [NFPA 211](#).
- f. Gas Fired Appliances: Clearances as required in [NFPA 54](#).

- g. Oil Fired Appliances: Clearances as required in [NFPA 31](#).

Blocking around flues and chimneys is not required when insulation blanket, including any attached vapor retarder, passed [ASTM E 136](#), in addition to meeting all other requirements stipulated in Part 2. Blocking is also not required if the chimneys are certified by the manufacturer for use in contact with insulating materials.

3.3 INSTALLATION

3.3.1 [Insulation](#)

Install and handle insulation in accordance with manufacturer's instructions. Keep material dry and free of extraneous materials. Ensure personal protective clothing and respiratory equipment is used as required. Observe safe work practices.

3.3.1.1 Electrical wiring

Do not install insulation in a manner that would sandwich electrical wiring between two layers of insulation.

3.3.1.2 Continuity of Insulation

Install blanket insulation to butt tightly against adjoining blankets and to studs, rafters, joists, sill plates, headers and any obstructions. Provide continuity and integrity of insulation at corners, wall to ceiling joints, roof, and floor. Avoid creating thermal bridges.

3.3.1.3 Installation at Bridging and Cross Bracing

Insulate at bridging and cross bracing by splitting blanket vertically at center and packing one half into each opening. Butt insulation at bridging and cross bracing; fill in bridged area with loose or scrap insulation.

3.3.1.4 Cold Climate Requirement

Place insulation to the outside of pipes.

3.3.1.5 Insulation without Affixed Vapor Retarder

Provide snug friction fit to hold insulation in place. Stuff pieces of insulation into cracks between trusses, joists, studs and other framing, such as at attic access doors, door and window heads, jambs, and sills, band joists, and headers.

3.3.1.6 Sizing of Blankets

Provide only full width blankets when insulating between trusses, joists, or studs. Size width of blankets for a snug fit where trusses, joists or studs are irregularly spaced.

-- End of Section --

SECTION 07 21 23

LOOSE FILL THERMAL INSULATION

04/06

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C 1015	(2002) Installation of Cellulosic and Mineral Fiber Loose-Fill Thermal Insulation
ASTM C 665	(2001e1) Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
ASTM C 764	(2004) Mineral Fiber Loose-Fill Thermal Insulation
ASTM C 930	(1999) Potential Health and Safety Concerns Associated with Thermal Insulation Materials and Accessories
ASTM E 136	(2004) Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 211	(2003) Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances
NFPA 31	(2001) Installation of Oil Burning Equipment
NFPA 54	(2006) National Fuel Gas Code
NFPA 70	(2007; AMD 1 2008) National Electrical Code - 2008 Edition

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

16 CFR 1209	Interim Safety Standard for Cellulose Insulation
16 CFR 1404.4	Requirements to Provide Performance and Technical Data by Labeling - Notice to Purchasers
29 CFR 1910.134	Respiratory Protection

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Loose fill insulation

SD-08 Manufacturer's Instructions

Loose Fill Insulation

1.3 DELIVERY, STORAGE, AND HANDLING

1.3.1 Delivery

Deliver materials to the site in original sealed containers or packages, each bearing manufacturer's name and brand designation, referenced specification number, type, and class, as applicable; recommended method of installation (pneumatic or pouring); minimum net weight of insulation; coverage charts; R-values; and, for cellulose insulation, a label certifying that the product meets Consumer Product Safety Commission (CPSC) Interim Safety Standard for Cellulose Insulation, 16 CFR 1209, and cautionary label regarding potential fire hazard as required in 16 CFR 1404.4.

1.3.2 Storage

Inspect materials delivered to the site for damage; unload and store out of weather in manufacturer's original packaging. Store only in dry locations, not subject to open flames or sparks, and easily accessible for inspection and handling.

1.4 SAFETY PRECAUTIONS

1.4.1 Respirators

Provide installers with dust/mist respirators, training in their use, and protective clothing, all approved by National Institute for Occupational Safety and Health (NIOSH)/Mine Safety and Health Administration (MSHA) in accordance with 29 CFR 1910.134.

1.4.2 Smoking

Do not smoke during installation of loose fill thermal insulation.

1.4.3 Other Safety Concerns

Consider other safety concerns and measures as outlined in ASTM C 930

PART 2 PRODUCTS

2.1 LOOSE FILL INSULATION

Provide loose fill insulation conforming to the following:

- a. Mineral Fiber Loose Fill: ASTM C 764, Type I, for pneumatic application, or II, for poured application, category 1.

2.1.1 Thermal Resistance Value(s) (R-Values)

Provide R-45 after settlement.

2.1.2 Recycled Material

Provide thermal insulation containing recycled materials to the extent practicable, provided that the material meets all the other requirements of this section. At the minimum, the recycled material content shall be:

Rockwool: 75 percent slag
Fiberglass: 20 to 25 percent glass cullet
Cellulose: 75 percent post-consumer paper

2.1.3 Prohibited Materials

- a. Asbestos-containing materials.
- b. Urea Formaldehyde containing materials
- c. Ammonium Sulfate containing material

2.2 BLOCKING

Wood, metal, unfaced mineral fiber blanket material in accordance with [ASTM C 665](#), Type I, or other approved materials. Provide only non-combustible materials (based on determination by [ASTM E 136](#) for blocking around chimneys and heat producing devices.

PART 3 EXECUTION

3.1 EXISTING CONDITIONS

Before installing insulation, verify that all areas that will be in contact with the insulation are dry and free of projections which could cause voids, compressed insulation, or punctured vapor retarders. If moisture or other conditions are found that do not allow the workmanlike installation of the insulation, do not proceed but notify the Contracting Officer of such conditions.

3.2 PREPARATION

3.2.1 Blocking at Attic Vents and Access Doors

Prior to installation of insulation, install permanent blocking to prevent insulation from covering, clogging, or restricting air flow through soffit vents at eaves. Install permanent blocking around attic trap doors. Install permanent blocking to maintain accessibility to equipment or controls that require maintenance or adjustment.

3.2.2 Blocking Around Heat Producing Devices

Install non-combustible blocking around heat producing devices to provide the following clearances:

- a. Recessed lighting fixtures, including wiring compartments, ballasts, and other heat producing devices, unless certified for installation surrounded by insulation: **3 inches** from outside face

of fixtures and devices or as required by NFPA 70 and, if insulation is to be placed above fixture or device, 24 inches above fixture.

- b. Masonry chimneys or masonry enclosing a flue: 2 inches from outside face of masonry. Masonry chimneys for medium and high heat operating appliances: Minimum clearances required by NFPA 211.
- c. Vents and vent connectors used for venting the products of combustion, flues, and chimneys other than masonry chimneys: minimum clearances as required by NFPA 211.
- d. Gas fired appliances: Clearances as required in NFPA 54.
- e. Oil fired appliances: Clearances as required in NFPA 31.

Blocking around flues and chimneys is not required if the insulation and vapor retarder, when provided, passed ASTM E 136, in addition to meeting all other requirements stipulated in Part 2. The blocking is also not required when chimneys are certified by the manufacturer for use in contact with insulating materials.

3.2.3 Protection of Ventilation System

Prior to installation of insulation, inspect existing HVAC equipment and ductwork to ensure that insulation will not infiltrate the air distribution/ventilation system. Where potential infiltration sources have been identified do not install insulation until repairs/modifications have been made to rectify the problem.

3.3 INSTALLATION

3.3.1 Insulation

Install and handle insulation in accordance with applicable provisions of ASTM C 1015, and manufacturer's instructions. Keep material dry and free of extraneous materials. Ensure personal protective clothing and respiratory equipment is used as required. Observe safe work practices. Use only pneumatic equipment compatible with insulation material. Operate equipment in accordance with the manufacturer's instructions. Do not tamp or rod insulation. Install insulation using the amount (by weight) of material per square foot required to achieve the specified thermal resistance value.

3.3.2 Attics

For pneumatic installations, use lowest air pressure allowed by manufacturer's instructions. Do not blow insulation into electrical devices, soffit vents, and mechanical vents which open into attic or other spaces to receive insulation.

3.3.2.1 Electrical Wiring

Do not install insulation in a manner that would sandwich electrical wiring between two layers of insulation.

3.3.2.2 Cold Climate Requirement

Place insulation to the outside of all pipes.

3.3.2.3 Special Requirements for Ceilings

Place insulation under electrical wiring occurring across joists. Pack insulation into narrowly spaced framing. Do not block flow of air through soffit vents.

3.3.2.4 Access Panels and Doors

Affix blanket insulation to all access panels and doors greater than [one square foot](#) in insulated floors and ceilings. Use insulation with same R-Value as that for floor or ceiling.

-- End of Section --

SECTION 07 31 13

ASPHALT SHINGLES

04/06

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

- ASTM D 224 (1989; R 1996) Smooth-Surfaced Asphalt Roll Roofing (Organic Felt)
- ASTM D 226 (2005) Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
- ASTM D 249 (1989; R 1996) Asphalt Roll Roofing (Organic Felt) Surfaced with Mineral Granules
- ASTM D 3018 (2003) Class A Asphalt Shingles Surfaced With Mineral Granules
- ASTM D 3462 (2004) Asphalt Shingles Made From Glass Felt and Surfaced with Mineral Granules
- ASTM D 41 (2005) Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing
- ASTM D 4586 (2000) Standard Specification for Asphalt Roof Cement, Asbestos-Free
- ASTM D 4869 (2004) Asphalt-Saturated Organic Felt Underlayment Used in Steep Slope Roofing

NATIONAL ROOFING CONTRACTORS ASSOCIATION (NRCA)

- NRCA Shingle Manual 1996 Asphalt Shingle Roofing Manual

UNDERWRITERS LABORATORIES (UL)

- UL 790 (2004) Test Methods for Fire Tests of Roof Coverings
- UL 997 (1995; Rev Jul 1998) Wind Resistance of Prepared Roof Covering Materials

1.2 DEFINITIONS

1.2.1 Top Lap

That portion of shingle overlapping shingle in course below.

1.2.2 Head Lap

The triple coverage portion of top lap which is the shortest distance from the butt edge of an overlapping shingle to the upper edge of a shingle in the second course below.

1.2.3 Exposure

That portion of a shingle exposed to the weather after installation.

1.3 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Shingles

Submit data including type, weight, class, UL labels, and special types of underlayment and eave flashing.

SD-04 Samples

Shingles

Full shingle sample and manufacturer's standard size samples of materials and products requiring color or finish selection.

SD-08 Manufacturer's Instructions

Application

1.4 DELIVERY AND STORAGE

Deliver materials in the manufacturer's unopened bundles and containers bearing the manufacturer's brand name. Keep materials dry, completely covered, and protected from the weather. Store according to manufacturer's written instructions. Roll goods shall be stored on end in an upright position or in accordance with manufacturer's recommendations. Immediately before laying, roofing felt shall be stored for 24 hours in an area maintained at a temperature not lower than 50 degrees F.

1.5 WARRANTIES

Warranties shall begin on the date of Government acceptance of the work.

1.5.1 Manufacturer's Warranty

Furnish the asphalt shingle manufacturer's standard 30 year other warranty for the asphalt shingles. The warranty shall run directly to the Government.

1.5.2 Contractor's Warranty

The Contractor shall warrant for 5 years that the asphalt shingle roofing system, as installed, is free from defects in workmanship. When repairs due to defective workmanship are required during the Contractor's warranty period, the Contractor shall make such repairs within 72 hours of notification. When repairs are not performed within the specified time, emergency repairs performed by others will not void the warranty.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Shingles

Mineral granule-surfaced asphalt shingles, self-sealing, square tab, strip, fungus-resistant. [ASTM D 3018](#), Type I, and [ASTM D 3462](#), weighing not less than 210 pounds per 100 square feet. Shingles shall meet the fire resistance requirements of [UL 790](#) for Class A and the wind resistance requirements of [UL 997](#). Color shall match the existing shingles as selected from the manufacturer's standard color charts.

2.1.2 Mineral-Surfaced Asphalt Roll Roofing

[ASTM D 249](#).

2.1.3 Smooth-Surfaced Asphalt Roll Roofing

[ASTM D 224](#), Type II.

2.1.4 Underlayment

Asphalt-saturated felt conforming to [ASTM D 4869](#) or [ASTM D 226](#), Type II, number 30, without perforations or other material specified by the shingle manufacturer for use as underlayment.

2.1.5 Nails for Applying Shingles and Asphalt-Saturated Felt

Aluminum or hot-dipped galvanized steel or equivalent corrosion resistant with sharp points and flat heads $\frac{3}{8}$ to $\frac{7}{16}$ inch in diameter. Shank diameter of nails shall be a minimum of 0.105 inch and a maximum of 0.135 inch with garb or otherwise deformed for added pull-out resistance. Nails shall be long enough to penetrate completely through or extend a minimum of $\frac{3}{4}$ inch into roof deck, whichever is less, when driven through materials to be fastened.

2.1.6 Asphalt Roof Cement

[ASTM D 4586](#), Type II.

2.1.7 Asphalt Primer

[ASTM D 41](#).

2.1.8 Ventilators

2.1.8.1 Nailable Plastic Shingle Over Type Ridge Vents

Ridge vents shall be constructed of UV stabilized nailable rigid

polypropylene material, approximately 1 foot wide and 1 inch thick, and shall be in 4 foot long interlocking sections with self-aligning ends or corrugated polyethylene rigid roll or rigid strip ridge vent with aluminum wind deflectors on each side. Vents shall be designed to prevent infiltration of insects, rain, and snow.

2.1.8.2 Nailable Mesh Shingle Over Type Ridge Vents

Ridge vents shall be constructed of UV stabilized nailable polyester mesh material, approximately one foot wide. Vents shall be designed to prevent infiltration of insects, rain, and snow.

PART 3 EXECUTION

3.1 VERIFICATION OF CONDITIONS

Ensure that roof deck is smooth, clean, dry, and without loose knots. Roof surfaces shall be firm and free from loose boards, large cracks, and projecting ends that might damage the roofing. Vents and other projections through roofs shall be properly flashed and secured in position, and projecting nails shall be driven flush with the deck.

3.2 SURFACE PREPARATION

Cover knotholes and cracks with sheet metal nailed securely to sheathing. Flash and secure vents and other roof projections, and drive projecting nails firmly home.

3.3 APPLICATION

Apply roofing materials as specified herein unless specified or recommended otherwise by shingle manufacturer's written instructions or by [NRCA Shingle Manual](#).

3.3.1 Underlayment

Apply one layer of shingle underlayment to roof deck. Lay underlayment parallel to roof eaves, starting at eaves. Provide minimum 2 inch head laps, 4 inch end laps, and 6 inch laps from both sides over hips and ridges. Nail sufficiently to hold until shingles are applied. Turn up vertical surfaces a minimum of 4 inches.

3.3.2 Drip Edges

Provide metal drip edges applied directly on the wood deck at eaves and over the underlayment at rakes. Extend back from edge of deck a minimum of 3 inches, and secure with nails spaced a maximum of 4 inches o.c. along inner edge.

3.3.3 Starter Strip

Apply starter strip at eaves, using 9 inch wide strip of mineral-surfaced roll roofing of a color to match shingles. Optionally, use a row of shingles with tabs removed and trimmed to ensure that joints are not exposed at shingle cutouts. Apply starter strip along eaves, overhanging the metal drip edge at eaves and rake edges 1/4 inch to 3/8 inch; fasten in a line parallel to and 3 to 4 inches above eave edge. Place nails so top of nail is not exposed in cutouts of first course of shingles. Seal tabs of first course of shingles with asphalt roof cement as specified below.

3.3.4 Shingle Courses

Start first course with full shingle, and apply succeeding courses with joints staggered at thirds or halves. Butt-end joints of shingles shall not align vertically more often than every fourth course. Apply shingle courses as follows:

- a. Fastening: Do not drive fasteners into or above the factory-applied adhesive unless adhesive is located $5/8$ inch or closer to top of cutouts. Place fasteners so they are concealed by shingle top lap and penetrate the head lap.
- b. Nailing: Apply shingles with nominal 5 inch exposure. Apply each shingle with minimum of six nails. Place one nail one inch from each end and one nail on each side of each cutout, on a horizontal line $5/8$ inch above cutouts.
- c. Sealing: Seal each tab with continuous, 9 inch long, $1/4$ inch diameter bead of asphalt roof cement, applied to the surface of course below. Place bead on horizontal line $5/8$ inch above cutouts so bead will be one inch from bottom edge of tab to be sealed and so bead will not show through cutouts. After nailing each shingle, press tabs down to ensure spreading and bonding of asphalt roof cement.

3.3.5 Hips and Ridges

Form with 9 by 12 inch individual shingles or with 12 by 12 inch shingles cut from 12 by 36 inch strip shingles. Bend shingles lengthwise down center with equal exposure on each side of hip or ridge. Lap shingles to provide a maximum 5 inch exposure, and nail each side in unexposed area $5\ 1/2$ inches from butt and one inch in from edge.

3.3.6 Valleys

Provide either closed cut or woven valleys.

3.3.6.1 Closed Cut Valleys

Provide 36 inch wide valley lining of single layer of smooth-surfaced or mineral-surfaced roll roofing, with mineral-surface facing down, for full length of valley as follows:

- a. Center lining in valley over underlayment. Provide minimum 12 inch end laps in the lining and seal laps with asphalt roof cement. Fasten lining to hold it in place until shingles are applied.
- b. Apply first regular course of shingles along eaves of one of the intersecting roof planes and across valley. Extend course at least 12 inches onto adjoining roof.
- c. Apply succeeding courses in same manner as first course, extending across valley and onto adjoining roof.
- d. Press shingles tightly into valley and nail in normal manner, except apply nails not closer than 6 inches to valley centerline, and apply additional nail in top corner of each shingle crossing

valley.

- e. Apply shingles on the adjoining roof plane, starting along eaves and across valley onto previously applied shingles. Trim overlapping courses back to a line parallel to and a minimum of 2 inches back from valley centerline.
- f. Trim one inch on a 45 degree angle from upper corner of each end shingle. Embed end shingles in a 3 inch wide band of asphalt roof cement.

3.3.6.2 Woven Valleys

Provide valley lining as specified for closed cut valley. Lay valley shingles over lining by either of the following methods:

- a. Method I: Apply regular shingles on both roofs simultaneously. Weave each course in turn over the valley. Lay the first regular course of shingles along eaves of roof up to and over valley. Extend course along adjoining roof deck at least 12 inches. Carry first regular course of shingles of adjoining roof over valley on top of previously applied shingles. Lay succeeding courses alternately, weaving valley shingles over each other for full length of valley.
- b. Method II: Apply regular shingles on each roof surface separately to a line about 3 feet from center of valley, and weave valley shingles in place later, as specified for Method I.

In following either method, press shingles tightly into valley, and fasten in normal manner; except apply nails not closer than 6 inches to valley centerline, and apply additional nail in top corner of terminal shingle on both sides of valley.

3.3.7 Flashing

3.3.7.1 Vent and Stack Flashing

Apply shingles up to point where vent or stack pipe projects through roof, and cut nearest shingle to fit around pipe. Before applying shingles beyond pipe, prepare flange of metal pipe vent flashing by applying a 1/8 inch thick coating of asphalt roof cement on bottom side of flashing flange. Slip flashing collar and flange over pipe, and set coated flange in 1/16 inch coating of asphalt roof cement. After applying flashing flange, continue shingling up roof. Lap lower part of flange over shingles. Overlap flange with side and upper shingles. Fit shingles around pipe, and embed in 1/16 inch thick coating of asphalt roof cement where shingles overlay flange.

-- End of Section --

SECTION 07 40 00

SOLID VINYL SIDING WORK
(Aluminum Soffit and Trim is Included)

07/07

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM B 209 (2007) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate

ASTM D 3679 (1999) Rigid Poly (Vinyl Chloride) (PVC) Siding

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS RR-W-365 (Rev. A; Int Am 1) Wire Fabric (Insect Screening)

1.2 SUBMITTALS

Submit in following in accordance with Section 01 33 00, "Submittal Procedures."

SD-04 Samples

A sample of each standard shape and a sample of each custom trim shape 12 inches long shall be submitted to and approved by the Contracting Officer

SD-07 Certificates

Vinyl siding

Vinyl soffit

Other accessories

Manufacturer's certificates or test reports shall be submitted indicating that the vinyl siding, inside corner posts, outside corner posts, "J" channel, sill trim, and other accessories meet the requirements of ASTM D 3679, and that aluminum accessories and custom trim shapes meet requirements of ASTM B 209

1.3 DELIVERY AND STORAGE

Materials shall be delivered to the job in the manufacturer's original unopened containers, with brand name clearly marked thereon. All materials

shall be carefully handled and stored to prevent damage.

PART 2 PRODUCTS

2.1 VINYL SIDING

The siding shall be rigid polyvinyl chloride horizontal lap siding of patterns indicated, conforming to ASTM D 3679, Class 2, except as otherwise specified herein. The siding and trim shall be made from a powder, not pellet, base. The vinyl shall have a minimum thickness of 0.040 inches. The color shall be as indicated and distributed throughout the thickness of the vinyl. The surface texture shall be as indicated. Where 3 colors are indicated, the color for each building shall be as directed by the Contracting Officer. The nailing hem shall have a protective ridge or other device to prevent over driving of nails. Nail slots shall be elongated to allow for horizontal expansion and contraction.

2.2 VINYL SOFFIT

The soffit shall be extruded polyvinyl chloride of patterns indicated, conforming to ASTM D 3679, Class 2, except as otherwise specified herein. The soffit and trim shall be made from a powder, not pellet, base. The vinyl shall be a minimum thickness of 0.044 inches. Provide a double 4 inch exposure, beaded, solid and aerated. Aeration slots are to be hidden in the grooves. Texture is to be smooth, low-gloss finish. The color shall be as indicated and distributed throughout the thickness of the vinyl. The surface texture shall be as indicated. Where 32 colors are indicated, the color for each building shall be as directed by the Contracting Officer. The nailing hem shall have a protective ridge or other device to prevent over driving of nails. Nail slots shall be elongated to allow for horizontal expansion and contraction.

2.3 INSIDE CORNER POSTS OUTSIDE CORNER POSTS ETC.

Inside corner posts, outside corner posts, starter strips, sill trim, "J" Channels, and other trim as required shall be rigid polyvinyl chloride and shall be of appropriate size and construction to accept the siding without loose joints or unsightly reveals.

2.4 BACKER PLATES

The backer plates shall be 8 inch aluminum suitable to backup laps or other strategic points for a smooth installation.

2.5 CUSTOM TRIM SHAPES AND OTHER ACCESSORIES

Shall be aluminum, 0.019 inch thickness with factory applied vinyl finish. Custom trim shapes shall be factory or site fabricated with a mechanical breaking machine in minimum lengths of 8 feet. Working tolerances for custom shapes shall be plus or minus 1/32 inch.

2.5.1 Finish Coating System

Factory-applied, minimum total dry film thickness of 1.0 mil, available in a minimum of six manufacturer's standard colors. Provide finish coating system on the exterior face. The interior face may receive an acrylic wash coat applied to a minimum total dry film thickness of 0.20 mil. Color shall be as selected from manufacturer's standard colors.

2.5.2 Accessories

Sheet metal flashings, trim, moldings, closure strips, caps, and other similar sheet metal accessories used in conjunction with preformed metal panels shall be made of the same material and finish as used for the panels. Thickness of the metal shall be not less than that used for the siding. Molded closure strips shall be closed-cell or solid-cell synthetic rubber, neoprene, or polyvinyl chloride premolded to match the configurations of the preformed metal panels.

2.5.3 Fasteners for attaching siding and accessories

Fasteners for attaching siding and accessories to adjoining panels shall be as approved and in accordance with the manufacturer's recommendations. Unless specified otherwise, the fasteners shall be either self-tapping screws, bolts and nuts, self-locking rivets, self-locking bolts, end-welded studs, bolted or riveted studs, or step rivets held by aluminum straps. Design the fastening system to withstand the design loads indicated. Fasteners shall be Series 305 stainless steel or aluminum. Fasteners, with the exception of those having integral hexagonal washer heads and those having aluminum drive caps, shall have composite metal and neoprene washers. Fasteners having integral hexagonal washer heads and fasteners having aluminum drive caps shall have polychloroprene washers. Heads of screws or bolts exposed on exterior face of factory-finished wall shall be nylon headed to match color of wall.

2.6 POP RIVETS

Shall be used to secure corners or joints which cannot be secured by nailing to backup materials and shall be aluminum or material which is non-reactive with aluminum.

2.7 NAILS

Aluminum or galvanized steel, with 5/16-inch head for siding, 7/16-inch head for insulation and 0.125 inch diameter, and of length required to penetrate existing wood 3/4 inch.

2.8 EXPOSED NAILS

Nails which will be exposed in the finish work shall have a 3/32-inch head or smaller and shall be color matched to the material being nailed.

2.9 FURRING STRIPS

Treated wood furring strips.

2.10 LOUVERS

Shall be fabricated of extruded aluminum to fit openings from which existing wood louvers are removed. Extruded sections for blades and frames shall have wall thickness of not less than 0.064 inch and shall have longitudinal ridges to prevent sagging and bowing. Louvers shall be designed and constructed so as to prevent entrance of water into the attic space. Corners of frames and intersections of blades with frames shall be welded or mechanically fastened and made watertight with sealant specified in section "Calking". All exposed aluminum surfaces shall be cleaned, treated, primed, and given a white vinyl finish, with total dry film thickness not less than 0.8 mils. Provide insect screening conforming to

FS RR-W-365, 18 by 18 mesh.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

Drive in loose nails in existing siding and wood trim. If any existing wood or plywood to be covered by vinyl shows evidence of rotting, the Contractor shall inform the Contracting Officer. Prior to installation of insulation and siding, deteriorated wood and plywood shall be removed and new wood or plywood shall be provided as directed by the Contracting Officer. The cost of such work performed at the direction of the Contracting Officer will be paid for by adjustment of the contract price in accordance with the Contract Clauses.

3.2 FURRING STRIPS

Shall be provided around openings and as required to level out irregularities.

3.3 SIDING

Apply starter strip in a true and level manner with nails 16 inches on center making sure that nails are in the center of nailing slots. Apply inside and outside corners similarly. Where still trim is used, lock punch siding 12 inches on center to lock. Hang siding with one nail at 16 inches on center. DO NOT DRIVE NAILS TIGHT. A minimum of 1/32-inch must be left between the nail and siding to allow for horizontal movement. Allow 3/16-inch between ends of siding and bottom of trim throat for expansion. Ends of siding and trim shall not be left open, but shall have metal or vinyl closures applied, or in the case of small open ends such as custom drip caps, the ends shall be calked and smoothed. If vinyl is required to be bent, the bend shall be accomplished with a heated mechanical break. Open flame shall not be used. Joints in siding shall be staggered vertically and shall occur at 8 foot intervals or greater horizontally. Backer plates shall be used behind joints in trim and where required to produce a smooth installation.

3.4 CUSTOM TRIM

Shall be fabricated to a tolerance of plus or minus 1/32-inch with a mechanical breaking apparatus in lengths of 8 feet or longer. The trim shall be nailed with small color matched aluminum nails and shall be blind nailed where possible. Exposed cut ends or edges shall be calked against the abutting material to make a smooth transition. Where splices in trim are required they shall be lapped in shingle fashion to repel water, and where there is no backup material for nailing, the trim shall be pop riveted as required to make a smooth joint without unsightly reveals or puckers.

3.5 GABLE LOUVERS

Shall be securely fastened into existing louver openings and trimmed and calked as required to produce a weathertight installation.

3.6 PROTECTION AND CLEANING

The Contractor shall take such measures as required to protect his work from damage and upon completion of work, all stains, smears, and other

soiling shall be removed and the work left in clean and neat condition.
The Contractor shall clean the site of construction debris daily.

-- End of Section --

SECTION 07 84 00

FIRESTOPPING

10/07

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM E 814 (2008b) Standard Test Method for Fire Tests of Through-Penetration Fire Stops

ASTM E 84 (2008a) Standard Test Method for Surface Burning Characteristics of Building Materials

FM GLOBAL (FM)

FM AS 4991 (2001) Approval of Firestop Contractors

FM P7825a (2005) Approval Guide Fire Protection

UNDERWRITERS LABORATORIES (UL)

UL 1479 (2003; Rev thru Dec 2008) Standard for Fire Tests of Through-Penetration Fire Stops

UL 723 (2008) Standard for Test for Surface Burning Characteristics of Building Materials

UL Fire Resistance (2008) Fire Resistance Directory

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Firestopping Materials.

Detail drawings including manufacturer's descriptive data, typical details conforming to UL Fire Resistance or other details certified by another nationally recognized testing laboratory, installation instructions or UL listing details for a firestopping assembly in lieu of fire-test data or report. For those firestop applications for which no UL tested system is available through a manufacturer, a manufacturer's engineering judgement, derived from

similar UL system designs or other tests, shall be submitted for review and approval prior to installation. Submittal shall indicate the firestopping material to be provided for each type of application. When more than a total of 5 penetrations and/or construction joints are to receive firestopping, provide drawings that indicate location, "F" and "T" ratings, and type of application.

SD-07 Certificates

Firestopping Materials.

Certificates attesting that firestopping material complies with the specified requirements. In lieu of certificates, drawings showing UL classified materials as part of a tested assembly may be provided. Drawings showing evidence of testing by an alternate nationally recognized independent laboratory may be substituted.

Installer Qualifications.

Documentation of training and experience.

Inspection.

Manufacturer's representative certification stating that firestopping work has been inspected and found to be applied according to the manufacturer's recommendations and the specified requirements.

1.3 GENERAL REQUIREMENTS

Firestopping shall consist of furnishing and installing tested and listed firestop systems, combination of materials, or devices to form an effective barrier against the spread of flame, smoke and gases, and maintain the integrity of fire resistance rated walls, partitions, floors, and ceiling-floor assemblies, including through-penetrations and construction joints and gaps. Through-penetrations include the annular space around pipes, tubes, conduit, wires, cables and vents. Construction joints include those used to accommodate expansion, contraction, wind, or seismic movement; firestopping material shall not interfere with the required movement of the joint. Gaps requiring firestopping include gaps between the curtain wall and the floor slab and between the top of the fire-rated walls and the roof or floor deck above.

1.4 DELIVERY AND STORAGE

Materials shall be delivered in the original unopened packages or containers showing name of the manufacturer and the brand name. Materials shall be stored off the ground and shall be protected from damage and exposure to elements. Damaged or deteriorated materials shall be removed from the site.

1.5 INSTALLER QUALIFICATIONS

The Contractor shall engage an experienced Installer who is:

- a. FM Research approved in accordance with FM AS 4991, or
- b. Certified, licensed, or otherwise qualified by the firestopping

manufacturer as having the necessary staff, training, and a minimum of 3 years experience in the installation of manufacturer's products in accordance with specified requirements. A manufacturer's willingness to sell its firestopping products to the Contractor or to an installer engaged by the Contractor does not in itself confer qualification on the buyer. The Installer shall have been trained by a direct representative of the manufacturer (not distributor or agent) in the proper selection and installation procedures.

1.6 COORDINATION

The specified work shall be coordinated with other trades. Firestopping materials, at penetrations of pipes and ducts, shall be applied prior to insulating, unless insulation meets requirements specified for firestopping. Firestopping materials at building joints and construction gaps shall be applied prior to completion of enclosing walls or assemblies. Cast-in-place firestop devices shall be located and installed in place before concrete placement. Pipe, conduit or cable bundles shall be installed through cast-in-place device after concrete placement but before area is concealed or made inaccessible.

PART 2 PRODUCTS

2.1 FIRESTOPPING MATERIALS

Firestopping materials shall consist of commercially manufactured, asbestos-free, noncombustible products FM P7825a approved, or UL listed, for use with applicable construction and penetrating items, complying with the following minimum requirements:

2.1.1 Fire Hazard Classification

Material shall have a flame spread of 25 or less, and a smoke developed rating of 50 or less, when tested in accordance with ASTM E 84 or UL 723. Material shall be an approved firestopping material as listed in UL Fire Resistance or by a nationally recognized testing laboratory.

2.1.2 Toxicity

Material shall be nontoxic to humans at all stages of application or during fire conditions.

2.1.3 Fire Resistance Rating

Firestop systems shall be UL Fire Resistance listed or FM P7825a approved with "F" rating at least equal to fire-rating of fire wall or floor in which penetrated openings are to be protected, except that "F" rating may be 3 hours in through-penetrations of 4 hour fire rated wall or floor. Firestop systems shall also have "T" rating where required.

2.1.3.1 Through-Penetrations

Firestopping materials for through-penetrations, as described in paragraph GENERAL REQUIREMENTS, shall provide "F" and "T" fire resistance ratings in accordance with ASTM E 814 or UL 1479. Fire resistance ratings shall be as follows:

- a. Penetrations of Fire Resistance Rated Walls and Partitions: F Rating = one hour Rating of wall or partition being penetrated.

PART 3 EXECUTION

3.1 PREPARATION

Areas to receive firestopping shall be free of dirt, grease, oil, or loose materials which may affect the fitting or fire resistance of the firestopping system. For cast-in-place firestop devices, formwork or metal deck to receive device prior to concrete placement shall be sound and capable of supporting device. Surfaces shall be prepared as recommended by the manufacturer.

3.2 INSTALLATION

Firestopping material shall completely fill void spaces regardless of geometric configuration, subject to tolerance established by the manufacturer. Firestopping systems for filling floor voids 4 inches or more in any direction shall be capable of supporting the same load as the floor is designed to support or shall be protected by a permanent barrier to prevent loading or traffic in the firestopped area. Firestopping shall be installed in accordance with manufacturer's written instructions. Tested and listed firestop systems shall be provided in the following locations, except in floor slabs on grade:

- a. Penetrations of duct, conduit, tubing, cable and pipe through floors and through fire-resistance rated walls, partitions, and ceiling-floor assemblies.
- b. Penetrations of vertical shafts such as pipe chases, elevator shafts, and utility chutes.
- c. Gaps at the intersection of floor slabs and curtain walls, including inside of hollow curtain walls at the floor slab.
- d. Gaps at perimeter of fire-resistance rated walls and partitions, such as between the top of the walls and the bottom of roof decks.
- e. Construction joints in floors and fire rated walls and partitions.
- f. Other locations where required to maintain fire resistance rating of the construction.

3.2.1 Insulated Pipes and Ducts

Thermal insulation shall be cut and removed where pipes or ducts pass through firestopping, unless insulation meets requirements specified for firestopping. Thermal insulation shall be replaced with a material having equal thermal insulating and firestopping characteristics.

3.2.2 Fire Dampers

Fire dampers shall be installed and firestopped in accordance with Section 23 73 33 "HEATING, VENTILATING, AND COOLING SYSTEMS."

3.2.3 Data and Communication Cabling

Cabling for data and communication applications shall be sealed with re-enterable firestopping products that do not cure over time. Firestopping shall be modular devices, containing built-in self-sealing

intumescent inserts. Firestopping devices shall allow for cable moves, adds or changes without the need to remove or replace any firestop materials.

3.3 INSPECTION

For Navy projects, install one of each type of penetration and have it inspected and accepted by the Naval Facilities Engineering Command, Fire Protection Engineer prior to the installation of the remainder of the penetrations. At this inspection, the manufacturer's technical representative of the firestopping material shall be present. For all projects, the remainder of the firestopped areas shall not be covered or enclosed until inspection is complete and approved by the manufacturer's technical representative. The manufacturer's representative shall inspect the applications initially to ensure adequate preparations (clean surfaces suitable for application, etc.) and periodically during the work to assure that the completed work has been accomplished according to the manufacturer's written instructions and the specified requirements. The Contractor shall submit written reports indicating locations of and types of penetrations and types of firestopping used at each location; type shall be recorded by UL listed printed numbers.

-- End of Section --

SECTION 07 92 00

JOINT SEALANTS

01/07

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C 834	(2005) Latex Sealants
ASTM C 920	(2008) Standard Specification for Elastomeric Joint Sealants
ASTM D 1056	(2000) Flexible Cellular Materials - Sponge or Expanded Rubber

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Sealants

Primers

Bond breakers

Backstops

Manufacturer's descriptive data including storage requirements, shelf life, curing time, instructions for mixing and application, and primer data (if required). Provide a copy of the Material Safety Data Sheet for each solvent, primer or sealant material.

SD-07 Certificates

Sealant

Certificates of compliance stating that the materials conform to the specified requirements.

1.3 ENVIRONMENTAL CONDITIONS

Apply sealant when the ambient temperature is between 40 and 90 degrees F.

1.4 DELIVERY AND STORAGE

Deliver materials to the job site in unopened manufacturers' external shipping containers, with brand names, date of manufacture, color, and material designation clearly marked thereon. Label elastomeric sealant containers to identify type, class, grade, and use. Carefully handle and store materials to prevent inclusion of foreign materials or subjection to sustained temperatures exceeding 90 degrees F or less than 0 degrees F.

1.5 QUALITY ASSURANCE

1.5.1 Compatibility with Substrate

Verify that each of the sealants are compatible for use with joint substrates.

1.5.2 Joint Tolerance

Provide joint tolerances in accordance with manufacturer's printed instructions.

1.6 SPECIAL WARRANTY

Guarantee sealant joint against failure of sealant and against water penetration through each sealed joint for five years.

PART 2 PRODUCTS

2.1 SEALANTS

Provide sealant that has been tested and found suitable for the substrates to which it will be applied.

2.1.1 Interior Sealant

Provide ASTM C 834 and ASTM C 920, Type S or M, Grade NS, Class 25, Use NT for wet areas. Location(s) and color(s) of sealant for the following:

	LOCATION	COLOR
a.	Small voids between walls or partitions and adjacent lockers, casework, shelving, door frames, built-in or surface-mounted equipment and fixtures, and similar items.	As selected
b.	Perimeter of frames at doors, windows, and access panels which adjoin exposed interior concrete and masonry surfaces.	As selected
c.	Joints of interior masonry walls and partitions which adjoin columns, pilasters, concrete walls, and exterior walls unless otherwise detailed.	As selected
d.	Joints between edge members for acoustical tile and adjoining vertical surfaces.	White
e.	Interior locations, not otherwise indicated or specified, where small voids exist between	As selected

LOCATION	COLOR
materials specified to be painted.	
f. Joints between bathtubs and ceramic tile; joints between shower receptors and ceramic tile; joints formed where nonplaner tile surfaces meet.	As selected
g. Joints formed between tile floors and tile base cove; joints between tile and dissimilar materials; joints occurring where substrates change.	As selected
h. Behind escutcheon plates at valve pipe penetrations and showerheads in showers.	White

2.1.2 Exterior Sealant

For joints in vertical surfaces, provide **ASTM C 920**, Type S or M, Grade NS, Class 25, Use NT for wet areas. For joints in horizontal surfaces, provide **ASTM C 920**, Type S or M, Grade P, Class 25, Use T. Provide location(s) and color(s) of sealant as follows:

LOCATION	COLOR
a. Joints and recesses formed where frames and subsills of windows, doors, louvers, and vents adjoin masonry, concrete, or metal frames. Use sealant at both exterior and interior surfaces of exterior wall penetrations.	Match adjacent surface color
b. Joints between new and existing exterior masonry walls.	Match adjacent surface color
c. Voids where items pass through exterior walls.	Match adjacent surface color
d. Metal reglets, where flashing is inserted into masonry joints, and where flashing is penetrated by coping dowels.	Match adjacent surface color
e. Metal-to-metal joints where sealant is indicated or specified.	Match adjacent surface color

2.1.3 Floor Joint Sealant

ASTM C 920, Type S or M, Grade P, Class 25, Use T. Provide location(s) and color(s) of sealant as follows:

LOCATION	COLOR
a. Seats of metal thresholds for exterior doors.	Gray
b. Control and expansion joints in floors,	Gray

LOCATION
slabs, ceramic tile, and walkways.

COLOR

2.2 PRIMERS

Provide a nonstaining, quick-drying type and consistency recommended by the sealant manufacturer for the particular application.

2.3 BOND BREAKERS

Provide the type and consistency recommended by the sealant manufacturer to prevent adhesion of the sealant to backing or to bottom of the joint.

2.4 BACKSTOPS

Provide glass fiber roving or neoprene, butyl, polyurethane, or polyethylene foams free from oil or other staining elements as recommended by sealant manufacturer. Provide 25 to 33 percent oversized backing for closed cell and 40 to 50 percent oversized backing for open cell material, unless otherwise indicated. Make backstop material compatible with sealant. Do not use oakum and other types of absorptive materials as backstops.

2.4.1 Neoprene

Conform to [ASTM D 1056](#), closed cell expanded neoprene cord Type 2, Class C, Grade 2C2.

2.5 CLEANING SOLVENTS

Provide type(s) recommended by the sealant manufacturer except for aluminum and bronze surfaces that will be in contact with sealant.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

Clean surfaces from dirt frost, moisture, grease, oil, wax, lacquer, paint, or other foreign matter that would tend to destroy or impair adhesion. Remove oil and grease with solvent. Surfaces must be wiped dry with clean cloths. When resealing an existing joint, remove existing calk or sealant prior to applying new sealant. For surface types not listed below, contact sealant manufacturer for specific recommendations.

3.1.1 Steel Surfaces

Remove loose mill scale by sandblasting or, if sandblasting is impractical or would damage finish work, scraping and wire brushing. Remove protective coatings by sandblasting or using a residue-free solvent.

3.1.2 Aluminum or Bronze Surfaces

Remove temporary protective coatings from surfaces that will be in contact with sealant. When masking tape is used as a protective coating, remove tape and any residual adhesive just prior to sealant application. For removing protective coatings and final cleaning, use nonstaining solvents recommended by the manufacturer of the item(s) containing aluminum or bronze surfaces.

3.1.3 Concrete and Masonry Surfaces

Where surfaces have been treated with curing compounds, oil, or other such materials, remove materials by sandblasting or wire brushing. Laitance, remove efflorescence and loose mortar from the joint cavity.

3.1.4 Wood Surfaces

Keep wood surfaces to be in contact with sealants free of splinters and sawdust or other loose particles.

3.2 SEALANT PREPARATION

Do not add liquids, solvents, or powders to the sealant. Mix multicomponent elastomeric sealants in accordance with manufacturer's instructions.

3.3 APPLICATION

3.3.1 Joint Width-To-Depth Ratios

a. Acceptable Ratios:

	<u>JOINT DEPTH</u>	
	Minimum	Maximum
<u>JOINT WIDTH</u>		
For metal, glass, or other nonporous surfaces:		
1/4 inch (minimum)	1/4 inch	1/4 inch
over 1/4 inch	1/2 of width	Equal to width
For wood, concrete, masonry,		
1/4 inch (minimum)	1/4 inch	1/4 inch
Over 1/4 inch to 1/2 inch	1/4 inch	Equal to width
Over 1/2 inch to 2 inch	1/2 inch	5/8 inch
Over 2 inch.	(As recommended by sealant manufacturer)	

- b. Unacceptable Ratios: Where joints of acceptable width-to-depth ratios have not been provided, clean out joints to acceptable depths and grind or cut to acceptable widths without damage to the adjoining work. Grinding is not required on metal surfaces.

3.3.2 Masking Tape

Place masking tape on the finish surface on one or both sides of a joint cavity to protect adjacent finish surfaces from primer or sealant smears. Remove masking tape within 10 minutes after joint has been filled and tooled.

3.3.3 Backstops

Install backstops dry and free of tears or holes. Tightly pack the back or

bottom of joint cavities with backstop material to provide a joint of the depth specified. Install backstops in the following locations:

- a. Where indicated.
- b. Where backstop is not indicated but joint cavities exceed the acceptable maximum depths specified in paragraph entitled, "Joint Width-to-Depth Ratios".

3.3.4 Primer

Immediately prior to application of the sealant, clean out loose particles from joints. Where recommended by sealant manufacturer, apply primer to joints in concrete masonry units, wood, and other porous surfaces in accordance with sealant manufacturer's instructions. Do not apply primer to exposed finish surfaces.

3.3.5 Bond Breaker

Provide bond breakers to the back or bottom of joint cavities, as recommended by the sealant manufacturer for each type of joint and sealant used, to prevent sealant from adhering to these surfaces. Carefully apply the bond breaker to avoid contamination of adjoining surfaces or breaking bond with surfaces other than those covered by the bond breaker.

3.3.6 Sealants

Provide a sealant compatible with the material(s) to which it is applied. Do not use a sealant that has exceeded shelf life or has jelled and can not be discharged in a continuous flow from the gun. Apply the sealant in accordance with the manufacturer's printed instructions with a gun having a nozzle that fits the joint width. Force sealant into joints to fill the joints solidly without air pockets. Tool sealant after application to ensure adhesion. Make sealant uniformly smooth and free of wrinkles. Upon completion of sealant application, roughen partially filled or unfilled joints, apply sealant, and tool smooth as specified. Apply sealer over the sealant when and as specified by the sealant manufacturer.

3.4 PROTECTION AND CLEANING

3.4.1 Protection

Protect areas adjacent to joints from sealant smears. Masking tape may be used for this purpose if removed 5 to 10 minutes after the joint is filled.

3.4.2 Final Cleaning

Upon completion of sealant application, remove remaining smears and stains and leave the work in a clean and neat condition.

- a. **Masonry and Other Porous Surfaces:** Immediately scrape off fresh sealant that has been smeared on masonry and rub clean with a solvent as recommended by the sealant manufacturer. Allow excess sealant to cure for 24 hour then remove by wire brushing or sanding.

- b. Metal and Other Non-Porous Surfaces: Remove excess sealant with a solvent-moistened cloth.

-- End of Section --

SECTION 08 11 13

STEEL DOORS AND FRAMES

08/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M (2008) Structural Welding Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM A 653/A 653M (2008) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

ASTM A 879/A 879M (2006) Standard Specification for Steel Sheet, zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface

ASTM A 924/A 924M (2008a) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process

ASTM C 578 (2008b) Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation

ASTM C 591 (2008) Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation

ASTM D 2863 (2006a) Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index)

ASTM E 1300 (2007e1) Determining Load Resistance of Glass in Buildings

ASTM F 2248 (2003) Standard Practice for Specifying an Equivalent 3-Second Duration Design Loading for Blast Resistant Glazing Fabricated with Laminated Glass

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

BHMA A115 (2006) (Complete Set - Spec dates Vary)

Specifications for Door and Frame
Preparation for Hardware (Incl A115.1
(1990), A115.2 (1987), A115.4 (1994),
A115.5 (1992), A115.6 (1993), A115.12
(1994), A115.13 (1991), A115.14 (1994),
A115.15 (1994), A115.16 (1990), A115.17
(1994), A115.18 (1994))

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

- NFPA 105** (2006; Errata 2007; Errata 2007)
Installation of Smoke Door Assemblies
- NFPA 252** (2007) Standard Methods of Fire Tests of
Door Assemblies
- NFPA 80** (2006; Errata 2008) Standard for Fire
Doors and Other Opening Protectives

STEEL DOOR INSTITUTE (SDI/DOOR)

- SDI/DOOR 111** (2000) Recommended Selection and Usage
Guide for Standard Steel Doors, Frames and
Accessories
- SDI/DOOR 113** (2001) Determining the Steady State
Thermal Transmittance of Steel Door and
Frame Assemblies
- SDI/DOOR A250.11** (2001) Recommended Erection Instructions
for Steel Frames
- SDI/DOOR A250.6** (2003) Hardware on Steel Doors
(Reinforcement - Application)
- SDI/DOOR A250.8** (2003) Recommended Specification for
Standard Steel Doors and Frames

UNDERWRITERS LABORATORIES (UL)

- UL 10B** (2008) Fire Tests of Door Assemblies

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00
SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Doors;

Frames;

Accessories

Show elevations, construction details, metal gages, hardware
provisions, method of glazing, and installation details.

Schedule of **doors;**

Schedule of frames;

Submit door and frame locations.

SD-03 Product Data

Doors;

Frames;

Accessories

Submit manufacturer's descriptive literature for doors, frames, and accessories. Include data and details on door construction, panel (internal) reinforcement, insulation, and door edge construction.

1.3 DELIVERY, STORAGE, AND HANDLING

Deliver doors, frames, and accessories undamaged and with protective wrappings or packaging. Strap knock-down frames in bundles. Provide temporary steel spreaders securely fastened to the bottom of each welded frame. Store doors and frames on platforms under cover in clean, dry, ventilated, and accessible locations, with 1/4 inch airspace between doors. Remove damp or wet packaging immediately and wipe affected surfaces dry. Replace damaged materials with new.

PART 2 PRODUCTS

2.1 STANDARD STEEL DOORS

SDI/DOOR A250.8, except as specified otherwise. Prepare doors to receive door hardware as specified in Section 08 71 00. Undercut where indicated. Exterior doors shall have top edge closed flush and sealed to prevent water intrusion. Doors shall be 1-3/4 inch thick, unless otherwise indicated. Provide exterior glazing in accordance with ASTM F 2248 and ASTM E 1300.

2.1.1 Classification - Level, Performance, Model

2.1.1.1 Extra Heavy Duty Doors

SDI/DOOR A250.8, Level 3, physical performance Level A, Model 1 with core construction as required by the manufacturer for interior doors and for indicated exterior doors, of size(s) and design(s) indicated. Where vertical stiffener cores are required, the space between the stiffeners shall be filled with mineral board insulation. Exterior doors are to be insulated.

2.2 Louvers

2.2.1 Interior Louvers

SDI/DOOR 111, Louvers shall be stationary sightproof type. Detachable moldings on room or non security side of door; on security side of door, moldings to be integral part of louver. Form louver frames of 20 gage steel and louver blades of a minimum 24 gage. Sightproof louvers to be inverted "V" blade design with minimum 55 percent net-free opening.

2.2.2 Exterior Louvers

Louvers shall be inverted "V" type with minimum of 55 percent net-free opening. Weld or tenon louver blades to continuous channel frame and weld assembly to door to form watertight assembly. Form louvers of hot-dip galvanized steel of same gage as door facings. Louvers shall have steel-framed insect screens secured to room side and readily removable. Provide aluminum wire cloth, 18 by 18 or 18 by 16 inch mesh, for insect screens. Net-free louver area to be before screening.

2.3 Astragals

For pairs of exterior steel doors which will not have aluminum astragals or removable mullions, as specified in Section 08 71 00 DOOR HARDWARE provide overlapping steel astragals with the doors. For interior pairs of fire rated and smoke control doors, provide stainless steel astragals complying with NFPA 80 for fire rated assemblies and NFPA 105 for smoke control assemblies.

2.4 Moldings

Provide moldings around glass of interior and exterior doors and louvers of interior doors. Provide nonremovable moldings on outside of exterior doors and on corridor side of interior doors. Other moldings may be stationary or removable. Secure inside moldings to stationary moldings, or provide snap-on moldings. Muntins shall interlock at intersections and shall be fitted and welded to stationary moldings.

2.5 INSULATION CORES

Insulated cores shall be of type specified, and provide an apparent U-factor of .48 in accordance with SDI/DOOR 113 and shall conform to:

- a. Rigid Cellular Polyisocyanurate Foam: ASTM C 591, Type I or II, foamed-in-place or in board form, with oxygen index of not less than 22 percent when tested in accordance with ASTM D 2863; or
- b. Rigid Polystyrene Foam Board: ASTM C 578, Type I or II

2.6 STANDARD STEEL FRAMES

SDI/DOOR A250.8, Level 3, except as otherwise specified. Form frames to sizes and shapes indicated, with welded corners or and knock-down field-assembled corners. Provide steel frames for doors, sidelights, and interior glazed panels, unless otherwise indicated.

2.6.1 Welded Frames

Continuously weld frame faces at corner joints. Mechanically interlock or continuously weld stops and rabbets. Grind welds smooth.

Weld frames in accordance with the recommended practice of the Structural Welding Code Sections 1 through 6, AWS D1.1/D1.1M and in accordance with the practice specified by the producer of the metal being welded.

2.6.2 Knock-Down Frames

Design corners for simple field assembly by concealed tenons, splice plates, or interlocking joints that produce square, rigid corners and a

tight fit and maintain the alignment of adjoining members. Provide locknuts for bolted connections.

2.6.3 Mullions and Transom Bars

Mullions and transom bars shall be closed or tubular construction and be a member with heads and jambs butt-welded thereto or knock-down for field assembly. Bottom of door mullions shall have adjustable floor anchors and spreader connections.

2.6.4 Stops and Beads

Form stops and beads from 20 gage steel. Provide for glazed and other openings in standard steel frames. Secure beads to frames with oval-head, countersunk Phillips self-tapping sheet metal screws or concealed clips and fasteners. Space fasteners approximately 12 to 16 inch on center. Miter molded shapes at corners. Butt or miter square or rectangular beads at corners.

2.6.5 Anchors

Provide anchors to secure the frame to adjoining construction. Provide steel anchors, zinc-coated or painted with rust-inhibitive paint, not lighter than 18 gage.

2.6.5.1 Wall Anchors

Provide at least three anchors for each jamb. For frames which are more than 7.5 feet in height, provide one additional anchor for each jamb for each additional 2.5 feet or fraction thereof.

- a. Masonry: Provide anchors of corrugated or perforated steel straps or 3/16 inch diameter steel wire, adjustable or T-shaped;
- b. Stud partitions: Weld or otherwise securely fasten anchors to backs of frames. Design anchors to be fastened to closed steel studs with sheet metal screws, and to open steel studs by wiring or welding;
- c. Completed openings: Secure frames to previously placed concrete or masonry with expansion bolts in accordance with SDI/DOOR 111; and

2.6.5.2 Floor Anchors

Provide floor anchors drilled for 3/8 inch anchor bolts at bottom of each jamb member.

2.7 FIRE AND SMOKE DOORS AND FRAMES

NFPA 80 and NFPA 105 and this specification. The requirements of NFPA 80 and NFPA 105 shall take precedence over details indicated or specified.

2.7.1 Labels

Fire doors and frames shall bear the label of Underwriters Laboratories (UL), Factory Mutual Engineering and Research (FM), or Warnock Hersey International (WHI) attesting to the rating required. Testing shall be in accordance with NFPA 252 or UL 10B. Labels shall be metal with raised

letters, and shall bear the name or file number of the door and frame manufacturer. Labels shall be permanently affixed at the factory to frames and to the hinge edge of the door. Door labels shall not be painted.

2.7.2 Oversized Doors

For fire doors and frames which exceed the size for which testing and labeling are available, furnish certificates stating that the doors and frames are identical in design, materials, and construction to a door which has been tested and meets the requirements for the class indicated.

2.7.3 Astragal on Fire and Smoke Doors

On pairs of labeled fire doors, conform to [NFPA 80](#) and UL requirements. On smoke control doors, conform to [NFPA 105](#).

2.8 WEATHERSTRIPPING

As specified in Section [08 71 00 DOOR HARDWARE](#).

2.9 HARDWARE PREPARATION

Provide minimum hardware reinforcing gages as specified in [SDI/DOOR A250.6](#). Drill and tap doors and frames to receive finish hardware. Prepare doors and frames for hardware in accordance with the applicable requirements of [SDI/DOOR A250.8](#) and [SDI/DOOR A250.6](#). For additional requirements refer to [BHMA A115](#). Drill and tap for surface-applied hardware at the project site. Build additional reinforcing for surface-applied hardware into the door at the factory. Locate hardware in accordance with the requirements of [SDI/DOOR A250.8](#), as applicable. Punch door frames, with the exception of frames that will have weatherstripping gasketing to receive a minimum of two rubber or vinyl door silencers on lock side of single doors and one silencer for each leaf at heads of double doors. Set lock strikes out to provide clearance for silencers.

2.10 FINISHES

2.10.1 Factory-Primed Finish

All surfaces of doors and frames shall be thoroughly cleaned, chemically treated and factory primed with a rust inhibiting coating as specified in [SDI/DOOR A250.8](#). Where coating is removed by welding, apply touchup of factory primer.

2.10.2 Hot-Dip Zinc-Coated and Factory-Primed Finish

Fabricate exterior doors and frames from hot dipped zinc coated steel, alloyed type, that complies with [ASTM A 924/A 924M](#) and [ASTM A 653/A 653M](#). The coating weight shall meet or exceed the minimum requirements for coatings having [0.4 ounces per square foot](#), total both sides, i.e., [A40](#). Repair damaged zinc-coated surfaces by the application of zinc dust paint. Thoroughly clean and chemically treat to insure maximum paint adhesion. Factory prime as specified in [SDI/DOOR A250.8](#).

2.10.3 Electrolytic Zinc-Coated Anchors and Accessories

Provide electrolytically deposited zinc-coated steel in accordance with [ASTM A 879/A 879M](#), Commercial Quality, Coating Class A. Phosphate treat and factory prime zinc-coated surfaces as specified in [SDI/DOOR A250.8](#).

2.11 FABRICATION AND WORKMANSHIP

Finished doors and frames shall be strong and rigid, neat in appearance, and free from defects, waves, scratches, cuts, dents, ridges, holes, warp, and buckle. Molded members shall be clean cut, straight, and true, with joints coped or mitered, well formed, and in true alignment. Dress exposed welded and soldered joints smooth. Design door frame sections for use with the wall construction indicated. Corner joints shall be well formed and in true alignment. Conceal fastenings where practicable. Design frames in exposed masonry walls or partitions to allow sufficient space between the inside back of trim and masonry to receive calking compound.

2.11.1 Grouted Frames

For frames to be installed in exterior walls and to be filled with mortar or grout, fill the stops with strips of rigid insulation to keep the grout out of the stops and to facilitate installation of stop-applied head and jamb seals.

2.12 PROVISIONS FOR GLAZING

Materials are specified in Section 08 81 00, GLAZING.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Frames

Set frames in accordance with SDI/DOOR A250.11. Plumb, align, and brace securely until permanent anchors are set. Anchor bottoms of frames with expansion bolts or powder-actuated fasteners. Build in or secure wall anchors to adjoining construction. Backfill frames with mortar. Coat inside of frames with corrosion-inhibiting bituminous material. For frames in exterior walls, ensure that stops are filled with rigid insulation before grout is placed.

3.1.2 Doors

Hang doors in accordance with clearances specified in SDI/DOOR A250.8. After erection and glazing, clean and adjust hardware.

3.1.3 Fire and Smoke Doors and Frames

Install fire doors and frames, including hardware, in accordance with NFPA 80. Install fire rated smoke doors and frames in accordance with NFPA 80 and NFPA 105.

3.2 PROTECTION

Protect doors and frames from damage. Repair damaged doors and frames prior to completion and acceptance of the project or replace with new, as directed. Wire brush rusted frames until rust is removed. Clean thoroughly. Apply an all-over coat of rust-inhibitive paint of the same type used for shop coat.

3.3 CLEANING

Upon completion, clean exposed surfaces of doors and frames thoroughly.
Remove mastic smears and other unsightly marks.

-- End of Section --

SECTION 08 14 00

WOOD DOORS

07/06

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ARCHITECTURAL WOODWORK INSTITUTE (AWI)

AWI Qual Stds (8th Edition) AWI Quality Standards

ASTM INTERNATIONAL (ASTM)

ASTM E 2074 (2000e1) Standard Test Method for Fire Tests of Door Assemblies, Including Positive Pressure Testing of Side-Hinged and Pivoted Swinging Door Assemblies

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 252 (2007) Standard Methods of Fire Tests of Door Assemblies

NFPA 80 (2006; Errata 2008) Standard for Fire Doors and Other Opening Protectives

UNDERWRITERS LABORATORIES (UL)

UL 10B (2008) Fire Tests of Door Assemblies

WINDOW AND DOOR MANUFACTURERS ASSOCIATION (WDMA)

WDMA I.S. 1-A (1997) Architectural Wood Flush Doors

WDMA I.S. 4 (2000) Water-Repellent Preservative Non-Pressure Treatment for Millwork

WDMA TM-5 (1990) Split Resistance Test Method

WDMA TM-7 (1990) Cycle Slam Test Method

WDMA TM-8 (1990) Hinge Loading Test Method

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

SD-02 Shop Drawings

Doors

Submit drawings or catalog data showing each type of door unit. Drawings and data shall indicate door type and construction, sizes, thickness, methods of assembly, door louvers, and glazing,.

SD-03 Product Data

Doors

Accessories

Sample warranty

Fire resistance rating

SD-06 Test Reports

Split resistance

Cycle-slam

Hinge loading resistance

Submit split resistance test report for doors tested in accordance with **WDMA TM-5**, cycle-slam test report for doors tested in accordance with **WDMA TM-7**, and hinge loading resistance test report for doors tested in accordance with **WDMA TM-8**.

1.3 DELIVERY, STORAGE, AND HANDLING

Deliver doors to the site in an undamaged condition and protect against damage and dampness. Stack doors flat under cover. Support on blocking, a minimum of 4 inch thick, located at each end and at the midpoint of the door. Store doors in a well-ventilated building so that they will not be exposed to excessive moisture, heat, dryness, direct sunlight, or extreme changes of temperature and humidity. Do not store in a building under construction until concrete, masonry work, and plaster are dry. Replace defective or damaged doors with new ones.

1.4 WARRANTY

Warrant doors free of defects as set forth in the door manufacturer's standard door warranty.

PART 2 PRODUCTS

2.1 DOORS

Provide doors of the types, sizes, and designs specified.

2.1.1 Flush Doors

Conform to **WDMA I.S. 1-A** for flush doors. Hardwood stile edge bands of doors shall have a matching face veneer. No visible finger joints will be accepted in stile edge bands.

2.1.1.1 Interior Doors

Provide particleboard core, Type II flush doors conforming to **WDMA I.S. 1-A** with faces of good grade natural birch. Hardwood veneers shall be rotary cut book matched.

2.1.2 Composite-Type Fire Doors

Provide doors specified or indicated to have a **fire resistance rating** conforming to the requirements of **UL 10B**, **ASTM E 2074**, or **NFPA 252** for the class of door indicated. Affix a permanent metal label with raised or incised markings indicating testing agency's name and approved hourly fire rating to hinge edge of each door.

2.2 ACCESSORIES

2.2.1 Door Louvers

Fabricate from wood and of sizes indicated. Provide louvers with a minimum of 35 percent free air. Equip louvers with sightproof inverted vee slat type. Mount louvers in the door with flush wood moldings.

2.2.2 Door Light Openings

Provide glazed openings with the manufacturer's standard wood moldings. Provide moldings for doors to receive natural finish of the same wood species and color as the wood face veneers.

2.2.3 Additional Hardware Reinforcement

Provide the minimum lock blocks to secure the specified hardware. The measurement of top, bottom, and intermediate rail blocks are a minimum 125 mm 5 inch by full core width. Comply with the manufacturer's labeling requirements for reinforcement blocking, but not mineral material similar to the core.

2.3 FABRICATION

2.3.1 Quality and Construction

Identify the standard on which the construction of the door was based, identify the standard under which preservative treatment was made, and identify doors having a Type I glue bond.

2.3.2 Preservative Treatment

Treat doors scheduled for restrooms, janitor closets and other possible wet locations including exterior doors with a water-repellent preservative treatment and so marketed at the manufacturer's plant in accordance with **WDMA I.S. 4**.

2.3.3 Adhesives and Bonds

WDMA I.S. 1-A. Use Type I bond for exterior doors and Type II bond for interior doors. Provide a nonstaining adhesive on doors with a natural finish.

2.3.4 Finishes

2.3.4.1 Factory Finish

Provide doors finished at the factory by the door manufacturer as follows: **AWI Qual Stds** Section 1500, specification for System No. 4 Conversion varnish alkyd urea or System No. 5 Vinyl catalyzed. The coating is **AWI Qual Stds** premium, medium rubbed sheen, open grain effect. Use stain when required to produce the finish specified for color. Seal edges, cutouts, trim, and wood accessories, and apply two coats of finish compatible with the door face finish. Touch-up finishes that are scratched or marred, or where exposed fastener holes are filled, in accordance with the door manufacturer's instructions. Match color and sheen of factory finish using materials compatible for field application.

2.3.4.2 Color

Provide door finish colors as selected by the Contracting Officer from the color selection samples.

2.3.5 Water-Resistant Sealer

Provide manufacturer's standard water-resistant sealer compatible with the specified finishes.

2.4 SOURCE QUALITY CONTROL

Meet or exceed the following minimum performance criteria of stiles of "B" and "C" label fire doors utilizing standard mortise leaf hinges:

- a. **Split resistance**: Averages of ten test samples not less than 500 pounds load when tested in accordance with **WDMA TM-5**.
- b. **Cycle-slam**: 200,000 cycles with no loose hinge screws or other visible signs of failure when tested in accordance with the requirements of **WDMA TM-7**.
- c. **Hinge loading resistance**: Averages of ten test samples not less than 700 pounds load when tested for direct screw withdrawal in accordance with **WDMA TM-8** using a No. 12, 1-1/4 inch long, steel, fully threaded wood screw. Drill 5/32 inch pilot hole, use 1-1/2 inch opening around screw for bearing surface, and engage screw full, except for last 1/8 inch. Do not use a steel plate to reinforce screw area.

PART 3 EXECUTION

3.1 INSTALLATION

Before installation, seal top and bottom edges of doors with the approved water-resistant sealer. Seal cuts made on the job immediately after cutting using approved water-resistant sealer. Fit, trim, and hang doors with a 1/16 inch minimum, 1/8 inch maximum clearance at sides and top, and a 3/16 inch minimum, 1/4 inch maximum clearance over thresholds. Provide 3/8 inch minimum, 7/16 inch maximum clearance at bottom where no threshold occurs. Bevel edges of doors at the rate of 1/8 inch in 2 inch. Door warp shall not exceed 1/4 inch when measured in accordance with **WDMA I.S. 1-A**.

3.1.1 Fire Doors

Install fire doors in accordance with **NFPA 80**. Do not paint over labels.

-- End of Section --

SECTION 08 41 00

ALUMINUM ENTRANCES AND STOREFRONTS

01/07

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

- AAMA WSG-1 (1995) Window Selection Guide
- AAMA CW-10 (1997) Curtain Wall Manual # 10 Care and Handling of Architectural Aluminum from Shop to Site
- AAMA 2605 (2005) Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels
- AAMA SFM-1 Aluminum Storefront and Entrance Manual

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- ANSI A117.1 Safety Standards for the Handicapped

ASTM INTERNATIONAL (ASTM)

- ASTM A 36/A 36M (2008) Standard Specification for Carbon Structural Steel
- ASTM A 446 (1991) Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process for Stone Sewer and Drainage Pipe
- ASTM B 209 (2007) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
- ASTM B 221 (2008) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
- ASTM E 283 (2004) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
- ASTM E 330 (2002) Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference

ASTM E 331 (2000) Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC Paint 15 (1991) Steel Joist Shop Paint

SSPC Paint 20 (1991) Zinc-Rich Primers (Type I - "Inorganic" and Type II - "Organic")

1.2 SUMMARY

This section includes:

- a. Aluminum doors and frames
- b. Vision glass, glass and insulated metal infill panels
- c. Integral air and vapor barrier
- d. Perimeter sealant

1.3 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

- a. Section 08 71 00 "Door Hardware": Hardware items other than specified in this section.

1.4 SYSTEM DESCRIPTION

Aluminum entrances and storefront system includes tubular aluminum sections with supplementary internal support framing, shop fabricated, factory pre-finished, vision glass and insulated metal panel infill, related flashings, anchorage and attachment devices.

1.5 PERFORMANCE REQUIREMENTS

- a. Design and size components to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of wall with a wind lead of 130 mph and as measured in accordance with ASTM E 330.
- b. Limit mullion deflection to flexure limit of glass with full recovery of glazing materials.
- c. System to accommodate, without damage to components or deterioration of seals, movement within system, movement between system and peripheral construction, dynamic loading and release of loads, deflection of structural support framing.
- d. Limit air leakage through assembly to 0.06 cfm/min/sq ft of wall area, measured at a static air pressure differential of 6.24 psf as measured in accordance with ASTM E 283.
- e. Water Leakage: None, when measured in accordance with ASTM E 331 with a test pressure difference of 12 lbf/sq ft.

- f. Maintain continuous air and vapor barrier throughout assembly, primarily in line with inside pane of glass and inner sheet of infill panel and heel bead of glazing compound.
- g. System to provide for expansion and contraction within system components caused by a cycling temperature range of 170 degrees F 12 hour period without causing detrimental affect to system components.
- h. Drain water entering joints, condensation occurring in glazing channels, or migrating moisture occurring within system, to the exterior by a weep drainage network.
- i. Blast Resistance: Aluminum framing system including storefront doors, glazing, anchors and connections, and hardware shall be able to meet the following requirements as designed by a Professional Engineer.
 - 1. ASTM E1300 "Standard Practice for Determining Load Resistance of Glass in Buildings".
 - 2. ASTM F 2248 "Standard Practice for Specifying on Equivalent 3-second Duration Design Loading for Blast Resistant Glazing Fabricated with Laminated Glass".
 - 3. Department of Defense (DoD) Antiterrorism / Force Protection Construction Standards UFC 4-010-01 "United Facilities Criteria (UFC) DoD Minimum Antiterrorism Standards for Buildings" including change 1, dated 22 January 2007, Applicable Level of Protection, Low, Applicable Explosive Weight, II.
 - a. Frame Member Design:

Steel members may be designed using ultimate yield stresses and aluminum members may be designed based on a 0.2% offset yield strength. Equivalent static design loads for the window, and door members shall be 7 kilopascals (1 lb per square in) applied to the surface of the glazing and frame. Deformations shall not exceed 1/60 of the unsupported member lengths.
 - b. Glazing Frame Bite:

The glazing shall have a minimum frame bite of 9.5-mm (3/8-in) for structurally glazed systems and 25-mm (1-in) for window systems that are not structurally glazed.
 - c. Connection Design:

Equivalent static design loads for connections of the window, or door frame to the surrounding walls or roof, hardware and associated connections, and glazing stop connections shall be 75 kilopascals (10.8 lbs per square inch) for glazing panels with a vision area less than or equal to 1.0 square meters (10.8 square feet) and 30 kilopascals (4.4 lbs per square inch) for glazing panels with a vision greater than 1.0 square meters (10.8 square feet) but less than or equal to 3.0 square meters (32 square feet). Loads shall be applied to the surface of the glazing and frame. Connections and hardware may be designed based on ultimate strength for steel and 0.2% offset yield strength for aluminum.

1.6 SUBMITTALS

Submit the following in accordance with Section 01 33 00, "Submittal Procedures."

SD-02 Shop Drawings

Components

Indicate system dimensions, framed opening requirements and tolerances, affected related work and expansion and contraction joint location and details.

SD-03 Product Data

Components

Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, and internal drainage details.

SD-04 Samples

Components

Submit two samples illustrating pre-finished aluminum surface, glass infill panels, and glazing materials.

SD-07 Certificates

Components

Certify that products meet or exceed specified requirements.

1.7 QUALITY ASSURANCE

Perform work in accordance with AAMA SFM-1 and AAMA WSG-1. Conform to requirements of ANSI A117.1.

1.8 QUALIFICATIONS

Manufacturer and Installer: Company specializing in manufacturing aluminum glazing systems with minimum five years documented experience.

1.9 PRE-INSTALLATION CONFERENCE

Convene two weeks prior to commencing work of this Section

1.10 DELIVERY, STORAGE, AND HANDLING

Handle work of this section in accordance with AAMA CW-10. Protect pre-finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.

1.11 ENVIRONMENTAL REQUIREMENTS

Do not install sealants when ambient temperature is less than 40 degrees F during and 48 hours after installation.

1.12 FIELD MEASUREMENTS

Verify that field measurements are as indicated on shop drawings.

1.13 COORDINATION

Coordinate work under provisions of Section 01 11 00, "Summary of Work." Coordinate the work with installation of air and vapor barrier and components or materials.

1.14 WARRANTY

Provide three year warranty under provisions of Section 01 77 00, "Closeout Procedures." Include coverage for complete system for failure to meet specified requirements.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Extruded Aluminum

ASTM B 221; 6063 alloy, T-5 temper, and/or 6063 - T6 alloy and temper

2.1.2 Sheet Aluminum

ASTM B 209; alloy, temper.

2.1.3 Sheet Steel

ASTM A 446; galvanized.

2.1.4 Steel Sections

ASTM A 36/A 36M; shaped to suit mullion sections, and as required to meet blast resistance requirements.

2.1.5 Fasteners

Stainless steel.

2.1.6 Shop and Touch-Up Primer For Steel Components

SSPC Paint 15, Type 1, red oxide.

2.1.7 Touch-Up Primer For Galvanized Steel Surfaces

SSPC Paint 20, zinc rich type.

2.2 COMPONENTS

2.2.1 Frame

2 1/2" x 5" minimum nominal dimension; thermally broken with interior tubular section insulated from exterior; flush glazing stops; drainage holes; internal weep drainage system.

2.2.2 Doors

1 3/4 inches thick, 5 inch wide top rail, 5 inch wide vertical stiles, 6-1/2 inch wide bottom rail; beveled glazing stops.

2.2.3 Flashings

Aluminum to match mullion sections where exposed.

2.3 GLASS AND GLAZING MATERIALS

As specified in Section 08 81 00, "Glazing." Types as described below:

- a. Glass in framing Lites: Type one-inch thick insulated.
 - 1. Exterior lite: 1/4" clear tempered
 - 2. Interior lite: 1/4" laminated glass with a 0.030-inch PVB interlayer.

- b. Glass in door Lites: Type one-inch thick insulated.
 - 1. Exterior lite: 1/4" clear tempered
 - 2. Interior lite: 1/4" laminated glass with a 0.030-inch PVB interlayer.

2.4 SEALANT MATERIALS

As specified in Section 07 92 00, "Sealants"

2.5 HARDWARE

As specified in Section 08 71 00, "DOOR HARDWARE"

2.6 FABRICATION

2.6.1 Components

Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.

2.6.2 Joint and Corner Fitting

Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.

2.6.3 Anchors

Prepare components to receive anchor devices. Fabricate anchors.

2.6.4 Fasteners

Arrange fasteners and attachments to conceal from view.

2.6.5 Door Hardware

Prepare components with internal reinforcement for door hardware and door operator hinge hardware.

2.6.6 Framing Members

Reinforce framing members for imposed loads.

2.7 FINISHES

2.7.1 Finish Coatings

Conform to AAMA 2605.

2.7.2 Exterior Exposed Aluminum Surfaces

AAMA 2605, high-performance finish with total dry film thickness of not less than 1.2 mils.

2.7.3 Concealed Steel Items

Primed with iron oxide paint.

2.7.4 Surfaces In Contact With Cementitious or Dissimilar Materials

Apply one coat of bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar materials.

PART 3 EXECUTION

3.1 EXAMINATION

3.1.1 Site Opening Conditions

Verify site opening conditions.

3.1.2 Dimensions, Tolerances, and Attachment Methods

Verify dimensions, tolerances, and method of attachment with other work.

3.1.3 Wall Openings

Verify wall openings and adjoining air and vapor seal materials are ready to receive work of this Section.

3.2 INSTALLATION

3.2.1 Wall System

Install wall system in accordance with manufacturer's instructions and AAMA CW-10, and with anchors which are required to meet blast resistance requirements.

3.2.2 Attachment and Alignment

Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities. Provide alignment attachments and shims to permanently fasten system to building structure. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work. Provide thermal isolation where components penetrate or disrupt building insulation. Install sill flashings. Coordinate attachment and seal of perimeter air and vapor barrier materials. Pack fibrous insulation in shim

spaces at perimeter of assembly to maintain continuity of thermal barrier. Install flashings and set thresholds in bed of mastic and secure.

3.2.3 Hardware

Install hardware using templates provided. Refer to Section 08 71 00, "Door Hardware" for installation requirements.

3.2.4 Glass

Install glass and infill panels in accordance with Section 08 81 00, "Glazing" to glazing method required to achieve performance criteria

3.2.5 Sealants

Install perimeter sealant to method required to achieve performance criteria. Type backing materials, and installation criteria in accordance with Section 07 92 00, "Sealants."

3.3 TOLERANCES

- a. Maximum Variation From Plumb: 0.06 inches every 3 feet non-cumulative or 1/16 inches per 10 feet, whichever is less.
- b. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.4 ADJUSTING

Adjust operating hardware for smooth operation.

3.5 CLEANING

Remove protective material from pre-finished aluminum surfaces. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean. Remove excess sealant by method acceptable to sealant manufacturer.

3.6 PROTECTION OF FINISHED WORK

Protect finished work from damage.

-- End of Section --

SECTION 08 71 00

DOOR HARDWARE

01/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM E 283 (2004) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

BHMA A156.1 (2006) Butts and Hinges

BHMA A156.13 (2005) Mortise Locks & Latches, Series 1000

BHMA A156.15 (2006) Closer Holder Release Devices

BHMA A156.16 (2002) Auxiliary Hardware

BHMA A156.18 (2006) Materials and Finishes

BHMA A156.2 (2003) Bored and Preassembled Locks and Latches

BHMA A156.21 (2006) Thresholds

BHMA A156.22 (2005) Door Gasketing and Edge Seal Systems

BHMA A156.3 (2001) Exit Devices

BHMA A156.4 (2000) Door Controls - Closers

BHMA A156.5 (2001) Auxiliary Locks & Associated Products

BHMA A156.6 (2005) Architectural Door Trim

BHMA A156.7 (2003) Template Hinge Dimensions

BHMA A156.8 (2005) Door Controls - Overhead Stops and Holders

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 101 (2008) Life Safety Code, 2006 Edition

NFPA 80 (2006; Errata 2008) Standard for Fire Doors and Other Opening Protectives

STEEL DOOR INSTITUTE (SDI/DOOR)

SDI/DOOR A250.8 (2003) Recommended Specification for Standard Steel Doors and Frames

UNDERWRITERS LABORATORIES (UL)

UL Bld Mat Dir (2008) Building Materials Directory

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

SD-02 Shop Drawings

Hardware schedule

Keying system

SD-03 Product Data

Hardware items

SD-08 Manufacturer's Instructions

Installation

SD-10 Operation and Maintenance Data

Hardware Schedule items, Data Package 1

Submit data package in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

SD-11 Closeout Submittals

Key Bitting

1.3 HARDWARE SCHEDULE

Prepare and submit hardware schedule in the following form:

Hard-ware Item	Quan-tity	Size	Reference Publi-cation Type No.	Finish	Mfr. Name and Catalog No.	Key Con-trol Symbols	UL Mark (If fire rated and listed)	BHMA Finish Designa-tion
-----	-----	-----	-----	-----	-----	-----	-----	-----

1.4 KEY BITTING CHART REQUIREMENTS

Submit key bitting charts to the Contracting Officer prior to completion of the work. Include:

- a. Complete listing of all keys (AA1, AA2, etc.).
- b. Complete listing of all key cuts (AA1-123456, AA2-123458).
- c. Tabulation showing which key fits which door.
- d. Copy of floor plan showing doors and door numbers.
- e. Listing of 20 percent more key cuts than are presently required in each master system.

1.5 QUALITY ASSURANCE

1.5.1 Hardware Manufacturers and Modifications

Provide, as far as feasible, locks, hinges, and closers of one lock, hinge, or closer manufacturer's make. Modify hardware as necessary to provide features indicated or specified.

1.6 DELIVERY, STORAGE, AND HANDLING

Deliver hardware in original individual containers, complete with necessary appurtenances including fasteners and instructions. Mark each individual container with item number as shown in hardware schedule. Deliver permanent keys to the Contracting Officer, either directly or by certified mail. Deliver construction master keys with the locks.

PART 2 PRODUCTS

2.1 TEMPLATE HARDWARE

Provide hardware to be applied to metal manufactured to template. Promptly furnish template information or templates to door and frame manufacturers. Conform to [BHMA A156.7](#) for template hinges. Coordinate hardware items to prevent interference with other hardware.

2.2 HARDWARE FOR FIRE DOORS AND EXIT DOORS

Provide all hardware necessary to meet the requirements of [NFPA 80](#) for fire doors and [NFPA 101](#) for exit doors, as well as to other requirements indicated, even if such hardware is not specifically mentioned under paragraph entitled "Hardware Schedule." Provide the label of Underwriters Laboratories, Inc. for such hardware listed in [UL Bld Mat Dir](#) or labeled and listed by another testing laboratory acceptable to the Contracting Officer.

2.3 [HARDWARE ITEMS](#)

Clearly and permanently mark with the manufacturer's name or trademark, hinges, pivots, locks, latches, exit devices, bolts and closers where the identifying mark will be visible after the item is installed. For closers with covers, the name or trademark may be beneath the cover.

2.3.1 Hinges

[BHMA A156.1](#), 4-1/2 by 4-1/2 inch unless otherwise indicated. Construct loose pin hinges for exterior doors and reverse-bevel interior doors so that pins will be nonremovable when door is closed. Other antifriction bearing hinges may be provided in lieu of ball-bearing hinges.

2.3.2 Pivots

BHMA A156.4

2.3.3 Locks and Latches

2.3.3.1 Bored Locks and Latches

BHMA A156.2, Series 4000, Grade 1.

2.3.3.2 Auxiliary Locks

BHMA A156.5, Grade 1.

2.3.3.3 Combination Locks

Heavy-duty, mechanical combination lockset with five pushbuttons, standard-sized knobs, 3/4 inch deadlocking latch, 2-3/4 inch backset. Operate the locks by pressing two or more of the buttons in unison or individually in the proper sequence. Inside knob will operate the latch. Provide a keyed cylinder on the interior to permit setting the combination. Provide a keyed removable-core cylinder on the exterior to permit bypassing the combination. Provide a thumb turn on the interior to activate passage set function, so that outside knob operates latch without using the combination.

2.3.4 Cylinders and Cores

Provide cylinders and cores for new locks, including locks provided under other sections of this specification. Provide cylinders and cores with seven pin tumblers. Provide cylinders with interchangeable and fully compatible cores with products from Best Lock Corp., Arrow Lock Corp., or Falcon Lock which are removable by special control keys. Engrave on or stamp into the metal of each interchangeable core with a key control symbol in a concealed place on the core.

2.3.5 Keying System

Provide a master keying system. Provide construction interchangeable cores. Provide key cabinet as specified.

2.3.6 Lock Trim

Cast, forged, or heavy wrought construction and commercial plain design.

2.3.6.1 Roses

Conform to the minimum test requirements of BHMA A156.2 and BHMA A156.13 for roses and escutcheons. For unreinforced roses and escutcheons, provide 0.050 inch thickness. For reinforced knobs, roses, and escutcheons, provide outer shell of 0.035 inch thickness, and combined thickness of 0.070 inch, except for knob shanks, which are 0.060 inch thick.

2.3.6.2 Lever Handles

Provide lever handles in lieu of knobs. Conform to the minimum requirements of BHMA A156.13 for mortise locks of lever handles for exit devices. Provide lever handle locks with a breakaway feature (such as a

weakened spindle or a shear key) to prevent irreparable damage to the lock when force in excess of that specified in BHMA A156.13 is applied to the lever handle. **Lever Trim is to be similar to the Best 16K.**

2.3.7 Keys

Furnish one file key, one duplicate key, and one working key for each key change and for each master keying system. Furnish one additional working key for each lock of each keyed-alike group. Furnish a quantity of key blanks equal to 20 percent of the total number of file keys. Stamp each key with appropriate key control symbol and "U.S. property - Do not duplicate." Do not place room number on keys.

2.3.8 Door Bolts

BHMA A156.16. Provide dustproof strikes for bottom bolts, except for doors having metal thresholds. Automatic latching flush bolts: **BHMA A156.3**, Type 25.

2.3.9 Closers

BHMA A156.4, Series C02000, Grade 1, with PT 4C. Provide with brackets, arms, mounting devices, fasteners, full size covers, except at storefront mounting, and other features necessary for the particular application. Size closers in accordance with manufacturer's recommendations, or provide multi-size closers, Sizes 1 through 6, and list sizes in the Hardware Schedule. Provide manufacturer's 10 year warranty.

2.3.9.1 Identification Marking

Engrave each closer with manufacturer's name or trademark, date of manufacture, and manufacturer's size designation located to be visible after installation.

2.3.10 Overhead Holders

BHMA A156.8.

2.3.11 Closer Holder-Release Devices

BHMA A156.15.

2.3.12 Door Protection Plates

BHMA A156.6.

2.3.12.1 Sizes of Armor Mop and Kick Plates

Plates shall be 2 inches less than door width for single doors; one inch less than door width for pairs of doors. Provide **10 inch** kick plates for flush doors. Provide a minimum **36 inch** armor plates for flush doors, except **16 inch** high armor plates on fire doors. Provide **6 inch** mop plates.

2.3.13 Door Stops and Silencers

BHMA A156.16. Silencers Type L03011. Provide three silencers for each single door, two for each pair.

2.3.14 Thresholds

BHMA A156.21. Use J32130, threshold shall meet the requirements for handicapped accessibility.

2.3.15 Weather Stripping Gasketing

BHMA A156.22. Provide the type and function designation where specified in paragraph entitled "Hardware Schedule". Provide a set to include head and jamb seals, sweep strips, and, for pairs of doors, astragals. Air leakage of weather stripped doors not to exceed 1.25 cubic feet per minute of air per square foot of door area when tested in accordance with ASTM E 283. Provide weather stripping with one of the following:

2.3.15.1 Extruded Aluminum Retainers

Extruded aluminum retainers not less than 0.050 inch wall thickness with vinyl, neoprene, silicone rubber, or polyurethane inserts. Provide clear (natural) anodized aluminum.

2.3.16 Special Tools

Provide special tools, such as spanner and socket wrenches and dogging keys, required to service and adjust hardware items.

2.4 FASTENERS

Provide fasteners of proper type, quality, size, quantity, and finish with hardware. Provide stainless steel or nonferrous metal fasteners that are exposed to weather. Provide fasteners of type necessary to accomplish a permanent installation.

2.5 FINISHES

BHMA A156.18. Provide hardware in BHMA 630 finish (satin stainless steel), unless specified otherwise. Provide items not manufactured in stainless steel in BHMA 626 finish (satin chromium plated) over brass or bronze, except prime coat finish for surface door closers, and except BHMA 652 finish (satin chromium plated) finish (primed for painting) for steel hinges. Provide hinges for exterior doors in stainless steel with BHMA 630 finish or chromium plated brass or bronze with BHMA 626 finish.

2.6 KEY CABINET AND CONTROL SYSTEM

BHMA A156.5, Type required to yield a capacity (number of hooks) 50 percent greater than the number of key changes used for door locks.

PART 3 EXECUTION

3.1 INSTALLATION

Install hardware in accordance with manufacturers' printed installation instructions. Fasten hardware to wood surfaces with full-threaded wood screws or sheet metal screws. Provide machine screws set in expansion shields for fastening hardware to solid concrete and masonry surfaces. Provide toggle bolts where required for fastening to hollow core construction. Provide through bolts where necessary for satisfactory installation.

3.1.1 Weather Stripping Installation

Handle and install weather stripping to prevent damage. Provide full contact, weather-tight seals. Operate doors without binding.

3.1.1.1 Stop-Applied Weather Stripping

Fasten in place with color-matched sheet metal screws not more than 9 inch on center after doors and frames have been finish painted.

3.1.2 Threshold Installation

Extend thresholds the full width of the opening and notch end for jamb stops. Set thresholds in a full bed of sealant and anchor to floor with cadmium-plated, countersunk, steel screws in expansion sleeves.

3.2 FIRE DOORS AND EXIT DOORS

Install hardware in accordance with NFPA 80 for fire doors, NFPA 101 for exit doors.

3.3 HARDWARE LOCATIONS

SDI/DOOR A250.8, unless indicated or specified otherwise.

- a. Kick and Armor Plates: Push side of single-acting doors. Both sides of double-acting doors.
- b. Mop Plates: Bottom flush with bottom of door.

3.4 KEY CABINET AND CONTROL SYSTEM

Locate where directed. Tag one set of file keys and one set of duplicate keys. Place other keys in appropriately marked envelopes, or tag each key. Furnish complete instructions for setup and use of key control system. On tags and envelopes, indicate door and room numbers or master or grand master key.

3.5 FIELD QUALITY CONTROL

After installation, protect hardware from paint, stains, blemishes, and other damage until acceptance of work. Submit notice of testing 15 days before scheduled, so that testing can be witnessed by the Contracting Officer. Adjust hinges, locks, latches, bolts, holders, closers, and other items to operate properly. Demonstrate that permanent keys operate respective locks, and give keys to the Contracting Officer. Correct, repair, and finish, as directed, errors in cutting and fitting and damage to adjoining work.

3.6 HARDWARE SETS

Quantity	Item	Description
HW-1 Doors 101A		
2 Sets	Offset Pivots	By Aluminum Door Mfr.
1	Lockset	E0271
2	Closer/Stop	C72021
4	Pulls	Back-to-back, off-set pulls, 1 3/16" diameter 10" center-to-center nylon, white
2 Sets	Weatherstripping/ Sill Sweep Strip	By Aluminum Door Mfr.
1	Threshold	J32130 for off-set pivots
HW-2 Doors 102A, 103A, 104A, 106A, 107A, 108A, 109A, 133B		
1 1/2 Pair	Hinges	A5112
1	Lockset	F75
1	Wallstop	L02251
3	Silencers	L03011
HW-3 Doors 105A, 120A, 128A, 148A, 155A, 201A, 214A, 221A, 235A, 244A		
1 1/2 Pair	Hinges	A5112
1	Combination Lock	Grade 1
1	Closer/Stop	C72021
1	Floor Stop	L02161 w/riser plate
1 Set	Weatherstripping	As specified
1	Threshold	As specified
HW-4 Doors 110A, 122A, 123A, 150A, 219A, 229A, 242A		
1 1/2 Pair	Hinges	A5112
1	Lockset	F86
1	Wallstop	L02251
3	Silencers	L03011
HW-5 Doors 111A, 208A		
3 Pair	Hinges	A5111
1	Lockset	F81
1	Double Dummy Trim	
2	Closers	C72021
2	Flush Bolts	L04081
1	Dustproof Strike	L04021
2	Wallstops	L02251
4	Silencers	L03011
2	Kickplates	J102

HW-6 Doors 113A

1 1/2 Pair	Hinges	A5112
1	Lockset	F76
1	Closer	C72021
1	Wallstop	L02251
3	Silencers	L03011
1	Kickplate	J102

HW-7 Doors 114A, 117A, 118A, 119A, 121A, 124A, 125A, 126A, 127A, 133A, 134A, 135A, 136A, 137A, 145A, 146A, 147A, 149A, 152A, 153A, 154A, 202A, 203A, 205A, 206A, 209A, 212A, 213A, 215A, 216A, 217A, 218A, 220A, 220B, 222A, 223A, 227A, 228A, 230A, 231A, 236A, 237A, 238A, 239A, 241A, 243A, 245A, 246A

1 1/2 Pair	Hinges	A5112
1	Lockset	F81
1	Wall Stop	L02251
3	Silencers	L03011

HW-8 Doors 116A, 143A, 210A, 247A

3 Pair	Hinges	A5112
1	Lockset	F86
1	Single Dummy Trim	
2	Closer/Stop	C72021
2	Flush/Bolts	Type 25
1	Dustproof Strike	L04021
1	Coordinator	Type 21
1	Astragal	By Door Mfr.
4	Silencers	L03011
2	Kickplates	J102

HW-9 Doors 129A, 129B, 144A, 144B, 211A, 211B, 234A, 234B

1 1/2 Pair	Hinges	A5111
1	Lockset	F81
1	O.H. Stop	C02541
3	Silencers	L03011

HW-10 Doors 130A, 139A, 224A, 233A

1 1/2 Pair	Hinges	A5112
1	Lockset	F86
1	Closer/Stop	C72021
3	Silencers	L03011

HW-11 Doors 131A, 138A

1 Set	Off-set Pivots	By Aluminum Door Mfgr.
1	Lockset	E0221
1	Closer/Stop	C72021
2	Pulls	Back to back, Off-set pulls, 1 3/16" diameter, 10" center to center, Nylon, White
2 Sets	Weatherstripping/ Sill Sweep Strip	By Aluminum Door Mfgr.
1	Threshold	J32130 for off-set pivots

HW-12 Doors 131B, 138B, 225A, 232A

1 1/2 Pair	Hinges	A5111
1	Lockset	F75
1	Closer	C72021
1	Wallstop	L02251
3	Silencers	L03011
1	Kickplate	J102

HW-13 Doors 131C, 138C, 225B, 232B

3 Pair	Hinges	A5111
1	Lockset	F81
1	Double Dummy Trim	
2	Closer/Stop	C72021
2	Flush Bolts	Type 25
1	Dustproof Strike	L04021
1	Coordinator	Type 21
1	Astragal	By Door Mfgr.
4	Silencers	L03011
2	Kickplates	J102

HW-14 Doors 140A, 248A

1 1/2 Pair	Hinges	A5111
1	Push Plate	J301
1	Pull	J402
1	Pull Plate	J405
1	Closer	C72021
1	Wallstop	L02251
3	Silencers	L03011
1	Kickplate	J102

HW-15 Doors 141A, 249A

1 1/2 Pair	Hinges	A5112
1	Lockset	F86
1	O.H. Stop	C02541
3	Silencers	L03011

HW-16 Doors 202B, 228B, 230B

1 1/2 Pair	Hinges	A5112
1	Lockset	F76
1	O.H. Stop	C02541
3	Silencers	L03011

HW-17 Door 151A

2 Pairs	Hinges-NRP	A5111
1	Lockset	F86
1	Lockset	E0151
2	Pulls	J402
2	Pull Plates	J405
2	Wallstops	L02251
4	Silencers	L03011

HW-18 Door 240A

1 1/2 Pairs	Hinges-NRP	A5111
1	Lockset CDX-09	FF-L-2890
1	Closer	C72021
1	Push Plate	J301
1	Pull	J402
1	Pull Plate	J405
1	Wallstop	L02251
3	Silencers	L03011
1	Kickplate	J102

HW-19 Door 204A

1 1/2 Pairs	Hinges	A5112
1	Lockset	F76
1	Wallstop	L02251
3	Silencers	L03011

HW-20 Door 115A

1 1/2 Pair	Hinges	A5112
1	Lockset	F81
1	Closer	C72021
1	Wallstop	L02251
3	Silencers	L03011

-- End of Section --

SECTION 08 81 00

GLAZING

02/09

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C 1036	(2006) Standard Specification for Flat Glass
ASTM C 1048	(2004) Standard Specification for Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass
ASTM C 1172	(2003) Standard Specification for Laminated Architectural Flat Glass
ASTM C 509	(2006) Elastomeric Cellular Preformed Gasket and Sealing Material
ASTM C 864	(2005) Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers
ASTM D 2287	(1996; R 2001) Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds
ASTM D 395	(2003; R 2008) Standard Test Methods for Rubber Property - Compression Set
ASTM E 773	(2001) Accelerated Weathering of Sealed Insulating Glass Units
ASTM E 774	(1997) Classification of the Durability of Sealed Insulating Glass Units

GLASS ASSOCIATION OF NORTH AMERICA (GANA)

GANA Glazing Manual	(2004) Glazing Manual
GANA Sealant Manual	(1990) Sealant Manual

INSULATING GLASS MANUFACTURERS ALLIANCE (IGMA)

IGMA TB-3001	(1990) Guidelines for Sloped Glazing
IGMA TM-3000	(1997) Glazing Guidelines for Sealed Insulating Glass Units

IGMA TR-1200

(1983) Commercial Insulating Glass
Dimensional Tolerances

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

Energy Star

(1992; R 2006) Energy Star Energy
Efficiency Labeling System

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

16 CFR 1201

Safety Standard for Architectural Glazing
Materials

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00
SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Installation

Drawings showing complete details of the proposed setting
methods, mullion details, edge blocking, size of openings, frame
details, materials, and types and thickness of glass.

SD-03 Product Data

Insulating Glass

Documentation for Energy Star qualifications.

Glazing Accessories

Manufacturer's descriptive product data, handling and storage
recommendations, installation instructions, and cleaning
instructions.

SD-04 Samples

Insulating Glass

Two 8 x 10 inch samples of insulating glass units.

SD-07 Certificates

Insulating Glass

Certificates stating that the glass meets the specified
requirements. Labels or manufacturers marking affixed to the
glass will be accepted in lieu of certificates.

SD-08 Manufacturer's Instructions

Setting and sealing materials

Glass setting

Submit glass manufacturer's recommendations for setting and sealing materials and for installation of each type of glazing material specified.

1.3 DELIVERY, STORAGE, AND HANDLING

Deliver products to the site in unopened containers, labeled plainly with manufacturers' names and brands. Store glass and setting materials in safe, enclosed dry locations and do not unpack until needed for installation. Handle and install materials in a manner that will protect them from damage.

1.4 ENVIRONMENTAL REQUIREMENTS

Do not start glazing work until the outdoor temperature is above 40 degrees F and rising, unless procedures recommended by the glass manufacturer and approved by the Contracting Officer are made to warm the glass and rabbet surfaces. Provide ventilation to prevent condensation of moisture on glazing work during installation. Do not perform glazing work during damp or rainy weather.

1.5 SUSTAINABLE DESIGN REQUIREMENTS

1.6 WARRANTY

1.6.1 Warranty for Insulating Glass Units

Warranty insulating glass units against development of material obstruction to vision (such as dust, fogging, or film formation on the inner glass surfaces) caused by failure of the hermetic seal, other than through glass breakage, for a 10-year period following acceptance of the work. Provide new units for any units failing to comply with terms of this warranty within 45 working days after receipt of notice from the Government.

PART 2 PRODUCTS

2.1 GLASS

ASTM C 1036, unless specified otherwise. In doors and sidelights, provide safety glazing material conforming to 16 CFR 1201.

2.1.1 Clear Glass

2.1.2 Annealed Glass

Annealed glass shall be Type I transparent flat type, Class 1 - clear, Quality q3 - glazing select, conforming to ASTM C 1036.

2.1.3 Laminated Glass

ASTM C 1172, Kind LA fabricated from two nominal 1/8 inch pieces of Type I, Class 1, Quality q3, flat annealed transparent glass conforming to ASTM C 1036. Flat glass shall be laminated together with a minimum of 0.030 inch thick, clear polyvinyl butyral interlayer. The total thickness shall be nominally 1/4 inch. Color shall be clear.

2.1.4 Tempered Glass

ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated), Type I,

Class 1 (transparent), Quality q3, 1/4 inch thick.

2.1.5 Heat-Strengthened Glass

ASTM C 1048, Kind HS (heat strengthened), Condition A (uncoated), Type I, Class 1 (clear), Quality q3, 1/4 inch thick.

2.2 INSULATING GLASS UNITS

Two panes of glass separated by a dehydrated airspace and hermetically sealed. Dimensional tolerances shall be as specified in IGMA TR-1200. The units shall conform to ASTM E 773 and ASTM E 774, Class A. Spacer shall be roll-formed, with bent or tightly welded or keyed and sealed joints to completely seal the spacer periphery and eliminate moisture and hydrocarbon vapor transmission into airspace through the corners. Primary seal shall be compressed polyisobutylene and the secondary seal shall be a specially formulated silicone.

2.2.1 Buildings

Insulated glass units shall have a Solar Heat Gain Coefficient (SHGC) maximum of 0.70 and a U-factor maximum of 0.47 Btu per square foot x hr x degree F.

Dimensional tolerances shall be as specified in IGMA TR-1200. The units shall conform to meet CBA Grade requirement when tested in accordance with ASTM E 773 and ASTM E 774, Class A. Spacer shall be black, roll-formed, steel-reinforced butyl rubber, with bent or tightly welded or keyed and sealed joints to completely seal the spacer periphery and eliminate moisture and hydrocarbon vapor transmission into airspace through the corners. Primary seal shall be compressed polyisobutylene and the secondary seal shall be a specially formulated silicone.

The inner light shall be ASTM C 1172, laminated glass, clear annealed flat glass Type I, Class I, Quality q3 1/4 inch thick. The outer light shall be ASTM C 1036, Type I, Class 1 (transparent), Quality q4, 1/4 inch thick and ASTM C 1048, Grade B (fully tempered), Style I (uncoated), Type I, Class 1 (clear), Quality q4, 1/4 inch thick.

2.2.2 Low Emissivity Insulating Glass

Interior and exterior glass panes for Low-E insulating units shall be Type I annealed flat glass, Class 1-clear with anti-reflective low-emissivity coating on No. 2 surface (inside surface of exterior pane), Quality q3 - glazing select, conforming to ASTM C 1036. Glass performance shall be U-Value/Winter Nighttime 0.47, shading coefficient 0.81.

2.3 SETTING AND SEALING MATERIALS

Provide as specified in the GANA Glazing Manual, IGMA TM-3000, IGMA TB-3001, and manufacturer's recommendations, unless specified otherwise herein. Do not use metal sash putty, nonskinning compounds, nonresilient preformed sealers, or impregnated preformed gaskets. Materials exposed to view and unpainted shall be gray or neutral color.

2.3.1 Preformed Channels

Neoprene, vinyl, or rubber, as recommended by the glass manufacturer for the particular condition.

2.3.2 Sealing Tapes

Preformed, semisolid, PVC-based material of proper size and compressibility for the particular condition, complying with [ASTM D 2287](#). Use only where glazing rabbet is designed for tape and [tape](#) is recommended by the glass or sealant manufacturer. Provide spacer shims for use with compressible tapes. Tapes shall be chemically compatible with the product being set.

2.3.3 Setting Blocks and Edge Blocks

Closed-cell neoprene setting blocks shall be dense extruded type conforming to [ASTM C 509](#) and [ASTM D 395](#), Method B, Shore A durometer between 70 and 90. Edge blocking shall be Shore A durometer of 50 (+ or - 5). Silicone setting blocks shall be required when blocks are in contact with silicone sealant. Profiles, lengths and locations shall be as required and recommended in writing by glass manufacturer. Block color shall be black.

2.3.4 Glazing Gaskets

Glazing gaskets shall be extruded with continuous integral locking projection designed to engage into metal glass holding members to provide a watertight seal during dynamic loading, building movements and thermal movements. Glazing gaskets for a single glazed opening shall be continuous one-piece units with factory-fabricated injection-molded corners free of flashing and burrs. Glazing gaskets shall be in lengths or units recommended by manufacturer to ensure against pull-back at corners. Glazing gasket profiles shall be as indicated on drawings.

2.3.4.1 Fixed Glazing Gaskets

Fixed glazing gaskets shall be closed-cell (sponge) smooth extruded compression gaskets of cured elastomeric virgin neoprene compounds conforming to [ASTM C 509](#), Type 2, Option 1.

2.3.4.2 Wedge Glazing Gaskets

Wedge glazing gaskets shall be high-quality extrusions of cured elastomeric virgin neoprene compounds, ozone resistant, conforming to [ASTM C 864](#), Option 1, Shore A durometer between 65 and 75.

2.3.4.3 Aluminum Framing Glazing Gaskets

Glazing gaskets for aluminum framing shall be permanent, elastic, non-shrinking, non-migrating, watertight and weathertight.

2.3.5 Accessories

Provide as required for a complete installation, including glazing points, clips, shims, angles, beads, and spacer strips. Provide noncorroding metal accessories. Provide primer-sealers and cleaners as recommended by the glass and sealant manufacturers.

PART 3 EXECUTION

3.1 PREPARATION

Preparation, unless otherwise specified or approved, shall conform to applicable recommendations in the [GANA Glazing Manual](#), [GANA Sealant Manual](#),

IGMA TB-3001, IGMA TM-3000, and manufacturer's recommendations. Determine the sizes to provide the required edge clearances by measuring the actual opening to receive the glass. Grind smooth in the shop glass edges that will be exposed in finish work. Leave labels in place until the installation is approved, except remove applied labels on heat-absorbing glass and on insulating glass units as soon as glass is installed. Securely fix movable items or keep in a closed and locked position until glazing compound has thoroughly set.

3.2 GLASS SETTING

Shop glaze or field glaze items to be glazed using glass of the quality and thickness specified or indicated. Glazing, unless otherwise specified or approved, shall conform to applicable recommendations in the GANA Glazing Manual, GANA Sealant Manual, IGMA TB-3001, IGMA TM-3000, and manufacturer's recommendations. Aluminum windows, wood doors, and wood windows may be glazed in conformance with one of the glazing methods described in the standards under which they are produced, except that face puttying with no bedding will not be permitted. Handle and install glazing materials in accordance with manufacturer's instructions. Use beads or stops which are furnished with items to be glazed to secure the glass in place. Verify products are properly installed, connected, and adjusted.

3.2.1 Sheet Glass

Cut and set with the visible lines or waves horizontal.

3.2.2 Insulating Glass Units

Do not grind, nip, or cut edges or corners of units after the units have left the factory. Springing, forcing, or twisting of units during setting will not be permitted. Handle units so as not to strike frames or other objects. Installation shall conform to applicable recommendations of IGMA TB-3001 and IGMA TM-3000.

3.2.3 Installation of Laminated Glass

Sashes which are to receive laminated glass shall be weeped to the outside to allow water drainage into the channel.

3.3 CLEANING

Clean glass surfaces and remove labels, paint spots, putty, and other defacement as required to prevent staining. Glass shall be clean at the time the work is accepted.

3.4 PROTECTION

Glass work shall be protected immediately after installation. Glazed openings shall be identified with suitable warning tapes, cloth or paper flags, attached with non-staining adhesives. Reflective glass shall be protected with a protective material to eliminate any contamination of the reflective coating. Protective material shall be placed far enough away from the coated glass to allow air to circulate to reduce heat buildup and moisture accumulation on the glass. Upon removal, separate protective materials for reuse or recycling. Glass units which are broken, chipped, cracked, abraded, or otherwise damaged during construction activities shall be removed and replaced with new units.

3.5 WASTE MANAGEMENT

Disposal and recycling of waste materials, including corrugated cardboard recycling, shall be in accordance with the Waste Management Plan. Separate float glass and reuse or recycle. Upon removal, separate protective materials and reuse or recycle. Separate tempered glass for use as aggregate or nonstructural fill. Close and seal tightly all partly used sealant containers and store protected in well-ventilated, fire-safe area at moderate temperature.

-- End of Section --

SECTION 09 22 00

SUPPORTS FOR PLASTER AND GYPSUM BOARD

01/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

- ASTM A 463/A 463M (2006) Standard Specification for Steel Sheet, Aluminum-Coated
- ASTM A 653/A 653M (2008) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- ASTM C 645 (2007a) Nonstructural Steel Framing Members
- ASTM C 754 (2004) Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products
- ASTM C 841 (2003) Installation of Interior Lathing and Furring
- ASTM C 847 (2006) Standard Specification for Metal Lath

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

- NAAMM ML/SFA 920 (1991) Metal Lathing and Furring

1.2 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the job site and store in ventilated dry locations. Storage area shall permit easy access for inspection and handling. If materials are stored outdoors, stack materials off the ground, supported on a level platform, and fully protected from the weather. Handle materials carefully to prevent damage. Remove damaged items and provide new items.

PART 2 PRODUCTS

2.1 MATERIALS

Provide steel materials for metal support systems with galvanized coating ASTM A 653/A 653M, G-60; aluminum coating ASTM A 463/A 463M, T1-25; or a 55-percent aluminum-zinc coating.

2.1.1 Materials for Attachment of Lath

2.1.1.1 Suspended and Furred Ceiling Systems and Wall Furring

ASTM C 841, and ASTM C 847.

2.1.1.2 Non-loadbearing Wall Framing

NAAMM ML/SFA 920.

2.1.2 Materials for Attachment of Gypsum Wallboard

2.1.2.1 Suspended and Furred Ceiling Systems

ASTM C 645. Provide 1 1/2 inch-16 gauge steel cold-rolled channels (main runners) at 4 ft. -0 inches o.c. and 7/8 inch -25 gauge metal furring channels at 2 ft -0 inches. o.c. Provide No. 8 gauge hanger wire spaced 4 ft. o.c. maximum. Attach furring channels perpendicular to cold-rolled channels with double strand of saddle-tied No. 16 gauge galvanized tie wire or 1 1/2 inch furring channel clips.

2.1.2.2 Nonload-Bearing Wall Framing and Furring

ASTM C 645, but not thinner than 0.0179 inch thickness, with 0.0329 inch minimum thickness supporting wall hung items such as cabinetwork, equipment and fixtures.

2.1.2.3 Z-Furring Channels with Wall Insulation

Not lighter than 26 gage galvanized steel, Z-shaped, with 1 1/4 inch and 3/4 inch flanges and 2 inch furring depth.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Systems for Attachment of Lath

3.1.1.1 Suspended and Furred Ceiling Systems and Wall Furring

ASTM C 841, except as indicated otherwise.

3.1.1.2 Non-loadbearing Wall Framing

NAAMM ML/SFA 920, except provide framing members 16 inches o.c. unless indicated otherwise.

3.1.2 Systems for Attachment of Gypsum Wallboard

3.1.2.1 Suspended and Furred Ceiling Systems

ASTM C 754, except provide framing members 16 inches o.c. unless indicated otherwise.

3.1.2.2 Non-loadbearing Wall Framing and Furring

ASTM C 754, except as indicated otherwise.

3.1.2.3 Z-Furring Channels with Wall Insulation

Install Z-furring channels vertically spaced not more than 24 inches o.c. Locate Z-furring channels at interior and exterior corners in accordance with manufacturer's printed erection instructions. Fasten furring channels to masonry walls with powder-driven fasteners or hardened concrete steel nails through narrow flange of channel. Space fasteners not more than 24 inches o.c.

3.2 ERECTION TOLERANCES

Provide framing members which will be covered by finish materials such as wallboard, plaster, or ceramic tile set in a mortar setting bed, within the following limits:

- a. Layout of walls and partitions: 1/4 inch from intended position;
- b. Plates and runners: 1/4 inch in 8 feet from a straight line;
- c. Studs: 1/4 inch in 8 feet out of plumb, not cumulative; and
- d. Face of framing members: 1/4 inch in 8 feet from a true plane.

Provide framing members which will be covered by ceramic tile set in dry-set mortar, latex-portland cement mortar, or organic adhesive within the following limits:

- a. Layout of walls and partitions: 1/4 inch from intended position;
- b. Plates and runners: 1/8 inch in 8 feet from a straight line;
- c. Studs: 1/8 inch in 8 feet out of plumb, not cumulative; and
- d. Face of framing members: 1/8 inch in 8 feet from a true plane.

-- End of Section --

SECTION 09 29 00

GYPSUM BOARD

10/06

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A108.11 (1992) Interior Installation of
Cementitious Backer Units

ANSI A108.1 (2005) Installation of Ceramic Tile

ASTM INTERNATIONAL (ASTM)

ASTM C 36/C 36M (2003) Gypsum Wallboard

ASTM C 442/C 442M (2004) Gypsum Backing Board, Gypsum
Coreboard, and Gypsum Shaftliner Board

ASTM C 475 (2002) Joint Compound and Joint Tape for
Finishing Gypsum Board

ASTM C 630/C 630M (2003) Water-Resistant Gypsum Backing Board

ASTM C 840 (2003) Application and Finishing of Gypsum
Board

ASTM C 954 (2000) Steel Drill Screws for the
Application of Gypsum Board or Metal
Plaster Bases to Steel Studs from 0.033
in. (0.84 mm) to 0.112 in. (2.84 mm) in
Thickness

ASTM C 1002 (2001) Steel Self-Piercing Tapping Screws
for the Application of Gypsum Panel
Products or Metal Plaster Bases to Wood
Studs or Steel Studs

ASTM C 1047 (1999) Accessories for Gypsum Wallboard
and Gypsum Veneer Base

ASTM C 1178/C 1178M (2004) Glass Mat Water-Resistant Gypsum
Backing Panel

ASTM C 1325 (2004) Standard Specification for
Non-Asbestos Fiber-Reinforced Fiber-Mat
Reinforced Cement substrate Sheets

- ASTM C 1396/C 1396M (2003a) Standard Specification for Gypsum Board
- ASTM D 226 (2005) Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
- ASTM D 1037 (1999) Standard Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials
- ASTM D 2394 (1999) Standard Method for Simulated Service Testing of Wood and Wood-Base Finish Flooring
- ASTM D 5420 (1998a) Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Striker Impacted by a Falling Weight (Gardner Impact)
- ASTM E 84 (2008a) Standard Test Method for Surface Burning Characteristics of Building Materials
- ASTM E 695 (2003) Standard Method for Measure Relative Resistance of Wall, Floor and Roof Construction to Impact Loads

GYPSUM ASSOCIATION (GA)

- GA 214 (1996) Recommended Levels of Gypsum Board Finish
- GA 216 (2000) Application and Finishing of Gypsum Board
- GA 600 (2003) Fire Resistance and Sound Control Design Manual

UNDERWRITERS LABORATORIES (UL)

- UL Fire Resist Dir (2006) Fire Resistance Directory

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

- Cementitious backer units
- Glass Mat Water-Resistant Gypsum Tile Backing Board
- Water-Resistant Gypsum Backing Board
- Impact Resistant Gypsum Board
- Accessories

Submit for each type of gypsum board and for cementitious backer units.

SD-07 Certificates

Asbestos Free Materials

Certify that gypsum board types, gypsum backing board types, cementitious backer units, and joint treating materials do not contain asbestos.

SD-08 Manufacturer's Instructions

Material Safety Data Sheets

1.3 DELIVERY, STORAGE, AND HANDLING

1.3.1 Delivery

Deliver materials in the original packages, containers, or bundles with each bearing the brand name, applicable standard designation, and name of manufacturer, or supplier.

1.3.2 Storage

Keep materials dry by storing inside a sheltered building. Where necessary to store gypsum board and cementitious backer units outside, store off the ground, properly supported on a level platform, and protected from direct exposure to rain, snow, sunlight, and other extreme weather conditions. Provide adequate ventilation to prevent condensation. Store per manufacturer's recommendations for allowable temperature and humidity range. Gypsum wallboard shall not be stored with materials which have high emissions of volatile organic compounds (VOCs) or other contaminants. Do not store panels near materials that may offgas or emit harmful fumes, such as kerosene heaters, fresh paint, or adhesives.

1.3.3 Handling

Neatly stack gypsum board and cementitious backer units flat to prevent sagging or damage to the edges, ends, and surfaces.

1.4 ENVIRONMENTAL CONDITIONS

1.4.1 Temperature

Maintain a uniform temperature of not less than 50 degrees F in the structure for at least 48 hours prior to, during, and following the application of gypsum board, cementitious backer units, and joint treatment materials, or the bonding of adhesives.

1.4.2 Exposure to Weather

Protect gypsum board and cementitious backer unit products from direct exposure to rain, snow, sunlight, and other extreme weather conditions.

1.4.3 Temporary Ventilation

Provide temporary ventilation for work of this section.

1.5 QUALIFICATIONS

Furnish type of gypsum board work specialized by the installer with a minimum of 3 years of documented successful experience.

PART 2 PRODUCTS

2.1 MATERIALS

Conform to specifications, standards and requirements specified. Provide gypsum board types, gypsum backing board types, cementitious backing units, and joint treating materials manufactured from [asbestos free materials](#) only.

[Submit Material Safety Data Sheets](#) and manufacturer maintenance instructions for gypsum materials including adhesives.

2.1.1 Gypsum Board

[ASTM C 36/C 36M](#) and [ASTM C 1396/C 1396M](#)

2.1.1.1 Regular

48 inch wide, 5/8 inch thick, tapered edges.

2.1.1.2 Type X (Special Fire-Resistant)

48 inch wide, 5/8 inch thick, tapered.

2.1.2 Gypsum Backing Board

[ASTM C 442/C 442M](#); use gypsum backing board as a base in a multilayer system.

2.1.3 Regular [Water-Resistant Gypsum Backing Board](#)

[ASTM C 630/C 630M](#)

2.1.3.1 Regular

48 inch wide, 5/8 inch thick, tapered edges.

2.1.4 [Glass Mat Water-Resistant Gypsum Tile Backing Board](#)

[ASTM C 1178/C 1178M](#)

2.1.4.1 Regular

48 inch wide, 5/8 inch thick, square edges.

2.1.4.2 Type X (Special Fire-Resistant)

48 inch wide, 5/8 inch thick, square edges.

2.1.5 [Impact Resistant Gypsum Board](#)

48 inch wide, 5/8 inch thick, tapered edges.

Reinforced gypsum panel with imbedded fiber mesh or lexan backing testing in accordance with the following tests. Provide fasteners that meet manufacturer requirements and specifications stated within this section.

Impact resistant gypsum board, when tested in accordance with [ASTM E 84](#), have a flame spread rating of 25 or less and a smoke developed rating of 50 or less.

2.1.5.1 Structural Failure Test

[ASTM E 695](#) or [ASTM D 2394](#) for structural failure (drop penetration). [ASTM E 695](#) using a 60 lb sand filled leather bag, resisting no less than 420 ft. lb. cumulative impact energy before failure. Provide test specimen stud spacing a minimum 16 inch on center.

2.1.5.2 Indentation Test

[ASTM D 5420](#) or [ASTM D 1037](#) for indentation resistance. [ASTM D 5420](#) using a 32 oz weight with a 5/8 inch hemispherical impacting head dropped once 3 feet creating not more than 0.114 inch indentation.

2.1.6 Cementitious Backer Units

[ANSI A108.1](#).

2.1.7 Joint Treatment Materials

[ASTM C 475](#). Use all purpose joint and texturing compound containing inert fillers and natural binders, including lime compound. Pre-mixed compounds shall be free of antifreeze, vinyl adhesives, preservatives, biocides and other slow releasing compounds.

2.1.7.1 Embedding Compound

Specifically formulated and manufactured for use in embedding tape at gypsum board joints and compatible with tape, substrate and fasteners.

2.1.7.2 Finishing or Topping Compound

Specifically formulated and manufactured for use as a finishing compound.

2.1.7.3 All-Purpose Compound

Specifically formulated and manufactured to serve as both a taping and a finishing compound and compatible with tape, substrate and fasteners.

2.1.7.4 Setting or Hardening Type Compound

Specifically formulated and manufactured for use with fiber glass mesh tape or paper joint tape.

2.1.7.5 Joint Tape

Use cross-laminated or tapered edge tape recommended by the manufacturer. [Paper and fiberglass joint tape are not permitted.](#)

2.1.8 Fasteners

2.1.8.1 Screws

[ASTM C 1002](#), Type "G", Type "S" or Type "W" steel drill screws for fastening gypsum board to gypsum board, wood framing members and steel framing members less than 0.033 inch thick. [ASTM C 954](#) steel drill screws

for fastening gypsum board to steel framing members 0.033 to 0.112 inch thick. Provide cementitious backer unit screws with a polymer coating.

2.1.9 Accessories

ASTM C 1047. Fabricate from corrosion protected steel or plastic designed for intended use. Accessories manufactured with paper flanges are not acceptable. Flanges shall be free of dirt, grease, and other materials that may adversely affect bond of joint treatment. Provide prefinished or job decorated materials.

2.1.10 Moisture Resistive Barrier

Provide a 15 lb asphalt moisture barrier over gypsum sheathing. Conforming to **ASTM D 226** Type 1 (No. 15).

2.1.11 Water

Provide clean, fresh, and potable water.

PART 3 EXECUTION

3.1 EXAMINATION

3.1.1 Framing and Furring

Verify that framing and furring are securely attached and of sizes and spacing to provide a suitable substrate to receive gypsum board and cementitious backer units. Verify that all blocking, headers and supports are in place to support plumbing fixtures and to receive soap dishes, grab bars, towel racks, and similar items. Do not proceed with work until framing and furring are acceptable for application of gypsum board and cementitious backer units.

3.2 APPLICATION OF GYPSUM BOARD

Apply gypsum board to framing and furring members in accordance with **ASTM C 840** or **GA 216** and the requirements specified. Apply gypsum board with separate panels in moderate contact; do not force in place. Stagger end joints of adjoining panels. Neatly fit abutting end and edge joints. Use gypsum board of maximum practical length; select panel sizes to minimize waste. Cut out gypsum board to make neat, close, and tight joints around openings. In vertical application of gypsum board, provide panels in lengths required to reach full height of vertical surfaces in one continuous piece. Lay out panels to minimize waste; reuse cutoffs whenever feasible. Surfaces of gypsum board and substrate members may be bonded together with an adhesive, except where prohibited by fire rating(s). Provide type of gypsum board for use in each system specified herein as indicated.

3.2.1 Application of Gypsum Board to Steel Framing and Furring

Apply in accordance with **ASTM C 840**, System VIII or **GA 216**.

3.2.2 Gypsum Board for Wall Tile or Tile Base Applied with Adhesive

In dry areas (areas other than tubs, shower enclosures, saunas, steam rooms, gang shower rooms), apply glass mat water-resistant gypsum tile backing board in accordance with **ASTM C 840**, System X or **GA 216**.

3.2.3 Control Joints

Install expansion and contraction joints in ceilings and walls in accordance with [ASTM C 840](#), System XIII or [GA 216](#). Fill control joints between studs in fire-rated construction with firesafing insulation to match the fire-rating of construction.

3.2.4 Application of Impact Resistant Gypsum Board

Apply in accordance with applicable system of [ASTM C 840](#) as specified or [GA 216](#). Follow manufacturers written instructions on how to cut, drill and attach board.

3.3 APPLICATION OF CEMENTITIOUS BACKER UNITS

[ASTM C 1325](#)

3.3.1 Application

In wet areas (tubs, shower enclosures, saunas, steam rooms, gang shower rooms), apply cementitious backer units in accordance with [ANSI A108.11](#). Place a 15 lb asphalt impregnated, continuous felt paper membrane behind cementitious backer units, between backer units and studs or base layer of gypsum board. Place membrane with a minimum 6 inch overlap of sheets laid shingle style.

3.3.2 Joint Treatment

[ANSI A108.11](#).

3.4 FINISHING OF GYPSUM BOARD

Tape and finish gypsum board in accordance with [ASTM C 840](#), [GA 214](#) and [GA 216](#). Finish plenum areas above ceilings to Level 1 in accordance with [GA 214](#). Finish water resistant gypsum backing board, [ASTM C 630/C 630M](#), to receive ceramic tile to Level 2 in accordance with [GA 214](#). Finish all gypsum board walls, partitions and ceilings to Level 5 in accordance with [GA 214](#). Provide joint, fastener depression, and corner treatment. Tool joints as smoothly as possible to minimize sanding and dust. Do not use fiber glass mesh tape with conventional drying type joint compounds; use setting or hardening type compounds only. Provide treatment for water-resistant gypsum board as recommended by the gypsum board manufacturer. Protect workers, building occupants, and HVAC systems from gypsum dust.

3.4.1 Uniform Surface

In accordance with [GA 214](#) Level 5, apply a thin skim coat of joint compound to the entire gypsum board surface, after the two-coat joint and fastener treatment is complete and dry.

3.5 SEALING

Seal openings around pipes, fixtures, and other items projecting through gypsum board and cementitious backer units as specified in Section 07 92 00 JOINT SEALANTS. Apply material with exposed surface flush with gypsum board or cementitious backer units.

3.6 FIRE-RESISTANT ASSEMBLIES

Wherever fire-rated construction is indicated, provide materials and application methods, including types and spacing of fasteners, wall framing in accordance with the specifications contained in [UL Fire Resist Dir](#) for the Design Number(s) indicated, or [GA 600](#) for the File Number(s) indicated. Joints of fire-rated gypsum board enclosures shall be closed and sealed in accordance with UL test requirements or GA requirements. Seal penetrations through rated partitions and ceilings tight in accordance with tested systems.

3.7 PATCHING

Patch surface defects in gypsum board to a smooth, uniform appearance, ready to receive finishes.

-- End of Section --

SECTION 09 30 00

CERAMIC TILE, QUARRY TILE, AND PAVER TILE

01/07

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A108.1 (2005) Installation of Ceramic Tile

ANSI A137.1 (1988) Ceramic Tile

ASTM INTERNATIONAL (ASTM)

ASTM A 185 (2002) Steel Welded Wire Reinforcement, Plain, for Concrete

ASTM C 1026 (2002) Measuring the Resistance of Ceramic Tile to Freeze-Thaw Cycling

ASTM C 1027 (1999) Determining Visible Abrasion Resistance of Glazed Ceramic Tile

ASTM C 1028 (1996) Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method

ASTM C 144 (2004) Standard Specification for Aggregate for Masonry Mortar

ASTM C 150 (2007) Standard Specification for Portland Cement

ASTM C 206 (2003) Finishing Hydrated Lime

ASTM C 207 (2006) Standard Specification for Hydrated Lime for Masonry Purposes

ASTM C 241 (1990; R 1997e1) Abrasion Resistance of Stone Subjected to Foot Traffic

ASTM C 33 (2003) Concrete Aggregates

ASTM C 373 (1988; R 1999) Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fired Whiteware Products

- ASTM C 648 (2004) Breaking Strength of Ceramic Tile
- ASTM C 847 (2006) Standard Specification for Metal Lath
- GREEN SEAL (GS)
- GS-36 (2000) Commercial Adhesives
- MARBLE INSTITUTE OF AMERICA (MIA)
- MIA Design Manual (2003) Dimension Stone Design Manual
- TILE COUNCIL OF AMERICA (TCA)
- TCA Hdbk (2003; R 2005) Handbook for Ceramic Tile Installation

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

- Tile
- Setting-Bed
- Mortar, Grout, and Adhesive

Manufacturer's catalog data and preprinted installation and cleaning instructions.

Reinforcing Wire Fabric

SD-04 Samples

- Tile
- Marble Thresholds
- Grout

Samples of sufficient size to show color range, pattern, type and joints.

1.3 DELIVERY AND STORAGE

Deliver materials to the project site in manufacturer's original unopened containers with seals unbroken and labels and hallmarks intact. Protect materials from weather, and stored under cover in accordance with manufacturer's printed instructions.

1.4 ENVIRONMENTAL REQUIREMENTS

- a. Close space in which tile is being set to traffic and other work. Keep closed until tile is firmly set. Do not walk or work on newly tiled floors without using kneeling boards or equivalent protection of the tiled surface. Keep traffic off horizontal portland cement mortar installations for at least 72 hours. Keep all traffic off epoxy installed floors for at least 40 hours after grouting, and heavy traffic off for at least 7 days, unless otherwise specifically authorized by manufacturer.

b. Do not perform ceramic tile work unless the substrate and ambient temperature is at least 50 degrees F and rising. Maintain temperature above 50 degrees F while the work is being performed and for at least 7 days after completion of the work. When temporary heaters are used, ventilate the area to the outside to avoid carbon dioxide damage to new tilework.

1.5 WARRANTY

Provide manufacturer's standard performance guarantees or warranties that extend beyond a 1-year period.

1.6 EXTRA STOCK

Supply an extra two percent of each type tile used in clean and marked cartons.

PART 2 PRODUCTS

2.1 TILE

Conform to ANSI A137.1 for standard grade tile. Provide grade sealed containers. Mark seals with the marks on the signed master grade certificate. Provide an impact resistant tile with a minimum floor breaking strength for wall tile of 90 pound and for floor tile of 250 pound in accordance with ASTM C 648. The manufacturer will provide a frost resistant rating for tile used in cold climate projects as determined by ASTM C 1026. Provide a 0.50 maximum percent water absorption in accordance with ASTM C 373. Provide a minimum coefficient of friction of 0.60 wet and dry in accordance with ASTM C 1028. Identify floor tile as Class IV Plus-Extra Heavy Traffic, durability classification as rated by the manufacturer when tested in accordance with ASTM C 1027 for abrasion resistance as related to foot traffic.

2.1.1 Mosaic Tile

Ceramic mosaic tile and trim shall be unglazed natural clay with cushion edges. Provide tile size 2 by 2 inch.

2.1.2 Glazed Wall Tile

Provide glazed wall tile with cushioned edges and trim edged with lead-free bright finish. Provide tile 4-1/4 by 4-1/4 inch.

2.2 SETTING-BED

Compose the setting-bed of the following materials:

2.2.1 Aggregate for Concrete Fill

Conform to ASTM C 33 for aggregate fill. Do not exceed one-half the thickness of concrete fill for maximum size of coarse aggregate.

2.2.2 Portland Cement

Conform to ASTM C 150 for cement, Type I, white for wall mortar and gray for other uses.

2.2.3 Sand

Conform to [ASTM C 144](#) for sand.

2.2.4 Hydrated Lime

Conform to [ASTM C 206](#) for hydrated lime, Type S or [ASTM C 207](#), Type S.

2.2.5 Metal Lath

Conform to [ASTM C 847](#) for flat expanded type metal lath, and weighing a minimum 2.5 pound/square yard.

2.2.6 Reinforcing Wire Fabric

Conform to [ASTM A 185](#) for wire fabric. Provide 2 by 2 inch mesh, 16/16 wire or 1-1/2 by 2 inch mesh, 16/13 wire.

2.3 WATER

Provide potable water.

2.4 MORTAR, GROUT, AND ADHESIVE

2.4.1 Dry-Set Portland Cement Mortar

[ANSI A108.1](#).

2.4.2 Conductive Dry-Set Mortar

[ANSI A108.1](#).

2.4.3 Latex-Portland Cement Mortar

[ANSI A108.1](#).

2.4.4 Ceramic Tile Grout

[ANSI A108.1](#); petroleum-free and plastic-free sand portland cement grout, dry-set grout, latex-portland cement grout or commercial portland cement grout.

2.4.5 Organic Adhesive

[ANSI A108.1](#), Type I. Water-resistant. Comply with applicable regulations regarding toxic and hazardous materials, [GS-36](#), and as specified.

2.5 MARBLE THRESHOLDS

Provide marble thresholds of size required by drawings or conditions. Categorize marble Group A as classified by [MIA Design Manual](#). Provide a fine sand-rubbed finish marble with gray in color as approved by the Contracting Officer. Provide minimum 12.0 marble abrasion when tested in accordance with [ASTM C 241](#).

PART 3 EXECUTION

3.1 PREPARATORY WORK AND WORKMANSHIP

Inspect surface to receive tile in conformance to the requirements of [ANSI A108.1](#) for surface conditions for the type setting bed specified and for workmanship. Provide variations of tiled surfaces that fall within maximum values shown below:

TYPE	WALLS	FLOORS
Dry-Set Mortar	1/8 inch in 8 ft.	1/8 inch in 10 ft.
Organic Adhesives	1/8 inch in 8 ft.	1/16 inch in 3 ft.
Latex Portland Cement Mortar	1/8 inch in 8 ft.	1/8 inch in 10 ft.
Epoxy	1/8 inch in 8 ft.	1/8 inch in 10 ft.

3.2 GENERAL INSTALLATION REQUIREMENTS

Do not start tile work until roughing in for mechanical and electrical work has been completed and tested, and built-in items requiring membrane waterproofing have been installed and tested. Do not start floor tile installation in spaces requiring wall tile until after wall tile has been installed. Apply tile in colors and patterns indicated in the area shown on the drawings. Install tile with the respective surfaces in true even planes to the elevations and grades shown. Provide special shapes as required for sills, jambs, recesses, offsets, external corners, and other conditions to provide a complete and neatly finished installation. Solidly back tile bases and coves with mortar.

3.3 INSTALLATION OF WALL TILE

Install wall tile in accordance with the [TCA Hdbk](#), method W245 and B415.

3.3.1 Workable or Cured Mortar Bed

Install tile over workable mortar bed or a cured mortar bed at the option of the Contractor. Install a 4 mil polyethylene membrane, metal lath, and scratch coat. Conform to [ANSI A108.1](#) for workable mortar bed, materials, and installation of tile. Conform to [ANSI A108.1](#) for cured mortar bed and materials.

3.3.2 Dry-Set Mortar and Latex-Portland Cement Mortar

Use Dry-set or Latex-Portland Cement to install tile in accordance with [ANSI A108.1](#).

3.3.3 Organic Adhesive

Conform to [ANSI A108.1](#) for the organic adhesive installation of ceramic tile.

3.4 INSTALLATION OF FLOOR TILE

Install floor tile in accordance with [TCA Hdbk](#) method F122 for first floor plan and [TCA Hdbk](#) method F121 for second floor plan. Install shower receptors in accordance with [TCA Hdbk](#) method B415.

3.4.1 Workable or Cured Mortar Bed

Install floor tile over a workable mortar bed or a cured mortar bed at the option of the Contractor. Conform to ANSI A108.1 for workable mortar bed materials and installation. Conform to ANSI A108.1 for cured mortar bed materials and installation. Provide minimum 1/4 inch to maximum 3/8 inch joints in uniformed width.

3.4.2 Dry-Set and Latex-Portland Cement

Use dry-set or Latex-Portland cement mortar to install tile directly over properly cured, plane, clean concrete slabs in accordance with ANSI A108.1.

3.4.3 Ceramic Tile Grout

Prepare and install ceramic tile grout in accordance with ANSI A108.1.

3.4.4 Waterproofing

Shower pans are specified in Section 22 00 00 PLUMBING, GENERAL PURPOSE. Conform to the requirements of Section 07 12 00 BUILT-UP BITUMINOUS WATERPROOFING for waterproofing under concrete fill.

3.5 INSTALLATION OF MARBLE THRESHOLDS

Install thresholds where indicated, in a manner similar to that of the ceramic tile floor. Provide thresholds full width of the opening. Install head joints at ends not exceeding 1/4 inch in width and grouted full.

3.6 EXPANSION JOINTS

Form and seal joints as specified in Section 07 92 00 JOINT SEALANTS.

3.6.1 Walls

Provide expansion joints at control joints in backing material. Wherever backing material changes, install an expansion joint to separate the different materials.

3.6.2 Floors

Provide expansion joints over construction joints, control joints, and expansion joints in concrete slabs. Provide expansion joints where tile abuts restraining surfaces such as perimeter walls, curbs and columns and at intervals of 24 to 36 feet each way in large interior floor areas and 12 to 16 feet each way in large exterior areas or areas exposed to direct sunlight or moisture. Extend expansion joints through setting-beds and fill.

3.7 CLEANING AND PROTECTING

Upon completion, thoroughly clean tile surfaces in accordance with manufacturer's approved cleaning instructions. Do not use acid for cleaning glazed tile. Clean floor tile with resinous grout or with factory mixed grout in accordance with printed instructions of the grout manufacturer. After the grout has set, provide a protective coat of a noncorrosive soap or other approved method of protection for tile wall surfaces. Cover tiled floor areas with building paper before foot traffic is permitted over the finished tile floors. Provide board walkways on

tiled floors that are to be continuously used as passageways by workmen.
Replace damaged or defective tiles.

-- End of Section --

SECTION 09 51 00

ACOUSTICAL CEILINGS

10/07

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM A 641/A 641M	(2003) Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
ASTM C 423	(2007a) Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
ASTM C 635/C 635M	(2007) Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings
ASTM C 636/C 636M	(2006) Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels
ASTM E 1264	(1998; R 2005) Acoustical Ceiling Products
ASTM E 1414	(2006) Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum
ASTM E 1477	(1998a; R 2003) Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers
ASTM E 795	(2005) Mounting Test Specimens During Sound Absorption Tests

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Acoustical Ceiling Systems

a. Manufacturer's data indicating percentage of recycle material in acoustic ceiling tiles to verify affirmative procurement compliance.

b. Total weight and volume quantities of acoustic ceiling tiles

with recycle material.

c. Manufacturer's catalog for the following items showing UL classification of fire-rated ceilings giving materials, construction details, types of floor and roof constructions to be protected, and UL design number and fire protection time rating for each required floor or roof construction and acoustic ceiling assembly.

SD-04 Samples

Acoustical Units

Two samples of each type of acoustical unit and each type of suspension grid tee section showing texture, finish, and color.

1.3 GENERAL REQUIREMENTS

Provide sound controlling units mechanically mounted on a ceiling suspension system for acoustical treatment. The unit size, texture, finish, and color must be as specified. Coordinate with paragraph RECLAMATION PROCEDURES for reclamation of mineral fiber acoustical ceiling panels to be removed from the job site.

1.3.1 Ceiling Attenuation Class and Test

Provide a ceiling system with an attenuation class (CAC) of 33 for when determined in accordance with [ASTM E 1414](#). Provide fixture attenuators over light fixtures and other ceiling penetrations, and provide acoustical blanket insulation adjacent to partitions, as required to achieve the specified CAC. Provide test ceiling continuous at the partition and assembled in the suspension system in the same manner that the ceiling will be installed on the project.

1.3.2 Ceiling Sound Absorption

Determine the Noise Reduction Coefficient (NRC) in accordance with [ASTM C 423](#) Test Method.

1.3.3 Light Reflectance

Determine light reflectance factor in accordance with [ASTM E 1477](#) Test Method.

1.4 DELIVERY AND STORAGE

Deliver materials to the site in the manufacturer's original unopened containers with brand name and type clearly marked. Carefully handle and store materials in dry, watertight enclosures. Immediately before installation, store acoustical units for not less than 24 hours at the same temperature and relative humidity as the space where they will be installed in order to assure proper temperature and moisture acclimation.

1.5 ENVIRONMENTAL REQUIREMENTS

Maintain a uniform temperature of not less than [60 degrees F](#) nor more than [85 degrees F](#) and a relative humidity of not more than 70 percent for 24 hours before, during, and 24 hours after installation of acoustical units.

1.6 SCHEDULING

Complete and dry interior finish work such as plastering, concrete and terrazzo work before ceiling installation. Complete mechanical, electrical, and other work above the ceiling line; install and start operating heating, ventilating, and air conditioning systems in order to maintain temperature and humidity requirements.

1.7 WARRANTY

Provide manufacturer's standard performance guarantees or warranties that extend beyond a one year period. Include an agreement to repair or replace acoustical panels that fail within the warranty period in the standard performance guarantee or warranty. Failures include, but are not limited to, sagging and warping of panels; rusting and manufacturers defects of grid system.

PART 2 PRODUCTS

2.1 ACOUSTICAL UNITS

Conform acoustical units to [ASTM E 1264](#), Class A, and the following requirements:

2.1.1 Humidity Resistant Composition Units

- a. Type: Non-asbestos mineral or glass fibers bonded with ceramic, moisture resistant thermo-setting resin, or other moisture resistant material and having a factory applied white paint finish. Provide panels that do not sag or warp under conditions of heat, high humidity or chemical fumes.
- b. Flame Spread: Class: A, 25 or less.
- c. Pattern: CE, fine fissured.
- d. Minimum NRC: Minimum 0.55 when tested on Mounting Type E-400 of [ASTM E 795](#).
- e. Minimum Light Reflectance Coefficient: LR-1, 0.85 or greater.
- f. Nominal Size: 24 by 24 inch.
- g. Edge Detail: Square.

2.2 SUSPENSION SYSTEM

Provide standard [exposed-grid](#) standard width flange suspension system conforming to [ASTM C 635/C 635M](#) for intermediate-duty systems. Provide surfaces exposed to view of aluminum with a factory-applied white baked-enamel finish. Provide wall molding having a flange of not less than [15/16 inch](#). Provide inside and outside corner caps. Suspended ceiling framing system must have the capability to support the finished ceiling, light fixtures, air diffusers, and accessories, as shown. Provide a suspension system with a maximum deflection of 1/360 of the span length.

2.3 HANGERS

Provide hangers and attachment capable of supporting a minimum [300 pound](#)

ultimate vertical load without failure of supporting material or attachment.

2.3.1 Wires

Conform wires to **ASTM A 641/A 641M**, Class 1, **0.11 inch** in diameter.

2.4 ACCESS PANELS

Provide access panels that match adjacent acoustical units, designed and equipped with suitable framing and fastenings for removal and replacement without damage. Size panel to be not less than **12 by 12 inch** or more than **12 by 24 inch**.

a. Attach an identification plate of **0.032 inch** thick aluminum, **3/4 inch** in diameter, stamped with the letters "AP" and finished the same as the unit, near one corner on the face of each access panel.

b. Identify ceiling access panel by a number utilizing white identification plates or plastic buttons with contrasting numerals. Provide plates or buttons of minimum **1 inch** diameter and securely attached to one corner of each access unit. Provide a typewritten card framed under glass listing the code identification numbers and corresponding system descriptions listed above. Mount the framed card where directed and furnish a duplicate card to the Contracting Officer. Code identification system is as follows:

- 1 Fire detection/alarm system
- 2 Air conditioning controls
- 3 Plumbing system
- 4 Heating and steam systems
- 5 Air conditioning duct system
- 6 Sprinkler system
- 7 Telephone junction boxes

2.5 FINISHES

Use manufacturer's standard textures, patterns and finishes as specified for acoustical units and suspension system members. Treat ceiling suspension system components to inhibit corrosion.

PART 3 EXECUTION

3.1 INSTALLATION

Examine surfaces to receive directly attached acoustical units for unevenness, irregularities, and dampness that would affect quality and execution of the work. Rid areas, where acoustical units will be cemented, of oils, form residue, or other materials that reduce bonding capabilities of the adhesive. Complete and dry interior finish work such as plastering, concrete, and terrazzo work before installation. Complete and approve mechanical, electrical, and other work above the ceiling line prior to the start of acoustical ceiling installation. Provide acoustical work complete with necessary fastenings, clips, and other accessories required for a

complete installation. Do not expose mechanical fastenings in the finished work. Lay out hangers for each individual room or space. Provide hangers to support framing around beams, ducts, columns, grilles, and other penetrations through ceilings. Keep main runners and carrying channels clear of abutting walls and partitions. Provide at least two main runners for each ceiling span. Wherever required to bypass an object with the hanger wires, install a subsuspension system so that all hanger wires will be plumb.

3.1.1 Suspension System

Install suspension system in accordance with [ASTM C 636/C 636M](#) and as specified herein. Do not suspend hanger wires or other loads from underside of steel decking.

3.1.1.1 Plumb Hangers

Install hangers plumb and not pressing against insulation covering ducts and pipes. Where lighting fixtures are supported from the suspended ceiling system, provide hangers at a minimum of four hangers per fixture and located not more than [6 inch](#) from each corner of each fixture.

3.1.1.2 Splayed Hangers

Where hangers must be splayed (sloped or slanted) around obstructions, offset the resulting horizontal force by bracing, countersplaying, or other acceptable means.

3.1.2 Wall Molding

Provide wall molding where ceilings abut vertical surfaces. Miter corners where wall moldings intersect or install corner caps. Secure wall molding not more than [3 inch](#) from ends of each length and not more than [16 inch](#) on centers between end fastenings. Provide wall molding springs at each acoustical unit in semi-exposed or concealed systems.

3.1.3 Acoustical Units

Install acoustical units in accordance with the approved installation instructions of the manufacturer. Ensure that edges of acoustical units are in close contact with metal supports, with each other, and in true alignment. Arrange acoustical units so that units less than one-half width are minimized. Hold units in exposed-grid system in place with manufacturer's standard hold-down clips, if units weigh less than [1 psf](#) or if required for fire resistance rating.

3.1.4 Caulking

Seal all joints around pipes, ducts or electrical outlets penetrating the ceiling. Apply a continuous ribbon of acoustical sealant on vertical web of wall or edge moldings.

3.2 CEILING ACCESS PANELS

Locate ceiling access panels directly under the items which require access.

3.3 CLEANING

Following installation, clean dirty or discolored surfaces of acoustical

units and leave them free from defects. Remove units that are damaged or improperly installed and provide new units as directed.

3.4 RECLAMATION PROCEDURES

Neatly stack ceiling tile, designated for recycling by the Contracting Officer, on 4 by 4 foot pallets not higher than 4 foot. Panels must be completely dry. Shrink wrap and symmetrically stack pallets on top of each other without falling over.

-- End of Section --

SECTION 09 65 00

RESILIENT FLOORING

02/09

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D 4078	(2002; R 2008) Water Emulsion Floor Polish
ASTM E 648	(2008a) Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
ASTM F 1066	(2004) Standard Specification for Vinyl Composition Floor Tile
ASTM F 1482	(2004) Installation and Preparation of Panel Type Underlayments to Receive Resilient Flooring
ASTM F 1861	(2008) Resilient Wall Base
ASTM F 1869	(2004) Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
ASTM F 2170	(2002) Determining Relative Humidity in Concrete Floor Slabs in situ Probes
ASTM F 710	(2008) Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring

1.2 FIRE RESISTANCE REQUIREMENTS

Provide a minimum average critical radiant flux of 0.45 watts per square centimeter for flooring in corridors and exits when tested in accordance with ASTM E 648.

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Resilient Flooring and Accessories

Manufacturer's descriptive data.

Adhesives

Manufacturer's descriptive data, documentation stating physical characteristics, and mildew and germicidal characteristics. Provide Material Safety Data Sheets (MSDS) for all primers and adhesives to the Contracting Officer. Highlight VOC emissions.

Vinyl Composition Tile;

Wall Base;

SD-04 Samples

Resilient Flooring and Accessories

Three samples of each indicated color and type of flooring, base, mouldings, and accessories. Provide a minimum 2-1/2 by 4 inch sample.

SD-06 Test Reports

Moisture, Alkalinity and Bond Tests

Copy of test reports for moisture and alkalinity content of concrete slab, and bond test stating date of test, person conducting the test, and the area tested.

SD-08 Manufacturer's Instructions

Surface Preparation Installation

Manufacturer's printed installation instructions for all flooring materials and accessories, including preparation of substrate, seaming techniques, and recommended adhesives.

SD-10 Operation and Maintenance Data

Resilient Flooring and Accessories

Data Package 1 in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

1.4 DELIVERY AND STORAGE

Deliver materials to the building site in original unopened containers bearing the manufacturer's name, style name, pattern color name and number, production run, project identification, and handling instructions. Store materials in a clean, dry, secure, and well-ventilated area free from strong contaminant sources and residues with ambient air temperature maintained above 68 degrees F and below 85 degrees F, stacked according to manufacturer's recommendations. Remove resilient flooring products from packaging to allow ventilation prior to installation. Protect materials from the direct flow of heat from hot-air registers, radiators and other heating fixtures and appliances. Observe ventilation and safety procedures specified in the MSDS. Do not store rubber surface products with materials that have a high capacity to adsorb volatile organic compound (VOC)

emissions. Do not store exposed rubber surface materials in occupied spaces.

1.5 ENVIRONMENTAL REQUIREMENTS

Maintain areas to receive resilient flooring at a temperature above 68 degrees F and below 85 degrees F for 3 days before application, during application and 2 days after application, unless otherwise directed by the flooring manufacturer for the flooring being installed. Maintain a minimum temperature of 55 degrees F thereafter. Provide adequate ventilation to remove moisture from area and to comply with regulations limiting concentrations of hazardous vapors.

1.6 SCHEDULING

Schedule resilient flooring application after the completion of other work which would damage the finished surface of the flooring.

1.7 WARRANTY

Provide manufacturer's standard performance guarantees or warranties that extend beyond a one year period.

PART 2 PRODUCTS

2.1 VINYL COMPOSITION TILE

Conform to ASTM F 1066 Class 2, (through pattern tile), Composition 1, asbestos-free, 12 inch square and 1/8 inch thick. Provide color and pattern uniformly distributed throughout the thickness of the tile. Tile shall contain a minimum of 90 percent recycled material.

2.2 WALL BASE

Conform to ASTM F 1861, Type TS (vulcanized thermoset rubber) Style B (coved - installed with resilient flooring). Provide 4 inch high and a minimum 1/8 inch thick wall base. Provide job formed corners in matching height, shape, and color. Rubber shall contain a minimum of 90 percent post-consumer recycled material.

2.3 MOULDING

Provide tapered mouldings of rubber and types as recommended by flooring manufacturer for both edges and transitions of flooring materials specified. Provide vertical lip on moulding of maximum 1/4 inch. Provide bevel change in level between 1/4 and 1/2 inch with a slope no greater than 1:2.

2.4 ADHESIVES

Provide adhesives for flooring, base and accessories as recommended by the manufacturer and comply with local indoor air quality standards.

2.5 SURFACE PREPARATION MATERIALS

Provide surface preparation materials, such as floor crack fillers as recommended by the flooring manufacturer for the subfloor conditions.

2.6 POLISH/FINISH

Provide polish finish as recommended by the manufacturer and conform to [ASTM D 4078](#) for polish.

2.7 CAULKING AND SEALANTS

Provide caulking and sealants in accordance with Section [07 92 00 JOINT SEALANTS](#).

2.8 MANUFACTURER'S COLOR, PATTERN AND TEXTURE

Provide color, pattern and texture for [resilient flooring and accessories](#) selected from manufacturer's standard colors. Color listed is not intended to limit the selection of equal colors from other manufacturers. Provide flooring in any one continuous area or replacement of damaged flooring in continuous area from same production run with same shade and pattern.

PART 3 EXECUTION

3.1 EXAMINATION/VERIFICATION OF CONDITIONS

Examine and verify that site conditions are in agreement with the design package. Report all conditions that will prevent a proper [installation](#). Do not take any corrective action without written permission from the Government. Work will proceed only when conditions have been corrected and accepted by the installer.

3.2 SURFACE PREPARATION

Provide a smooth, true, level plane for surface preparation of the flooring, except where indicated as sloped. Floor to be flat to within [3/16 inch in 10 feet](#). Prepare subfloor in accordance with flooring manufacturer's recommended instructions. Prepare the surfaces of lightweight concrete slabs (as defined by the flooring manufacturer) as recommended by the flooring manufacturer. Comply with [ASTM F 710](#) for concrete subfloor preparation. Floor fills or toppings may be required as recommended by the flooring manufacturer. Install underlayments, when required by the flooring manufacturer, in accordance with manufacturer's recommended printed installation instructions. Comply with [ASTM F 1482](#) for panel type underlayments. Before any work under this section is begun, correct all defects such as rough or scaling concrete, chalk and dust, cracks, low spots, high spots, and uneven surfaces. Repair all damaged portions of concrete slabs as recommended by the flooring manufacturer. Remove concrete curing and sealer compounds from the slabs, other than the type that does not adversely affect adhesion. Remove paint, varnish, oils, release agents, sealers, waxes, and adhesives, as required by the flooring product in accordance with manufacturer's printed installation instructions.

3.3 MOISTURE, ALKALINITY AND BOND TESTS

Determine the suitability of the concrete subfloor for receiving the resilient flooring with regard to moisture content and pH level by moisture and alkalinity tests. Conduct moisture testing in accordance with [ASTM F 1869](#) or [ASTM F 2170](#), unless otherwise recommended by the flooring manufacturer. Conduct alkalinity testing as recommended by the flooring manufacturer. Determine the compatibility of the resilient flooring adhesives to the concrete floors by a bond test in accordance with the flooring manufacturer's recommendations.

3.4 PLACING VINYL COMPOSITION TILES

Install tile flooring and accessories in accordance with manufacturer's printed installation instructions. Prepare and apply adhesives in accordance with manufacturer's directions. Keep tile lines and joints square, symmetrical, tight, and even. Keep each floor in true, level plane, except where slope is indicated. Vary edge width as necessary to maintain full-size tiles in the field, no edge tile to be less than one-half the field tile size, except where irregular shaped rooms make it impossible. Cut flooring to fit around all permanent fixtures, built-in furniture and cabinets, pipes, and outlets. Cut, fit, and scribe edge tile to walls and partitions after field flooring has been applied.

3.5 PLACING MOULDING

Provide moulding where flooring termination is higher than the adjacent finished flooring and at transitions between different flooring materials. When required, locate moulding under door centerline. Moulding is not required at doorways where thresholds are provided. Secure moulding with adhesive as recommended by the manufacturer. Prepare and apply adhesives in accordance with manufacturer's printed directions.

3.6 PLACING WALL BASE

Install wall base in accordance with manufacturer's printed installation instructions. Prepare and apply adhesives in accordance with manufacturer's printed directions. Tighten base joints and make even with adjacent resilient flooring. Fill voids along the top edge of base at masonry walls with caulk. Roll entire vertical surface of base with hand roller, and press toe of base with a straight piece of wood to ensure proper alignment. Avoid excess adhesive in corners.

3.7 CLEANING

Immediately upon completion of installation of flooring in a room or an area, dry/clean the flooring and adjacent surfaces to remove all surplus adhesive. Clean flooring as recommended in accordance with manufacturer's printed maintenance instructions. No sooner than 5 days after installation, wash flooring with a nonalkaline cleaning solution, rinse thoroughly with clear cold water, and, except for rubber flooring and stair treads, risers and stringers, vinyl and other flooring not requiring polish finish by manufacturer, apply the number of coats of polish in accordance with manufacturer's written instructions. Clean and maintain all other flooring as recommended by the manufacturer.

3.8 WASTE MANAGEMENT

Separate offcuts and waste materials and reuse or recycle in accordance with the Waste Management Plan, keeping sheet materials larger than 2 square feet and tiles larger than 1/2 tiles separate for reuse. Identify manufacturer's policy for collection or return of construction scrap, unused material, demolition scrap, and/or packaging material. Place materials defined as hazardous or toxic waste in designated containers and dispose of properly. Close and seal tightly partly used sealant and adhesive containers and store protected in a well ventilated fire-safe area at moderate temperature.

3.9 PROTECTION

From the time of installation until acceptance, protect flooring from damage as recommended by the flooring manufacturer. Remove and replace flooring which becomes damaged, loose, broken, or curled and wall base which is not tight to wall or securely adhered.

-- End of Section --

SECTION 09 68 00

CARPET

01/07

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS (AATCC)

AATCC 107	(2002) Colorfastness to Water
AATCC 134	(2001) Electrostatic Propensity of Carpets
AATCC 16	(2004) Colorfastness to Light
AATCC 165	(1999) Colorfastness to Crocking: Textile Floor Coverings - AATCC Crockmeter Method
AATCC 174	(1998) Antimicrobial Activity Assessment of Carpets

ASTM INTERNATIONAL (ASTM)

ASTM D 3278	(1996e1; R 2004) Flash Point of Liquids by Small Scale Closed-Cup Apparatus
ASTM D 5252	(1998a; R 2003) Operation of the Hexapod Drum Tester
ASTM D 5417	(1999; R 2003) Operation of the Vettermann Drum Tester
ASTM D 5793	(2003) Binding Sites Per Unit Length or Width of Pile Yarn Floor Coverings
ASTM D 5848	(1998) Mass Per Unit Area of Pile Yarn Floor Coverings
ASTM E 648	(2008a) Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source

CARPET AND RUG INSTITUTE (CRI)

CRI 104	(2002) Standard for Installation Specification of Commercial Carpet
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U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

16 CFR 1630	Standard for the Surface Flammability of
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Carpets and Rugs (FF 1-70)

40 CFR 247

Comprehensive Procurement Guideline for Products Containing Recovered Materials

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Installation
Molding

Three copies of drawings indicating areas receiving carpet, carpet types, textures and patterns, direction of pile, location of seams, and locations of edge molding. Installation drawings for the following items diagramming the location of seams, edge moldings, and carpet direction for approval prior to installation.

- 1) Carpet Moldings

SD-03 Product Data

Carpet
Carpet Moldings
Base

Manufacturer's catalog data and printed documentation stating physical characteristics, durability, resistance to fading, and flame resistance characteristics for each type of carpet material and installation accessory. Submit manufacturer's catalog data for the following items:

- 1) Carpet Moldings

Surface Preparation
Installation

Three copies of the manufacturer's printed installation instructions for the carpet, including preparation of substrate, seaming techniques, and recommended adhesives and tapes.

Regulatory Requirements

Three copies of report stating that carpet and carpet components contain recycled materials and/or involvement in a recycling or reuse program.

SD-04 Samples

Carpet
Molding

- a. Carpet: Two "Production Quality" samples 18 by 18 inches of each carpet proposed for use, showing quality, pattern, and color specified.

b. Vinyl Moldings: Two pieces of each type at least 12 inches long.

c. Special Treatment Materials: Two samples showing system and installation method.

SD-06 Test Reports

Moisture and Alkalinity Tests

Three copies of test reports of moisture and alkalinity content of concrete slab stating date of test, person conducting the test, and the area tested.

SD-07 Certificates

Carpet

Certificates of compliance from a laboratory accredited by the National Laboratory Accreditation Program of the National Institute of Standards and Technology attesting that each type of carpet and carpet with cushion material conforms to the standards specified.

Regulatory Requirements

Report stating that the carpet contains recycled materials and indicating the actual percentage of recycled material. Certificates, showing conformance with the referenced standards contained in this section, for the following:

- 1) Carpet Moldings

SD-10 Operation and Maintenance Data

**Carpet
Cleaning and Protection**

Three copies of carpet manufacturer's maintenance instructions describing recommended type of cleaning equipment and material, spotting and cleaning methods, and cleaning cycles.

Operational Service

Documentation of manufacturer's maintenance agreement for carpet. Include contact information, summary of procedures, and the limitations and conditions applicable to the project. Indicate manufacturer's commitment to reclaim materials for recycling and/or reuse.

1.3 REGULATORY REQUIREMENTS

Provide the Carpet and Rug Institute (CRI) Indoor Air Quality (IAQ) label for carpet, carpet cushion, and adhesives or demonstrate compliance with testing criteria and frequencies through independent laboratory test results. Carpet, carpet cushion, and adhesives bearing the label will indicate that the carpet has been tested and meets the criteria of the CRI IAQ Carpet Testing Program, and minimizes the impact on indoor air quality.

Procure carpet in accordance with 40 CFR 247, and where possible,

purchased locally to reduce emissions of fossil fuels from transporting.

1.4 DELIVERY AND STORAGE

Deliver materials to the site in the manufacturer's original wrappings and packages clearly labeled with the manufacturer's name, brand name, size, dye lot number, and related information. Remove materials from packaging and store them in a clean, dry, well ventilated area (100 percent outside air supply, minimum of 1.5 air changes per hour, and no recirculation), protected from damage, soiling, and moisture, and strong contaminant sources and residues, and maintain at a temperature above 60 degrees F for 2 days prior to installation. Carpet or carpet tiles shall not be stored with materials which have high emissions of volatile organic compounds (VOCs) or other contaminants. Do not store carpet near materials that may offgas or emit harmful fumes, such as kerosene heaters, fresh paint, or adhesives.

1.5 ENVIRONMENTAL REQUIREMENTS

Maintain areas in which carpeting is to be installed at a temperature above 60 degrees F and below 90 degrees F for 2 days before installation, during installation, and for 2 days after installation. Provide temporary ventilation during work of this section. Maintain a minimum temperature of 55 degrees F thereafter for the duration of the contract. Do not permit traffic or movement of furniture or equipment in carpeted area for 24 hours after installation. Complete other work which would damage the carpet prior to installation of carpet.

1.6 WARRANTY

Provide manufacturer's standard performance guarantees or warranties including minimum ten (10) year wear warranty, two (2) year material and workmanship and ten (10) year tuft bind and delamination.

1.7 OPERATIONAL SERVICE

Collect information from the manufacturer about maintenance agreement options, and submit to Contracting Officer. Service shall reclaim materials for recycling and/or reuse. Service shall not landfill or burn reclaimed materials. When such a service is not available, local recyclers shall be sought after to reclaim the materials.

1.8 EXTRA MATERIAL

Provide extra material from same dye lot consisting of full width continuous broadloom for future maintenance. Provide a minimum of five percent of total square yards of each carpet type, pattern, and color.

PART 2 PRODUCTS

2.1 CARPET

Furnish first quality carpet; free of visual blemishes, streaks, poorly dyed areas, fuzzing of pile yarn, spots or stains, and other physical and manufacturing defects. Provide carpet materials and treatments as reasonably nonallergenic and free of other recognized health hazards. Provide a static control construction on all grade carpets which gives adequate durability and performance. Provide the Carpet and Rug Institute (CRI) Indoor Air Quality (IAQ) Label. Carpet type bearing the label will

indicate that carpet has been tested and meets the criteria of the CRI Green Label Requirements for Indoor Air Quality Test Criteria.

2.1.1 Polyester Carpet Face Fibers

For informational purposes, a list of sources known to recycle polyester carpet face fibers is provided below. Note that the Contractor is not limited to these sources. An approved product from other sources may be submitted for the Government's approval during construction. Acceptable manufacturer's include, but are not limited to:

Bretlin, Inc.
LaFayette, Georgia

Central Vermont Carpet
Barre, Vermont

Environmental Building Supplies
Portland, Oregon

Image Industries
Amuchee, Georgia

Martin Color-FI
Edgefield, South Carolina

Talisman Mills, Inc.
Mequon, Wisconsin

2.1.2 Physical Characteristics

2.1.2.1 Broadloom Carpet

Carpet shall comply with the following:

- a. Carpet Construction: Pattern loop.
- b. Type: Broadloom 12 feet minimum usable carpet width.
- c. Pile Fiber: Commercial 100 percent branded (federally registered trademark) nylon continuous filament.
- e. Pile Thickness: Minimum 0.165 inch.
- f. Gauge or Pitch: Minimum 1/10 inch in accordance with ASTM D 5793.
- g. Stitches or Rows/Wires: Minimum 12 per square inch.
- h. Tufted: Minimum 28 ounces per square yard. This does not include weight of backings. Determine weight in accordance with ASTM D 5848.
- i. Average Density: Minimum 6,109 sq/yd.
- j. Pattern Repeat: 13/32 inch wide x 22/32 inch length.
- k. Weight Density: 171,052.
- l. Dye Method: Solution dyed Yarn dyed.

- m. Backing Materials: Provide primary backing materials of [polypropylene](#). Provide secondary backing to suit project requirements of those customarily used and accepted by the trade for each type of carpet, except when a special unitary back designed for gluedown is needed.

2.2 PERFORMANCE REQUIREMENTS

- a. ARR (Appearance Retention Rating): Test carpet with the minimum 3.5-4.0 (Severe) ARR in accordance with either the [ASTM D 5252](#) (Hexapod) or [ASTM D 5417](#) (Vettermann) test methods using the number of cycles for short and long term tests as specified.
- b. Static Control: Provide static control to permanently regulate static buildup to less than 3.5 kV when tested at 20 percent relative humidity and [70 degrees F](#) in accordance with [AATCC 134](#).
- c. Flammability and Critical Radiant Flux Requirements: Comply carpet with [16 CFR 1630](#). Provide carpet in corridors and exits with a minimum average critical radiant flux of 0.22 watts per square centimeter when tested in accordance with [ASTM E 648](#).
- d. Tuft Bind: Provide tuft bind force required to pull a tuft or loop free from carpet backing with a minimum [10 pound](#) average force for loop pile.
- e. Colorfastness to Crocking: Comply dry and wet crocking with [AATCC 165](#) and with a Class 4 minimum rating on the AATCC Color Transference Chart for all colors.
- f. Colorfastness to Light: Comply colorfastness to light with [AATCC 16](#), Test Option E "Water-Cooled Xenon-Arc Lamp, Continuous Light" and with a minimum 4 grey scale rating after 40 hours.
- g. Colorfastness to Water: Comply colorfastness to water with [AATCC 107](#) and with a minimum 4.0 gray scale rating and a minimum 4.0 transfer scale rating.
- h. Delamination Strength: Provide delamination strength for tufted carpet with a secondary back of minimum [2.5 lbs/inch](#).
- i. Antimicrobial: Nontoxic antimicrobial treatment in accordance with [AATCC 174](#) Part I (qualitative), guaranteed by the carpet manufacturer to last the life of the carpet.

2.3 CARPET MOLDINGS

Install carpet moldings, where floor covering material changes or carpet edge does not abut a vertical surface.

2.4 ADHESIVES AND CONCRETE PRIMER

Adhesives and concrete primers shall comply with applicable regulations regarding toxic and hazardous materials. [Provide waterproof, nonflammable, and nonstaining adhesives and concrete primers for carpet installation to meet local air-quality standards, and as required by the carpet](#)

manufacturer. Provide release adhesive for modular tile carpet as recommended by the carpet manufacturer. Provide adhesives flashpoint of minimum 140 degrees F in accordance with ASTM D 3278.

2.5 MOLDING

Provide a heavy-duty vinyl molding designed for the type of carpet being installed. Provide floor flange of a minimum 2 inches wide.

2.6 TAPE

Provide tape for seams as recommended by the carpet manufacturer for the type of seam used in installation. Any seam sealant shall have a maximum VOC content of 50 grams/liter. Do not use sealants that contain 1,1,1-trichloroethane or toluene.

2.7 COLOR, TEXTURE, AND PATTERN

Provide color, texture, and pattern as indicated on the drawings.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

Do not install carpet on surfaces that are unsuitable and will prevent a proper installation. Repair holes, cracks, depressions, or rough areas using material recommended by the carpet or adhesive manufacturer. Free floor of any foreign materials and sweep clean. Before beginning work, test subfloor with glue and carpet to determine "open time" and bond.

3.2 MOISTURE AND ALKALINITY TESTS

Test concrete slab shall for moisture content and excessive alkalinity in accordance with CRI 104.

3.3 PREPARATION OF CONCRETE SUBFLOOR

Do not commence installation of the carpeting shall until concrete substrate is at least 90 days old. Prepare the concrete surfaces in accordance with instructions of the carpet manufacturer. Match carpet, when required, and adhesives to prevent off-gassing to a type of curing compounds, leveling agents, and concrete sealer.

3.4 INSTALLATION

Isolate area of installation from rest of building. Perform all work by installers who are CFI certified (International Certified Floorcovering Installer Association), or manufacturer's approved installers. Conduct installation in accordance with the manufacturer's printed instructions and CRI 104. Protect edges of carpet meeting hard surface flooring with molding and install in accordance with the molding manufacturer's printed instructions. Mothproofing for wool carpets shall use autofoam mothproofing system. Follow ventilation, personal protection, and other safety precautions recommended by the adhesive manufacturer. Continue ventilation during installation and for at least 72 hours following installation.

3.4.1 Broadloom Installation

Install broadloom carpet as required by the carpet manufacturer and smooth, uniform, and secure, with a minimum of seams. Apply regular, unnoticeable, and treated seams with a seam adhesive. Run side seams toward the light, where practical, and where such layout does not increase the number of seams. Install breadths parallel, with carpet pile in the same direction. Match patterns accurately. Neatly cut and fit cutouts, at door jambs, columns and ducts securely. Locate seams at doorways parallel to and centered directly under doors. Do not make seams perpendicular to doors or at pivot points. Provide seams at changes in directions of corridors to follow the wall line parallel to the carpet direction. Lay the carpet lengthwise down the corridors with widths less than 6 feet.

3.5 CLEANING AND PROTECTION

3.5.1 Cleaning

After installation of the carpet, remove debris, scraps, and other foreign matter. Remove soiled spots and adhesive from the face of the carpet with appropriate spot remover. Cut off and remove protruding face yarn. Vacuum carpet clean with a high-efficiency particulate air (HEPA) filtration vacuum.

3.5.2 Protection

Protect the installed carpet from soiling and damage with heavy, reinforced, nonstaining kraft paper, plywood, or hardboard sheets. Lap and secure edges of kraft paper protection to provide a continuous cover. Restrict traffic for at least 48 hours. Remove protective covering when directed by the Contracting Officer.

3.6 REMNANTS

Collect information from manufacturer about maintenance agreement options, and provide to Contracting Officer. Provide remnants remaining from the installation, consisting of scrap pieces more than 2 feet in dimension with more than 6 square feet total to the Government. Non-retained scraps shall be set aside and returned to manufacturer for recycling into new product.

-- End of Section --

SECTION 09 90 00

PAINTS AND COATINGS

08/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)

ACGIH 0100Doc (2005) Documentation of the Threshold Limit Values and Biological Exposure Indices

ASTM INTERNATIONAL (ASTM)

ASTM D 2092 (1995; R 2001e1) Standard Guide for Preparation of Zinc-Coated (Galvanized) Steel Surfaces for Painting

ASTM D 235 (2002; R 2008) Mineral Spirits (Petroleum Spirits) (Hydrocarbon Dry Cleaning Solvent)

ASTM D 4214 (2007) Standard Test Method for Evaluating the Degree of Chalking of Exterior Paint Films

ASTM D 4263 (1983; R 2005) Indicating Moisture in Concrete by the Plastic Sheet Method

ASTM D 4444 (2008) Use and Calibration of Hand-Held Moisture Meters

ASTM D 523 (2008) Standard Test Method for Specular Gloss

ASTM F 1869 (2004) Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

MASTER PAINTERS INSTITUTE (MPI)

MPI 101 (Jan 2004) Epoxy Anti-Corrosive Metal Primer

MPI 107 (Jan 2004) Rust Inhibitive Primer (Water-Based)

MPI 108 (Jan 2004) High Build Epoxy Coating, Low Gloss

MPI 11	(Jan 2004) Exterior Latex, Semi-Gloss, MPI Gloss Level 5
MPI 134	(Jan 2004) Galvanized Primer (Waterbased)
MPI 141	(Jan 2004) Interior High Performance Latex MPI Gloss Level 5
MPI 147	(Jan 2004) Institutional Low Odor / VOC Interior Latex, Semi-Gloss, MPI Gloss Level 5
MPI 163	(Jan 2006) Exterior W.B. Light Industrial Coating, Semi-Gloss, MPI Gloss Level 5
MPI 23	(Jan 2004) Surface Tolerant Metal Primer
MPI 39	(Jan 2004) Interior Latex-Based Wood Primer
MPI 4	(Jan 2004) Interior/Exterior Latex Block Filler
MPI 42	(Jan 2004) Latex Stucco and Masonry Textured Coating
MPI 47	(Jan 2004) Interior Alkyd, Semi-Gloss, MPI Gloss Level 5
MPI 50	(Jan 2004) Interior Latex Primer Sealer
MPI 79	(Jan 2004) Alkyd Anti-Corrosive Metal Primer
MPI 94	(Jan 2004) Exterior Alkyd, Semi-Gloss, MPI Gloss Level 5
MPI 95	(Jan 2004) Quick Drying Primer for Aluminum

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS SP-01	(2000) Environmentally Preferable Product Specification for Architectural and Anti-Corrosive Paints
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THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC Guide 6	(2004) Guide for Containing Debris Generated During Paint Removal Operations
SSPC Guide 7	(2004; E 2004) Guide for the Disposal of Lead-Contaminated Surface Preparation Debris
SSPC PA 1	(2000; E 2004) Shop, Field, and Maintenance Painting
SSPC PA Guide 3	(1982; E 1995) A Guide to Safety in Paint Application

SSPC SP 1 (1982; E 2004) Solvent Cleaning

SSPC SP 10 (2007) Near-White Blast Cleaning

SSPC SP 12 (2002) Surface Preparation and Cleaning of Metals by Waterjetting Prior to Recoating

SSPC SP 2 (1982; E 2004) Hand Tool Cleaning

SSPC SP 3 (2004; E 2004) Power Tool Cleaning

SSPC SP 6 (7) Commercial Blast Cleaning

SSPC SP 7 (2007) Brush-Off Blast Cleaning

SSPC VIS 1 (2002; E 2004) Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning

SSPC VIS 3 (2004) Visual Standard for Power-and Hand-Tool Cleaned Steel

SSPC VIS 4 (1998; E 2000; E 2004) Guide and Reference Photographs for Steel Surfaces Prepared by Waterjetting

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1 (2008) Safety and Health Requirements Manual

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-STD-101 (Rev B) Color Code for Pipelines & for Compressed Gas Cylinders

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA Method 24 (2000) Determination of Volatile Matter Content, Water Content, Density, Volume Solids, and Weight Solids of Surface Coatings

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FED-STD-313 (Rev D; Am 1) Material Safety Data, Transportation Data and Disposal Data for Hazardous Materials Furnished to Government Activities

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.1000 Air Contaminants

29 CFR 1910.1001 Asbestos

29 CFR 1910.1025 Lead

29 CFR 1926.62 Lead

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

The current MPI, "Approved Product List" which lists paint by brand, label, product name and product code as of the date of contract award, will be used to determine compliance with the submittal requirements of this specification. The Contractor may choose to use a subsequent MPI "Approved Product List", however, only one list may be used for the entire contract and each coating system is to be from a single manufacturer. All coats on a particular substrate must be from a single manufacturer. No variation from the MPI Approved Products List is acceptable.

Samples of specified materials may be taken and tested for compliance with specification requirements.

In keeping with the intent of Executive Order 13101, "Greening the Government through Waste Prevention, Recycling, and Federal Acquisition", products certified by SCS as meeting SCS SP-01 shall be given preferential consideration over registered products. Products that are registered shall be given preferential consideration over products not carrying any EPP designation.

SD-03 Product Data

Coating;

Manufacturer's Technical Data Sheets;

Sealant

SD-04 Samples

Color

Submit manufacturer's samples of paint colors. Cross reference color samples to color scheme as indicated.

SD-07 Certificates

Applicator's qualifications

SD-08 Manufacturer's Instructions

Application instructions

Mixing

Detailed mixing instructions, minimum and maximum application temperature and humidity, potlife, and curing and drying times between coats.

Manufacturer's Material Safety Data Sheets

Submit manufacturer's Material Safety Data Sheets for coatings, solvents, and other potentially hazardous materials, as defined in FED-STD-313.

SD-10 Operation and Maintenance Data

Coatings:

Preprinted cleaning and maintenance instructions for all coating systems shall be provided.

1.3 APPLICATOR'S QUALIFICATIONS

1.3.1 Contractor Qualification

Submit the name, address, telephone number, FAX number, and e-mail address of the contractor that will be performing all surface preparation and coating application. Submit evidence that key personnel have successfully performed surface preparation and application of coatings on a minimum of three similar projects within the past three years. List information by individual and include the following:

- a. Name of individual and proposed position for this work.
- b. Information about each previous assignment including:

Position or responsibility

Employer (if other than the Contractor)

Name of facility owner

Mailing address, telephone number, and telex number (if non-US) of facility owner

Name of individual in facility owner's organization who can be contacted as a reference

Location, size and description of structure

Dates work was carried out

Description of work carried out on structure

1.4 QUALITY ASSURANCE

1.4.1 Field Samples and Tests

The Contracting Officer may choose up to two coatings that have been delivered to the site to be tested at no cost to the Government. Take samples of each chosen product as specified in the paragraph "Sampling Procedures." Test each chosen product as specified in the paragraph "Testing Procedure." Products which do not conform, shall be removed from the job site and replaced with new products that conform to the referenced specification. Testing of replacement products that failed initial testing shall be at no cost to the Government.

1.4.1.1 Sampling Procedure

The Contracting Officer will select paint at random from the products that have been delivered to the job site for sample testing. The Contractor shall provide one quart samples of the selected paint materials. The

samples shall be taken in the presence of the Contracting Officer, and labeled, identifying each sample. Provide labels in accordance with the paragraph "Packaging, Labeling, and Storage" of this specification.

1.5 REGULATORY REQUIREMENTS

1.5.1 Environmental Protection

In addition to requirements specified elsewhere for environmental protection, provide coating materials that conform to the restrictions of the local Air Pollution Control District and regional jurisdiction. Notify Contracting Officer of any paint specified herein which fails to conform.

1.5.2 Lead Content

Do not use coatings having a lead content over 0.06 percent by weight of nonvolatile content.

1.5.3 Chromate Content

Do not use coatings containing zinc-chromate or strontium-chromate.

1.5.4 Asbestos Content

Materials shall not contain asbestos.

1.5.5 Mercury Content

Materials shall not contain mercury or mercury compounds.

1.5.6 Silica

Abrasive blast media shall not contain free crystalline silica.

1.5.7 Human Carcinogens

Materials shall not contain [ACGIH 0100Doc](#) and [ACGIH 0100Doc](#) confirmed human carcinogens (A1) or suspected human carcinogens (A2).

1.6 PACKAGING, LABELING, AND STORAGE

Paints shall be in sealed containers that legibly show the contract specification number, designation name, formula or specification number, batch number, color, quantity, date of manufacture, manufacturer's formulation number, manufacturer's directions including any warnings and special precautions, and name and address of manufacturer. Pigmented paints shall be furnished in containers not larger than 5 gallons. Paints and thinners shall be stored in accordance with the manufacturer's written directions, and as a minimum, stored off the ground, under cover, with sufficient ventilation to prevent the buildup of flammable vapors, and at temperatures between 40 to 95 degrees F. Do not store paint, polyurethane, varnish, or wood stain products with materials that have a high capacity to adsorb VOC emissions. Do not store paint, polyurethane, varnish, or wood stain products in occupied spaces.

1.7 SAFETY AND HEALTH

Apply coating materials using safety methods and equipment in accordance

with the following:

Work shall comply with applicable Federal, State, and local laws and regulations, and with the ACCIDENT PREVENTION PLAN, including the Activity Hazard Analysis as specified in Section 01 35 29 SAFETY AND OCCUPATIONAL HEALTH REQUIREMENTS and in Appendix A of EM 385-1-1. The Activity Hazard Analysis shall include analyses of the potential impact of painting operations on painting personnel and on others involved in and adjacent to the work zone.

1.7.1 Safety Methods Used During Coating Application

Comply with the requirements of SSPC PA Guide 3.

1.7.2 Toxic Materials

To protect personnel from overexposure to toxic materials, conform to the most stringent guidance of:

- a. The applicable manufacturer's Material Safety Data Sheets (MSDS) or local regulation.
- b. 29 CFR 1910.1000.
- c. ACGIH 0100Doc, threshold limit values.
- d. The appropriate OSHA standard in 29 CFR 1910.1025 and 29 CFR 1926.62 for surface preparation on painted surfaces containing lead. Removal and disposal of coatings which contain lead is specified in Section 02 82 33.12 REMOVAL AND DISPOSAL OF MATERIALS COATED WITH LEAD-CONTAINING PAINT." Additional guidance is given in SSPC Guide 6 and SSPC Guide 7. Refer to drawings for list of hazardous materials located on this project. Contractor to coordinate paint preparation activities with this specification section.
- e. The appropriate OSHA standards in 29 CFR 1910.1001 for surface preparation of painted surfaces containing asbestos. Removal and disposal of coatings which contain asbestos materials is specified in Section 02 82 16 REMOVAL AND DISPOSAL OF ASBESTOS MATERIALS. Refer to drawings for list of hazardous materials located on this project. Contractor to coordinate paint preparation activities with this specification section.

1.8 ENVIRONMENTAL CONDITIONS

Comply, at minimum, with manufacturer recommendations for space ventilation during and after installation. Isolate area of application from rest of building when applying high-emission paints or coatings.

1.8.1 Coatings

Do not apply coating when air or substrate conditions are:

- a. Less than 5 degrees F above dew point;
- b. Below 50 degrees F or over 95 degrees F, unless specifically pre-approved by the Contracting Officer and the product manufacturer. Under no circumstances shall application conditions

exceed manufacturer recommendations.

1.8.2 Post-Application

Vacate space for as long as possible after application. Wait a minimum of 48 hours before occupying freshly painted rooms. Maintain one of the following ventilation conditions during the curing period, or for 72 hours after application:

- a. Supply 100 percent outside air 24 hours a day.
- b. Supply airflow at a rate of 6 air changes per hour, when outside temperatures are between 55 degrees F and 85 degrees F and humidity is between 30 percent and 60 percent.
- c. Supply airflow at a rate of 1.5 air changes per hour, when outside air conditions are not within the range stipulated above.

1.9 SCHEDULING

Allow paint, polyurethane, varnish, and wood stain installations to cure prior to the installation of materials that adsorb VOCs.

1.10 LOCATION AND SURFACE TYPE TO BE PAINTED

1.10.1 Painting Included

Where a space or surface is indicated to be painted, include the following unless indicated otherwise.

- a. Surfaces behind portable objects and surface mounted articles readily detachable by removal of fasteners, such as screws and bolts.
- b. New factory finished surfaces that require identification or color coding and factory finished surfaces that are damaged during performance of the work.
- c. Existing coated surfaces that are damaged during performance of the work.

1.10.1.1 Exterior Painting

Includes new surfaces, existing coated surfaces, of the building and appurtenances. Also included are existing coated surfaces made bare by cleaning operations.

1.10.1.2 Interior Painting

Includes new surfaces and existing coated surfaces of the building and appurtenances as indicated and existing coated surfaces made bare by cleaning operations. Where a space or surface is indicated to be painted, include the following items, unless indicated otherwise.

- a. Exposed columns, girders, beams, joists, and metal deck; and
- b. Other contiguous surfaces.

1.10.2 Painting Excluded

Do not paint the following unless indicated otherwise.

- a. Surfaces concealed and made inaccessible by panelboards, fixed ductwork, machinery, and equipment fixed in place.
- b. Surfaces in concealed spaces. Concealed spaces are defined as enclosed spaces above suspended ceilings, furred spaces, attic spaces, crawl spaces, elevator shafts and chases.
- c. Steel to be embedded in concrete.
- d. Copper, stainless steel, aluminum, brass, and lead except existing coated surfaces.
- e. Hardware, fittings, and other factory finished items.

1.10.3 Mechanical and Electrical Painting

Includes field coating of interior and exterior new and existing surfaces.

- a. Where a space or surface is indicated to be painted, include the following items unless indicated otherwise.
 - (1) Exposed piping, conduit, and ductwork;
 - (2) Supports, hangers, air grilles, and registers;
 - (3) Miscellaneous metalwork and insulation coverings.
- b. Do not paint the following, unless indicated otherwise:
 - (1) New zinc-coated, aluminum, and copper surfaces under insulation
 - (2) New aluminum jacket on piping
 - (3) New interior ferrous piping under insulation.

1.10.3.1 Fire Extinguishing Sprinkler Systems

Clean, pretreat, prime, and paint new fire extinguishing sprinkler systems including valves, piping, conduit, hangers, supports, miscellaneous metalwork, and accessories. Apply coatings to clean, dry surfaces, using clean brushes. Clean the surfaces to remove dust, dirt, rust, and loose mill scale. Immediately after cleaning, provide the metal surfaces with one coat primer per schedules. Shield sprinkler heads with protective covering while painting is in progress. Upon completion of painting, remove protective covering from sprinkler heads. Remove sprinkler heads which have been painted and replace with new sprinkler heads. Provide primed surfaces with the following:

- a. Piping in Unfinished Areas: Provide primed surfaces with one coat of red alkyd gloss enamel applied to a minimum dry film thickness of 1.0 mil in attic spaces, spaces above suspended ceilings, crawl spaces, pipe chases, mechanical equipment room, and spaces where walls or ceiling are not painted or not constructed of a prefinished material.

- b. Piping in Finished Areas: Provide primed surfaces with two coats of paint to match adjacent surfaces, except provide valves and operating accessories with one coat of red alkyd gloss enamel applied to a minimum dry film thickness of 1.0 mil. Provide piping with 2 inch wide red enamel bands or self-adhering red plastic bands spaced at maximum of 20 foot intervals throughout the piping systems.

1.10.4 Definitions and Abbreviations

1.10.4.1 Qualification Testing

Qualification testing is the performance of all test requirements listed in the product specification. This testing is accomplished by MPI to qualify each product for the MPI Approved Product List, and may also be accomplished by Contractor's third party testing lab if an alternative to Batch Quality Conformance Testing by MPI is desired.

1.10.4.2 Batch Quality Conformance Testing

Batch quality conformance testing determines that the product provided is the same as the product qualified to the appropriate product specification. This testing shall only be accomplished by MPI testing lab.

1.10.4.3 Coating

A film or thin layer applied to a base material called a substrate. A coating may be a metal, alloy, paint, or solid/liquid suspensions on various substrates (metals, plastics, wood, paper, leather, cloth, etc.). They may be applied by electrolysis, vapor deposition, vacuum, or mechanical means such as brushing, spraying, calendaring, and roller coating. A coating may be applied for aesthetic or protective purposes or both. The term "coating" as used herein includes emulsions, enamels, stains, varnishes, sealers, epoxies, and other coatings, whether used as primer, intermediate, or finish coat. The terms paint and coating are used interchangeably.

1.10.4.4 DFT or dft

Dry film thickness, the film thickness of the fully cured, dry paint or coating.

1.10.4.5 DSD

Degree of Surface Degradation, the MPI system of defining degree of surface degradation. Five (5) levels are generically defined under the Assessment sections in the MPI Maintenance Repainting Manual.

1.10.4.6 EPP

Environmentally Preferred Products, a standard for determining environmental preferability in support of Executive Order 13101.

1.10.4.7 EXT

MPI short term designation for an exterior coating system.

1.10.4.8 INT

MPI short term designation for an interior coating system.

1.10.4.9 micron / microns

The metric measurement for 0.001 mm or one/one-thousandth of a millimeter.

1.10.4.10 mil / mils

The English measurement for 0.001 in or one/one-thousandth of an inch, equal to 25.4 microns or 0.0254 mm.

1.10.4.11 mm

The metric measurement for millimeter, 0.001 meter or one/one-thousandth of a meter.

1.10.4.12 MPI Gloss Levels

MPI system of defining gloss. Seven (7) gloss levels (G1 to G7) are generically defined under the Evaluation sections of the MPI Manuals. Traditionally, Flat refers to G1/G2, Eggshell refers to G3, Semigloss refers to G5, and Gloss refers to G6.

Gloss levels are defined by MPI as follows:

Gloss Level	Description	Units @ 60 degrees	Units @ 85 degrees
G1	Matte or Flat	0 to 5	10 max
G2	Velvet	0 to 10	10 to 35
G3	Eggshell	10 to 25	10 to 35
G4	Satin	20 to 35	35 min
G5	Semi-Gloss	35 to 70	
G6	Gloss	70 to 85	
G7	High Gloss		

Gloss is tested in accordance with [ASTM D 523](#). Historically, the Government has used Flat (G1 / G2), Eggshell (G3), Semi-Gloss (G5), and Gloss (G6).

1.10.4.13 MPI System Number

The MPI coating system number in each Division found in either the MPI Architectural Painting Specification Manual or the Maintenance Repainting Manual and defined as an exterior (EXT/REX) or interior system (INT/RIN). The Division number follows the CSI Master Format.

1.10.4.14 Paint

See Coating definition.

1.10.4.15 REX

MPI short term designation for an exterior coating system used in repainting projects or over existing coating systems.

1.10.4.16 RIN

MPI short term designation for an interior coating system used in repainting projects or over existing coating systems.

PART 2 PRODUCTS

2.1 MATERIALS

Conform to the coating specifications and standards referenced in PART 3. Submit manufacturer's technical data sheets for specified coatings and solvents. Minimum 10 percent post-consumer plus one-half pre-consumer recycled content for light-colored paints and primers. Comply with applicable regulations regarding toxic and hazardous materials.

PART 3 EXECUTION

3.1 PROTECTION OF AREAS AND SPACES NOT TO BE PAINTED

Prior to surface preparation and coating applications, remove, mask, or otherwise protect, hardware, hardware accessories, machined surfaces, radiator covers, plates, lighting fixtures, public and private property, and other such items not to be coated that are in contact with surfaces to be coated. Following completion of painting, workmen skilled in the trades involved shall reinstall removed items. Restore surfaces contaminated by coating materials, to original condition and repair damaged items.

3.2 SURFACE PREPARATION

Remove dirt, splinters, loose particles, grease, oil, disintegrated coatings, and other foreign matter and substances deleterious to coating performance as specified for each substrate before application of paint or surface treatments. Oil and grease shall be removed prior to mechanical cleaning. Cleaning shall be programmed so that dust and other contaminants will not fall on wet, newly painted surfaces. Exposed ferrous metals such as nail heads on or in contact with surfaces to be painted with water-thinned paints, shall be spot-primed with a suitable corrosion-inhibitive primer capable of preventing flash rusting and compatible with the coating specified for the adjacent areas.

3.2.1 Additional Requirements for Preparation of Surfaces With Existing Coatings

Before application of coatings, perform the following on surfaces covered by soundly-adhered coatings, defined as those which cannot be removed with a putty knife:

- a. Test existing finishes for lead before sanding, scraping, or removing. If lead is present, refer to paragraph Toxic Materials.
- b. Wipe previously painted surfaces to receive solvent-based coatings, except stucco and similarly rough surfaces clean with a clean, dry cloth saturated with mineral spirits, ASTM D 235. Allow surface to dry. Wiping shall immediately precede the application of the first coat of any coating, unless specified otherwise.
- c. Sand existing glossy surfaces to be painted to reduce gloss.

Brush, and wipe clean with a damp cloth to remove dust.

- d. The requirements specified are minimum. Comply also with the [application instructions](#) of the paint manufacturer.
- e. Previously painted surfaces specified to be repainted shall be thoroughly cleaned of all grease, dirt, dust or other foreign matter.
- f. Blistering, cracking, flaking and peeling or other deteriorated coatings shall be removed.
- g. Chalk shall be removed so that when tested in accordance with ASTM D 4214, the chalk resistance rating is no less than 8.
- h. Slick surfaces shall be roughened. Damaged areas such as, but not limited to, nail holes, cracks, chips, and spalls shall be repaired with suitable material to match adjacent undamaged areas.
- i. Edges of chipped paint shall be feather edged and sanded smooth.
- j. Rusty metal surfaces shall be cleaned as per SSPC requirements. Solvent, mechanical, or chemical cleaning methods shall be used to provide surfaces suitable for painting.
- k. New, proposed coatings shall be compatible with existing coatings.

3.2.2 Existing Coated Surfaces with Minor Defects

Sand, spackle, and treat minor defects to render them smooth. Minor defects are defined as scratches, nicks, cracks, gouges, spalls, alligatoring, chalking, and irregularities due to partial peeling of previous coatings. Remove chalking by sanding so that when tested in accordance with [ASTM D 4214](#), the chalk rating is not less than 8.

3.2.3 Removal of Existing Coatings

Remove existing coatings from the following surfaces:

- a. Surfaces containing large areas of minor defects;
- b. Surfaces containing more than 20 percent peeling area; and
- c. Surfaces designated by the Contracting Officer, such as surfaces where rust shows through existing coatings.

3.2.4 Substrate Repair

- a. Repair substrate surface damaged during coating removal;
- b. Sand edges of adjacent soundly-adhered existing coatings so they are tapered as smooth as practical to areas involved with coating removal; and
- c. Clean and prime the substrate as specified.

3.3 PREPARATION OF METAL SURFACES

3.3.1 Existing and New Ferrous Surfaces

- a. Ferrous Surfaces including Shop-coated Surfaces and Small Areas That Contain Rust, Mill Scale and Other Foreign Substances: Solvent clean or detergent wash in accordance with [SSPC SP 1](#) to remove oil and grease. Where shop coat is missing or damaged, clean according to [SSPC SP 2](#), [SSPC SP 3](#), [SSPC SP 6](#), or [SSPC SP 10](#). Brush-off blast remaining surface in accordance with [SSPC SP 7](#). Shop-coated ferrous surfaces shall be protected from corrosion by treating and touching up corroded areas immediately upon detection.
- b. Surfaces With More Than 20 Percent Rust, Mill Scale, and Other Foreign Substances: Clean entire surface in accordance with [SSPC SP 6/SSPC SP 12](#) WJ-3.

3.3.2 Final Ferrous Surface Condition:

For tool cleaned surfaces, the requirements are stated in [SSPC SP 2](#) and [SSPC SP 3](#). As a visual reference, cleaned surfaces shall be similar to photographs in [SSPC VIS 3](#).

For abrasive blast cleaned surfaces, the requirements are stated in [SSPC SP 7](#), [SSPC SP 6](#), and [SSPC SP 10](#). As a visual reference, cleaned surfaces shall be similar to photographs in [SSPC VIS 1](#).

For waterjet cleaned surfaces, the requirements are stated in [SSPC SP 12](#). As a visual reference, cleaned surfaces shall be similar to photographs in [SSPC VIS 4](#).

3.3.3 Galvanized Surfaces

- a. New or Existing Galvanized Surfaces With Only Dirt and Zinc Oxidation Products: Clean with solvent, steam, or non-alkaline detergent solution in accordance with [SSPC SP 1](#). If the galvanized metal has been passivated or stabilized, the coating shall be completely removed by brush-off abrasive blast. New galvanized steel to be coated shall not be "passivated" or "stabilized" If the absence of hexavalent stain inhibitors is not documented, test as described in [ASTM D 2092](#), Appendix X2, and remove by one of the methods described therein.
- b. Galvanized with Slight Coating Deterioration or with Little or No Rusting: Water jetting to [SSPC SP 12](#) WJ3 to remove loose coating from surfaces with less than 20 percent coating deterioration and no blistering, peeling, or cracking. Use inhibitor as recommended by the coating manufacturer to prevent rusting.

3.3.4 Non-Ferrous Metallic Surfaces

Aluminum and aluminum-alloy, lead, copper, and other nonferrous metal surfaces.

- a. Surface Cleaning: Solvent clean in accordance with [SSPC SP 1](#) and wash with mild non-alkaline detergent to remove dirt and water soluble contaminants.

3.3.5 Existing Surfaces with a Bituminous or Mastic-Type Coating

Remove chalk, mildew, and other loose material by washing with a solution of $\frac{1}{2}$ cup trisodium phosphate, $\frac{1}{4}$ cup household detergent, one quart 5 percent sodium hypochlorite solution and 3 quarts of warm water.

3.4 PREPARATION OF CONCRETE AND CEMENTITIOUS SURFACE

3.4.1 Concrete and Masonry

- a. Curing: Concrete, stucco and masonry surfaces shall be allowed to cure at least 30 days before painting, except concrete slab on grade, which shall be allowed to cure 90 days before painting.
- b. Surface Cleaning: Remove the following deleterious substances.
 - (1) Dirt, Chalking, Grease, and Oil: Wash new and existing uncoated surfaces with a solution composed of $\frac{1}{2}$ cup trisodium phosphate, $\frac{1}{4}$ cup household detergent, and 4 quarts of warm water. Then rinse thoroughly with fresh water. Wash existing coated surfaces with a suitable detergent and rinse thoroughly. For large areas, water blasting may be used.
 - (2) Fungus and Mold: Wash new, existing coated, and existing uncoated surfaces with a solution composed of $\frac{1}{2}$ cup trisodium phosphate, $\frac{1}{4}$ cup household detergent, 1 quart 5 percent sodium hypochlorite solution and 3 quarts of warm water. Rinse thoroughly with fresh water.
 - (3) Paint and Loose Particles: Remove by wire brushing.
 - (4) Efflorescence: Remove by scraping or wire brushing followed by washing with a 5 to 10 percent by weight aqueous solution of hydrochloric (muriatic) acid. Do not allow acid to remain on the surface for more than five minutes before rinsing with fresh water. Do not acid clean more than 4 square feet of surface, per workman, at one time.
 - (5) Removal of Existing Coatings: For surfaces to receive textured coating MPI 42, remove existing coatings including soundly adhered coatings if recommended by textured coating manufacturer.
- c. Cosmetic Repair of Minor Defects: Repair or fill mortar joints and minor defects, including but not limited to spalls, in accordance with manufacturer's recommendations and prior to coating application.
- d. Allowable Moisture Content: Latex coatings may be applied to damp surfaces, but not to surfaces with droplets of water. Do not apply epoxies to damp vertical surfaces as determined by ASTM D 4263 or horizontal surfaces that exceed 3 lbs of moisture per 1000 square feet in 24 hours as determined by ASTM F 1869. In all cases follow manufacturers recommendations. Allow surfaces to cure a minimum of 30 days before painting.

3.4.2 Gypsum Board, Plaster, and Stucco

- a. Surface Cleaning: Plaster and stucco shall be clean and free from

loose matter; gypsum board shall be dry. Remove loose dirt and dust by brushing with a soft brush, rubbing with a dry cloth, or vacuum-cleaning prior to application of the first coat material. A damp cloth or sponge may be used if paint will be water-based.

- b. Repair of Minor Defects: Prior to painting, repair joints, cracks, holes, surface irregularities, and other minor defects with patching plaster or spackling compound and sand smooth.
- c. Allowable Moisture Content: Latex coatings may be applied to damp surfaces, but not surfaces with droplets of water. Do not apply epoxies to damp surfaces as determined by [ASTM D 4263](#). New plaster to be coated shall have a maximum moisture content of 8 percent, when measured in accordance with [ASTM D 4444](#), Method A, unless otherwise authorized. In addition to moisture content requirements, allow new plaster to age a minimum of 30 days before preparation for painting.

3.5 PREPARATION OF WOOD AND PLYWOOD SURFACES

3.5.1 New Plywood and Wood Surfaces, Except Floors:

- a. Wood surfaces shall be cleaned of foreign matter.

Surface Cleaning: Surfaces shall be free from dust and other deleterious substances and in a condition approved by the Contracting Officer prior to receiving paint or other finish. Do not use water to clean uncoated wood.

- b. Removal of Fungus and Mold: Wash existing coated surfaces with a solution composed of [3 ounces \(2/3 cup\)](#) trisodium phosphate, [1 ounce \(1/3 cup\)](#) household detergent, [1 quart](#) 5 percent sodium hypochlorite solution and [3 quarts](#) of warm water. Rinse thoroughly with fresh water.
- c. Moisture content of the wood shall not exceed 12 percent as measured by a moisture meter in accordance with [ASTM D 4444](#), Method A, unless otherwise authorized.
- d. Wood surfaces adjacent to surfaces to receive water-thinned paints shall be primed and/or touched up before applying water-thinned paints.
- e. Cracks and Nailheads: Set and putty stop nailheads and putty cracks after the prime coat has dried.
- f. Cosmetic Repair of Minor Defects:
 - (1) Knots and Resinous Wood : Prior to application of coating, cover knots and stains with two or more coats of [3-pound-cut](#) shellac varnish, plasticized with [5 ounces](#) of castor oil per [gallon](#). Scrape away existing coatings from knotty areas, and sand before treating. Prime before applying any putty over shellacked area.
 - (2) Open Joints and Other Openings: Fill with whiting putty, linseed oil putty. Sand smooth after putty has dried.
 - (3) Checking: Where checking of the wood is present, sand the surface, wipe and apply a coat of pigmented orange shellac. Allow

to dry before paint is applied.

- g. Prime Coat For New Exterior Surfaces: Prime coat trim before wood becomes dirty or warped.

3.5.2 Interior Wood Surfaces, Stain Finish

Interior wood surfaces to receive stain shall be sanded. Oak and other open-grain wood to receive stain shall be given a coat of wood filler not less than 8 hours before the application of stain; excess filler shall be removed and the surface sanded smooth.

3.6 APPLICATION

3.6.1 Coating Application

Painting practices shall comply with applicable federal, state and local laws enacted to insure compliance with Federal Clean Air Standards. Apply coating materials in accordance with SSPC PA 1. SSPC PA 1 methods are applicable to all substrates, except as modified herein.

At the time of application, paint shall show no signs of deterioration. Uniform suspension of pigments shall be maintained during application.

Unless otherwise specified or recommended by the paint manufacturer, paint may be applied by brush, roller, or spray. Use trigger operated spray nozzles for water hoses. Rollers for applying paints and enamels shall be of a type designed for the coating to be applied and the surface to be coated. Wear protective clothing and respirators when applying oil-based paints or using spray equipment with any paints.

Paints, except water-thinned types, shall be applied only to surfaces that are completely free of moisture as determined by sight or touch.

Thoroughly work coating materials into joints, crevices, and open spaces. Special attention shall be given to insure that all edges, corners, crevices, welds, and rivets receive a film thickness equal to that of adjacent painted surfaces.

Each coat of paint shall be applied so dry film shall be of uniform thickness and free from runs, drops, ridges, waves, pinholes or other voids, laps, brush marks, and variations in color, texture, and finish. Hiding shall be complete.

Touch up damaged coatings before applying subsequent coats. Interior areas shall be broom clean and dust free before and during the application of coating material.

Apply paint to new fire extinguishing sprinkler systems including valves, piping, conduit, hangers, supports, miscellaneous metal work, and accessories. Shield sprinkler heads with protective coverings while painting is in progress. Remove sprinkler heads which have been painted and replace with new sprinkler heads. For piping in unfinished spaces, provide primed surfaces with one coat of red alkyd gloss enamel to a minimum dry film thickness of 1.0 mil. Unfinished spaces include attic spaces, spaces above suspended ceilings, crawl spaces, pipe chases, mechanical equipment room, and space where walls or ceiling are not painted or not constructed of a prefinished material. For piping in finished areas, provide prime surfaces with two coats of paint to match adjacent

surfaces, except provide valves and operating accessories with one coat of red alkyd gloss enamel. Upon completion of painting, remove protective covering from sprinkler heads.

- a. Drying Time: Allow time between coats, as recommended by the coating manufacturer, to permit thorough drying, but not to present topcoat adhesion problems. Provide each coat in specified condition to receive next coat.
- b. Primers, and Intermediate Coats: Do not allow primers or intermediate coats to dry more than 30 days, or longer than recommended by manufacturer, before applying subsequent coats. Follow manufacturer's recommendations for surface preparation if primers or intermediate coats are allowed to dry longer than recommended by manufacturers of subsequent coatings. Each coat shall cover surface of preceding coat or surface completely, and there shall be a visually perceptible difference in shades of successive coats.
- c. Finished Surfaces: Provide finished surfaces free from runs, drops, ridges, waves, laps, brush marks, and variations in colors.
- d. Thermosetting Paints: Topcoats over thermosetting paints (epoxies and urethanes) should be applied within the overcoating window recommended by the manufacturer.

3.6.2 Mixing and Thinning of Paints

Reduce paints to proper consistency by adding fresh paint, except when thinning is mandatory to suit surface, temperature, weather conditions, application methods, or for the type of paint being used. Obtain written permission from the Contracting Officer to use thinners. The written permission shall include quantities and types of thinners to use.

When thinning is allowed, paints shall be thinned immediately prior to application with not more than 1 pint of suitable thinner per gallon. The use of thinner shall not relieve the Contractor from obtaining complete hiding, full film thickness, or required gloss. Thinning shall not cause the paint to exceed limits on volatile organic compounds. Paints of different manufacturers shall not be mixed.

3.6.3 Two-Component Systems

Two-component systems shall be mixed in accordance with manufacturer's instructions. Any thinning of the first coat to ensure proper penetration and sealing shall be as recommended by the manufacturer for each type of substrate.

3.6.4 Coating Systems

- a. Systems by Substrates: Apply coatings that conform to the respective specifications listed in the following Tables:

Table

Division 3.	Exterior Concrete Paint Table
Division 4.	Exterior Concrete Masonry Units Paint Table
Division 5.	Exterior Metal, Ferrous and Non-Ferrous Paint Table
Division 6.	Exterior Wood; Dressed Lumber, Paneling, Decking,

Shingles Paint Table

Division 9: Exterior Stucco Paint Table

Division 10. Exterior Cloth Coverings and Bituminous Coated Surfaces Paint Table

Division 3. Interior Concrete Paint Table

Division 4. Interior Concrete Masonry Units Paint Table

Division 5. Interior Metal, Ferrous and Non-Ferrous Paint Table

Division 6. Interior Wood Paint Table

Division 9: Interior Plaster, Gypsum Board, Textured Surfaces Paint Table

- b. Minimum Dry Film Thickness (DFT): Apply paints, primers, varnishes, enamels, undercoats, and other coatings to a minimum dry film thickness of 1.5 mil each coat unless specified otherwise in the Tables. Coating thickness where specified, refers to the minimum dry film thickness.
- c. Coatings for Surfaces Not Specified Otherwise: Coat surfaces which have not been specified, the same as surfaces having similar conditions of exposure.
- d. Existing Surfaces Damaged During Performance of the Work, Including New Patches In Existing Surfaces: Coat surfaces with the following:
 - (1) One coat of primer.
 - (2) One coat of undercoat or intermediate coat.
 - (3) One topcoat to match adjacent surfaces.
- e. Existing Coated Surfaces To Be Painted: Apply coatings conforming to the respective specifications listed in the Tables herein, except that pretreatments, sealers and fillers need not be provided on surfaces where existing coatings are soundly adhered and in good condition. Do not omit undercoats or primers.

3.7 COATING SYSTEMS FOR METAL

Apply coatings of Tables in Division 5 for Exterior and Interior.

- a. Apply specified ferrous metal primer on the same day that surface is cleaned, to surfaces that meet all specified surface preparation requirements at time of application.
- b. Inaccessible Surfaces: Prior to erection, use one coat of specified primer on metal surfaces that will be inaccessible after erection.
- c. Shop-primed Surfaces: Touch up exposed substrates and damaged coatings to protect from rusting prior to applying field primer.
- d. Surface Previously Coated with Epoxy or Urethane: Apply MPI 101, 1.5 mils DFT immediately prior to application of epoxy or urethane coatings.
- e. Pipes and Tubing: The semitransparent film applied to some pipes and tubing at the mill is not to be considered a shop coat, but

shall be overcoated with the specified ferrous-metal primer prior to application of finish coats.

- f. Exposed Nails, Screws, Fasteners, and Miscellaneous Ferrous Surfaces. On surfaces to be coated with water thinned coatings, spot prime exposed nails and other ferrous metal with latex primer MPI 107.

3.8 COATING SYSTEMS FOR CONCRETE AND CEMENTITIOUS SUBSTRATES

Apply coatings of Tables in Division 3, 4 and 9 for Exterior and Interior.

3.9 COATING SYSTEMS FOR WOOD AND PLYWOOD

- a. Apply coatings of Tables in Division 6 for Exterior and Interior.
- b. Prior to erection, apply two coats of specified primer to treat and prime wood and plywood surfaces which will be inaccessible after erection.
- c. Apply stains in accordance with manufacturer's printed instructions.

3.10 PIPING IDENTIFICATION

Piping Identification, Including Surfaces In Concealed Spaces: Provide in accordance with MIL-STD-101. Place stenciling in clearly visible locations. On piping not covered by MIL-STD-101, stencil approved names or code letters, in letters a minimum of 1/2 inch high for piping and a minimum of 2 inches high elsewhere. Stencil arrow-shaped markings on piping to indicate direction of flow using black stencil paint.

3.11 INSPECTION AND ACCEPTANCE

In addition to meeting previously specified requirements, demonstrate mobility of moving components, including swinging and sliding doors, cabinets, and windows with operable sash, for inspection by the Contracting Officer. Perform this demonstration after appropriate curing and drying times of coatings have elapsed and prior to invoicing for final payment.

3.12 WASTE MANAGEMENT

As specified in the Waste Management Plan and as follows. Do not use kerosene or any such organic solvents to clean up water based paints. Properly dispose of paints or solvents in designated containers. Close and seal partially used containers of paint to maintain quality as necessary for reuse. Store in protected, well-ventilated, fire-safe area at moderate temperature. Place materials defined as hazardous or toxic waste in designated containers. Coordinate with manufacturer for take-back program. Set aside scrap to be returned to manufacturer for recycling into new product. When such a service is not available, local recyclers shall be sought after to reclaim the materials. Set aside extra paint for future color matches or reuse by the Government. Where local options exist for leftover paint recycling, collect all waste paint by type and provide for delivery to recycling or collection facility for reuse by local organizations.

3.13 PAINT TABLES

All DFT's are minimum values. Use only materials with a GPS green check mark having a minimum MPI "Environmentally Friendly" E1, E2 or E3 rating based on VOC (EPA Method 24) content levels. Use only interior paints and coatings that meet VOC requirements of LEED low emitting materials credit. Acceptable products are listed in the MPI Green Approved Products List, available at <http://www.specifygreen.com/APL/ProductIdxByMPInum.asp>.

3.13.1 EXTERIOR PAINT TABLES

DIVISION 3: EXTERIOR CONCRETE PAINT TABLE

A. New and uncoated existing and Existing, previously painted concrete; vertical surfaces.

1. Latex

New; MPI EXT 3.1A-G5 (Semigloss) / Existing; MPI EXT 3.1A-G5 (Semigloss)
 Primer: Intermediate: Topcoat:
 MPI 11 MPI 11 MPI 11
 System DFT: 3.5 mils

Primer as recommended by manufacturer. Topcoat: Coating to match adjacent surfaces.

DIVISION 5: EXTERIOR METAL, FERROUS AND NON-FERROUS PAINT TABLE

STEEL / FERROUS SURFACES

A. New Steel that has been hand or power tool cleaned to SSPC SP 2 or SSPC SP 3

1. Alkyd

New; MPI EXT 5.1Q-G5 (Semigloss) Existing; MPI REX 5.1D-G5
 Primer: Intermediate: Topcoat:
 MPI 23 MPI 94 MPI 94
 System DFT: 5.25 mils

B. New Steel that has been blast-cleaned to SSPC SP 6:

1. Alkyd

New; MPI EXT 5.1D-G5 (Semigloss) / Existing; MPI REX 5.1D-G5
 Primer: Intermediate: Topcoat:
 MPI 79 MPI 94 MPI 94
 System DFT: 5.25 mils

C. Existing steel that has been spot-blasted to SSPC SP 6:

1. Surface previously coated with alkyd or latex:

Waterborne Light Industrial Coating
 MPI REX 5.1C-G5 (Semigloss)
 Spot Primer: Intermediate: Topcoat:
 MPI 79 MPI 163 MPI 163
 System DFT: 5 mils

D. New and existing steel blast cleaned to SSPC SP 10:

STEEL / FERROUS SURFACES

- 1. Waterborne Light Industrial
 MPI EXT 5.1R-G5 (Semigloss)
 Primer: Intermediate: Topcoat:
 MPI 101 MPI 108 MPI 163
 System DFT: 8.5 mils

EXTERIOR GALVANIZED SURFACES

F. New Galvanized surfaces:

- 1. Waterborne Primer / Latex
 MPI EXT 5.3H-G5 (Semigloss)
 Primer: Intermediate: Topcoat:
 MPI 134 MPI 11 MPI 11
 System DFT: 4.5 mils

G. Galvanized surfaces with slight coating deterioration; little or no rusting:

- 1. Waterborne Light Industrial Coating
 MPI REX 5.3J-G5 (Semigloss)
 Primer: Intermediate: Topcoat:
 MPI 134 N/A MPI 163
 System DFT: 4.5 mils

EXTERIOR SURFACES, OTHER METALS (NON-FERROUS)

I. Aluminum, aluminum alloy and other miscellaneous non-ferrous metal items not otherwise specified except hot metal surfaces, roof surfaces, and new prefinished equipment. Match surrounding finish:

- 1. Alkyd
 MPI EXT 5.4F-G5 (Semigloss)
 Primer: Intermediate: Topcoat:
 MPI 95 MPI 94 MPI 94
 System DFT: 5 mils

J. Surfaces adjacent to painted surfaces; Mechanical, Electrical, Fire extinguishing sprinkler systems including valves, conduit, hangers, supports, and miscellaneous metal items not otherwise specified except floors, hot metal surfaces, and new prefinished equipment. Match surrounding finish:

- 1. Alkyd
 MPI EXT 5.1D-G5 (Semigloss)
 Primer: Intermediate: Topcoat:
 MPI 79 MPI 94 MPI 94
 System DFT: 5.25 mils

3.13.2 INTERIOR PAINT TABLES

DIVISION 4: INTERIOR CONCRETE MASONRY UNITS PAINT TABLE

A. New and uncoated Existing Concrete masonry:

- 1. Institutional Low Odor / Low VOC Latex
 New; MPI INT 4.2E-G5 (Semigloss)
 Filler Primer: Intermediate: Topcoat:

DIVISION 4: INTERIOR CONCRETE MASONRY UNITS PAINT TABLE

MPI 4	N/A	MPI 147	MPI 147
System DFT: 4 mils			

B. Existing, previously painted Concrete masonry:

- 1. Institutional Low Odor / Low VOC Latex Existing; MPI RIN 4.2L-G5 (Semigloss)

Spot Primer:	Intermediate:	Topcoat:
MPI 50	MPI 147	MPI 147
System DFT: 4 mils		

DIVISION 5: INTERIOR METAL, FERROUS AND NON-FERROUS PAINT TABLE

INTERIOR STEEL / FERROUS SURFACES

A. Metal, Mechanical, Electrical, Fire extinguishing sprinkler systems including valves, conduit, hangers, supports, Surfaces adjacent to painted surfaces (Match surrounding finish), not otherwise specified except floors, hot metal surfaces, and new prefinished equipment:

- 1. High Performance Architectural Latex MPI INT 5.1R-G5 (Semigloss)

Primer:	Intermediate:	Topcoat:
MPI 79	MPI 141	MPI 141
System DFT: 5 mils		

C. Metal in toilets, restrooms, areas requiring a high degree of sanitation, and other high-humidity areas not otherwise specified except floors, hot metal surfaces, and new prefinished equipment:

- 1. Alkyd MPI INT 5.1E-G5 (Semigloss)

Primer:	Intermediate:	Topcoat:
MPI 79	MPI 47	MPI 47
System DFT: 5.25 mils		

E. Miscellaneous non-ferrous metal items not otherwise specified except floors, hot metal surfaces, and new prefinished equipment. Match surrounding finish:

- 2. Alkyd MPI INT 5.4J-G5 (Semigloss)

Primer:	Intermediate:	Topcoat:
MPI 95	MPI 47	MPI 47
System DFT: 5 mils		

DIVISION 6: INTERIOR WOOD PAINT TABLE

A. New Wood and plywood not otherwise specified:

- 1. Institutional Low Odor / Low VOC Latex New; MPI INT 6.3V-G5 (Semigloss)

Primer:	Intermediate:	Topcoat:
MPI 39	MPI 147	MPI 147
System DFT: 4 mils		

B. Existing, previously painted Wood and plywood not otherwise specified:

DIVISION 6: INTERIOR WOOD PAINT TABLE

1. Institutional Low Odor / Low VOC Latex

Existing; MPI RIN 6.4D-G5 (Semigloss)

Primer:	Intermediate:	Topcoat:
MPI 39	MPI 147	MPI 147

System DFT: 4 mils

DIVISION 9: INTERIOR PLASTER, GYPSUM BOARD, TEXTURED SURFACES PAINT TABLE

A. New Wallboard not otherwise specified:

1. Institutional Low Odor / Low VOC Latex

New; MPI INT 9.2M-G5 (Semigloss) / Existing; MPI RIN 9.2M-G5 (Semigloss)

Primer:	Intermediate:	Topcoat:
MPI 50	MPI 147	MPI 147

System DFT: 4 mils

B. New Wallboard in toilets, restrooms, laundry, shower areas, areas requiring a high degree of sanitation, and other high humidity areas not otherwise specified.

1. Alkyd

New; MPI INT 9.2C-G5 (Semigloss) / Existing; MPI RIN 9.2C-G5 (Semigloss)

Primer:	Intermediate:	Topcoat:
MPI 50	MPI 47	MPI 47

System DFT: 4 mils

-- End of Section --

SECTION 10 21 13

TOILET COMPARTMENTS

01/07

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ALUMINUM ASSOCIATION (AA)

AA DAF-45 (2003) Designation System for Aluminum Finishes

American National Standards Institute (ANSI)

ANSI A117.1 Safety Standards for the Handicapped

ASTM INTERNATIONAL (ASTM)

ASTM A 123/A 123M (2002) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM A 167 (1999; R 2004) Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

ASTM A 385 (2003) Providing High-Quality Zinc Coatings (Hot-Dip)

ASTM A 653/A 653 M (2004a) Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process

ASTM D 2092 (1995; R 2001e1) Standard Guide for Preparation of Zinc-Coated (Galvanized) Steel Surfaces for Painting

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-60003 (Basic) Partitions, Toilet, Complete

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

36 CFR 1191 Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL

PROCEDURES:

SD-02 Shop Drawings

Installation Drawings
Fabrication Drawings

Drawings showing plans, elevations, details of construction, hardware, reinforcing, fittings, mountings, and anchorings for metal partitions and urinal screens. Installation drawings as specified.

SD-03 Product Data

Toilet Partition System
Cleaning and Maintenance Instructions
Colors And Finishes
Galvanized Steel Sheet
Sound Deadening Cores
Partition Panels and Doors
Anchoring Devices and Fasteners
Hardware and Fittings
Brackets
Door Hardware
Overhead-Braced Partitions

Manufacturer's technical data and catalog cuts including installation and cleaning instructions.

SD-04 Samples

Colors and Finishes

Manufacturer's standard color charts and color samples.

Partition Panels

Three samples showing a finished edge on two adjacent sides and core construction, each not less than 12-inch square

Hardware and Fittings
Anchoring Devices and Fasteners

Three samples of each item. Approved hardware samples may be installed in the work if properly identified.

SD-07 Certificates

Certification

Documentation of product quality, as specified.

1.3 SYSTEM DESCRIPTION

Provide a complete and usable [toilet partition system](#), including toilet enclosures, room entrance screens, urinal screens, system of panels, hardware, and support components. Furnish the partition system from a single manufacturer, with a standard product as shown in the most recent catalog data. Submit [Fabrication Drawings](#) for metal toilet partitions and

urinal screens consisting of fabrication and assembly details to be performed in the factory. Submit manufacturer's [Cleaning and Maintenance Instructions](#) with Fabrication Drawings for review.

1.4 REGULATORY REQUIREMENTS

Conform to [ANSI A117.1](#) code for access for the handicapped operation of toilet compartment door and hardware.

1.5 DELIVERY, STORAGE, AND HANDLING

Deliver materials in the manufacturer's original unopened packages with the brand, item identification, and project reference clearly marked. Store Components in a dry location that is adequately ventilated; free from dust, water, other contaminants, and damage during delivery, storage, and construction.

1.6 WARRANTY

Provide [Certification](#) or warranties that metal toilet partitions will be free of defects in materials, fabrication, finish, and installation and will remain so for a period of not less than 15 years after completion.

1.7 FIELD MEASUREMENTS

Take field measurements prior to the preparation of drawing and fabrication to ensure proper fits.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 [Galvanized Steel Sheet](#)

Provide galvanized steel sheet cold-rolled, stretcher-level, commercial quality material, conforming to [ASTM A 653/A 653 M](#). Conform surface preparation of material for painting to [ASTM D 2092](#), Method A.

2.1.2 [Sound-Deadening Cores](#)

Provide sound deadening consisting of treated kraft paper honeycomb cores with a cell size of not more than [1 inch](#). Resin-material content must weigh not less than 11 percent of the finished core weight. Expanded cores must be faced on both sides with kraft paper.

2.1.3 [Anchoring Devices and Fasteners](#)

Provide steel anchoring devices and fasteners hot-dipped galvanized after fabrication, in conformance with [ASTM A 385](#) and [ASTM A 123/A 123M](#). Conceal all galvanized anchoring devices.

2.1.4 [Brackets](#)

Wall brackets must be two-ear panel brackets, T-style, [1-inch](#) stock. Provide stirrup style panel-to-pilaster brackets.

2.1.5 Hardware and Fittings

2.1.5.1 General Requirements

Hardware for the toilet partition system must conform to **CID A-A-60003** for the specified type and style of partitions. Provide hardware finish highly resistant to alkalies, urine, and other common toilet room acids. Comply latching devices and hinges for handicap compartments with **36 CFR 1191**; devices and hinges must be stainless steel door latches that operate without either tight grasping or twisting of the wrist of the operator.

- a. Corrosion-resistant steel must conform to **ASTM A 167**, Type 304.

2.1.5.2 Finishes

- a. Corrosion-resistant steel must have a No. 4 finish.
- b. Exposed fasteners must match the hardware and fittings.

2.1.6 Door Hardware

2.1.6.1 Hinges

Hinges must be self-lubricating with the indicated swing. Hinges must be the cutout-insert type and have the following type of return movement:

Gravity return movement

Hinge must be adjustable to hold in-swinging doors open at any angle up to 90 degrees and outswinging doors to 10 degrees.

2.1.6.2 Latch and Pull

Latch and pull must be a combination rubber-faced door strike and keeper equipped with emergency access.

2.1.6.3 Coat Hooks

Coat hooks must be combination units with hooks and rubber tipped pins.

2.2 PARTITION PANELS AND DOORS

Partition Panels and doors must be not less than **1 inch** thick with face sheets not less than **0.0396 inch** thick.

2.2.1 Toilet Enclosures

Conform toilet enclosures to **CID A-A-60003**, Type I, Style C, overhead braced. Furnish width, length, and height of toilet enclosures as shown. Provide a width of **1 inch**. Finish surface of panels must be Finish #2, #4 satin stainless steel. Panels indicated to receive toilet paper holders or grab bars must be reinforced for mounting of the items required. Provide grab bars to withstand a bending stress, shear stress, shear force, and a tensile force induced by **250 lbf**. Grab bars must not rotate within their fittings.

2.2.2 Urinal Screens

Conform urinal screens to **CID A-A-60003**, Type III, Style A, floor

supported. Provide finish for surface of screens as Finish #2, #4 satin stainless steel. Furnish width and height of urinal screens as shown. Provide thickness of 1 inch. Screens must be fabricated from the same types of panels and pilasters as the toilet partitions. Fittings and fasteners must be corrosion-resistant steel.

2.3 OVERHEAD-BRACED PARTITIONS

Pilasters must be not less than 1-1/4 inch thick with face sheets not less than 0.0393 inch thick. Provide anchoring device at the bottom of the pilaster consisting of a channel-shaped floor stirrup fabricated from not less than 0.0635 inch thick material and a leveling bolt. Stirrup must be secured to the pilaster with not less than a 3/16 inch bolt and nut after the pilaster is leveled. Stirrup must be secured to the floor with not less than two lead expansion shields and sheetmetal screws. Overhead brace must be fabricated from a continuous extruded aluminum tube not less than 1 inch wide by 1-1/2 inch high, 0.125-inch wall thickness. Finish must be AA-C22A31 in accordance with AA DAF-45. Set and secure brace into the top of each pilaster. Trim piece at the floor must be 3 inch high and fabricated from not less than 0.030 inch thick corrosion-resistant steel.

2.4 PILASTER SHOES

Provide shoes at pilasters to conceal floor-mounted anchorage. Pilaster shoes shall be stainless steel.

2.5 HARDWARE

Hardware for the toilet partition system shall conform to CID A-A-60003 for the specified type and style of partitions. Hardware shall be pre-drilled by manufacturer. Hardware finish shall be highly resistant to alkalies, urine, and other common toilet room acids. Hardware shall include: chrome plated non ferrous cast pivot hinges, gravity type, adjustable for door close positioning; nylon bearings; black anodized aluminum door latch; door strike and keeper with rubber bumper; and cast alloy chrome plated coat hook and bumper. Latching devices and hinges for handicap compartments shall comply with 36 CFR 1191 and shall be stainless steel door latches that operate without either tight grasping or twisting of the wrist of the operator. Screws and bolts shall be stainless steel, tamper proof type. Wall mounting brackets shall be continuous, full height, stainless steel, in accordance with toilet compartment manufacturer's instructions. Floor-mounted anchorage shall consist of corrosion-resistant anchoring assemblies with threaded rods, lock washers, and leveling adjustment nuts at pilasters for structural connection to floor.

2.6 COLORS AND FINISHES

2.6.1 Colors

Provide manufacturer's standard color charts for color of finishes for toilet partition system components.

2.6.2 Finishes No. 2

Conform partitions, panels, screen, and door finishes to CID A-A-60003 finished with Finish No. 2, No. 4 satin stainless steel.

PART 3 EXECUTION

3.1 PREPARATION

Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive work. Verify correct spacing of plumbing fixtures. Verify correct location of built in framing, anchorage, and bracing. Report in writing to Contracting Officer prevailing conditions that will adversely affect satisfactory execution of the work of this section. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

Install partitions rigid, straight, plumb, and level, with the panels centered between the fixtures. Provide a panel clearance of not more than $1/2$ inch and secure the panels to walls and pilasters with not less than two wall brackets attached near the top and bottom of the panel. Locate wall brackets so that holes for wall bolts occur in masonry or tile joints. Secure Panels to pilasters with brackets matching the wall brackets. Provide for adjustment due to minor floor variations. Locate head rail joints at pilaster center lines. Install adjacent components for consistency of line and plane. Equip each door with hinges, one door latch, and one coat hook and bumper. Align hardware to uniform clearance at vertical edges of doors.

a. Secure panels to hollow plastered walls with toggle bolts using not less than $1/4$ -20 screws of the length required for the wall thickness. Toggle bolts must have a load-carrying strength of not less than 600 pounds per anchor.

b. Secure panels to ceramic tile on hollow plastered walls or hollow concrete-masonry walls with toggle bolts using not less than $1/4$ -20 screws of the length required for the wall thickness. Toggle bolts must have a load-carrying strength of not less than 600 pounds per anchor.

c. Secure panels to solid masonry or concrete with lead or brass expansion shields designed for use with not less than $1/4$ -20 screws, with a shield length of not less than $1-1/2$ inch. Expansion shields must have a load-carrying strength of not less than 600 pounds per anchor.

d. Submit Installation Drawings for metal toilet partitions and urinal screens showing plans, elevations, details of construction, hardware, reinforcing and blocking, fittings, mountings and escutcheons. Indicate on drawings the type of partition, location, mounting height, cutouts, and reinforcement required for toilet-room accessories.

3.3 OVERHEAD-BRACED PARTITIONS

Secure pilasters to the floor with the anchorage device specified. Make all leveling devices readily accessible for leveling, plumbing, and tightening the installation. Overhead brace must be secured to the pilaster face with not less than two fasteners per face. Expansion shields must have a minimum 2-inch penetration into the concrete slab. Tops of doors must be parallel with the overhead brace when doors are in a closed position.

3.4 FINAL ADJUSTMENT

After completion of the installation, make final adjustments to the pilaster-leveling devices, door hardware, and other working parts of the partition assembly. Doors shall have a uniform vertical edge clearance of approximately 3/16 inch and shall rest open at approximately 30 degrees when unlatched.

3.5 CLEANING

Baked enamel finish shall be touched up with the same color of paint that was used for the finish. Clean all surfaces of the work, and adjacent surfaces soiled as a result of the work, in an approved manner compliant with the manufacturer's recommended cleaning and protection from damage procedures until accepted. Remove all equipment, tools, surplus materials, and work debris from the site.

-- End of Section --

SECTION 10 28 13

TOILET ACCESSORIES

07/06

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C 1036 (2006) Standard Specification for Flat Glass

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Finishes
Accessory Items

Manufacturer's descriptive data and catalog cuts indicating materials of construction, fasteners proposed for use for each type of wall construction, mounting instructions, operation instructions, and cleaning instructions.

SD-07 Certificates

Accessory Items

Certificate for each type of accessory specified, attesting that the items meet the specified requirements.

1.3 DELIVERY, STORAGE, AND HANDLING

Wrap toilet accessories for shipment and storage, then deliver to the jobsite in manufacturer's original packaging, and store in a clean, dry area protected from construction damage and vandalism.

1.4 WARRANTY

Provide manufacturer's standard performance guarantees or warranties that extend beyond a 1 year period.

PART 2 PRODUCTS

2.1 MANUFACTURED UNITS

Provide toilet accessories shall be provided where indicated in accordance

with paragraph SCHEDULE. Porcelain type, tile-wall accessories are specified in Section 09 30 00 CERAMIC TILE QUARRY TILE, AND PAVER TILE. Provide each accessory item shall be complete with the necessary mounting plates of sturdy construction with corrosion resistant surface.

2.1.1 Anchors and Fasteners

Provide anchors and fasteners capable of developing a restraining force commensurate with the strength of the accessory to be mounted and suited for use with the supporting construction. Provide oval heads exposed fasteners with finish to match the accessory.

2.1.2 Finishes

Except where noted otherwise, provide the following finishes on metal:

Metal	Finish
_____	_____
Stainless steel	No. 4 satin finish
Carbon steel, copper alloy, and brass	Chromium plated, bright

2.2 ACCESSORY ITEMS

Conform to the requirements for accessory items specified below.

2.2.1 Grab Bar (GB)

Provide an 18 gauge, 1-1/4 inch grab bar OD Type 304 stainless steel. Provide form and length for grab bar as indicated. Provide concealed exposed mounting flange. Provide grab with satin finish peened non-slip surface. Furnish installed bars capable of withstanding a 500 pound vertical load without coming loose from the fastenings and without obvious permanent deformation. Allow 1-1/2 inch space between wall and grab bar.

2.2.2 Mirrors, Glass (MG)

Provide Type I transparent flat type, Class 1-clear glass for mirrors. Glazing Quality q1 1/4 inch thick conforming to ASTM C 1036. Coat glass on one surface with silver coating, copper protective coating, and mirror backing paint. Provide highly adhesive pure silver coating of a thickness which provides reflectivity of 83 percent or more of incident light when viewed through 1/4 inch thick glass, free of pinholes or other defects. Provide copper protective coating with pure bright reflective copper, homogeneous without sludge, pinholes or other defects, of proper thickness to prevent "adhesion pull" by mirror backing paint. Provide mirror backing paint with two coats of special scratch and abrasion-resistant paint and baked in uniform thickness to provide a protection for silver and copper coatings which will permit normal cutting and edge fabrication.

2.2.3 Mirror, Tilt (MT)

Provide surface mounted tilt mirror with full visibility for persons in a wheelchair. Furnish adjustable fixed tilt mirror, extending at least 4 inch from the wall at the top and tapering to 1 inch at the bottom. Provide size in accordance with the drawings. Conform to ASTM C 1036 and paragraph Glass Mirrors.

2.2.4 Paper Towel Dispenser (PTD)

Provide paper towel dispenser constructed of a minimum 0.269 inch Type 304 stainless steel, surface mounted. Provide a towel compartment for each dispenser. Furnish tumbler key lock locking mechanism.

2.2.5 Sanitary Napkin Disposer (SND)

Construct a Type 304 stainless steel sanitary napkin disposal with removable leak-proof receptacle for disposable liners. Provide fifty disposable liners of the type standard with the manufacturer. Retain receptacle in cabinet by tumbler lock. Provide disposer with a door for inserting disposed napkins, partition mounted surface mounted.

2.2.6 Shower Curtain (SC)

Provide shower curtain, size to suit conditions. Provide anti-bacterial nylon/vinyl fabric curtain. Color is to be white.

2.2.7 Shower Curtain Rods (SCR)

Provide Type 304 stainless steel shower curtain rods 1-1/4 inch OD by 0.049 inch minimum straight to meet installation conditions.

2.2.8 Soap Dispenser (SD)

Provide soap dispenser surface mounted, liquid type consisting of a vertical Type 304 stainless steel tank with holding capacity of 40 fluid ounces with a corrosion-resistant all-purpose valve that dispenses liquid soaps, lotions, detergents and antiseptic soaps.

2.2.9 Shelf, Metal, Heavy Duty (SMHD) with Utility Hooks and Mop Strip

Furnish a minimum 18 gauge stainless steel heavy duty metal shelf 8 inches deep with return edges. Mop holders are to be riveted to the strip and rubber cams are to be ribbed.

2.2.10 Toilet Tissue Dispenser (TTD)

Furnish Type II - surface mounted toilet tissue holder with two rolls of standard tissue mounted horizontally. Provide stainless steel, satin finish cabinet.

2.2.11 Folding Shower Seat

Fabricated or 16 gauge stainless steel polished to a #4 satin finish. Bracket for wall mounting 1/8 inch thick stainless steel piano hinge. Sitting area edges beveled, welded, ground and polished smooth. Overall size: 15 1/2 inch x 15 1/2 inch x 3/4 inch.

PART 3 EXECUTION

3.1 INSTALLATION

Provide the same finish for the surfaces of fastening devices exposed after installation as the attached accessory. Provide oval exposed screw heads. Install accessories at the location and height indicated. Protect exposed surfaces of accessories with strippable plastic or by other means until the

installation is accepted. After acceptance of accessories, remove and dispose of strippable plastic protection. Coordinate accessory manufacturer's mounting details with other trades as their work progresses. Use sealants for brackets, plates, anchoring devices and similar items in showers (a silicone or polysulphide sealant) as they are set to provide a watertight installation. After installation, thoroughly clean exposed surfaces and restore damaged work to its original condition or replace with new work.

3.1.1 Surface Mounted Accessories

Mount on concealed backplates, unless specified otherwise. Conceal fasteners on accessories without backplates. Install accessories with sheet metal screws or wood screws in lead-lined braided jute, teflon or neoprene sleeves, or lead expansion shields, or with toggle bolts or other approved fasteners as required by the construction. Install backplates in the same manner, or provide with lugs or anchors set in mortar, as required by the construction. Fasten accessories mounted on gypsum board and plaster walls without solid backing into the metal or wood studs or to solid wood blocking secured between wood studs, or to metal backplates secured to metal studs.

3.2 CLEANING

Clean material in accordance with manufacturer's recommendations. Do not use alkaline or abrasive agents. Take precautions to avoid scratching or marring exposed surfaces.

-- End of Section --

SECTION 10 44 30

ROOM SIGNS

01/07

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ARCHITECTURAL & TRANSPORTATION BARRIERS COMPLIANCE BOARD (ATBCB)

ATBCB ADA TITLE III (1990) Americans with Disabilities Act - Buildings and Facilities

ASTM INTERNATIONAL (ASTM)

ASTM D 702 (1981) Cast Methacrylate Plastic Sheets, Rods, Tubes, and Shapes

ASTM D 3841 (1997) Glass-Fiber-Reinforced Polyester Plastic Panels

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-M-43719 (Rev. B; Am. 1) Marking Materials and Markers, Adhesive Elastomeric, Pigmented

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00, "Submittal Procedures."

SD-02 Shop Drawings

Plaque signs

Letters

Submit complete detail drawings, templates, erection and installation details for products listed. Indicate dimensions, construction details, reinforcement, anchorage, and installation with relation to the building construction.

SD-03 Product Data

Adhesive

SD-07 Certificates

Fiber-reinforced polyester

Acrylic sheet

1.3 ROOM NUMBERING SCHEME

Room numbering scheme may vary from the drawings. After award the Government will provide the Contractor with the scheme for room numbering for the signage.

PART 2 PRODUCTS

2.1 FIBER-REINFORCED POLYESTER (FRP)

ASTM D 3841, Type II, Grade 1, color: White.

2.2 ACRYLIC SHEET

ASTM D 702, Type II, color: White.

2.3 VINYL SHEETING FOR GRAPHICS

MIL-M-43719, minimum 0.003 inch film thickness. Provide a pre-coated pressure sensitive adhesive backing. Class 1, or positionable pressure sensitive adhesive backing, Class 3.

2.4 FABRICATION AND MANUFACTURE

2.4.1 Plaque Signs

ATBCB ADA TITLE III. Provide message panels in sizes to allow 1 1/2-inch minimum clearance on all sides of letters. Fabricate of minimum 0.125-inch fiber-reinforced polyester (FRP). Design panels to be fixed to wall surface with mounting hardware.

2.5 LETTERS

Letters shall be either applied letters on acrylic sheet or embedded letters in FRP sheet. Color of letters shall be light green. Height shall be 5/8 inch minimum. Typeface shall be Helvetica Medium.

2.5.1 Applied Letters

Provide pressure sensitive die-cut vinyl letters. Hand-cut letters are not acceptable.

2.5.2 FRP Embedded Letters

Embed message in FRP sheet and completely cover with thermosetting polyester resin. Embed message minimum 1/32-inch. Process sheets in one piece, in one process, to prevent delamination.

2.6 PRESSURE SENSITIVE LETTERS

Ensure that edges and corners of finished letterforms and graphics are true and clean. Do not use letterforms and graphics with rounded positive or negative corners, nicked, cut, or ragged edges.

2.7 ADHESIVE FOR MOUNTING PLAQUES

Provide sufficient quantities of manufacturer's recommended adhesive to adhere signs to substrate.

PART 3 EXECUTION

3.1 EXAMINATION

Examine condition of location and surfaces on which signs will be installed. Do not proceed with installation until defects or errors which would result in poor installation have been corrected.

3.2 INSTALLATION

Install signs with height of plaque centered at 5-feet 0-inches above finished floor closest edge of plaque 8-inches from outside edge of door frame on lock/latch side. Ensure that signs are installed plumb and true, at mounting heights indicated, and by method shown or specified. Do not install signs on doors until finishes on such surfaces have been applied. Place room numeral signs by each door. Also, place "Men" above room number on each men's room, "Women" above room number on each women's room, and other specified or indicated designations above room numbers as designated.

3.3 PROTECTION

Protect work and adjacent work and materials against damage during progress or work until completion. Wrap finished work with paper, polyethylene film, or strippable waterproof tape for shipment and storage and protect from damage during installation.

3.4 ADJUST AND CLEAN

Repair damage to signs incurred during installation. Replace signs which cannot be repaired to new condition.

-- End of Section --

SECTION 10 51 13

METAL LOCKERS

07/07

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

- ASTM A 653/A 653M (2008) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- ASTM A 924/A 924M (2008a) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
- ASTM B 456 (2003) Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium
- ASTM D 2092 (1995; R 2001e1) Standard Guide for Preparation of Zinc-Coated (Galvanized) Steel Surfaces for Painting

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

- FS AA-L-00486 (Rev J) Lockers, Clothing, Steel

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Types

Location

Installation

Numbering system

SD-03 Product Data

Material

Locking Devices

Handles

Finish

Locker components

Assembly instructions

SD-04 Samples

Color chips

1.3 DELIVERY, HANDLING, AND STORAGE

Deliver lockers and associated materials in their original packages, containers, or bundles bearing the manufacturer's name and the name of the material. Protect from weather, soil, and damage during delivery, storage, and construction.

1.4 FIELD MEASUREMENTS

To ensure proper fits, make field measurements prior to the preparation of drawings and fabrication. Verify correct location

1.5 QUALITY ASSURANCE

1.5.1 Color Chips

Provide a minimum of three color chips, not less than 3 inches square, of each color indicated.

PART 2 PRODUCTS

2.1 TYPES

Locker must have the following type and size in the location and quantities indicated. Locker finish colors will be as scheduled.

2.1.1 Single-tier Lockers

Single-tier lockers must be as follows:

Type STL-1: Single-tier locker 12 inches wide, 12 inches deep, and 72 inches high.

2.2 MATERIAL

2.2.1 Galvanized Steel Sheet

ASTM A 653/A 653M and ASTM A 924/A 924M, commercial quality, minimized spangle, galvanized steel sheet with not less than G60 zinc coating. Prepare surface of sheet for painting in accordance with ASTM D 2092, Method A. Minimum uncoated sheet thickness 24 gauge.

2.2.2 Chromium Coating

Nickel and chromium electrodeposited on the specified base metal. Conform

to ASTM B 456, SC-3, as applicable to the base metal.

2.2.3 Finish

FS AA-L-00486.

2.2.3.1 Color

As selected.

2.3 COMPONENTS

2.3.1 Built-In Locks

FS AA-L-00486. Provide locking devices as a padlock eye in the door latching mechanism.

2.3.2 Coat Hooks

FS AA-L-00486, chromium plated.

2.3.3 Hanger Rods

FS AA-L-00486.

2.3.4 Door Handles

FS AA-L-00486. Provide zinc alloy or steel handles with a chromium coating.

2.3.5 Doors

FS AA-L-00486, not less than 0.0598 inch thick steel sheet.

2.3.5.1 Hinges

In addition to the requirements of FS AA-L-00486, provide 5-knuckle hinges, minimum 2 inches high. Fabricate knuckle hinges from not less than 0.0787 inch thick steel sheet. A full height piano hinge may be provided if standard with the manufacturer. Weld or bolt hinges to the door frame. Weld, bolt, or rivet hinges to the door.

2.3.5.2 Latching Mechanisms

FS AA-L-00486.

2.3.6 Latch Strikes

FS AA-L-00486. Fabricate from not less than 0.0787 inch thick steel sheet, except latch strike may be continuous from top to bottom and fabricated as part of the door framing.

2.3.7 Silencers

FS AA-L-00486.

2.3.8 Back and Side Panels, Tops, and Bottoms

FS AA-L-00486, not less than 0.0474 inch thick steel sheet.

2.3.9 Sloping Locker Tops

Provide sloping locker tops in addition to the locker-section flat tops. Sloping tops must be continuous in length. Provide fillers or closures at the exposed end of sloping tops. Fabricate sloping tops from not less than 0.0478-inch thick steel sheet.

2.3.10 Shelves

FS AA-L-00486. Fabricate from not less than 0.0598 inch thick steel sheet.

2.3.11 Number Plates

FS AA-L-00486. Aluminum. Provide consecutive numbers beginning with the number 1.

2.3.12 Fastening Devices

Provide bolts, nuts, and rivets as specified in FS AA-L-00486.

PART 3 EXECUTION

3.1 ASSEMBLY AND INSTALLATION

Assemble lockers according to the locker manufacturer's instructions. Align lockers horizontally and vertically. Secure lockers to wall and base with screws as indicated. Bolt adjacent lockers together. Adjust doors to operate freely without sticking or binding and to ensure they close tightly.

3.2 NUMBERING SYSTEM

Install number plates on lockers consecutively.

3.3 FIELD QUALITY CONTROL

3.3.1 Testing

Government may request performance-characteristic tests on assembled lockers in accordance with FS AA-L-00486. Lockers not conforming will be rejected.

3.3.2 Repairing

Remove and replace damaged and unacceptable portions of completed work with new.

3.3.3 Cleaning

Clean surfaces of the work, and adjacent surfaces soiled as a result of the work, in an approved manner. Remove equipment, surplus materials, and rubbish from the site.

-- End of Section --

SECTION 10 52 20

FIRE EXTINGUISHERS AND CABINETS

01/07

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C 1036 (2006) Standard Specification for Flat Glass

FM GLOBAL (FM)

FM P7825 (2005) Approval Guide

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 10 (2007; Errata 2007; AMD 1 2007) Standard for Portable Fire Extinguishers

UNDERWRITERS LABORATORIES (UL)

UL FPED (2002) Fire Protection Equipment Directory

1.2 SYSTEM DESCRIPTION

Provide fire extinguishers and fire extinguisher cabinets in accordance with the required and advisory provisions of NFPA 10, and as specified herein. Fire extinguishers shall be UL FPED listed or FM P7825 approved. In the publications referred to herein, the advisory provisions shall be considered to be mandatory, as though the word "shall" has been substituted for "should" wherever it appears; reference to the "authority having jurisdiction" shall be interpreted to mean the local fire department.

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00, "Submittal Procedures."

SD-03 Product Data

Fire extinguishers

Fire extinguisher cabinets

Submit for each type of fire extinguisher

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the site in the manufacturer's original sealed containers or packages, bearing the manufacturer's name and brand designation. handle and store materials to protect them from damage during the entire construction period. Replace all damaged items with new items.

PART 2 PRODUCTS

2.1 DRY CHEMICAL FIRE EXTINGUISHERS

UL 299. Provide stored pressure multi-purpose dry chemical fire extinguishers, equipped with integral pressure indicating gage, 5 pound nominal charge weight having a minimum fire test rating of 3A:40B:C.

2.2 FIRE EXTINGUISHER CABINETS

Provide semi-recessed mounted cabinets where indicated. Cabinets shall be prime grade, cold-rolled, reannealed, process-leveled, furniture steel. Fabricate cabinet from 20 gage steel and door and trim from 18 gage steel. Provide fully welded joints ground smooth. On each jamb, provide at least two anchors or reinforcements spaced approximately 24 inches apart for building in or attaching the cabinets to adjacent construction. Doors shall be flush hollow metal type with fully welded joints ground smooth and full glazed opening. Provide door with continuous hinge, latch, and pull. Hinge door for 180 degree opening. Glass shall conform to ASTM C 1036 and shall be clear, Type II (flat wired glass), Form 1 (wired, polished both sides), Quality q 8 (glazing quality), diamond or square wire mesh (1/4 inch thick. Factory finish cabinet inside and out with one coat of enamel applied over a primer. Interior finish color shall be white. Exterior finish color shall be red. Provide manufacturer's optional bracket designed to accommodate specified fire extinguisher.

PART 3 EXECUTION

3.1 INSTALLATION

Install cabinets plumb and level. The top of installed extinguishers shall not be more than 5 feet above the finished floor. Provide fire extinguishers fully charged and ready for use.

SECTION 12 21 00

WINDOW BLINDS

02/09

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 701 (2004) Fire Tests for Flame Propagation of Textiles and Films

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES

SD-03 Product Data

Window Blinds;
Installation

Manufacturer's data composed of catalog cuts, brochures, product information, and maintenance instructions.

SD-04 Samples

Window Blinds;

Samples of each type and color of window treatment. Provide aluminum horizontal louver blind slats 6 inch in length for each color. Provide 6 inch sample of horizontal blind slats in each color specified.

SD-08 Manufacturer's Instructions

Window Blinds;

SD-10 Operation and Maintenance Data

Window Blinds;

1.3 SYSTEM DESCRIPTION

Provide window treatment, conforming to NFPA 701, complete with necessary brackets, fittings, and hardware. Each window treatment type shall be a complete unit provided in accordance with paragraph WINDOW TREATMENT PLACEMENT SCHEDULE. Mount and operate equipment in accordance with manufacturer's instructions. Windows to receive a treatment shall be completely covered.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver components to the jobsite in the manufacturer's original packaging with the brand or company name, item identification, and project reference clearly marked. Store components in a dry location that is adequately ventilated and free from dust, water, or other contaminants and has easy access for inspection and handling. Store materials flat in a clean dry area with temperature maintained above 50 degrees F. Do not open containers until needed for installation unless verification inspection is required.

1.5 WARRANTY

Provide manufacturer's standard performance guarantees or warranties that extend beyond a 1 year period.

PART 2 PRODUCTS

2.1 WINDOW BLINDS

Provide each blind, including hardware, accessory items, mounting brackets and fastenings, as a complete unit produced by one manufacturer. All parts shall be one color, unless otherwise indicated, to match the color of the blind slat. Treat steel features for corrosion resistance.

2.1.1 Horizontal Blinds

Provide horizontal blinds with 1 inch slats. Blind units shall be capable of nominally 180 degree partial tilting operation and full-height raising. Blinds shall be inside mount. Provide tapes for 2 inch slats with longitudinal reinforced vinyl plastic in 1-piece turn ladder construction. Tapes for 1 inch slats shall be braided polyester or nylon.

2.1.1.1 Head Channel and Slats

Provide head channel made of steel or aluminum with corrosion-resistant finish nominal 0.024 inch for 1 inch slats. Provide slats of aluminum, not less than 0.006 inch thick, and of sufficient strength to prevent sag or bow in the finished blind. Provide a sufficient amount of slats to assure proper control, uniform spacing, and adequate overlap. Enclose all hardware in the headrail.

2.1.1.2 Controls

The slats shall be tilted by a transparent tilting wand, hung vertically by its own weight, and shall swivel for easy operation. Provide a tilter control of enclosed construction. Provide moving parts and mechanical drive made of compatible materials which do not require lubrication during normal expected life. The tilter shall tilt the slats to any desired angle and hold them at that angle so that any vibration or movement of ladders and slats will not drive the tilter and change the angle of slats. Include a mechanism to prevent over tightening. Provide a wand of sufficient length to reach to within 5 feet of the floor.

2.1.1.3 Intermediate Brackets

Provide intermediate brackets for installation, as recommended by the manufacturer, of blinds over 48 inch wide.

2.1.1.4 Bottom Rail

Provide bottom rail made of corrosion-resistant steel with factory applied finish. Provide closed oval shaped bottom rail with double-lock seam for maximum strength. Bottom rail and end caps to match slats in color.

2.1.1.5 Braided Ladders

Provide braided ladders of 100 percent polyester yarn, color to match the slat color. Space ladders 15.2 slats per foot of drop in order to provide a uniform overlap of the slats in a closed position.

2.2 COLOR

Provide color, pattern and texture selected from manufacturer's standard colors. Color listed is not intended to limit the selection of equal colors from other manufacturers.

PART 3 EXECUTION

3.1 EXAMINATION

After becoming familiar with details of the work, verify all dimensions in the field, and advise the Contracting Officer of any discrepancy before performing the work.

3.2 WINDOW TREATMENT PLACEMENT SCHEDULE

Provide window blinds at each window in the exterior walls.

3.3 INSTALLATION

3.3.1 Horizontal Blinds

Perform installation of Horizontal Blinds in accordance with the approved detail drawings and manufacturer's installation instructions. Install units level, plumb, secure, and at proper height and location relative to window units. Provide and install supplementary or miscellaneous items in total, including clips, brackets, or anchorages incidental to or necessary for a sound, secure, and complete installation. Do not start installation until completion of room painting and finishing operations.

3.4 CLEAN-UP

Upon completion of the installation, free window treatments from soiling, damage or blemishes; and adjust them for form and appearance and proper operating condition. Repair or replace damaged units as directed by the Contracting Officer. Isolate metal parts from direct contact with concrete, mortar, or dissimilar metals. Ensure blinds installed in recessed pockets can be removable without disturbing the pocket. The entire blind, when retracted, shall be contained behind the pocket. For blinds installed outside the jambs and mullions, overlap each jamb and mullion 0.75 inch or more when the jamb and mullion sizes permit. Include all hardware, brackets, anchors, fasteners, and accessories necessary for a complete, finished installation.

-- End of Section --

SECTION 21 13 00.00 20

WET-PIPE FIRE SUPPRESSION SPRINKLERS

04/06

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)

ASSE 1015 (2005) Double Check Backflow Prevention Assemblies and Double Check Fire Protection Backflow Prevention Assemblies

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C651 (2005; Errata 2005) Standard for Disinfecting Water Mains

FM GLOBAL (FM)

FM P7825 (2005) Approval Guide

FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC RESEARCH (FCCCHR)

FCCCHR List (continuously updated) List of Approved Backflow Prevention Assemblies

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-58 (2002) Standard for Pipe Hangers and Supports - Materials, Design and Manufacture

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 13 (2006; Errata 2007; Amendment 1 2008) Installation of Sprinkler Systems

NFPA 24 (2006) Standard for the Installation of Private Fire Service Mains and Their Appurtenances

NFPA 70 (2007; AMD 1 2008) National Electrical Code - 2008 Edition

UNDERWRITERS LABORATORIES (UL)

UL 262 (2004) Standard for Gate Valves for

Fire-Protection Service

UL Fire Prot Dir

(2008) Fire Protection Equipment Directory

1.2 DEFINITION

- a. Year 2000 compliant - means computer controlled facility components that accurately process date and time data (including, but not limited to, calculating, comparing, and sequencing) from, into, and between the twentieth and twenty-first centuries, and the years 1999 and 2000 and leap year calculations.

1.3 SYSTEM DESCRIPTION

Design and provide new automatic wet pipe fire extinguishing sprinkler systems for complete fire protection coverage throughout.

1.4 SPRINKLER SYSTEM DESIGN

Design automatic wet pipe fire extinguishing sprinkler systems in accordance with the required and advisory provisions of [NFPA 13](#), except as modified herein, by ordinary hazard occupancy. Discharge from individual heads in the hydraulically most remote area shall be between 100 percent and 120 percent of the specified density. Each system shall include materials, accessories, and equipment inside and outside the building to provide each system complete and ready for use. Design and provide each system to give full consideration to blind spaces, piping, electrical equipment, ducts, and other construction and equipment in accordance with detailed working drawings to be submitted for approval. Locate sprinkler heads in a consistent pattern with ceiling grid, lights, and air supply diffusers. Provide [sprinkler heads and piping system layout](#). Devices and equipment for fire protection service shall be [UL Fire Prot Dir](#) listed or [FM P7825](#) approved for use in wet pipe sprinkler systems. Design systems for earthquake protection.

1.4.1 Location of Sprinkler Heads

Heads in relation to the ceiling and the spacing of sprinkler heads shall comply with [NFPA 13](#) as modified by UFC 3-600-01.

1.4.2 Water Distribution

Distribution shall be uniform throughout the area in which the sprinkler heads will open. Discharge from individual heads in the hydraulically most remote area shall be 100 percent of the specified density.

1.4.3 Density of Application of Water

Size pipe to provide the specified density when the system is discharging the specified total maximum required flow. Application to horizontal surfaces below the sprinklers shall be as indicated on plans.

1.4.4 Sprinkler Discharge Area

Area shall be the hydraulically most remote 3000 sq ft area as defined in [NFPA 13](#).

1.4.5 Outside Hose Allowances

Hydraulic calculations shall include a hose stream allowance as per UFC 3-600-01.

1.4.6 Friction Losses

Calculate losses in piping in accordance with the Hazen-Williams formula with 'C' values referenced in [NFPA 13](#).

1.4.7 Water Supply

Base hydraulic calculations on a static pressure of 60 [psig](#) with 1060 [gpm](#) available at a residual pressure of 57 [psig](#) at the junction with the water distribution piping system.

1.4.8 Detail Drawings

Prepare [24 by 36 inch](#) detail working drawings of sprinkler heads and piping system layout in accordance with [NFPA 13](#), "Working Drawings (Plans)." Show data essential for proper installation of each system. Show details, plan view, elevations, and sections of the systems supply and piping. Show piping schematic of systems supply, devices, valves, pipe, and fittings. Show point to point [electrical wiring diagrams](#). Submit drawings signed by a registered fire protection engineer.

1.4.9 As-Built Drawings

After completion, but before final acceptance, submit complete set of as-built drawings of each system for record purposes. Submit [24 by 36 inch](#) drawings on reproducible mylar film with title block similar to full size contract drawings. Furnish the as-built (record) working drawings in addition to as-built contract drawings required by Division 1, "General Requirements." In addition to reproducible mylar asbuilts, submit asbuilt in AutoCAD 2000 format on CD.

1.5 SUBMITTALS

The NAVFAC MidLant, NAVFAC MIDLANT Fire Protection Engineer, will review and approve all submittals in this section requiring Government approval.

[SD-02 Shop Drawings](#)

[Sprinkler heads and piping system layout](#)

[Electrical wiring diagrams](#)

[SD-03 Product Data](#)

[Piping](#)

[Alarm valves](#)

[Valves](#), including gate, check, and globe

[Sprinkler heads](#)

[Pipe hangers and supports](#)

Pressure switch

Fire department connections

Mechanical couplings

Backflow Preventer

Annotate descriptive data to show the specific model, type, and size of each item.

SD-05 Design Data

Sprinkler system design

Submit hydraulic calculations to substantiate compliance with hydraulic design requirements. Submit name of software program used.

SD-06 Test Reports

Preliminary tests on piping system

SD-07 Certificates

Qualifications of installer

SD-10 Operation and Maintenance Data

Alarm valves, Data Package 3

Excess pressure pump, Data Package 3

Backflow preventer, Data Package 3

SD-11 Closeout Submittals

As-built drawings of each system

1.6 QUALITY ASSURANCE

1.6.1 Qualifications of Installer

Prior to installation, submit data showing that the Contractor has successfully installed systems of the same type and design as specified herein, or that Contractor has a firm contractual agreement with a subcontractor having such required experience. Data shall include names and locations of at least two installations where the Contractor, or the subcontractor referred to above, has installed such systems. Indicate type and design of each system and certify that each system has performed satisfactorily in the manner intended for not less than 18 months.

Qualifications of System Technician: Installation drawings, shop drawing and as-built drawings shall be prepared, by or under the supervision of, an individual who is experienced with the types of works specified herein, and is currently certified by the National Institute for Certification in Engineering Technologies (NICET) as an engineering technician with minimum Level-III certification in Automatic Sprinkler System program. Contractor shall submit data for approval showing the name and certification of all

involved individuals with such qualifications at or prior to submittal of drawings.

PART 2 PRODUCTS

2.1 Y2K COMPLIANT PRODUCTS

Provide computer controlled facility components, specified in this section, that are Year 2000 compliant (Y2K). Computer controlled facility components refers to software driven technology and embedded microchip technology. This includes, but is not limited to, telecommunications switches, programmable thermostats, HVAC controllers, elevator controllers, utility monitoring and control systems, fire detection and suppression systems, alarms, security systems, traffic signals, and other facilities control systems utilizing microcomputer, minicomputer, or programmable logic controllers.

2.2 ABOVEGROUND PIPING SYSTEMS

Provide fittings for changes in direction of piping and for connections. Perform welding in the shop; field welding will not be permitted. Conceal piping in areas with suspended ceiling.

2.2.1 Sprinkler Piping

NFPA 13, except as modified herein. Steel piping shall be Schedule 40 for sizes less than 2 inches, and Schedule 10 or 40 for sizes 2 inches and larger. Fittings into which sprinkler heads, sprinkler head riser nipples, or drop nipples are threaded shall be welded, threaded, or grooved-end type. Plain-end fittings with mechanical couplings and fittings which use steel gripping devices to bite into the pipe when pressure is applied will not be permitted. Rubber gasketed grooved-end pipe and fittings with mechanical couplings shall be permitted in pipe sizes 1.5 inches and larger. Fittings shall be **UL Fire Prot Dir** listed or **FM P7825** approved for use in wet pipe sprinkler systems. Fittings, mechanical couplings, and rubber gaskets shall be supplied by the same manufacturer. Steel piping with wall thickness less than Schedule 30 shall not be threaded. Sprinkler pipe and fittings shall be metal.

2.2.2 Sprinkler Heads

Provide nominal 0.50 inch orifice sprinkler heads. O-rings will not be permitted in sprinkler heads. Release element of each head shall be of the intermediate temperature rating or higher as suitable for the specific application. Provide polished stainless steel ceiling plates or chromium-plated finish on copper alloy ceiling plates, and chromium-plated pendent sprinklers below suspended ceilings. Provide corrosion-resistant sprinkler heads and sprinkler head guards as required by **NFPA 13**. Deflector shall not be more than 3 inches below suspended ceilings. Ceiling plates shall not be more than 0.5 inch deep. Ceiling cups shall not be permitted. Provide two (2) piece escutcheon ceiling plates in suspended acoustical ceilings.

2.2.3 Cabinet

Provide metal cabinet with extra sprinkler heads and sprinkler head wrench adjacent to each alarm valve. The number and types of extra sprinkler heads shall be as specified in **NFPA 13**.

2.2.4 Alarm Valves

Provide variable pressure type alarm valve complete with alarm test valve, alarm shutoff valve, drain valve, pressure gages, accessories, and appurtenances for the proper operation of the system.

2.2.5 Pressure Switch

Provide switch with circuit opener or closer for the automatic transmittal of an alarm over the facility fire alarm system. Connection of switch shall be under 28 31 76 INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM. Alarm actuating device shall have mechanical diaphragm controlled retard device adjustable from 10 to 60 seconds and shall instantly recycle.

2.2.6 Pipe Hangers and Supports

Provide in accordance with NFPA 13 as modified by UFC 3-600-01. Attach to steel joists with MSS SP-58, Type 19 or 23 clamps and retaining straps. Attach to Steel W or S beams with Type 21, 28, 29, or 30 clamps. Attach to steel angles and vertical web steel channels with Type 20 clamp with beam clamp channel adapter. Attach to horizontal web steel channel and wood with drilled hole on centerline and double nut and washer. Attach to concrete with Type 18 insert or drilled expansion anchor.

2.2.7 Valves

NFPA 13. Provide valves of types approved for fire service. Gate valves shall open by counterclockwise rotation. Provide reduced pressure assembly type backflow preventer with OS&Y gate valves on both ends. Each check valve shall have a drain. Each OS&Y gate valve shall be supervised; minimum contact ratings shall be 2.5 amps at 24 volt DC. Provide supervision against valve closure or tampering of valve. Double check valve assembly shall be tested and certified under ASSE 1015.

2.2.8 Backflow Preventer

Provide reduced pressure zone assembly backflow preventer with OS&Y gate valve on both ends. Each check valve shall have a drain. Backflow prevention assemblies shall have current "Certificate of Approval from the Foundation for Cross-Connection Control and Hydraulic Research, FCCCHR List. Listing of the specific make, model, design, and size in the FCCCHR List shall be acceptable as the required documentation."

2.2.9 Identification Signs

NFPA 13. Attach properly lettered and approved metal signs to each valve and alarm device.

2.2.10 Test Connections

2.2.10.1 Inspector's Test Connection for Preaction Systems

Provide test connections approximately 6 feet above the floor for each sprinkler system or portion of each sprinkler system equipped with an alarm device; locate at the hydraulically most remote part of each system. Provide test connection piping to a drain location that can accept full flow where the discharge will be readily visible and where water may be discharged without property damage. Discharge to janitor sinks or similar fixtures shall not be permitted. Provide discharge orifice of same size as

corresponding sprinkler orifice. The penetration of the exterior wall shall be no greater than 2 feet above finished grade.

2.2.10.2 Backflow Preventer Test Connection

Provide downstream of the backflow prevention assembly listed hose valves with 2.5 inch National Standard male hose threads with cap and chain. Provide one valve for each 250 gpm of system demand or fraction thereof. Provide a permanent sign in accordance with paragraph entitled "Identification Signs" which reads, "Test Valve."

2.2.11 Main Drains

Provide separate drain piping to discharge at safe points outside each building. Provide auxiliary drains as required by NFPA 13. Provide precast concrete splash block under each exterior drain discharge. The penetration of the exterior wall shall be no greater than 2 feet above finished grade.

2.2.12 Fire Department Connections

Provide 4 inch connections approximately 3 feet above finish grade, of the approved two-way type with 2.5 inch National Standard female hose threads with plug, chain, and identifying fire department connection escutcheon plate.

2.3 BURIED WATER PIPING SYSTEMS

2.3.1 Pipe and Fittings

Provide outside-coated, cement-mortar lined, ductile-iron pipe, and fittings conforming to NFPA 24 for piping under the building and outside of building walls. Anchor joints in accordance with NFPA 24. Provide concrete thrust block at the elbow where the pipe turns up toward the floor, and restrain the pipe riser with steel rods from the elbow to the flange above the floor. Minimum pipe size shall be 6 inches. Minimum depth of cover shall be 3 feet at finish grade. Piping beyond 5 feet outside of building walls shall be provided.

2.3.2 Valves

Provide as required by NFPA 24. Gate valves shall conform to UL 262 and shall open by counterclockwise rotation.

2.3.3 Valve Boxes

Except where indicator posts are provided, for each buried valve, provide cast-iron, ductile-iron, or plastic valve box of a suitable size. Plastic boxes shall be constructed of acrylonitrile-butadiene-styrene (ABS) or inorganic fiber-reinforced black polyolefin. Provide cast-iron, ductile-iron, or plastic cover for valve box with the word "WATER" cast on the cover. The minimum box shaft diameter shall be 5.25 inches. Coat cast-iron and ductile-iron boxes with bituminous paint applied to a minimum dry-film thickness of 10 mils.

2.3.4 Buried Utility Warning and Identification Tape

Provide detectable aluminum foil plastic backed tape or detectable magnetic plastic tape manufactured specifically for warning and identification of buried piping. Tape shall be detectable by an electronic detection

instrument. Provide tape in rolls, 3 inches minimum width, color coded for the utility involved with warning and identification imprinted in bold black letters continuously and repeatedly over entire tape length. Warning and identification shall read "CAUTION BURIED WATER PIPING BELOW" or similar wording. Use permanent code and letter coloring unaffected by moisture and other substances contained in trench backfill material.

2.4 PIPE SLEEVES

Provide where piping passes entirely through walls, floors, and roofs. Secure sleeves in position and location during construction. Provide sleeves of sufficient length to pass through entire thickness of walls, floors, and roofs. Provide one inch minimum clearance between exterior of piping and interior of sleeve or core-drilled hole. Firmly pack space with mineral wool insulation. Seal space at both ends of the sleeve or core-drilled hole with plastic waterproof cement which will dry to a firm but pliable mass, or provide a mechanically adjustable segmented elastomeric seal. In fire walls and fire floors, seal both ends of pipe sleeves or core-drilled holes with UL listed fill, void, or cavity material.

- a. Sleeves in Masonry and Concrete Walls, Floors, and Roofs: Provide hot-dip galvanized steel, ductile-iron, or cast-iron sleeves. Core drilling of masonry and concrete may be provided in lieu of pipe sleeves when cavities in the core-drilled hole are completely grouted smooth.
- b. Sleeves in Other Than Masonry and Concrete Walls, Floors, and Roofs: Provide 26 gage galvanized steel sheet.

2.5 ESCUTCHEON PLATES

Provide split hinge metal plates for piping entering walls, floors, and ceilings in exposed spaces. Provide polished stainless steel plates or chromium-plated finish on copper alloy plates in finished spaces. Provide paint finish on metal plates in unfinished spaces.

PART 3 EXECUTION

3.1 INSTALLATION

Installation, workmanship, fabrication, assembly, erection, examination, inspection, and testing shall be in accordance with NFPA 13, except as modified herein. Install piping straight and true to bear evenly on hangers and supports. Do not hang piping from plaster ceilings. Keep the interior and ends of new piping and existing piping affected by Contractor's operations thoroughly cleaned of water and foreign matter. Keep piping systems clean during installation by means of plugs or other approved methods. When work is not in progress, securely close open ends of piping to prevent entry of water and foreign matter. Inspect piping before placing into position. Provide Teflon pipe thread paste on male threads.

3.1.1 Electrical Work

Provide electrical work associated with this section under Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM, except for control and fire alarm wiring. Provide fire alarm system under Section 28 31 76 INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM. Provide control and fire alarm wiring, including connections to fire alarm systems, under this section in accordance with NFPA 70. Provide wiring in rigid metal conduit or intermediate metal

conduit, except electrical metallic tubing conduit may be used in dry locations not enclosed in concrete or where not subject to mechanical damage.

3.1.2 Disinfection

Disinfect the new water piping and existing water piping affected by Contractor's operations in accordance with [AWWA C651](#). Fill piping systems with solution containing minimum of 50 [parts per million \(ppm\)](#) of available chlorine and allow solution to stand for minimum of 24 hours. Flush solution from the systems with domestic water until maximum residual chlorine content is within the range of 0.2 to 0.5 [ppm](#), or the residual chlorine content of domestic water supply. Obtain at least two consecutive satisfactory bacteriological samples from new water piping, analyze by a certified laboratory, and submit results prior to the new water piping being placed into service. Disinfection of systems supplied by nonpotable water is not required.

3.1.3 Connections to Existing Water Supply Systems

Use tapping or drilling machine valve and mechanical joint type sleeves for connections to be made under pressure. Bolt sleeves around the main piping; bolt valve to the branch connection. Open valve, attach drilling machine, make tap, close valve, and remove drilling machine, all without interruption of service. Notify the Contracting Officer in writing at least 15 days prior to connection date; receive approval before any service is interrupted. Furnish materials required to make connections into existing water supply systems, and perform excavating, backfilling, and other incidental labor as required. Government will furnish only the labor and the tapping or drilling machine for making the actual connections to existing systems.

3.1.4 Buried Piping System

Bury tape with the printed side up at a depth of [12 inches](#) below the top surface of earth or the top surface of the subgrade under pavements.

3.2 FIELD QUALITY CONTROL

Perform test to determine compliance with the specified requirements in the presence of the Contracting Officer. Test, inspect, and approve piping before covering or concealing.

3.2.1 Preliminary Tests

Hydrostatically test each system at [200 psig](#) for a 2 hour period with no leakage or reduction in pressure. Flush piping with potable water in accordance with [NFPA 13](#). Piping above suspended ceilings shall be tested, inspected, and approved before installation of ceilings. Test the alarms and other devices. Test the water flow alarms by flowing water through the inspector's test connection. When tests have been completed and corrections made, submit a signed and dated certificate, similar to that specified in [NFPA 13](#).

3.2.2 Formal Tests and Inspections

Do not submit a request for formal test and inspection until the preliminary test and corrections are completed and approved. Submit a written request for formal inspection at least 15 days prior to inspection

date. An experienced technician regularly employed by the system installer shall be present during the inspection. At this inspection, repeat any or all of the required tests as directed. Correct defects in work provided by the Contractor, and make additional tests until the systems comply with contract requirements. Furnish appliances, equipment, water, electricity, instruments, connecting devices, and personnel for the tests. The Atlantic Division, Naval Facilities Engineering Command, Fire Protection Engineer, will witness formal tests and approve systems before they are accepted.

3.3 FIELD PAINTING

Field painting of fire extinguishing sprinkler system shall be specified in Section 09 90 00 PAINTS AND COATINGS.

-- End of Section --

SECTION 21 13 16.00 20

DRY-PIPE FIRE SPRINKLER SYSTEMS

04/06

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C651 (2005; Errata 2005) Standard for
Disinfecting Water Mains

FM GLOBAL (FM)

FM P7825 (2005) Approval Guide

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS
INDUSTRY (MSS)

MSS SP-58 (2002) Standard for Pipe Hangers and
Supports - Materials, Design and
Manufacture

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 13 (2006; Errata 2007; Amendment 1 2008)
Installation of Sprinkler Systems

NFPA 70 (2007; AMD 1 2008) National Electrical
Code - 2008 Edition

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC Paint 25 (1997; R 2004) Zinc Oxide, Alkyd, Linseed
Oil Primer for Use Over Hand Cleaned
Steel, Type I and Type II

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS TT-E-489 (Rev J; Notice 1)) Enamel, Alkyd, Gloss,
Low Voc Content

FS TT-P-664 (Rev D) Primer Coating, Alkyd,
Corrosion-Inhibiting, Lead and Chromate
Free, VOC-Compliant

UNDERWRITERS LABORATORIES (UL)

UL Fire Prot Dir (2008) Fire Protection Equipment Directory

1.2 SYSTEM DESCRIPTION

Design and provide new automatic dry pipe fire extinguishing sprinkler systems for complete fire protection coverage throughout Building 326.

1.3 SPRINKLER SYSTEM DESIGN

Design automatic dry pipe fire extinguishing sprinkler systems in accordance with the required and advisory provisions of **NFPA 13**, hydraulic calculations using the area/density method for uniform distribution of water over the design area for ordinary extra hazard occupancy. Each system shall include materials, accessories, and equipment inside and outside the building to provide each system complete and ready for use. Design and provide each system to give full consideration to blind spaces, piping, electrical equipment, ducts, and other construction and equipment in accordance with detailed working drawings to be submitted for approval. Locate sprinkler heads in a consistent pattern with ceiling grid, lights, and air supply diffusers. Devices and equipment for fire protection service shall be **UL Fire Prot Dir** listed or **FM P7825** approved for use in dry pipe sprinkler systems.

1.3.1 Location of Sprinkler Heads

Spacing of sprinklers and position and orientation of sprinklers in relation to the ceiling, walls, and obstructions shall conform to **NFPA 13** for ordinary hazard occupancy; except for discharge density greater than **0.20 gpm per sq ft** the spacing of sprinkler heads shall not exceed that for extra hazard occupancy. Uniformly space sprinklers on the branch piping.

1.3.2 Water Distribution

Distribution shall be uniform throughout the area in which the sprinkler heads will open. Discharge from individual sprinklers in the hydraulically most remote area shall be not less than 100 percent of the specified density.

1.3.3 Density of Application of Water

Size pipe to provide the specified density when the system is discharging the specified total maximum required flow. Application to horizontal surfaces below the sprinklers shall be **.15 gpm per sq ft**.

1.3.4 Sprinkler Design Area

Area shall be the hydraulically most remote **3900 sq ft** area as defined in **NFPA 13**, When specially listed Attic sprinklers are used, they may be installed in accordance with their listing.

1.3.5 Outside Hose Allowances

Hydraulic calculations shall include a hose stream allowance as per **UFC 3-600-01**.

1.3.6 Friction Losses

Calculate losses in piping in accordance with the Hazen-Williams formula with 'C' value of 100 for steel piping, 150 for copper tubing, and 140 for cement-lined ductile-iron piping. Velocity in the sprinkler piping shall be limited to a maximum of **20 ft/sec**.

1.3.7 Water Supply

Base hydraulic calculations on a static pressure of 69 psig with 1060 gpm available at a residual pressure of 57 psig at the base of the sprinkler piping riser.

1.3.8 Detail Drawing

Prepare 24 by 36 inch detail working drawings of sprinkler heads and piping system layout in accordance with NFPA 13, "Working Drawings (Plans)." Show data essential for proper installation of each system. Show details, plan view, elevations, and sections of the systems supply and piping. Show piping schematic of systems supply, devices, valves, pipe, and fittings. Show point to point electrical wiring diagrams. Show location and orientation of sprinkler heads in relation to obstructions. Submit drawings signed by a registered fire protection engineer.

1.3.9 Detail Drawings

After completion, but before final acceptance, submit complete set of as-built drawings of each system for record purposes. Submit 24 by 36 inch drawings on reproducible mylar film with title block similar to full size contract drawings. Furnish the as-built (record) working drawings in addition to as-built contract drawings required by Division 1, "General Requirements."

1.4 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

The NAVFAC MidLant, NAVFAC MIDLANT Fire Protection Engineer, will review and approve all submittals in this section requiring Government approval.

SD-02 Shop Drawings

Sprinkler heads and piping system layout

Electrical wiring diagrams

SD-03 Product Data

Piping

Valves, including gate, check, and globe

Sprinkler heads

Pipe hangers and supports

Low air pressure supervisory switch

Dry pipe valves

Air compressor

Mechanical couplings

Pressure Switch

Annotate descriptive data to show the specific model, type, and size of each item.

SD-05 Design Data

Sprinkler system design

Submit computer program generated hydraulic calculations to substantiate compliance with hydraulic design requirements. Calculations generated by computer program shall include the name, address, and telephone number of the software manufacturer.

SD-06 Test Reports

Preliminary tests on piping system

SD-07 Certificates

Qualifications of installer

SD-10 Operation and Maintenance Data

Dry pipe valves, Data Package 3

Air compressor, Data Package 3

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

SD-11 Closeout Submittals

As-built drawings of each system

1.5 QUALITY ASSURANCE

1.5.1 Qualifications of Installer

Prior to installation, submit data showing that the Contractor has successfully installed systems of the same type and design as specified herein, or that Contractor has a firm contractual agreement with a subcontractor having such required experience. Data shall include names and locations of at least two installations where the Contractor, or the subcontractor referred to above, has installed such systems. Indicate type and design of each system and certify that each system has performed satisfactorily in the manner intended for not less than 18 months.

PART 2 PRODUCTS

2.1 ABOVEGROUND PIPING SYSTEMS

Provide fittings for changes in direction of piping and for connections. Make changes in piping sizes through tapered reducing pipe fittings; bushings will not be permitted. Perform welding in the shop; field welding will not be permitted. Conceal piping in areas with ceilings.

2.1.1 Sprinkler Piping

NFPA 13, except as modified herein. All piping shall be schedule 40 galvanized steel. Groove end connections must be cut not rolled. Fittings into which sprinkler heads, sprinkler head riser nipples, or drop nipples are threaded shall be welded, threaded, or grooved-end type. Plain-end fittings with mechanical couplings and fittings which use steel gripping devices to bite into the pipe when pressure is applied will not be permitted. Rubber gasketed grooved-end pipe and fittings with mechanical couplings shall be permitted in pipe sizes 1.5 inches and larger. Fittings shall be **UL Fire Prot Dir** listed or **FM P7825** approved for use in dry pipe sprinkler systems. Fittings, **mechanical couplings**, and rubber gaskets shall be supplied by the same manufacturer. Steel piping with wall thickness less than Schedule 30 shall not be threaded. Steel piping shall be galvanized. Sprinkler pipe and fittings shall be metal.

2.1.2 Sprinkler Heads

Provide nominal 0.50 inch or 0.53 inch orifice standard response sprinkler heads. No o-rings will be permitted in sprinkler heads. Release element of each head shall be of the ordinary temperature rating or higher as suitable for the specific application. Provide polished stainless steel ceiling plates or chromium-plated finish on copper alloy ceiling plates, and chromium-plated pendent sprinklers below suspended ceilings. Automatic sprinklers installed in the pendent position shall be of the dry-pendent type except that standard pendent sprinklers may be installed on return bends when both the sprinklers and the return bends are located in a heated area.

2.1.3 Cabinet

Provide metal cabinet with extra sprinkler heads and sprinkler head wrench adjacent to each dry pipe valve. The number and types of extra sprinkler heads shall be as specified in **NFPA 13**.

2.1.4 Dry Pipe Valves

Provide valve complete with accessories and appurtenances for the proper operation of the system.

2.1.5 Water Motor Alarms

Provide alarms of the approved weatherproof and guarded type, to sound locally on the flow of water in each corresponding sprinkler system. Mount alarms on the outside of the outer walls of each building at a location as directed. Provide separate drain piping directly to exterior of building.

2.1.6 Pressure Switch

Provide switch with circuit opener or closer for the automatic transmittal of an alarm over the facility fire alarm system. Connection of switch shall be under Section 28 31 76 INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM. Do not install a shutoff valve in the piping between the dry pipe valve and any pressure switch.

2.1.7 Low Air Pressure Supervisory Switch

Provide switch for each sprinkler system and connect to building fire alarm system to activate the system supervisory alarm when air pressure in system

drops halfway from the normal pressure to the tripping point. Connection of switch shall be under Section 28 31 76 INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM. Provide a bleeder valve in the air line ahead of the switch for testing operation of the switch. The valve shall be normally open. Closing the valve shall shut off the air supply to the switch and exhaust the pressure between the switch and valve.

2.1.1.8 Tank Mounted Air Compressor

Provide an approved, automatic type, electric motor-driven air compressor including pressure switch, air piping, and 10 gallon minimum capacity tank. Compressor shall have a minimum capacity capable of charging the complete sprinkler system to normal system air pressure within 30 minutes. Provide an approved automatic air maintenance device for each system.

2.1.1.9 Pipe Hangers and Supports

Provide in accordance with NFPA 13. Attach to steel joists with MSS SP-58, Type 19 or 23 clamps and retaining straps. Attach to Steel W or S beams with Type 21, 28, 29, or 30 clamps. Attach to steel angles and vertical web steel channels with Type 20 clamp with beam clamp channel adapter. Attach to horizontal web steel channel and wood with drilled hole on centerline and double nut and washer. Attach to concrete with Type 18 insert or drilled expansion anchor.

2.1.1.10 Valves

NFPA 13. Provide valves of types approved for fire service. Valves shall open by counterclockwise rotation. Provide an OS&Y valve beneath each dry pipe valve. Check valves shall be flanged clear opening swing-check type valves with flanged inspection and access cover plate for sizes 4 inches and larger.

2.1.1.10.1 Valve Supervision

Provide supervision of each control valve against closure and tampering in accordance with NFPA 13. Provide switch with SPDT (Form C) dry contacts for the automatic transmittal of a supervisory signal over the facility fire alarm system; minimum switch contact rating shall be 2.5 amperes at 24 VDC. A supervisory signal shall be initiated during the first two revolutions of the hand wheel, or during the first 1/5th of travel distance of the valve stem, from the full open position. Connection of the switch shall be under Section 28 31 76 INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM. Provide breakaway key operated locks and steel chains to secure all control valves against unauthorized closure or tampering.

2.1.1.11 Identification Signs

NFPA 13. Attach properly lettered and approved metal signs to each valve and alarm device. Permanently affix hydraulic design information sign to the riser of each system. For pipe schedule systems, provide a hydraulic design information sign stating: This is a ordinary hazard pipe schedule system.

2.1.1.12 Inspector's Test Connection

Provide test connections approximately 6 feet above the floor for each sprinkler system or portion of each sprinkler system equipped with an alarm device; locate at the hydraulically most remote part of each system.

Provide test connection piping to a location where the discharge will be readily visible and where water may be discharged without property damage. Provide discharge orifice of same size as corresponding sprinkler orifice. Provide a precast concrete splash block under each exterior discharge orifice.

2.1.13 Main Drains

Provide separate drain piping to discharge at safe points outside each building to sight cones attached to drains of adequate size to readily receive the full flow from each drain under maximum pressure. The penetration of the exterior wall shall be no greater than 2.0 feet above finished grade. Provide auxiliary drains as required by NFPA 13. Provide precast concrete splash blocks under each exterior drain discharge.

2.2 PIPE SLEEVES

Provide where piping passes entirely through walls, floors, and roofs. Secure sleeves in position and location during construction. Provide sleeves of sufficient length to pass through entire thickness of walls, floors, and roofs. Provide one inch minimum clearance between exterior of piping and interior of sleeve or core-drilled hole. Firmly pack space with mineral wool insulation. Seal space at both ends of the sleeve or core-drilled hole with plastic waterproof cement which will dry to a firm but pliable mass, or provide a mechanically adjustable segmented elastomeric seal. In fire walls and fire floors, seal both ends of pipe sleeves or core-drilled holes with UL listed fill, void, or cavity material.

- a. Sleeves in Masonry and Concrete Walls, Floors, and Roofs: Provide hot-dip galvanized steel, ductile-iron, or cast-iron sleeves. Core drilling of masonry and concrete may be provided in lieu of pipe sleeves when cavities in the core-drilled hole are grouted smooth.
- b. Sleeves in Other Than Masonry and Concrete Walls, Floors, and Roofs: Provide 26 gage galvanized steel sheet.

2.3 ESCUTCHEON PLATES

Provide split hinge metal plates for piping entering walls, floors, and ceilings in exposed spaces. Provide polished stainless steel plates or chromium-plated finish on copper alloy plates in finished spaces. Provide paint finish on metal plates in unfinished spaces.

PART 3 EXECUTION

3.1 INSTALLATION

Installation, workmanship, fabrication, assembly, erection, examination, inspection, and testing shall be in accordance with NFPA 13, except as modified herein. Install piping straight and true to bear evenly on hangers and supports. Do not hang piping from plaster ceilings. Keep the interior and ends of new piping and existing piping affected by Contractor's operations thoroughly cleaned of water and foreign matter. Keep piping systems clean during installation by means of plugs or other approved methods. When work is not in progress, securely close open ends of piping to prevent entry of water and foreign matter. Inspect piping before placing into position. Provide Teflon pipe thread paste on male threads.

3.1.1 Electrical Work

Provide electrical work associated with this section under Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM, except for control and fire alarm wiring. Provide fire alarm system under Section 28 31 76 INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM. Provide control and fire alarm wiring, including connections to fire alarm systems, under this section in accordance with NFPA 70. Provide wiring in rigid metal conduit or intermediate metal conduit, except electrical metallic tubing conduit may be used in dry locations not enclosed in concrete or where not subject to mechanical damage.

3.1.2 Disinfection

Disinfect the new water piping and existing water piping affected by Contractor's operations up to the bottom flange of the dry pipe valve in accordance with AWWA C651. Fill piping systems with solution containing minimum of 50 parts per million (ppm) of available chlorine and allow solution to stand for minimum of 24 hours. Flush solution from the systems with domestic water until maximum residual chlorine content is within the range of 0.2 to 0.5 ppm, or the residual chlorine content of domestic water supply. Obtain at least two consecutive satisfactory bacteriological samples from new water piping, analyze by a certified laboratory, and submit results prior to the new water piping being placed into service. Disinfection of systems supplied by nonpotable water is not required.

3.1.3 Connections to Existing Water Supply Systems

Use tapping or drilling machine valve and mechanical joint type sleeves for connections to be made under pressure. Bolt sleeves around the main piping; bolt valve to the branch connection. Open valve, attach drilling machine, make tap, close valve, and remove drilling machine, all without interruption of service. Notify the Contracting Officer in writing at least 15 days prior to connection date; receive approval before any service is interrupted. Furnish materials required to make connections into existing water supply systems, and perform excavating, backfilling, and other incidental labor as required. Government will furnish only the labor and the tapping or drilling machine for making the actual connections to existing systems. All piping shall be photographed prior to burying, covering, or concealing.

3.1.4 Buried Piping System

Bury tape with the printed side up at a depth of 12 inches below the top surface of earth or the top surface of the subgrade under pavements.

3.1.5 Field Painting

Painting of sprinkler systems above suspended ceilings and in crawl spaces is not required. Clean, prime, and paint new sprinkler system piping, valves, hangers, accessories, and miscellaneous metal work as specified in Section 09 90 00 PAINTS AND COATINGS and herein. Clean surfaces prior to painting. Immediately after cleaning, prime metal surfaces with FS TT-P-664 or SSPC Paint 25 metal primer applied to a minimum dry film thickness of 1.5 mils. Exercise care to avoid painting sprinkler heads and operating devices. Upon completion of painting, remove materials which were used to protect sprinkler heads and operating devices which have been inadvertently painted and provide new clean sprinkler heads and operating devices of the proper type. Finish primed surfaces as follows:

3.1.5.1 Systems in Unfinished Areas

Paint piping in valve rooms, and attics with FS TT-E-489 gloss red enamel applied to a minimum dry film thickness of 1.6 mils.

3.2 FIELD QUALITY CONTROL

Perform test to determine compliance with the specified requirements in the presence of the Contracting Officer. Test, inspect, and approve piping before covering or concealing.

3.2.1 Preliminary Tests

Hydrostatically test each system at 50 psig above normal system static pressure or 200 psig, whichever is greater, for a 2-hour period with no leakage or reduction in pressure. Flush piping with potable water and air test each system in accordance with NFPA 13. Piping above suspended ceilings shall be tested, inspected, and approved before installation of ceilings. Test the alarms and other devices. Test the water flow alarms by flowing water through the inspector's test connection. Water shall be delivered to the system test connection in not more than 60 seconds, starting at the normal air pressure on the system and at the time of a fully opened inspection test connection. When tests have been completed and corrections made, submit a signed and dated certificate, similar to that specified in NFPA 13.

3.2.2 Formal Tests and Inspections

Do not submit a request for formal test and inspection until the preliminary test and corrections are completed and approved. Submit a written request for formal inspection at least 15 days prior to inspection date. An experienced technician regularly employed by the system installer shall be present during the inspection. At this inspection, repeat any or all of the required tests as directed. Correct defects in work provided by the Contractor, and make additional tests until the systems comply with contract requirements. Furnish appliances, equipment, electricity, instruments, connecting devices, and personnel for the tests. The Government will furnish water for the tests. The Atlantic Division, Naval Facilities Engineering Command, Fire Protection Engineer, will witness formal tests and approve systems before they are accepted.

-- End of Section --

SECTION 22 00 00

PLUMBING, GENERAL PURPOSE

08/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE (AHRI)

AHRI 1010 (2002) Self-Contained, Mechanically Refrigerated Drinking-Water Coolers

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 90.1 - IP (2007) Energy Standard for Buildings Except Low-Rise Residential Buildings, I-P Edition

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)

ASSE 1001 (2008) Atmospheric Type Vacuum Breakers

ASSE 1003 (2001; Errata, 2003) Performance Requirements for Water Pressure Reducing Valves

ASSE 1010 (2004) Water Hammer Arresters

ASSE 1011 (2004; Errata 2004) Hose Connection Vacuum Breakers

ASSE 1012 (2002) Backflow Preventer with Intermediate Atmospheric Vent

ASSE 1013 (2005) Reduced Pressure Principle Backflow Preventers and Reduced Pressure Fire Protection Principle Backflow Preventers

ASSE 1018 (2001) Trap Seal Primer Valves - Potable, Water Supplied

ASSE 1019 (2004; Errata 2005) Vacuum Breaker Wall Hydrants, Freeze Resistant, Automatic Draining Type

ASSE 1020 (2004; Errata 2004; Errata 2004) Pressure Vacuum Breaker Assembly

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA 10084	(2005) Standard Methods for the Examination of Water and Wastewater
AWWA B300	(2004) Hypochlorites
AWWA B301	(2004) Liquid Chlorine
AWWA C203	(2002) Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot-Applied
AWWA C606	(2006) Grooved and Shouldered Joints
AWWA C651	(2005; Errata 2005) Standard for Disinfecting Water Mains
AWWA C652	(2002) Disinfection of Water-Storage Facilities

AMERICAN WELDING SOCIETY (AWS)

AWS A5.8/A5.8M	(2004; Errata 2004) Specification for Filler Metals for Brazing and Braze Welding
AWS B2.2	(1991) Brazing Procedure and Performance Qualification

ASME INTERNATIONAL (ASME)

ASME B16.34	(2004) Valves - Flanged, Threaded and Welding End
ASME A112.1.2	(2004) Standard for Air Gaps in Plumbing Systems (For Plumbing Fixtures and Water-Connected Receptors)
ASME A112.19.2	(2008) Standard for Vitreous China Plumbing Fixtures and Hydraulic Requirements for Water Closets and Urinals
ASME A112.19.3	(2008) Stainless Steel Plumbing Fixtures (Designed for Residential Use)
ASME A112.36.2M	(1991; R 2008) Cleanouts
ASME A112.6.1M	(1997; R 2008) Floor Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use
ASME A112.6.3	(2001; R 2007) Standard for Floor and Trench Drains
ASME B1.20.1	(1983; R 2006) Pipe Threads, General Purpose (Inch)
ASME B16.12	(1998; R 2006) Cast Iron Threaded Drainage Fittings

ASME B16.15	(2006) Cast Bronze Threaded Fittings Classes 125 and 250
ASME B16.18	(2001; R 2005) Cast Copper Alloy Solder Joint Pressure Fittings
ASME B16.21	(2005) Nonmetallic Flat Gaskets for Pipe Flanges
ASME B16.22	(2001; R 2005) Standard for Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
ASME B16.34	(2004) Valves - Flanged, Threaded and Welding End
ASME B16.4	(2006) Standard for Gray Iron Threaded Fittings; Classes 125 and 250
ASME B16.5	(2003) Standard for Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24
ASME B31.1	(2007; Addenda 2008) Power Piping
ASME B31.5	(2006) Refrigeration Piping and Heat Transfer Components
ASME B40.100	(2005) Pressure Gauges and Gauge Attachments
ASME BPVC SEC IX	(2007) Boiler and Pressure Vessel Code; Section IX, Welding and Brazing Qualifications

ASTM INTERNATIONAL (ASTM)

ASTM A 105/A 105M	(2005) Standard Specification for Carbon Steel Forgings for Piping Applications
ASTM A 183	(2003) Standard Specification for Carbon Steel Track Bolts and Nuts
ASTM A 193/A 193M	(2008b) Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
ASTM A 47/A 47M	(1999; R 2004) Standard Specification for Steel Sheet, Aluminum-Coated, by the Hot-Dip Process
ASTM A 515/A 515M	(2003; R 2007) Standard Specification for Pressure Vessel Plates, Carbon Steel, for Intermediate- and Higher-Temperature Service
ASTM A 516/A 516M	(2006) Standard Specification for Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service

ASTM A 536	(1984e1; R 2004) Standard Specification for Ductile Iron Castings
ASTM A 74	(2006) Standard Specification for Cast Iron Soil Pipe and Fittings
ASTM A 888	(2007a) Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications
ASTM B 117	(2007a) Standing Practice for Operating Salt Spray (Fog) Apparatus
ASTM B 32	(2008) Standard Specification for Solder Metal
ASTM B 370	(2003) Standard Specification for Copper Sheet and Strip for Building Construction
ASTM B 584	(2006a) Standard Specification for Copper Alloy Sand Castings for General Applications
ASTM B 813	(2000e1) Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube
ASTM B 88	(2003) Standard Specification for Seamless Copper Water Tube
ASTM B 88M	(2005) Standard Specification for Seamless Copper Water Tube (Metric)
ASTM C 564	(2003a) Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings
ASTM C 920	(2008) Standard Specification for Elastomeric Joint Sealants
ASTM D 2000	(2008) Standard Classification System for Rubber Products in Automotive Applications
ASTM D 2822	(2005) Asphalt Roof Cement
ASTM D 3139	(1998; R 2005) Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM D 3212	(2007) Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D 3311	(2006a) Drain, Waste, and Vent (DWV) Plastic Fittings Patterns
ASTM E 1	(2007) Standard Specification for ASTM Liquid-in-Glass Thermometers

- ASTM F 409 (2002) Thermoplastic Accessible and Replaceable Plastic Tube and Tubular Fittings
- ASTM F 477 (2008) Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
- CAST IRON SOIL PIPE INSTITUTE (CISPI)
- CISPI 301 (2004) Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications
- CISPI 310 (2004) Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications
- COPPER DEVELOPMENT ASSOCIATION (CDA)
- CDA A4015 (1994; R 1995) Copper Tube Handbook
- CSA AMERICA, INC. (CSA/AM)
- CSA/AM Z21.22 (1999; R 2004; A 2000, 2001; R 2004) Relief Valves for Hot Water Supply Systems
- FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC RESEARCH (FCCCHR)
- FCCCHR Manual (1988e9) Manual of Cross-Connection Control
- INTERNATIONAL CODE COUNCIL (ICC)
- ICC A117.1 (2003; R 2004) Standard for Accessible and Usable Buildings and Facilities
- ICC IPC (2006; Supplement 2007) International Plumbing Code
- MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)
- MSS SP-110 (1996) Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends
- MSS SP-25 (1998) Standard Marking System for Valves, Fittings, Flanges and Unions
- MSS SP-58 (2002) Standard for Pipe Hangers and Supports - Materials, Design and Manufacture
- MSS SP-67 (2002a; R 2004) Standard for Butterfly Valves

MSS SP-69	(2003; R 2004) Standard for Pipe Hangers and Supports - Selection and Application
MSS SP-70	(2006) Standard for Cast Iron Gate Valves, Flanged and Threaded Ends
MSS SP-71	(2005) Standard for Gray Iron Swing Check Valves, Flanged and Threaded Ends
MSS SP-72	(1999) Standard for Ball Valves with Flanged or Butt-Welding Ends for General Service
MSS SP-73	(2003) Brazing Joints for Copper and Copper Alloy Pressure Fittings
MSS SP-78	(2005a) Cast Iron Plug Valves, Flanged and Threaded Ends
MSS SP-80	(2003) Bronze Gate, Globe, Angle and Check Valves
MSS SP-85	(2002) Standard for Cast Iron Globe & Angle Valves, Flanged and Threaded Ends
NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)	
NFPA 90A	(2008) Standard for the Installation of Air Conditioning and Ventilating Systems
NSF INTERNATIONAL (NSF)	
NSF 61	(2007a) Drinking Water System Components - Health Effects
PLASTIC PIPE AND FITTINGS ASSOCIATION (PPFA)	
PPFA-01	(1998) Plastic Pipe in Fire Resistive Construction
PLUMBING AND DRAINAGE INSTITUTE (PDI)	
PDI WH 201	(2006) Water Hammer Arresters Standard
SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)	
SAE J1508	(1997) Hose Clamp Specifications
U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)	
Energy Star	(1992; R 2006) Energy Star Energy Efficiency Labeling System
PL 93-523	(1974; A 1999) Safe Drinking Water Act
U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)	
40 CFR 50.12	National Primary and Secondary Ambient Air Quality Standards for Lead

PL 109-58

Energy Policy Act of 2005 (EPA05)

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00
SUBMITTAL PROCEDURES:

Materials

List of installed fixtures with manufacturer, model, and flow rate.

Flush Valve Water Closets

Flush Valve Urinals

Wall hung lavatories

Service sinks

Drinking-water coolers

Hand Sinks

Backflow prevention assemblies

Shower Faucets

Welding

A copy of qualified procedures and a list of names and
identification symbols of qualified welders and welding operators.

Vibration-Absorbing Features

Details of vibration-absorbing features, including arrangement,
foundation plan, dimensions and specifications.

Plumbing System

Diagrams, instructions, and other sheets proposed for posting.
Manufacturer's recommendations for the installation of bell and
spigot and hubless joints for cast iron soil pipe.

SD-06 Test Reports

Tests, Flushing and Disinfection

Test reports in booklet form showing all field tests performed to
adjust each component and all field tests performed to prove
compliance with the specified performance criteria, completion and
testing of the installed system. Each test report shall indicate
the final position of controls.

Test of Backflow Prevention Assemblies.

Certification of proper operation shall be as accomplished in
accordance with state regulations by an individual certified by
the state to perform such tests. If no state requirement exists,

the Contractor shall have the manufacturer's representative test the device, to ensure the unit is properly installed and performing as intended. The Contractor shall provide written documentation of the tests performed and signed by the individual performing the tests.

SD-07 Certificates

Materials and Equipment

Where equipment is specified to conform to requirements of the ASME Boiler and Pressure Vessel Code, the design, fabrication, and installation shall conform to the code.

Bolts

Written certification by the bolt manufacturer that the bolts furnished comply with the specified requirements.

SD-10 Operation and Maintenance Data

Plumbing System.

1.3 STANDARD PRODUCTS

Specified materials and equipment shall be standard products of a manufacturer regularly engaged in the manufacture of such products. Specified equipment shall essentially duplicate equipment that has performed satisfactorily at least two years prior to bid opening. Standard products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year use shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2 year period.

1.3.1 Alternative Qualifications

Products having less than a two-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturer's factory or laboratory tests, can be shown.

1.3.2 Service Support

The equipment items shall be supported by service organizations. Submit a certified list of qualified permanent service organizations for support of the equipment which includes their addresses and qualifications. These service organizations shall be reasonably convenient to the equipment installation and able to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

1.3.3 Manufacturer's Nameplate

Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

1.3.4 Modification of References

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction", or words of similar meaning, to mean the Contracting Officer.

1.3.4.1 Definitions

For the International Code Council (ICC) Codes referenced in the contract documents, advisory provisions shall be considered mandatory, the word "should" shall be interpreted as "shall." Reference to the "code official" shall be interpreted to mean the "Contracting Officer." For Navy owned property, references to the "owner" shall be interpreted to mean the "Contracting Officer." For leased facilities, references to the "owner" shall be interpreted to mean the "lessor." References to the "permit holder" shall be interpreted to mean the "Contractor."

1.3.4.2 Administrative Interpretations

For ICC Codes referenced in the contract documents, the provisions of Chapter 1, "Administrator," do not apply. These administrative requirements are covered by the applicable Federal Acquisition Regulations (FAR) included in this contract and by the authority granted to the Officer in Charge of Construction to administer the construction of this project. References in the ICC Codes to sections of Chapter 1, shall be applied appropriately by the Contracting Officer as authorized by his administrative cognizance and the FAR.

1.4 DELIVERY, STORAGE, AND HANDLING

Handle, store, and protect equipment and materials to prevent damage before and during installation in accordance with the manufacturer's recommendations, and as approved by the Contracting Officer. Replace damaged or defective items.

1.5 PERFORMANCE REQUIREMENTS

1.5.1 Welding

Piping shall be welded in accordance with qualified procedures using performance-qualified welders and welding operators. Procedures and welders shall be qualified in accordance with ASME BPVC SEC IX. Welding procedures qualified by others, and welders and welding operators qualified by another employer, may be accepted as permitted by ASME B31.1. The Contracting Officer shall be notified 24 hours in advance of tests, and the tests shall be performed at the work site if practicable. Welders or welding operators shall apply their assigned symbols near each weld they make as a permanent record.

1.6 REGULATORY REQUIREMENTS

Unless otherwise required herein, plumbing work shall be in accordance with ICC IPC. Energy consuming products and systems shall be in accordance with PL 109-58 and ASHRAE 90.1 - IP

1.7 PROJECT/SITE CONDITIONS

The Contractor shall become familiar with details of the work, verify dimensions in the field, and advise the Contracting Officer of any discrepancy before performing any work.

1.8 INSTRUCTION TO GOVERNMENT PERSONNEL

When specified in other sections, furnish the services of competent instructors to give full instruction to the designated Government personnel in the adjustment, operation, and maintenance, including pertinent safety requirements, of the specified equipment or system. Instructors shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory as well as practical operation and maintenance work.

Instruction shall be given during the first regular work week after the equipment or system has been accepted and turned over to the Government for regular operation. The number of man-days (8 hours per day) of instruction furnished shall be as specified in the individual section. When more than 4 man-days of instruction are specified, use approximately half of the time for classroom instruction. Use other time for instruction with the equipment or system.

When significant changes or modifications in the equipment or system are made under the terms of the contract, provide additional instruction to acquaint the operating personnel with the changes or modifications.

1.9 ACCESSIBILITY OF EQUIPMENT

Install all work so that parts requiring periodic inspection, operation, maintenance, and repair are readily accessible. Install concealed valves, expansion joints, controls, dampers, and equipment requiring access, in locations freely accessible through access doors.

1.10 SUSTAINABLE DESIGN REQUIREMENTS

1.10.1 Local/Regional Materials

Use materials or products extracted, harvested, or recovered, as well as manufactured, within a 500 mile radius from the project site, if available from a minimum of three sources.

PART 2 PRODUCTS

2.1 MATERIALS

Materials for various services shall be in accordance with TABLES I and II. PVC pipe shall contain a minimum of 25 percent recycled content, with a minimum of 5 percent post-consumer recycled content. Steel pipe shall contain a minimum of 25 percent recycled content, with a minimum of 16 percent post-consumer recycled content. Pipe schedules shall be selected based on service requirements. Pipe fittings shall be compatible with the applicable pipe materials. Pipe threads (except dry seal) shall conform to ASME B1.20.1. Grooved pipe couplings and fittings shall be from the same manufacturer. Material or equipment containing lead shall not be used in any potable water system. In line devices such as water meters, building valves, check valves, meter stops, valves, fittings and back flow preventers shall comply with PL 93-523 and NSF 61, Section 8. End point devices such as drinking water fountains, lavatory faucets, kitchen and bar

faucets, residential ice makers, supply stops and end point control valves used to dispense water for drinking must meet the requirements of NSF 61, Section 9. Hubless cast-iron soil pipe shall not be installed underground, under concrete floor slabs, or in crawl spaces below kitchen floors.

2.1.1.1 Pipe Joint Materials

Grooved pipe and hubless cast-iron soil pipe shall not be used under ground. Solder containing lead shall not be used with copper pipe. Cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Institute. Joints and gasket materials shall conform to the following:

- a. Coupling for Cast-Iron Pipe: for hub and spigot type ASTM A 74, AWWA C606. For hubless type: CISPI 310
- b. Coupling for Steel Pipe: AWWA C606.
- c. Couplings for Grooved Pipe: Ductile Iron ASTM A 536 (Grade 65-45-12) Malleable Iron ASTM A 47/A 47M, Grade 32510. Copper ASTM A 536.
- d. Flange Gaskets: Gaskets shall be made of non-asbestos material in accordance with ASME B16.21. Gaskets shall be flat, 1/16 inch thick, and contain Aramid fibers bonded with Styrene Butadiene Rubber (SBR) or Nitro Butadiene Rubber (NBR). Gaskets shall be the full face or self centering flat ring type. Gaskets used for hydrocarbon service shall be bonded with NBR.
- e. Brazing Material: Brazing material shall conform to AWS A5.8/A5.8M, BCuP-5.
- f. Brazing Flux: Flux shall be in paste or liquid form appropriate for use with brazing material. Flux shall be as follows: lead-free; have a 100 percent flushable residue; contain slightly acidic reagents; contain potassium borides; and contain fluorides.
- g. Solder Material: Solder metal shall conform to ASTM B 32.
- h. Solder Flux: Flux shall be liquid form, non-corrosive, and conform to ASTM B 813, Standard Test 1.
- i. PTFE Tape: PTFE Tape, for use with Threaded Metal or Plastic Pipe.
- j. Rubber Gaskets for Cast-Iron Soil-Pipe and Fittings (hub and spigot type and hubless type): ASTM C 564.
- k. Rubber Gaskets for Grooved Pipe: ASTM D 2000, maximum temperature 230 degrees F.
- l. Flexible Elastomeric Seals: ASTM D 3139, ASTM D 3212 or ASTM F 477.
- m. Bolts and Nuts for Grooved Pipe Couplings: Heat-treated carbon steel, ASTM A 183.
- n. Flanged fittings including flanges, bolts, nuts, bolt patterns, etc., shall be in accordance with ASME B16.5 class 150 and shall have the manufacturer's trademark affixed in accordance with MSS SP-25. Flange material shall conform to ASTM A 105/A 105M.

Blind flange material shall conform to ASTM A 516/A 516M cold service and ASTM A 515/A 515M for hot service. Bolts shall be high strength or intermediate strength with material conforming to ASTM A 193/A 193M.

2.1.2 Miscellaneous Materials

Miscellaneous materials shall conform to the following:

- a. Water Hammer Arrester: PDI WH 201. Water hammer arrester shall be diaphragm or piston type.
- b. Copper, Sheet and Strip for Building Construction: ASTM B 370.
- c. Asphalt Roof Cement: ASTM D 2822.
- d. Hose Clamps: SAE J1508.
- e. Supports for Off-The-Floor Plumbing Fixtures: ASME A112.6.1M.
- f. Metallic Cleanouts: ASME A112.36.2M.
- g. Plumbing Fixture Setting Compound: A preformed flexible ring seal molded from hydrocarbon wax material. The seal material shall be nonvolatile nonasphaltic and contain germicide and provide watertight, gastight, odor proof and verminproof properties.
- h. Coal-Tar Protective Coatings and Linings for Steel Water Pipelines: AWWA C203.
- i. Hypochlorites: AWWA B300.
- j. Liquid Chlorine: AWWA B301.
- k. Gauges - Pressure and Vacuum Indicating Dial Type - Elastic Element: ASME B40.100.
- l. Thermometers: ASTM E 1. Mercury shall not be used in thermometers.

2.1.3 Pipe Insulation Material

Insulation shall be as specified in Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

2.2 PIPE HANGERS, INSERTS, AND SUPPORTS

Pipe hangers, inserts, and supports shall conform to MSS SP-58 and MSS SP-69.

2.3 VALVES

Valves shall be provided on supplies to equipment and fixtures. Valves 2-1/2 inches and smaller shall be bronze with threaded bodies for pipe and solder-type connections for tubing. Valves 3 inches and larger shall have flanged iron bodies and bronze trim. Pressure ratings shall be based upon the application. Grooved end valves may be provided if the manufacturer certifies that the valves meet the performance requirements of applicable MSS standard. Valves shall conform to the following standards:

Description	Standard
Butterfly Valves	MSS SP-67
Cast-Iron Gate Valves, Flanged and Threaded Ends	MSS SP-70
Cast-Iron Swing Check Valves, Flanged and Threaded Ends	MSS SP-71
Ball Valves with Flanged Butt-Welding Ends for General Service	MSS SP-72
Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends	MSS SP-110
Cast-Iron Plug Valves, Flanged and Threaded Ends	MSS SP-78
Bronze Gate, Globe, Angle, and Check Valves	MSS SP-80
Steel Valves, Socket Welding and Threaded Ends	ASME B16.34
Cast-Iron Globe and Angle Valves, Flanged and Threaded Ends	MSS SP-85
Backwater Valves	ASME B16.34
Vacuum Relief Valves	CSA/AM Z21.22
Water Pressure Reducing Valves	ASSE 1003
Trap Seal Primer Valves	ASSE 1018

2.3.1 Wall Hydrants (Frostproof)

ASSE 1019 with vacuum-breaker backflow preventer shall have a nickel-brass or nickel-bronze wall plate or flange with nozzle and detachable key handle. A brass or bronze operating rod shall be provided within a galvanized iron casing of sufficient length to extend through the wall so that the valve is inside the building, and the portion of the hydrant between the outlet and valve is self-draining. A brass or bronze valve with coupling and union elbow having metal-to-metal seat shall be provided. Valve rod and seat washer shall be removable through the face of the hydrant. The hydrant shall have 3/4 inch exposed hose thread on spout and 3/4 inch male pipe thread on inlet.

2.4 FIXTURES

Fixtures shall be water conservation type, in accordance with ICC IPC. Fixtures for use by the physically handicapped shall be in accordance with ICC A117.1. Vitreous china, nonabsorbent, hard-burned, and vitrified throughout the body shall be provided. Porcelain enameled ware shall have specially selected, clear white, acid-resisting enamel coating evenly applied on surfaces. No fixture will be accepted that shows cracks, crazes, blisters, thin spots, or other flaws. Fixtures shall be equipped with appurtenances such as traps, faucets, stop valves, and drain fittings. Each fixture and piece of equipment requiring connections to the drainage

system, except grease interceptors, shall be equipped with a trap. Brass expansion or toggle bolts capped with acorn nuts shall be provided for supports, and polished chromium-plated pipe, valves, and fittings shall be provided where exposed to view. Fixtures with the supply discharge below the rim shall be equipped with backflow preventers. Internal parts of flush and/or flushometer valves, shower mixing valves, shower head face plates, pop-up stoppers of lavatory waste drains, and pop-up stoppers and overflow tees and shoes of bathtub waste drains may contain acetal resin, fluorocarbon, nylon, acrylonitrile-butadiene-styrene (ABS) or other plastic material, if the material has provided satisfactory service under actual commercial or industrial operating conditions for not less than 2 years.

2.4.1 Flush Valve Water Closets

ASME A112.19.2M, white vitreous china, siphon jet, elongated bowl, floor-mounted, floor outlet. Top of toilet seat height above floor shall be 14 to 15 inches, except 17 to 19 inches for wheelchair water closets. Provide wax bowl ring including plastic sleeve. Water flushing volume of the water closet and flush valve combination shall not exceed 1.6 gallons per flush. Provide white solid plastic elongated open-front seat. Provide large diameter flush valve including angle control-stop valve, vacuum breaker, tail pieces, slip nuts, and wall plates; exposed to view components shall be chromium-plated or polished stainless steel. Flush valves shall be nonhold-open type. Mount flush valves not less than 11 inches above the fixture. Mounted height of flush valve shall not interfere with the hand rail in ADA stalls. Provide solenoid-activated flush valves including electrical-operated light-beam-sensor to energize the solenoid. Provide piston type, oil operated, flush valve and wall support for salt water service.

2.4.2 Flush Valve Urinals

ASME A112.19.2, white vitreous china, wall-mounted, wall outlet, siphon jet, integral trap, and extended side shields. Provide urinal with the rim 17 inches above the floor. Water flushing volume of the urinal and flush valve combination shall not exceed 1 pint per flush. Provide ASME A112.6.1M concealed chair carriers with vertical steel pipe supports. Provide large diameter flush valve including angle control-stop valve, vacuum breaker, tail pieces, slip nuts, and wall plates; exposed to view components shall be chromium-plated or polished stainless steel. Flush valves shall be nonhold-open type. Mount flush valves not less than 11 inches above the fixture.

2.4.3 Wall Hung Lavatories

ASME A112.19.2, white vitreous china, straight back type, minimum dimensions of 19 inches, wide by 17 inches front to rear, with supply openings for use with top mounted centerset faucets, and openings for concealed arm carrier installation. Provide aerator with faucet. Water flow rate shall not exceed 1.0 gpm when measured at a flowing water pressure of 60 psi. Provide ASME A112.6.1M concealed chair carriers with vertical steel pipe supports and concealed arms for the lavatory. Mount lavatory with the front rim 34 inches above floor and with 29 inches minimum clearance from bottom of the front rim to floor. Provide top mounted washerless centerset lavatory faucets. Provide top-mounted solenoid-activated lavatory faucets including electrical-operated light-beam-sensor to energize the solenoid.

2.4.4 Service Sinks

ASME A112.19.2, white vitreous china with integral back and wall hanger supports, minimum dimensions of 22 inches wide by 20 inches front to rear, with two supply openings in 10 inch high back. Provide floor supported wall outlet cast iron P-trap and stainless steel rim guards as recommended by service sink manufacturer. Provide back mounted washerless service sink faucets with vacuum breaker and 0.75 inch external hose threads.

2.4.5 Drinking-Water Coolers

AHRI 1010 with more than a single thickness of metal between the potable water and the refrigerant in the heat exchanger, wall-hung, bubbler style, air-cooled condensing unit, 4.75 gph minimum capacity, stainless steel splash receptor and basin, and stainless steel cabinet. Bubblers shall be controlled by push levers or push bars, front mounted near the front edge of the cabinet. Bubbler spouts shall be mounted at maximum of 36 inches above floor and at front of unit basin. Spouts shall direct water flow at least 4 inches above unit basin and trajectory parallel or nearly parallel to the front of unit. Provide ASME A112.6.1M concealed steel pipe chair carriers.

2.4.5.1 Hand Sink

ASME A112.19.3, 20 gage stainless steel with integral mounting rim for flush installation, minimum dimensions of 21 inches wide by 21 inches front to rear, single compartment, with undersides fully sound deadened, with supply openings for use with top mounted washerless sink faucets, and with 3.5 inch drain outlet. Water flow rate shall not exceed 1.0 gpm when measured at a flowing water pressure of 60 psi. Provide stainless steel drain outlets and stainless steel cup strainers. Provide 1.5 inch P-trap and drain piping to vertical vent piping. Provide top mounted washerless sink faucets. Provide filters for chlorine at faucets.

2.5 BACKFLOW PREVENTERS

Backflow preventers shall be approved and listed by the Foundation For Cross-Connection Control & Hydraulic Research. Reduced pressure principle assemblies, double check valve assemblies, atmospheric (nonpressure) type vacuum breakers, and pressure type vacuum breakers shall be tested, approved, and listed in accordance with FCCCHR Manual. Backflow preventers with intermediate atmospheric vent shall conform to ASSE 1012. Reduced pressure principle backflow preventers shall conform to ASSE 1013. Hose connection vacuum breakers shall conform to ASSE 1011. Pipe applied atmospheric type vacuum breakers shall conform to ASSE 1001. Pressure vacuum breaker assembly shall conform to ASSE 1020. Air gaps in plumbing systems shall conform to ASME A112.1.2.

2.6 DRAINS

2.6.1 Floor and Shower Drains

Floor and shower drains shall consist of a galvanized body, integral seepage pan, and adjustable perforated or slotted chromium-plated bronze, nickel-bronze, or nickel-brass strainer, consisting of grate and threaded collar. Floor drains shall be cast iron except where metallic waterproofing membrane is installed. Drains shall be of double drainage pattern for embedding in the floor construction. The seepage pan shall have weep holes or channels for drainage to the drainpipe. The strainer shall be adjustable

to floor thickness. A clamping device for attaching flashing or waterproofing membrane to the seepage pan without damaging the flashing or waterproofing membrane shall be provided when required. Drains shall be provided with threaded connection. Between the drain outlet and waste pipe, a neoprene rubber gasket conforming to [ASTM C 564](#) may be installed, provided that the drain is specifically designed for the rubber gasket compression type joint. Floor and shower drains shall conform to [ASME A112.6.3](#). Provide drain with trap primer connection, trap primer, and connection piping. Primer shall meet [ASSE 1018](#).

2.6.2 Shower Faucets and Drain Fittings

Provide single control pressure equalizing bathtub and shower faucets with body mounted from behind the wall with threaded connections. Provide ball joint self-cleaning shower heads. Provide shower heads which deliver a maximum of 2.0 GPM at 80 PSI per [Energy Star](#) requirements. Provide tubing mounted from behind the wall between bathtub faucets and shower heads and bathtub diverter spouts. Provide separate globe valves or angle valves with union connections in each supply to faucet. Provide trip-lever pop-up drain fittings for above-the-floor drain installations. The top of drain pop-ups, drain outlets, tub overflow outlet, and; control handle for pop-up drain shall be chromium-plated or polished stainless steel. Linkage between drain pop-up and pop-up control handle at bathtub overflow outlet shall be copper alloy or stainless steel. Provide 1.5 inch copper alloy adjustable tubing with slip nuts and gaskets between bathtub overflow and drain outlet; chromium-plated finish is not required. Provide shower valve with ball type control handle.

2.6.3 Area Drains

Area drains shall be plain pattern with polished stainless steel perforated or slotted grate and bottom outlet. The drain shall be circular or square with a 12 inch nominal overall width or diameter and 10 inch nominal overall depth. Drains shall be cast iron with manufacturer's standard coating. Grate shall be easily lifted out for cleaning. Outlet shall be suitable for inside caulked connection to drain pipe. Drains shall conform to [ASME A112.6.3](#).

2.7 TRAPS

Unless otherwise specified, traps shall be plastic per [ASTM F 409](#) or copper-alloy adjustable tube type with slip joint inlet and swivel. Traps shall be with a cleanout. Provide traps with removable access panels for easy clean-out at sinks and lavatories. Tubes shall be copper alloy with walls not less than 0.032 inch thick within commercial tolerances, except on the outside of bends where the thickness may be reduced slightly in manufacture by usual commercial methods. Inlets shall have rubber washer and copper alloy nuts for slip joints above the discharge level. Swivel joints shall be below the discharge level and shall be of metal-to-metal or metal-to-plastic type as required for the application. Nuts shall have flats for wrench grip. Outlets shall have internal pipe thread, except that when required for the application, the outlets shall have sockets for solder-joint connections. The depth of the water seal shall be not less than 2 inches. The interior diameter shall be not more than 1/8 inch over or under the nominal size, and interior surfaces shall be reasonably smooth throughout. A copper alloy "P" trap assembly consisting of an adjustable "P" trap and threaded trap wall nipple with cast brass wall flange shall be provided for lavatories. The assembly shall be a standard manufactured unit and may have a rubber-gasketed swivel joint.

2.8 MISCELLANEOUS PIPING ITEMS

2.8.1 Escutcheon Plates

Provide one piece or split hinge metal plates for piping entering floors, walls, and ceilings in exposed spaces. Provide chromium-plated on copper alloy plates or polished stainless steel finish in finished spaces. Provide paint finish on plates in unfinished spaces.

2.8.2 Pipe Sleeves

Provide where piping passes entirely through walls, ceilings, roofs, and floors. Secure sleeves in position and location during construction. Provide sleeves of sufficient length to pass through entire thickness of walls, ceilings, roofs, and floors. Provide **one inch** minimum clearance between exterior of piping or pipe insulation, and interior of sleeve or core-drilled hole. Firmly pack space with mineral wool insulation. Seal space at both ends of sleeve or core-drilled hole with plastic waterproof cement which will dry to a firm but pliable mass, or provide a mechanically adjustable segmented elastomeric seal. In fire walls and fire floors, seal both ends of sleeves or core-drilled holes with UL listed fill, void, or cavity material.

2.8.2.1 Sleeves in Masonry and Concrete

Provide steel pipe sleeves or schedule 40 PVC plastic pipe sleeves. Sleeves are not required where drain, waste, and vent (DWV) piping passes through concrete floor slabs located on grade. Core drilling of masonry and concrete may be provided in lieu of pipe sleeves when cavities in the core-drilled hole are completely grouted smooth.

2.8.3 Sleeves Not in Masonry and Concrete

Provide 26 gage galvanized steel sheet or PVC plastic pipe sleeves.

2.8.4 Pipe Hangers (Supports)

Provide **MSS SP-58** and **MSS SP-69**, Type 1 with adjustable type steel support rods, except as specified or indicated otherwise. Attach to steel joists with Type 19 or 23 clamps and retaining straps. Attach to Steel W or S beams with Type 21, 28, 29, or 30 clamps. Attach to steel angles and vertical web steel channels with Type 20 clamp with beam clamp channel adapter. Attach to horizontal web steel channel and wood with drilled hole on centerline and double nut and washer. Attach to concrete with Type 18 insert or drilled expansion anchor. Provide Type 40 insulation protection shield for insulated piping.

2.8.5 Nameplates

Provide **0.125 inch** thick melamine laminated plastic nameplates, black matte finish with white center core, for equipment, gages, thermometers, and valves; valves in supplies to faucets will not require nameplates. Accurately align lettering and engrave minimum of **0.25 inch** high normal block lettering into the white core. Minimum size of nameplates shall be **1.0 by 2.5 inches**. Key nameplates to a chart and schedule for each system. Frame charts and schedules under glass and place where directed near each system. Furnish two copies of each chart and schedule.

PART 3 EXECUTION**3.1 GENERAL INSTALLATION REQUIREMENTS**

Piping located in air plenums shall conform to NFPA 90A requirements. Plastic pipe shall not be installed in air plenums. Piping located in shafts that constitute air ducts or that enclose air ducts shall be noncombustible in accordance with NFPA 90A. Installation of plastic pipe where in compliance with NFPA may be installed in accordance with PPFA-01. The plumbing system shall be installed complete with necessary fixtures, fittings, traps, valves, and accessories. Water and drainage piping shall be extended 5 feet outside the building, unless otherwise indicated. A gate valve and drain shall be installed on the water service line inside the building approximately 6 inches above the floor from point of entry. Piping shall be connected to the exterior service lines or capped or plugged if the exterior service is not in place. Sewer and water pipes shall be laid in separate trenches, except when otherwise shown. Exterior underground utilities shall be at least 12 inches below the average local frost depth or as indicated on the drawings. If trenches are closed or the pipes are otherwise covered before being connected to the service lines, the location of the end of each plumbing utility shall be marked with a stake or other acceptable means. Valves shall be installed with control no lower than the valve body.

3.1.1 Water Pipe, Fittings, and Connections**3.1.1.1 Utilities**

The piping shall be extended to fixtures, outlets, and equipment. The hot-water and cold-water piping system shall be arranged and installed to permit draining. The supply line to each item of equipment or fixture, except faucets, flush valves, or other control valves which are supplied with integral stops, shall be equipped with a shutoff valve to enable isolation of the item for repair and maintenance without interfering with operation of other equipment or fixtures. Supply piping to fixtures, faucets, hydrants, shower heads, and flushing devices shall be anchored to prevent movement.

3.1.1.2 Cutting and Repairing

The work shall be carefully laid out in advance, and unnecessary cutting of construction shall be avoided. Damage to building, piping, wiring, or equipment as a result of cutting shall be repaired by mechanics skilled in the trade involved.

3.1.1.3 Protection of Fixtures, Materials, and Equipment

Pipe openings shall be closed with caps or plugs during installation. Fixtures and equipment shall be tightly covered and protected against dirt, water, chemicals, and mechanical injury. Upon completion of the work, the fixtures, materials, and equipment shall be thoroughly cleaned, adjusted, and operated. Safety guards shall be provided for exposed rotating equipment.

3.1.1.4 Mains, Branches, and Runouts

Piping shall be installed as indicated. Pipe shall be accurately cut and worked into place without springing or forcing. Structural portions of the building shall not be weakened. Aboveground piping shall run parallel with

the lines of the building, unless otherwise indicated. Branch pipes from service lines may be taken from top, bottom, or side of main, using crossover fittings required by structural or installation conditions. Supply pipes, valves, and fittings shall be kept a sufficient distance from other work and other services to permit not less than 1/2 inch between finished covering on the different services. Bare and insulated water lines shall not bear directly against building structural elements so as to transmit sound to the structure or to prevent flexible movement of the lines. Water pipe shall not be buried in or under floors unless specifically indicated or approved. Changes in pipe sizes shall be made with reducing fittings. Use of bushings will not be permitted except for use in situations in which standard factory fabricated components are furnished to accommodate specific accepted installation practice. Change in direction shall be made with fittings, except that bending of pipe 4 inches and smaller will be permitted, provided a pipe bender is used and wide sweep bends are formed. The center-line radius of bends shall be not less than six diameters of the pipe. Bent pipe showing kinks, wrinkles, flattening, or other malformations will not be acceptable.

3.1.1.5 Pipe Drains

Pipe drains indicated shall consist of 3/4 inch hose bibb with renewable seat and ball valve ahead of hose bibb. At other low points, 3/4 inch brass plugs or caps shall be provided. Disconnection of the supply piping at the fixture is an acceptable drain.

3.1.1.6 Expansion and Contraction of Piping

Allowance shall be made throughout for expansion and contraction of water pipe. Each hot-water and hot-water circulation riser shall have expansion loops or other provisions such as offsets, changes in direction, etc., where indicated and/or required. Risers shall be securely anchored as required or where indicated to force expansion to loops. Branch connections from risers shall be made with ample swing or offset to avoid undue strain on fittings or short pipe lengths. Horizontal runs of pipe over 50 feet in length shall be anchored to the wall or the supporting construction about midway on the run to force expansion, evenly divided, toward the ends. Sufficient flexibility shall be provided on branch runouts from mains and risers to provide for expansion and contraction of piping. Flexibility shall be provided by installing one or more turns in the line so that piping will spring enough to allow for expansion without straining. If mechanical grooved pipe coupling systems are provided, the deviation from design requirements for expansion and contraction may be allowed pending approval of Contracting Officer.

3.1.1.7 Thrust Restraint

Plugs, caps, tees, valves and bends deflecting 11.25 degrees or more, either vertically or horizontally, in waterlines 4 inches in diameter or larger shall be provided with thrust blocks, where indicated, to prevent movement. Thrust blocking shall be concrete of a mix not leaner than: 1 cement, 2-1/2 sand, 5 gravel; and having a compressive strength of not less than 2000 psi after 28 days. Blocking shall be placed between solid ground and the fitting to be anchored. Unless otherwise indicated or directed, the base and thrust bearing sides of the thrust block shall be poured against undisturbed earth. The side of the thrust block not subject to thrust shall be poured against forms. The area of bearing will be as shown. Blocking shall be placed so that the joints of the fitting are accessible for repair. Steel rods and clamps, protected by galvanizing or by coating with

bituminous paint, shall be used to anchor vertical down bends into gravity thrust blocks.

3.1.1.8 Commercial-Type Water Hammer Arresters

Commercial-type water hammer arresters shall be provided on hot- and cold-water supplies and shall be located as generally indicated, with precise location and sizing to be in accordance with PDI WH 201. Water hammer arresters, where concealed, shall be accessible by means of access doors or removable panels. Commercial-type water hammer arresters shall conform to ASSE 1010. Vertical capped pipe columns will not be permitted.

3.1.2 Joints

Installation of pipe and fittings shall be made in accordance with the manufacturer's recommendations. Mitering of joints for elbows and notching of straight runs of pipe for tees will not be permitted. Joints shall be made up with fittings of compatible material and made for the specific purpose intended.

3.1.2.1 Threaded

Threaded joints shall have American Standard taper pipe threads conforming to ASME B1.20.1. Only male pipe threads shall be coated with graphite or with an approved graphite compound, or with an inert filler and oil, or shall have a polytetrafluoroethylene tape applied.

3.1.2.2 Mechanical Couplings

Grooved mechanical joints shall be prepared according to the coupling manufacturer's instructions. Pipe and groove dimensions shall comply with the tolerances specified by the coupling manufacturer. The diameter of grooves made in the field shall be measured using a "go/no-go" gauge, vernier or dial caliper, or narrow-land micrometer. Groove width and dimension of groove from end of the pipe shall be measured and recorded for each change in grooving tool setup to verify compliance with coupling manufacturer's tolerances. Grooved joints shall not be used in concealed locations, such as behind solid walls or ceilings, unless an access panel is shown on the drawings for servicing or adjusting the joint.

3.1.2.3 Unions and Flanges

Unions, flanges and mechanical couplings shall not be concealed in walls, ceilings, or partitions. Unions shall be used on pipe sizes 2-1/2 inches and smaller; flanges shall be used on pipe sizes 3 inches and larger.

3.1.2.4 Cast Iron Soil, Waste and Vent Pipe

Bell and spigot compression and hubless gasketed clamp joints for soil, waste and vent piping shall be installed per the manufacturer's recommendations.

3.1.2.5 Copper Tube and Pipe

- a. Brazed. Brazed joints shall be made in conformance with AWS B2.2, MSS SP-73, and CDA A4015 with flux and are acceptable for all pipe sizes. Copper to copper joints shall include the use of copper-phosphorus or copper-phosphorus-silver brazing metal without flux. Brazing of dissimilar metals (copper to bronze or

brass) shall include the use of flux with either a copper-phosphorus, copper-phosphorus-silver or a silver brazing filler metal.

- b. Soldered. Soldered joints shall be made with flux and are only acceptable for piping 2 inches and smaller. Soldered joints shall conform to ASME B31.5 and CDA A4015. Soldered joints shall not be used in compressed air piping between the air compressor and the receiver.
- c. Copper Tube Extracted Joint. Mechanically extracted joints shall be made in accordance with ICC IPC.

3.1.2.6 Other Joint Methods

3.1.3 Dissimilar Pipe Materials

Connections between ferrous and non-ferrous copper water pipe shall be made with dielectric unions or flange waterways. Dielectric waterways shall have temperature and pressure rating equal to or greater than that specified for the connecting piping. Waterways shall have metal connections on both ends suited to match connecting piping. Dielectric waterways shall be internally lined with an insulator specifically designed to prevent current flow between dissimilar metals. Dielectric flanges shall meet the performance requirements described herein for dielectric waterways. Connecting joints between plastic and metallic pipe shall be made with transition fitting for the specific purpose.

3.1.4 Pipe Sleeves and Flashing

Pipe sleeves shall be furnished and set in their proper and permanent location.

3.1.4.1 Sleeve Requirements

Pipes passing through concrete or masonry walls or concrete floors or roofs shall be provided with pipe sleeves fitted into place at the time of construction. Sleeves are not required for supply, drainage, waste and vent pipe passing through concrete slab on grade, except where penetrating a membrane waterproof floor. A modular mechanical type sealing assembly may be installed in lieu of a waterproofing clamping flange and caulking and sealing of annular space between pipe and sleeve. The seals shall consist of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and sleeve using galvanized steel bolts, nuts, and pressure plates. The links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and each nut. After the seal assembly is properly positioned in the sleeve, tightening of the bolt shall cause the rubber sealing elements to expand and provide a watertight seal between the pipe and the sleeve. Each seal assembly shall be sized as recommended by the manufacturer to fit the pipe and sleeve involved. Sleeves shall not be installed in structural members, except where indicated or approved. Rectangular and square openings shall be as detailed. Each sleeve shall extend through its respective floor, or roof, and shall be cut flush with each surface, except for special circumstances. Pipe sleeves passing through floors in wet areas such as mechanical equipment rooms, lavatories, kitchens, and other plumbing fixture areas shall extend a minimum of 4 inches above the finished floor. Unless otherwise indicated, sleeves shall be of a size to provide a minimum of 1/4 inch clearance between bare pipe

or insulation and inside of sleeve or between insulation and inside of sleeve. Sleeves in bearing walls and concrete slab on grade floors shall be steel pipe or cast-iron pipe. Sleeves in nonbearing walls or ceilings may be steel pipe, cast-iron pipe, galvanized sheet metal with lock-type longitudinal seam, or plastic. Except as otherwise specified, the annular space between pipe and sleeve, or between jacket over insulation and sleeve, shall be sealed as indicated with sealants conforming to ASTM C 920 and with a primer, backstop material and surface preparation as specified in Section 07 92 00 JOINT SEALANTS. The annular space between pipe and sleeve, between bare insulation and sleeve or between jacket over insulation and sleeve shall not be sealed for interior walls which are not designated as fire rated. Sleeves through below-grade walls in contact with earth shall be recessed 1/2 inch from wall surfaces on both sides. Annular space between pipe and sleeve shall be filled with backing material and sealants in the joint between the pipe and wall as specified above. Sealant selected for the earth side of the wall shall be compatible with dampproofing/waterproofing materials that are to be applied over the joint sealant. Pipe sleeves in fire-rated walls shall conform to the requirements in Section 07 84 00 FIRESTOPPING.

3.1.4.2 Flashing Requirements

Pipes passing through roof shall be installed through a 16 ounce copper flashing, each within an integral skirt or flange. Flashing shall be suitably formed, and the skirt or flange shall extend not less than 8 inches from the pipe and shall be set over the roof or floor membrane in a solid coating of bituminous cement. The flashing shall extend up the pipe a minimum of 10 inches. For cleanouts, the flashing shall be turned down into the hub and caulked after placing the ferrule. Pipes passing through pitched roofs shall be flashed, using lead or copper flashing, with an adjustable integral flange of adequate size to extend not less than 8 inches from the pipe in all directions and lapped into the roofing to provide a watertight seal. The annular space between the flashing and the bare pipe or between the flashing and the metal-jacket-covered insulation shall be sealed as indicated. Flashing for dry vents shall be turned down into the pipe to form a waterproof joint. Pipes, up to and including 10 inches in diameter, passing through roof or floor waterproofing membrane may be installed through a cast-iron sleeve with caulking recess, anchor lugs, flashing-clamp device, and pressure ring with brass bolts. Flashing shield shall be fitted into the sleeve clamping device. Pipes passing through wall waterproofing membrane shall be sleeved as described above. A waterproofing clamping flange shall be installed.

3.1.4.3 Waterproofing

Waterproofing at floor-mounted water closets shall be accomplished by forming a flashing guard from soft-tempered sheet copper. The center of the sheet shall be perforated and turned down approximately 1-1/2 inches to fit between the outside diameter of the drainpipe and the inside diameter of the cast-iron or steel pipe sleeve. The turned-down portion of the flashing guard shall be embedded in sealant to a depth of approximately 1-1/2 inches; then the sealant shall be finished off flush to floor level between the flashing guard and drainpipe. The flashing guard of sheet copper shall extend not less than 8 inches from the drainpipe and shall be lapped between the floor membrane in a solid coating of bituminous cement. If cast-iron water closet floor flanges are used, the space between the pipe sleeve and drainpipe shall be sealed with sealant and the flashing guard shall be upturned approximately 1-1/2 inches to fit the outside diameter of the drainpipe and the inside diameter of the water closet floor flange.

The upturned portion of the sheet fitted into the floor flange shall be sealed.

3.1.4.4 Optional Counterflashing

Instead of turning the flashing down into a dry vent pipe, or caulking and sealing the annular space between the pipe and flashing or metal-jacket-covered insulation and flashing, counterflashing may be accomplished by utilizing the following:

- a. A standard roof coupling for threaded pipe up to 6 inches in diameter.
- b. A tack-welded or banded-metal rain shield around the pipe.

3.1.4.5 Pipe Penetrations of Slab on Grade Floors

Where pipes, fixture drains, floor drains, cleanouts or similar items penetrate slab on grade floors, except at penetrations of floors with waterproofing membrane as specified in paragraphs Flashing Requirements and Waterproofing, a groove 1/4 to 1/2 inch wide by 1/4 to 3/8 inch deep shall be formed around the pipe, fitting or drain. The groove shall be filled with a sealant as specified in Section 07 92 00 JOINT SEALANTS.

3.1.4.6 Pipe Penetrations

Provide sealants for all pipe penetrations. All pipe penetrations shall be sealed to prevent infiltration of air, insects, and vermin.

3.1.5 Fire Seal

Where pipes pass through fire walls, fire-partitions, fire-rated pipe chase walls or floors above grade, a fire seal shall be provided as specified in Section 07 84 00 FIRESTOPPING.

3.1.6 Supports

3.1.6.1 General

Hangers used to support piping 2 inches and larger shall be fabricated to permit adequate adjustment after erection while still supporting the load. Pipe guides and anchors shall be installed to keep pipes in accurate alignment, to direct the expansion movement, and to prevent buckling, swaying, and undue strain. Piping subjected to vertical movement when operating temperatures exceed ambient temperatures shall be supported by variable spring hangers and supports or by constant support hangers. In the support of multiple pipe runs on a common base member, a clip or clamp shall be used where each pipe crosses the base support member. Spacing of the base support members shall not exceed the hanger and support spacing required for an individual pipe in the multiple pipe run. Threaded sections of rods shall not be formed or bent.

3.1.6.2 Pipe Supports and Structural Bracing, Seismic Requirements

Piping and attached valves shall be supported and braced to resist seismic loads. Structural steel required for reinforcement to properly support piping, headers, and equipment, but not shown, shall be provided.

3.1.6.3 Pipe Hangers, Inserts, and Supports

Installation of pipe hangers, inserts and supports shall conform to MSS SP-58 and MSS SP-69, except as modified herein.

- a. Types 5, 12, and 26 shall not be used.
- b. Type 3 shall not be used on insulated pipe.
- c. Type 18 inserts shall be secured to concrete forms before concrete is placed. Continuous inserts which allow more adjustment may be used if they otherwise meet the requirements for type 18 inserts.
- d. Type 19 and 23 C-clamps shall be torqued per MSS SP-69 and shall have both locknuts and retaining devices furnished by the manufacturer. Field-fabricated C-clamp bodies or retaining devices are not acceptable.
- e. Type 20 attachments used on angles and channels shall be furnished with an added malleable-iron heel plate or adapter.
- f. Type 24 may be used only on trapeze hanger systems or on fabricated frames.
- g. Type 39 saddles shall be used on insulated pipe 4 inches and larger when the temperature of the medium is 60 degrees F or higher. Type 39 saddles shall be welded to the pipe.
- h. Type 40 shields shall:
 - (1) Be used on insulated pipe less than 4 inches.
 - (2) Be used on insulated pipe 4 inches and larger when the temperature of the medium is 60 degrees F or less.
 - (3) Have a high density insert for all pipe sizes. High density inserts shall have a density of 8 pcf or greater.
- i. Horizontal pipe supports shall be spaced as specified in MSS SP-69 and a support shall be installed not over 1 foot from the pipe fitting joint at each change in direction of the piping. Pipe supports shall be spaced not over 5 feet apart at valves. Operating temperatures in determining hanger spacing for PVC or CPVC pipe shall be 120 degrees F for PVC and 180 degrees F for CPVC. Horizontal pipe runs shall include allowances for expansion and contraction.
- j. Vertical pipe shall be supported at each floor, except at slab-on-grade, at intervals of not more than 15 feet nor more than 8 feet from end of risers, and at vent terminations. Vertical pipe risers shall include allowances for expansion and contraction.
- k. Type 35 guides using steel, reinforced polytetrafluoroethylene (PTFE) or graphite slides shall be provided to allow longitudinal pipe movement. Slide materials shall be suitable for the system operating temperatures, atmospheric conditions, and bearing loads encountered. Lateral restraints shall be provided as needed. Where steel slides do not require provisions for lateral restraint the following may be used:

(1) On pipe 4 inches and larger when the temperature of the medium is 60 degrees F or higher, a Type 39 saddle, welded to the pipe, may freely rest on a steel plate.

(2) On pipe less than 4 inches a Type 40 shield, attached to the pipe or insulation, may freely rest on a steel plate.

(3) On pipe 4 inches and larger carrying medium less than 60 degrees F a Type 40 shield, attached to the pipe or insulation, may freely rest on a steel plate.

1. Pipe hangers on horizontal insulated pipe shall be the size of the outside diameter of the insulation. The insulation shall be continuous through the hanger on all pipe sizes and applications.
- m. Where there are high system temperatures and welding to piping is not desirable, the type 35 guide shall include a pipe cradle, welded to the guide structure and strapped securely to the pipe. The pipe shall be separated from the slide material by at least 4 inches or by an amount adequate for the insulation, whichever is greater.
- n. Hangers and supports for plastic pipe shall not compress, distort, cut or abrade the piping, and shall allow free movement of pipe except where otherwise required in the control of expansion/contraction.

3.1.6.4 Structural Attachments

Attachment to building structure concrete and masonry shall be by cast-in concrete inserts, built-in anchors, or masonry anchor devices. Inserts and anchors shall be applied with a safety factor not less than 5. Supports shall not be attached to metal decking. Supports shall not be attached to the underside of concrete filled floor or concrete roof decks unless approved by the Contracting Officer. Masonry anchors for overhead applications shall be constructed of ferrous materials only.

3.1.7 Welded Installation

Plumbing pipe weldments shall be as indicated. Changes in direction of piping shall be made with welding fittings only; mitering or notching pipe to form elbows and tees or other similar type construction will not be permitted. Branch connection may be made with either welding tees or forged branch outlet fittings. Branch outlet fittings shall be forged, flared for improvement of flow where attached to the run, and reinforced against external strains. Beveling, alignment, heat treatment, and inspection of weld shall conform to ASME B31.1. Weld defects shall be removed and repairs made to the weld, or the weld joints shall be entirely removed and rewelded. After filler metal has been removed from its original package, it shall be protected or stored so that its characteristics or welding properties are not affected. Electrodes that have been wetted or that have lost any of their coating shall not be used.

3.1.8 Pipe Cleanouts

Pipe cleanouts shall be the same size as the pipe except that cleanout plugs larger than 4 inches will not be required. A cleanout installed in connection with cast-iron soil pipe shall consist of a long-sweep 1/4 bend

or one or two 1/8 bends extended to the place shown. An extra-heavy cast-brass or cast-iron ferrule with countersunk cast-brass head screw plug shall be caulked into the hub of the fitting and shall be flush with the floor. Cleanouts in connection with other pipe, where indicated, shall be T-pattern, 90-degree branch drainage fittings with cast-brass screw plugs, except plastic plugs shall be installed in plastic pipe. Plugs shall be the same size as the pipe up to and including 4 inches. Cleanout tee branches with screw plug shall be installed at the foot of soil and waste stacks, at the foot of interior downspouts, on each connection to building storm drain where interior downspouts are indicated, and on each building drain outside the building. Cleanout tee branches may be omitted on stacks in single story buildings with slab-on-grade construction or where less than 18 inches of crawl space is provided under the floor. Cleanouts on pipe concealed in partitions shall be provided with chromium plated bronze, nickel bronze, nickel brass or stainless steel flush type access cover plates. Round access covers shall be provided and secured to plugs with securing screw. Square access covers may be provided with matching frames, anchoring lugs and cover screws. Cleanouts in finished walls shall have access covers and frames installed flush with the finished wall. Cleanouts installed in finished floors subject to foot traffic shall be provided with a chrome-plated cast brass, nickel brass, or nickel bronze cover secured to the plug or cover frame and set flush with the finished floor. Heads of fastening screws shall not project above the cover surface. Where cleanouts are provided with adjustable heads, the heads shall be cast iron or plastic.

3.2 FIXTURES AND FIXTURE TRIMMINGS

Polished chromium-plated pipe, valves, and fittings shall be provided where exposed to view. Angle stops, straight stops, stops integral with the faucets, or concealed type of lock-shield, and loose-key pattern stops for supplies with threaded, sweat or solvent weld inlets shall be furnished and installed with fixtures. Where connections between copper tubing and faucets are made by rubber compression fittings, a beading tool shall be used to mechanically deform the tubing above the compression fitting. Exposed traps and supply pipes for fixtures and equipment shall be connected to the rough piping systems at the wall, unless otherwise specified under the item. Floor and wall escutcheons shall be as specified. Drain lines and hot water lines of fixtures for handicapped personnel shall be insulated and do not require polished chrome finish. Plumbing fixtures and accessories shall be installed within the space shown.

3.2.1 Fixture Connections

Where space limitations prohibit standard fittings in conjunction with the cast-iron floor flange, special short-radius fittings shall be provided. Connections between earthenware fixtures and flanges on soil pipe shall be made gastight and watertight with a closet-setting compound or neoprene gasket and seal. Use of natural rubber gaskets or putty will not be permitted. Fixtures with outlet flanges shall be set the proper distance from floor or wall to make a first-class joint with the closet-setting compound or gasket and fixture used.

3.2.2 Flushometer Valves

Flushometer valves shall be secured to prevent movement by anchoring the long finished top spud connecting tube to wall adjacent to valve with approved metal bracket. Flushometer valves for water closets shall be installed 39 inches above the floor, except at water closets intended for use by the physically handicapped where flushometer valves shall be mounted

at approximately 30 inches above the floor and arranged to avoid interference with grab bars.

3.2.3 Height of Fixture Rims Above Floor

Lavatories shall be mounted with rim 31 inches above finished floor. Wall-hung drinking fountains and water coolers shall be installed with rim 42 inches above floor. Wall-hung service sinks shall be mounted with rim 28 inches above the floor. Installation of fixtures for use by the physically handicapped shall be in accordance with ICC A117.1.

3.2.4 Shower Bath Outfits

The area around the water supply piping to the mixing valves and behind the escutcheon plate shall be made watertight by caulking or gasketing.

3.2.5 Fixture Supports

Fixture supports for off-the-floor lavatories, urinals, water closets, and other fixtures of similar size, design, and use, shall be of the chair-carrier type. The carrier shall provide the necessary means of mounting the fixture, with a foot or feet to anchor the assembly to the floor slab. Adjustability shall be provided to locate the fixture at the desired height and in proper relation to the wall. Support plates, in lieu of chair carrier, shall be fastened to the wall structure only where it is not possible to anchor a floor-mounted chair carrier to the floor slab.

3.2.5.1 Support for Solid Masonry Construction

Chair carrier shall be anchored to the floor slab. Where a floor-anchored chair carrier cannot be used, a suitable wall plate shall be imbedded in the masonry wall.

3.2.5.2 Support for Concrete-Masonry Wall Construction

Chair carrier shall be anchored to floor slab. Where a floor-anchored chair carrier cannot be used, a suitable wall plate shall be fastened to the concrete wall using through bolts and a back-up plate.

3.2.5.3 Support for Steel Stud Frame Partitions

Chair carrier shall be used. The anchor feet and tubular uprights shall be of the heavy duty design; and feet (bases) shall be steel and welded to a square or rectangular steel tube upright. Wall plates, in lieu of floor-anchored chair carriers, shall be used only if adjoining steel partition studs are suitably reinforced to support a wall plate bolted to these studs.

3.2.5.4 Support for Wood Stud Construction

Where floor is a concrete slab, a floor-anchored chair carrier shall be used. Where entire construction is wood, wood crosspieces shall be installed. Fixture hanger plates, supports, brackets, or mounting lugs shall be fastened with not less than No. 10 wood screws, 1/4 inch thick minimum steel hanger, or toggle bolts with nut. The wood crosspieces shall extend the full width of the fixture and shall be securely supported.

3.2.5.5 Wall-Mounted Water Closet Gaskets

Where wall-mounted water closets are provided, reinforced wax, treated felt, or neoprene gaskets shall be provided. The type of gasket furnished shall be as recommended by the chair-carrier manufacturer.

3.2.6 Backflow Prevention Devices

Plumbing fixtures, equipment, and pipe connections shall not cross connect or interconnect between a potable water supply and any source of nonpotable water. Backflow preventers shall be installed where indicated and in accordance with at all other locations necessary to preclude a cross-connect or interconnect between a potable water supply and any nonpotable substance. In addition backflow preventers shall be installed at all locations where the potable water outlet is below the flood level of the equipment, or where the potable water outlet will be located below the level of the nonpotable substance. Backflow preventers shall be located so that no part of the device will be submerged. Backflow preventers shall be of sufficient size to allow unrestricted flow of water to the equipment, and preclude the backflow of any nonpotable substance into the potable water system. Bypass piping shall not be provided around backflow preventers. Access shall be provided for maintenance and testing. Each device shall be a standard commercial unit.

3.2.7 Access Panels

Access panels shall be provided for concealed valves and controls, or any item requiring inspection or maintenance. Access panels shall be of sufficient size and located so that the concealed items may be serviced, maintained, or replaced. Access panels shall be as specified in Section 05 50 13 MISCELLANEOUS METAL FABRICATIONS.

3.2.8 Sight Drains

Sight drains shall be installed so that the indirect waste will terminate 2 inches above the flood rim of the funnel to provide an acceptable air gap.

3.2.9 Traps

Each trap shall be placed as near the fixture as possible, and no fixture shall be double-trapped. Traps installed on cast-iron soil pipe shall be cast iron. Traps installed on steel pipe or copper tubing shall be recess-drainage pattern, or brass-tube type. Traps installed on plastic pipe may be plastic conforming to ASTM D 3311. Traps for acid-resisting waste shall be of the same material as the pipe.

3.3 IDENTIFICATION SYSTEMS

3.3.1 Identification Tags

Identification tags made of brass, engraved laminated plastic, or engraved anodized aluminum, indicating service and valve number shall be installed on valves, except those valves installed on supplies at plumbing fixtures. Tags shall be 1-3/8 inch minimum diameter, and marking shall be stamped or engraved. Indentations shall be black, for reading clarity. Tags shall be attached to valves with No. 12 AWG, copper wire, chrome-plated beaded chain, or plastic straps designed for that purpose.

3.3.2 Pipe Color Code Marking

Color code marking of piping shall be as specified in Section 09 90 00 PAINTS AND COATINGS.

3.3.3 Color Coding Scheme for Locating Hidden Utility Components

Scheme shall be provided in buildings having suspended grid ceilings. The color coding scheme shall identify points of access for maintenance and operation of operable components which are not visible from the finished space and installed in the space directly above the suspended grid ceiling. The operable components shall include valves, dampers, switches, linkages and thermostats. The color coding scheme shall consist of a color code board and colored metal disks. Each colored metal disk shall be approximately 3/8 inch in diameter and secured to removable ceiling panels with fasteners. The fasteners shall be inserted into the ceiling panels so that the fasteners will be concealed from view. The fasteners shall be manually removable without tools and shall not separate from the ceiling panels when panels are dropped from ceiling height. Installation of colored metal disks shall follow completion of the finished surface on which the disks are to be fastened. The color code board shall have the approximate dimensions of 3 foot width, 30 inches height, and 1/2 inch thickness. The board shall be made of wood fiberboard and framed under glass or 1/16 inch transparent plastic cover. Unless otherwise directed, the color code symbols shall be approximately 3/4 inch in diameter and the related lettering in 1/2 inch high capital letters. The color code board shall be mounted and located in the mechanical or equipment room. The color code system shall be as indicated below:

Color	System	Item	Location
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3.4 ESCUTCHEONS

Escutcheons shall be provided at finished surfaces where bare or insulated piping, exposed to view, passes through floors, walls, or ceilings, except in boiler, utility, or equipment rooms. Escutcheons shall be fastened securely to pipe or pipe covering and shall be satin-finish, corrosion-resisting steel, polished chromium-plated zinc alloy, or polished chromium-plated copper alloy. Escutcheons shall be either one-piece or split-pattern, held in place by internal spring tension or setscrew.

3.5 PAINTING

Painting of pipes, hangers, supports, and other iron work, either in concealed spaces or exposed spaces, is specified in Section 09 90 00 PAINTS AND COATINGS.

3.5.1 PAINTING OF NEW EQUIPMENT

New equipment painting shall be factory applied or shop applied, and shall be as specified herein, and provided under each individual section.

3.5.1.1 Factory Painting Systems

Manufacturer's standard factory painting systems may be provided subject to certification that the factory painting system applied will withstand 125 hours in a salt-spray fog test, except that equipment located outdoors shall withstand 500 hours in a salt-spray fog test. Salt-spray fog test shall be in accordance with ASTM B 117, and for that test the acceptance

criteria shall be as follows: immediately after completion of the test, the paint shall show no signs of blistering, wrinkling, or cracking, and no loss of adhesion; and the specimen shall show no signs of rust creepage beyond 0.125 inch on either side of the scratch mark.

The film thickness of the factory painting system applied on the equipment shall not be less than the film thickness used on the test specimen. If manufacturer's standard factory painting system is being proposed for use on surfaces subject to temperatures above 120 degrees F, the factory painting system shall be designed for the temperature service.

3.5.1.2 Shop Painting Systems for Metal Surfaces

Clean, pretreat, prime and paint metal surfaces; except aluminum surfaces need not be painted. Apply coatings to clean dry surfaces. Clean the surfaces to remove dust, dirt, rust, oil and grease by wire brushing and solvent degreasing prior to application of paint, except metal surfaces subject to temperatures in excess of 120 degrees F shall be cleaned to bare metal.

Where more than one coat of paint is specified, apply the second coat after the preceding coat is thoroughly dry. Lightly sand damaged painting and retouch before applying the succeeding coat. Color of finish coat shall be aluminum or light gray.

- a. Temperatures Less Than 120 Degrees F: Immediately after cleaning, the metal surfaces subject to temperatures less than 120 degrees F shall receive one coat of pretreatment primer applied to a minimum dry film thickness of 0.3 mil, one coat of primer applied to a minimum dry film thickness of one mil; and two coats of enamel applied to a minimum dry film thickness of one mil per coat.
- b. Temperatures Between 120 and 400 Degrees F: Metal surfaces subject to temperatures between 120 and 400 degrees F shall receive two coats of 400 degrees F heat-resisting enamel applied to a total minimum thickness of 2 mils.
- c. Temperatures Greater Than 400 Degrees F: Metal surfaces subject to temperatures greater than 400 degrees F shall receive two coats of 600 degrees F heat-resisting paint applied to a total minimum dry film thickness of 2 mils.

3.6 TESTS, FLUSHING AND DISINFECTION

3.6.1 Plumbing System

The following tests shall be performed on the plumbing system in accordance with , except that the drainage and vent system final test shall include the smoke test. The Contractor has the option to perform a peppermint test in lieu of the smoke test. If a peppermint test is chosen, the Contractor must submit a testing procedure to the Contracting Officer for approval.

- a. Drainage and Vent Systems Test. The final test shall include a smoke test.
- b. Building Sewers Tests.
- c. Water Supply Systems Tests.

3.6.1.1 Test of Backflow Prevention Assemblies

Backflow prevention assembly shall be tested using gauges specifically designed for the testing of backflow prevention assemblies. Gauges shall be tested annually for accuracy in accordance with the University of Southern California's Foundation of Cross Connection Control and Hydraulic Research or the American Water Works Association Manual of Cross Connection (Manual M-14). Report form for each assembly shall include, as a minimum, the following:

Data on Device	Data on Testing Firm
Type of Assembly	Name
Manufacturer	Address
Model Number	Certified Tester
Serial Number	Certified Tester No.
Size	Date of Test
Location	
Test Pressure Readings	Serial Number and Test Data of
Gauges	

If the unit fails to meet specified requirements, the unit shall be repaired and retested.

3.6.2 Defective Work

If inspection or test shows defects, such defective work or material shall be replaced or repaired as necessary and inspection and tests shall be repeated. Repairs to piping shall be made with new materials. Caulking of screwed joints or holes will not be acceptable.

3.6.3 System Flushing

3.6.3.1 During Flushing

Before operational tests or disinfection, potable water piping system shall be flushed with hot potable water. Sufficient water shall be used to produce a water velocity that is capable of entraining and removing debris in all portions of the piping system. This requires simultaneous operation of all fixtures on a common branch or main in order to produce a flushing velocity of approximately 4 fps through all portions of the piping system. In the event that this is impossible due to size of system, the Contracting Officer (or the designated representative) shall specify the number of fixtures to be operated during flushing. Contractor shall provide adequate personnel to monitor the flushing operation and to ensure that drain lines are unobstructed in order to prevent flooding of the facility. Contractor shall be responsible for any flood damage resulting from flushing of the system. Flushing shall be continued until entrained dirt and other foreign materials have been removed and until discharge water shows no discoloration. All faucets and drinking water fountains, to include any device considered as an end point device by NSF 61, Section 9, shall be flushed a minimum of 0.25 gallons per 24 hour period, ten times over a 14 day period.

3.6.3.2 After Flushing

System shall be drained at low points. Strainer screens shall be removed, cleaned, and replaced. After flushing and cleaning, systems shall be prepared for testing by immediately filling water piping with clean, fresh potable water. Any stoppage, discoloration, or other damage to the finish,

furnishings, or parts of the building due to the Contractor's failure to properly clean the piping system shall be repaired by the Contractor. When the system flushing is complete, the hot-water system shall be adjusted for uniform circulation. Flushing devices and automatic control systems shall be adjusted for proper operation according to manufacturer's instructions. Comply with ASHRAE 90.1 - IP for minimum efficiency requirements. Unless more stringent local requirements exist, lead levels shall not exceed limits established by 40 CFR 50.12 Part 141.80(c)(1). The water supply to the building shall be tested separately to ensure that any lead contamination found during potable water system testing is due to work being performed inside the building.

3.6.4 Operational Test

Upon completion of flushing and prior to disinfection procedures, the Contractor shall subject the plumbing system to operating tests to demonstrate satisfactory installation, connections, adjustments, and functional and operational efficiency. Such operating tests shall cover a period of not less than 8 hours for each system and shall include the following information in a report with conclusion as to the adequacy of the system:

- a. Time, date, and duration of test.
- b. Water pressures at the most remote and the highest fixtures.
- c. Operation of each fixture and fixture trim.
- d. Operation of each valve, hydrant, and faucet.
- e. Operation of each floor and roof drain by flooding with water.
- f. Operation of each vacuum breaker and backflow preventer.
- g. Complete operation of each water pressure booster system, including pump start pressure and stop pressure.

3.6.5 Disinfection

After operational tests are complete, the entire domestic hot- and cold-water distribution system shall be disinfected. System shall be flushed as specified, before introducing chlorinating material. The chlorinating material shall be hypochlorites or liquid chlorine. Except as herein specified, water chlorination procedure shall be in accordance with AWWA C651 and AWWA C652. The chlorinating material shall be fed into the water piping system at a constant rate at a concentration of at least 50 parts per million (ppm). A properly adjusted hypochlorite solution injected into the main with a hypochlorinator, or liquid chlorine injected into the main through a solution-feed chlorinator, shall be used. If after the 24 hour and 6 hour holding periods, the residual solution contains less than 25 ppm and 50 ppm chlorine respectively, flush the piping and tank with potable water, and repeat the above procedures until the required residual chlorine levels are satisfied. The system including the tanks shall then be flushed with clean water until the residual chlorine level is reduced to less than one part per million. During the flushing period each valve and faucet shall be opened and closed several times. Samples of water in disinfected containers shall be obtained from several locations selected by the Contracting Officer. The samples of water shall be tested for total coliform organisms (coliform bacteria, fecal coliform, streptococcal, and

other bacteria) in accordance with AWWA 10084. The testing method used shall be either the multiple-tube fermentation technique or the membrane-filter technique. Disinfection shall be repeated until tests indicate the absence of coliform organisms (zero mean coliform density per 100 milliliters) in the samples for at least 2 full days. The system will not be accepted until satisfactory bacteriological results have been obtained.

3.7 WASTE MANAGEMENT

Place materials defined as hazardous or toxic waste in designated containers. Return solvent and oil soaked rags for contaminant recovery and laundering or for proper disposal. Close and seal tightly partly used sealant and adhesive containers and store in protected, well-ventilated, fire-safe area at moderate temperature. Place used sealant and adhesive tubes and containers in areas designated for hazardous waste. Separate copper and ferrous pipe waste in accordance with the Waste Management Plan and place in designated areas for reuse.

3.8 POSTED INSTRUCTIONS

Framed instructions under glass or in laminated plastic, including wiring and control diagrams showing the complete layout of the entire system, shall be posted where directed. Condensed operating instructions explaining preventive maintenance procedures, methods of checking the system for normal safe operation, and procedures for safely starting and stopping the system shall be prepared in typed form, framed as specified above for the wiring and control diagrams and posted beside the diagrams. The framed instructions shall be posted before acceptance testing of the systems.

3.9 TABLES

TABLE I
PIPE AND FITTING MATERIALS FOR
DRAINAGE, WASTE, AND VENT PIPING SYSTEMS

Item #	Pipe and Fitting Materials	SERVICE					
		A	B	C	D	E	F
1	Cast iron soil pipe and fittings, hub and spigot, ASTM A 74 with compression gaskets. Pipe and fittings shall be marked with the CISPI trademark.	X	X	X	X	X	
2	Cast iron soil pipe and fittings hubless, CISPI 301 and ASTM A 888. Pipe and fittings shall be marked with the CISPI trademark.		X	X	X	X	
3	Cast iron drainage fittings, threaded, ASME B16.12 for use with Item 10	X		X	X		
4	Cast iron screwed fittings (threaded) ASME B16.4 for use with Item 10				X	X	
5	Grooved pipe couplings, ferrous and non-ferrous pipe ASTM A 536 and ASTM A 47/A 47M	X	X		X	X	
6	Ductile iron grooved joint fittings for ferrous pipe ASTM A 536 and ASTM A 47/A 47M for use with Item 5	X	X		X	X	

SERVICE:

- A - Underground Building Soil, Waste and Storm Drain
- B - Aboveground Soil, Waste, Drain In Buildings
- C - Underground Vent
- D - Aboveground Vent
- E - Interior Rainwater Conductors Aboveground
- F - Corrosive Waste And Vent Above And Belowground
- * - Hard Temper

TABLE II
PIPE AND FITTING MATERIALS FOR PRESSURE PIPING SYSTEMS

Item No.	Pipe and Fitting Materials	SERVICE			
		A	B	C	D
1	Seamless copper water tube, ASTM B 88, ASTM B 88M	X**	X**	X**	X***
2	Cast bronze threaded fittings, ASME B16.15 for use with Items 5 and 7	X	X		X
3	Wrought copper and bronze solder-joint pressure fittings, ASME B16.22 for use with Items 5, 7 and 8	X	X	X	X
4	Cast copper alloy solder-joint pressure fittings, ASME B16.18 for use with Item 8	X	X	X	X
5	Bronze and sand castings grooved joint pressure fittings for non- ferrous pipe ASTM B 584, for use with Item 2	X	X	X	

A - Cold Water Service Aboveground

B - Hot and Cold Water Distribution 180 degrees F Maximum Aboveground

C - Compressed Air Lubricated

D - Cold Water Service Belowground

Indicated types are minimum wall thicknesses.

** - Type L - Hard

*** - Type K - Hard temper with brazed joints only or type K-soft temper
without joints in or under floors

**** - In or under slab floors only brazed joints

-- End of Section --

SECTION 23 03 00

BASIC MECHANICAL MATERIALS AND METHODS

01/07

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM B 117 (2007a) Standing Practice for Operating Salt Spray (Fog) Apparatus

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C2 (2007; Errata 2007; INT 2008) National Electrical Safety Code

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1 (2007; Errata 2008) Standard for Motors and Generators

NEMA MG 10 (1994) Energy Management Guide for Selection and Use of Fixed Frequency Medium AC Squirrel-Cage Polyphase Induction Motors

NEMA MG 11 (1977; R 1992) Energy Management Guide of Selection and Use of Single-Phase Motors

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2007; AMD 1 2008) National Electrical Code - 2008 Edition

1.2 RELATED REQUIREMENTS

This section applies to all sections of Division 15, "Mechanical" of this project specification, unless specified otherwise in the individual section.

1.3 QUALITY ASSURANCE

1.3.1 Material and Equipment Qualifications

Provide materials and equipment that are standard products of manufacturers regularly engaged in the manufacture of such products, which are of a similar material, design and workmanship. Standard products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year use shall include applications of equipment and materials under similar circumstances and of similar size. The product

shall have been for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2 year period.

1.3.2 Alternative Qualifications

Products having less than a two-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturer's factory or laboratory tests, can be shown.

1.3.3 Service Support

The equipment items shall be supported by service organizations. Submit a certified list of qualified permanent service organizations for support of the equipment which includes their addresses and qualifications. These service organizations shall be reasonably convenient to the equipment installation and able to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

1.3.4 Manufacturer's Nameplate

Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

1.3.5 Modification of References

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction", or words of similar meaning, to mean the Contracting Officer.

1.3.5.1 Definitions

For the International Code Council (ICC) Codes referenced in the contract documents, advisory provisions shall be considered mandatory, the word "should" shall be interpreted as "shall." Reference to the "code official" shall be interpreted to mean the "Contracting Officer." For Navy owned property, references to the "owner" shall be interpreted to mean the "Contracting Officer." For leased facilities, references to the "owner" shall be interpreted to mean the "lessor." References to the "permit holder" shall be interpreted to mean the "Contractor."

1.3.5.2 Administrative Interpretations

For ICC Codes referenced in the contract documents, the provisions of Chapter 1, "Administrator," do not apply. These administrative requirements are covered by the applicable Federal Acquisition Regulations (FAR) included in this contract and by the authority granted to the Officer in Charge of Construction to administer the construction of this project. References in the ICC Codes to sections of Chapter 1, shall be applied appropriately by the Contracting Officer as authorized by his administrative cognizance and the FAR.

1.4 DELIVERY, STORAGE, AND HANDLING

Handle, store, and protect equipment and materials to prevent damage before

and during installation in accordance with the manufacturer's recommendations, and as approved by the Contracting Officer. Replace damaged or defective items.

1.5 ELECTRICAL REQUIREMENTS

Furnish motors, controllers, disconnects and contactors with their respective pieces of equipment. Motors, controllers, disconnects and contactors shall conform to and have electrical connections provided under Section 26 20 00, "Interior Distribution System." Furnish internal wiring for components of packaged equipment as an integral part of the equipment. Extended voltage range motors will not be permitted. Controllers and contactors shall have a maximum of 120 volt control circuits, and shall have auxiliary contacts for use with the controls furnished. When motors and equipment furnished are larger than sizes indicated, the cost of additional electrical service and related work shall be included under the section that specified that motor or equipment. Power wiring and conduit for field installed equipment shall be provided under and conform to the requirements of Section 26 20 00, "Interior Distribution System."

1.6 ELECTRICAL INSTALLATION REQUIREMENTS

Electrical installations shall conform to IEEE C2, NFPA 70, and requirements specified herein.

1.6.1 New Work

Provide electrical components of mechanical equipment, such as motors, motor starters, control or push-button stations, float or pressure switches, solenoid valves, integral disconnects, and other devices functioning to control mechanical equipment, as well as control wiring and conduit for circuits rated 100 volts or less, to conform with the requirements of the section covering the mechanical equipment. Extended voltage range motors shall not be permitted. The interconnecting power wiring and conduit, control wiring rated 120 volts (nominal) and conduit, the motor control equipment forming a part of motor control centers, and the electrical power circuits shall be provided under Division 16, except internal wiring for components of package equipment shall be provided as an integral part of the equipment. When motors and equipment furnished are larger than sizes indicated, provide any required changes to the electrical service as may be necessary and related work as a part of the work for the section specifying that motor or equipment.

1.6.2 Modifications to Existing Systems

Where existing mechanical systems and motor-operated equipment require modifications, provide electrical components under Division 16.

1.6.3 High Efficiency Motors

1.6.3.1 High Efficiency Single-Phase Motors

Unless otherwise specified, single-phase fractional-horsepower alternating-current motors shall be high efficiency types corresponding to the applications listed in NEMA MG 11.

1.6.3.2 High Efficiency Polyphase Motors

Unless otherwise specified, polyphase motors, except motors integral to

equipment with a total efficiency rating, shall be selected based on premium efficiency characteristics relative to the applications as listed in NEMA MG 10. Additionally, polyphase squirrel-cage medium induction motors with continuous ratings shall meet or exceed energy efficient ratings in accordance with Table 12-6C of NEMA MG 1.

1.6.4 Three-Phase Motor Protection

Provide controllers for 3 phase motors rated one horsepower (.75 kilowatts) and larger with electronic phase-voltage monitors designed to protect motors from phase-loss, undervoltage, and over voltage. Provide protection for motors from immediate restart by a time adjustable restart relay.

1.7 INSTRUCTION TO GOVERNMENT PERSONNEL

When specified in other sections, furnish the services of competent instructors to give full instruction to the designated Government personnel in the adjustment, operation, and maintenance, including pertinent safety requirements, of the specified equipment or system. Instructors shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory as well as practical operation and maintenance work.

Instruction shall be given during the first regular work week after the equipment or system has been accepted and turned over to the Government for regular operation. The number of man-days (8 hours per day) of instruction furnished shall be as specified in the individual section. When more than 4 man-days of instruction are specified, use approximately half of the time for classroom instruction. Use other time for instruction with the equipment or system.

When significant changes or modifications in the equipment or system are made under the terms of the contract, provide additional instruction to acquaint the operating personnel with the changes or modifications.

1.8 ACCESSIBILITY

Install all work so that parts requiring periodic inspection, operation, maintenance, and repair are readily accessible. Install concealed valves, expansion joints, controls, dampers, and equipment requiring access, in locations freely accessible through access doors.

1.9 EQUIPMENT INVENTORY UPDATE

Submit information for each piece of equipment removed and supplied for use of Camp Lejeune to update the Maximo equipment inventory. For the purposes of this paragraph, inventoried equipment is defined as equipment listed on the Maximo Equipment Inventory Update form.

1.9.1 Requirements

The contractor shall prepare and submit one Maximo Equipment Inventory Update form for each individual item of inventoried equipment that is demolished, removed, replaced, or installed. (ex: three new condensing units would require the submission of three Equipment Inventory Update forms. The replacement of two existing air handling units with two new air handling units would require the submission of two Equipment Inventory Update forms). The contractor shall prepare and submit a VAV/TAB Room Number List for each VAV/Tab model installed in a single building. Only one Maximo Equipment Inventory Update form is required for each model of VAV or

TAB in a single building.

1.9.1.1 Demolition of all equipment in a structure or facility

When all the inventoried equipment in a building or structure is demolished or removed, and not replaced, an Equipment Inventory Update form is not required.

1.9.1.2 Standards

The contractor shall provide accurate, complete, and legible information on all required forms. All required forms shall be completed and delivered to the Contracting Officer on or before the Beneficial Occupancy Date. All information on Equipment Inventory Update forms shall be obtained by visual inspection of equipment data plate(s).

1.9.1.3 Form Preparation

Each required Maximo Equipment Inventory Update form shall contain the following information:

- (1) The name and telephone number of an individual who can be contacted for clarification or additional information pertaining to the data on the form.
- (2) The date of data collection
- (3) The building or structure identification number and the specific location of the equipment within the structure (ex: 3d deck mech room)
- (4) A check adjacent to the description of the new or replacement item, and a check adjacent to the supplemental description if applicable (ex: circulating pump and HVAC or steam)
- (5) The Maximo number or serial number of the demolished or removed item, if applicable
- (6) All applicable data from the equipment data plate

Each Room Number List form shall contain the following information:

- (1) The name and telephone number of the individual providing the information
- (2) The date the form was completed
- (3) The building or structure identification number
- (4) A check in the box adjacent to each applicable room number

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 PAINTING OF NEW EQUIPMENT

New equipment painting shall be factory applied or shop applied, and shall

be as specified herein, and provided under each individual section.

3.1.1 Factory Painting Systems

Manufacturer's standard factory painting systems may be provided subject to certification that the factory painting system applied will withstand 125 hours in a salt-spray fog test, except that equipment located outdoors shall withstand 500 hours in a salt-spray fog test. Salt-spray fog test shall be in accordance with [ASTM B 117](#), and for that test the acceptance criteria shall be as follows: immediately after completion of the test, the paint shall show no signs of blistering, wrinkling, or cracking, and no loss of adhesion; and the specimen shall show no signs of rust creepage beyond [0.125 inch](#) on either side of the scratch mark.

The film thickness of the factory painting system applied on the equipment shall not be less than the film thickness used on the test specimen. If manufacturer's standard factory painting system is being proposed for use on surfaces subject to temperatures above [120 degrees F](#), the factory painting system shall be designed for the temperature service.

3.1.2 Shop Painting Systems for Metal Surfaces

Clean, pretreat, prime and paint metal surfaces; except aluminum surfaces need not be painted. Apply coatings to clean dry surfaces. Clean the surfaces to remove dust, dirt, rust, oil and grease by wire brushing and solvent degreasing prior to application of paint, except metal surfaces subject to temperatures in excess of [120 degrees F](#) shall be cleaned to bare metal.

Where more than one coat of paint is specified, apply the second coat after the preceding coat is thoroughly dry. Lightly sand damaged painting and retouch before applying the succeeding coat. Color of finish coat shall be aluminum or light gray.

- a. [Temperatures Less Than 120 Degrees F](#): Immediately after cleaning, the metal surfaces subject to temperatures less than [120 degrees F](#) shall receive one coat of pretreatment primer applied to a minimum dry film thickness of [0.3 mil](#), one coat of primer applied to a minimum dry film thickness of [one mil](#); and two coats of enamel applied to a minimum dry film thickness of [one mil](#) per coat.
- b. [Temperatures Between 120 and 400 Degrees F](#): Metal surfaces subject to temperatures between [120 and 400 degrees F](#) shall receive two coats of [400 degrees F](#) heat-resisting enamel applied to a total minimum thickness of [2 mils](#).
- c. [Temperatures Greater Than 400 Degrees F](#): Metal surfaces subject to temperatures greater than [400 degrees F](#) shall receive two coats of [600 degrees F](#) heat-resisting paint applied to a total minimum dry film thickness of [2 mils](#).

MAXIMO EQUIPMENT INVENTORY UPDATE

Employee: _____ Phone: _____ Date: ____/____/____

Bldg: _____ Specific Location: _____

- | | |
|--|---|
| <input type="checkbox"/> AC, Computer Room | <input type="checkbox"/> Heat Pump, Indoor Unit |
| <input type="checkbox"/> AC, Package | <input type="checkbox"/> Heat Pump, Outdoor Unit |
| <input type="checkbox"/> AC, Package Terminal | <input type="checkbox"/> Heat Pump, Package |
| <input type="checkbox"/> Assembly, Trap line | <input type="checkbox"/> Heat Pump, Package Terminal |
| <input type="checkbox"/> Backflow Preventer | <input type="checkbox"/> Pump, Circulating, Chilled Water |
| <input type="checkbox"/> Boiler | <input type="checkbox"/> Pump, Circulating, Domestic Water |
| <input type="checkbox"/> Chiller, Air Cooled Recip | <input type="checkbox"/> Pump, Circulating, Dual Temp Water |
| <input type="checkbox"/> Chiller, Air Cooled Screw | <input type="checkbox"/> Pump, Circulating, Heating Water |
| <input type="checkbox"/> Chiller, Air Cooled Scroll | <input type="checkbox"/> Pump, Condensate |
| <input type="checkbox"/> Chiller, Water Cooled Recip | <input type="checkbox"/> Pump, Sump |
| <input type="checkbox"/> Chiller, Water Cooled Screw | <input type="checkbox"/> Regulator, Temperature |
| <input type="checkbox"/> Compressor, Control Air | <input type="checkbox"/> Tank, Hot Water Storage |
| <input type="checkbox"/> Compressor, Industrial Air | <input type="checkbox"/> Tower, Cooling |
| <input type="checkbox"/> Dryer, Refrigerated Air | <input type="checkbox"/> Unit, Air Handling |
| <input type="checkbox"/> Exchanger, Heat | <input type="checkbox"/> Unit, AC Condensing |
| <input type="checkbox"/> Evaporator, Freezer | <input type="checkbox"/> Unit, Freezer Condensing |
| <input type="checkbox"/> Evaporator, Refrigerator | <input type="checkbox"/> Unit, Refrigerator Condensing |
| <input type="checkbox"/> Fan, Exhaust | <input type="checkbox"/> Unit, Fan Coil |
| <input type="checkbox"/> Generator | <input type="checkbox"/> Unit, TAB (Attach Room No. List) |
| <input type="checkbox"/> Heater, Space | <input type="checkbox"/> Unit, VAV (Attach Room No. List) |
| <input type="checkbox"/> Heater, Unit | <input type="checkbox"/> Valve, Pressure Reducing |
| <input type="checkbox"/> Heat Pump, Geo-Thermal | <input type="checkbox"/> Valve, Steam Pilot |
| | <input type="checkbox"/> Water Heater |

Demolished/Removed Equipment

Maximo no: _____ or Ser no: _____

New Equipment

Manufacturer: _____

Model no: _____

Ser no: _____

Type: Elec Oil LP Gas Nat Gas Steam Water Air

Motor Data: HP _____ Volts _____ Phase _____ RLA _____ RPM _____ Frame _____

Tons _____ No. of Motors _____ no. of Belts _____ Belt size(s) _____ CFM _____

KW _____ Refrig type _____ Refrig Qty _____ Filter Size(s) _____

VAV/TAB Room Number List

Employee: _____

Phone: _____

Bldg: _____

Date: _____

VAV/TAB Model Number: _____

100 <input type="checkbox"/>	130 <input type="checkbox"/>	160 <input type="checkbox"/>	200 <input type="checkbox"/>	230 <input type="checkbox"/>	260 <input type="checkbox"/>	300 <input type="checkbox"/>	330 <input type="checkbox"/>	360 <input type="checkbox"/>
101 <input type="checkbox"/>	131 <input type="checkbox"/>	161 <input type="checkbox"/>	201 <input type="checkbox"/>	231 <input type="checkbox"/>	261 <input type="checkbox"/>	301 <input type="checkbox"/>	331 <input type="checkbox"/>	361 <input type="checkbox"/>
102 <input type="checkbox"/>	132 <input type="checkbox"/>	162 <input type="checkbox"/>	202 <input type="checkbox"/>	232 <input type="checkbox"/>	262 <input type="checkbox"/>	302 <input type="checkbox"/>	332 <input type="checkbox"/>	362 <input type="checkbox"/>
103 <input type="checkbox"/>	133 <input type="checkbox"/>	163 <input type="checkbox"/>	203 <input type="checkbox"/>	233 <input type="checkbox"/>	263 <input type="checkbox"/>	303 <input type="checkbox"/>	333 <input type="checkbox"/>	363 <input type="checkbox"/>
104 <input type="checkbox"/>	134 <input type="checkbox"/>	164 <input type="checkbox"/>	204 <input type="checkbox"/>	234 <input type="checkbox"/>	264 <input type="checkbox"/>	304 <input type="checkbox"/>	334 <input type="checkbox"/>	364 <input type="checkbox"/>
105 <input type="checkbox"/>	135 <input type="checkbox"/>	165 <input type="checkbox"/>	205 <input type="checkbox"/>	235 <input type="checkbox"/>	265 <input type="checkbox"/>	305 <input type="checkbox"/>	335 <input type="checkbox"/>	365 <input type="checkbox"/>
106 <input type="checkbox"/>	136 <input type="checkbox"/>	166 <input type="checkbox"/>	206 <input type="checkbox"/>	236 <input type="checkbox"/>	266 <input type="checkbox"/>	306 <input type="checkbox"/>	336 <input type="checkbox"/>	366 <input type="checkbox"/>
107 <input type="checkbox"/>	137 <input type="checkbox"/>	167 <input type="checkbox"/>	207 <input type="checkbox"/>	237 <input type="checkbox"/>	267 <input type="checkbox"/>	307 <input type="checkbox"/>	337 <input type="checkbox"/>	367 <input type="checkbox"/>
108 <input type="checkbox"/>	138 <input type="checkbox"/>	168 <input type="checkbox"/>	208 <input type="checkbox"/>	238 <input type="checkbox"/>	268 <input type="checkbox"/>	308 <input type="checkbox"/>	338 <input type="checkbox"/>	368 <input type="checkbox"/>
109 <input type="checkbox"/>	139 <input type="checkbox"/>	169 <input type="checkbox"/>	209 <input type="checkbox"/>	239 <input type="checkbox"/>	269 <input type="checkbox"/>	309 <input type="checkbox"/>	339 <input type="checkbox"/>	369 <input type="checkbox"/>
110 <input type="checkbox"/>	140 <input type="checkbox"/>	170 <input type="checkbox"/>	210 <input type="checkbox"/>	240 <input type="checkbox"/>	270 <input type="checkbox"/>	310 <input type="checkbox"/>	340 <input type="checkbox"/>	370 <input type="checkbox"/>
111 <input type="checkbox"/>	141 <input type="checkbox"/>	171 <input type="checkbox"/>	211 <input type="checkbox"/>	241 <input type="checkbox"/>	271 <input type="checkbox"/>	311 <input type="checkbox"/>	341 <input type="checkbox"/>	371 <input type="checkbox"/>
112 <input type="checkbox"/>	142 <input type="checkbox"/>	172 <input type="checkbox"/>	212 <input type="checkbox"/>	242 <input type="checkbox"/>	272 <input type="checkbox"/>	312 <input type="checkbox"/>	342 <input type="checkbox"/>	372 <input type="checkbox"/>
113 <input type="checkbox"/>	143 <input type="checkbox"/>	173 <input type="checkbox"/>	213 <input type="checkbox"/>	243 <input type="checkbox"/>	273 <input type="checkbox"/>	313 <input type="checkbox"/>	343 <input type="checkbox"/>	373 <input type="checkbox"/>
114 <input type="checkbox"/>	144 <input type="checkbox"/>	174 <input type="checkbox"/>	214 <input type="checkbox"/>	244 <input type="checkbox"/>	274 <input type="checkbox"/>	314 <input type="checkbox"/>	344 <input type="checkbox"/>	374 <input type="checkbox"/>
115 <input type="checkbox"/>	145 <input type="checkbox"/>	175 <input type="checkbox"/>	215 <input type="checkbox"/>	245 <input type="checkbox"/>	275 <input type="checkbox"/>	315 <input type="checkbox"/>	345 <input type="checkbox"/>	375 <input type="checkbox"/>
116 <input type="checkbox"/>	146 <input type="checkbox"/>		216 <input type="checkbox"/>	246 <input type="checkbox"/>		316 <input type="checkbox"/>	346 <input type="checkbox"/>	
117 <input type="checkbox"/>	147 <input type="checkbox"/>		217 <input type="checkbox"/>	247 <input type="checkbox"/>		317 <input type="checkbox"/>	347 <input type="checkbox"/>	
118 <input type="checkbox"/>	148 <input type="checkbox"/>		218 <input type="checkbox"/>	248 <input type="checkbox"/>		318 <input type="checkbox"/>	348 <input type="checkbox"/>	
119 <input type="checkbox"/>	149 <input type="checkbox"/>		219 <input type="checkbox"/>	249 <input type="checkbox"/>		319 <input type="checkbox"/>	349 <input type="checkbox"/>	
120 <input type="checkbox"/>	150 <input type="checkbox"/>		220 <input type="checkbox"/>	250 <input type="checkbox"/>		320 <input type="checkbox"/>	350 <input type="checkbox"/>	
121 <input type="checkbox"/>	151 <input type="checkbox"/>		221 <input type="checkbox"/>	251 <input type="checkbox"/>		321 <input type="checkbox"/>	351 <input type="checkbox"/>	
122 <input type="checkbox"/>	152 <input type="checkbox"/>		222 <input type="checkbox"/>	252 <input type="checkbox"/>		322 <input type="checkbox"/>	352 <input type="checkbox"/>	
123 <input type="checkbox"/>	153 <input type="checkbox"/>		223 <input type="checkbox"/>	253 <input type="checkbox"/>		323 <input type="checkbox"/>	353 <input type="checkbox"/>	
124 <input type="checkbox"/>	154 <input type="checkbox"/>		224 <input type="checkbox"/>	254 <input type="checkbox"/>		324 <input type="checkbox"/>	354 <input type="checkbox"/>	
125 <input type="checkbox"/>	155 <input type="checkbox"/>		225 <input type="checkbox"/>	255 <input type="checkbox"/>		325 <input type="checkbox"/>	355 <input type="checkbox"/>	
126 <input type="checkbox"/>	156 <input type="checkbox"/>		226 <input type="checkbox"/>	256 <input type="checkbox"/>		326 <input type="checkbox"/>	356 <input type="checkbox"/>	
127 <input type="checkbox"/>	157 <input type="checkbox"/>		227 <input type="checkbox"/>	257 <input type="checkbox"/>		327 <input type="checkbox"/>	357 <input type="checkbox"/>	
128 <input type="checkbox"/>	158 <input type="checkbox"/>		228 <input type="checkbox"/>	258 <input type="checkbox"/>		328 <input type="checkbox"/>	358 <input type="checkbox"/>	
129 <input type="checkbox"/>	159 <input type="checkbox"/>		229 <input type="checkbox"/>	259 <input type="checkbox"/>		329 <input type="checkbox"/>	359 <input type="checkbox"/>	

Instructions

- (1) Confirm room numbers by visual inspection
- (2) Check the box next to each applicable room number

-- End of Section --

SECTION 23 07 00

INSULATION OF MECHANICAL SYSTEMS

01/07

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM A 167	(1999; R 2004) Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM A 240/A 240M	(1996) Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels
ASTM B 209	(2007) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM C 177	(1985; R 1997) Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus
ASTM C 195	(1995) Mineral Fiber Thermal Insulating Cement
ASTM C 533	(1995) Calcium Silicate Block and Pipe Thermal Insulation
ASTM C 534	(1994) Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form
ASTM C 547	(1995) Mineral Fiber Preformed Pipe Insulation
ASTM C 552	(1991) Cellular Glass Thermal Insulation
ASTM C 553	(1992) Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications
ASTM C 591	(2008) Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation
ASTM C 612	(1993) Mineral Fiber Block and Board

Thermal Insulation

- ASTM C 916 (1985; R 1990) Adhesives for Duct Thermal Insulation
- ASTM C 1136 (1995) Flexible, Low permeance Vapor Retarders for Thermal Insulation
- ASTM D 828 (1993) Tensile Breaking Strength of Paper and Paperboard
- ASTM E 84 (2008a) Standard Test Method for Surface Burning Characteristics of Building Materials
- ASTM E 96 (2005) Standard Test Methods for Water Vapor Transmission of Materials

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

- FS L-P-535 (Rev. E; Notice 2) Plastic Sheet (Sheeting): Plastic Strip: Poly (Vinyl Chloride) and Poly(Vinyl Chloride-Vinyl Acetate), Rigid

U.S. DEPARTMENT OF DEFENSE (DOD)

- MIL-A-3316 (Rev. C; Am. 2) Adhesives, Fire-Resistant, Thermal Insulation
- MIL-C-19565 (Rev. C; Am. 1) Coating Compounds, Thermal Insulation, Fire- and Water-Resistant, Vapor Barrier
- MIL-C-20079 (Rev. H) Cloth, Glass: Tape, Textile Glass; and Thread, Glass and Wire-Reinforced Glass
- MIL-A-24179 (Rev. A) (Valid Notice 1) Adhesive, Flexible Unicellular-Plastic Thermal Insulation

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

- NFPA 255 (1996) Surface Burning Characteristics of Building Materials

UNDERWRITERS LABORATORIES (UL)

- UL 723 (2008) Standard for Test for Surface Burning Characteristics of Building Materials

1.2 SYSTEM DESCRIPTION

Provide new and modify existing field-applied insulation for heating, ventilating, and cooling (HVAC) air distribution systems and piping systems which are located within, on, under, and adjacent to buildings; and for plumbing piping systems.

1.2.1 Air Distribution System

Obtain Contracting Officer's written approval of systems under Section 23 08 00.00 20, "HVAC Testing/Adjusting/Balancing" before applying field-applied insulation to air distribution systems.

1.2.2 Piping Systems

Obtain Contracting Officer's written approval of HVAC water distribution systems under Section 23 08 00.00 20, "HVAC TESTING/ADJUSTING/BALANCING" before applying field-applied insulation to HVAC water distribution systems. At the Contractor's option and with Contracting Officer's written approval, the piping systems may be insulated before systems are tested, adjusted, and balanced (TAB'd). Piping insulation shall terminate immediately adjacent to each flow control valve, automatic control valve, or device. For chilled water and chilled-hot water piping, the ends of pipe insulation and the space between ends of pipe insulation and piping shall be sealed with waterproof vapor barrier coating. After systems are TAB'd, the control valves and devices shall be insulated.

1.3 DEFINITIONS

1.3.1 Finished Spaces

Spaces used for habitation or occupancy where rough surfaces are plastered, paneled, or otherwise treated to provide a pleasing appearance.

1.3.2 Unfinished Spaces

Spaces used for storage or work areas where appearance is not a factor, such as unexcavated spaces and crawl space.

1.3.3 Concealed Spaces

Spaces out of sight. For example, above ceilings; below floors; between double walls; furred-in areas; pipe and duct shafts; and similar spaces.

1.3.4 Exposed

Open to view. For example, pipe running through a room and not covered by other construction.

1.3.5 Fugitive Treatments

Treatment subject to deterioration due to aging, moisture, high humidity, oxygen, ozone, and heat. Fugitive materials are entrapped materials that can cause deterioration, such as solvents and water vapor.

1.3.6 Outside

Open to view up to 5 feet beyond the exterior side of walls, above the roof, and unexcavated or crawl spaces.

1.3.7 Conditioned Space

An area, room or space normally occupied and being heated or cooled for human habitation by any equipment.

1.4 SUBMITTALS

Submit the following in accordance with Section 01 33 00, "Submittal Procedures."

SD-03 Product Data

Piping insulation

Piping insulation finishes

Heating, ventilating, and air conditioning systems insulation

Duct insulation finishes

Accessory materials

Adhesives, sealants, and coating compounds

1.5 QUALITY ASSURANCE

Every package or standard container of insulation, jackets, cements, adhesives, and coatings delivered to the project site shall have the manufacturer's stamp or label attached giving name of manufacturer, brand and description of material. Insulation packages and containers shall be asbestos-free.

1.6 FLAME-SPREAD AND SMOKE-DEVELOPED RATINGS

In accordance with NFPA 255, ASTM E 84 or UL 723, the materials shall have a flame-spread rating of not more than 25 and a smoke-developed rating of not more than 50.

1.6.1 Materials Tests

Test factory-applied materials as assembled. Field-applied materials may be tested individually. Use no fugitive or corrosive treatments to impart flame resistance. UL label or satisfactory certified test report from a testing laboratory will be required to indicate that fire hazard ratings for materials proposed for use do not exceed those specified. Flame-proofing treatments subject to deterioration due to effects of moisture or high humidity are not acceptable.

1.6.2 Materials Exempt From Fire-Resistant Rating

Nylon anchors.

PART 2 PRODUCTS

2.1 PIPING INSULATION

Piping systems, except buried pipe requiring insulation, types of insulation required, and insulation thickness shall be as listed in Tables I herein. Unless otherwise specified, insulate all fittings, flanges, and valves, except valve stems, hand wheels, and operators. Provide factory premolded, pre-cut, or field-fabricated insulation of the same thickness and conductivity as insulation on adjacent piping. Insulation exterior shall be factory cleanable, grease resistant, non-flaking and non-peeling. Pipe insulation shall conform to the referenced publications.

2.1.1 Pipe Insulation Beyond Building Walls

For 5 feet beyond the exterior side of building walls, in tunnels, in manholes, under and above piers, in trenches on piers, and for aboveground piping.

2.1.2 Flexible Unicellular Insulation

2.1.2.1 Recommended Adhesive

ASTM C 534. Provide adhesive as recommended by insulation manufacturer or conforming with MIL-A-24179, Type II, Class 1.

2.1.2.2 Polyolefin thermoplastic

Polyolefin thermoplastic meets ASTM C 534, except density.

2.1.2.3 Adhesive For Finishing Flexible Unicellular Insulation

MIL-A-3316, Class 1, Grade A.

2.1.2.4 Glass Cloth For Finishing Flexible Unicellular Insulation

MIL-C-20079, Type I, Class 1, 3, or 5.

2.1.3 Cellular Glass Insulation

ASTM C 552, Type II.

2.1.4 Cellular Phenolic Insulation

ASTM C 1136.

2.1.5 Mineral Fiber

ASTM C 547, Class I.

2.1.6 Calcium Silicate

ASTM C 533, Class I.

2.1.7 Piping Insulation Finishes

2.1.7.1 All-Purpose Jacket

Provide a factory applied all-purpose jacket when field applied jacketing is not specified. All purpose jackets shall include integral vapor barrier as required by service. Provide jackets in exposed locations with a white surface suitable for field painting. Allow a maximum water vapor permeance of 0.05 perm in accordance with ASTM E 96, a puncture resistance of not less than 50 Beach units, and a minimum tensile strength of 35 pounds-force per inch of width in accordance with ASTM D 828.

2.1.7.2 Vapor-Barrier Material

ASTM C 1136. Resistant to flame, moisture penetration, and mold growth. Provide vapor-barrier material on pipe insulation as required in Table I.

2.1.7.3 Metal Jackets

- a. Aluminum Jackets: [ASTM B 209](#), Temper H14, minimum thickness of 27 gage (0.016 inch), with factory-applied polyethylene and kraft paper moisture barrier on inside surface. Provide smooth surface jackets for jacket outside diameters less than 8 inches. Provide corrugated surface jackets for jacket outside diameters 8 inches and larger. Provide stainless steel bands, minimum width of 0.5 inch. Provide factory prefabricated aluminum covers for insulation on fittings, valves and flanges.
- b. Stainless Steel Jackets: [ASTM A 167](#) or [ASTM A 240/A 240M](#); Type 304, minimum thickness of 33 gage (0.010 inch), smooth surface with factory-applied polyethylene and kraft paper moisture barrier on inside surface. Provide stainless steel bands, minimum width of 0.5 inch. Provide factory prefabricated stainless steel covers for insulation on fittings, valves, and flanges.
- c. Piping, Fittings, Flanges, and Valves in Outside Locations: Finish elbows and curved piping with factory-fabricated metal covers. Finish tees, flanges, and valves with metal covers. Covers shall be same thickness and material as jackets on adjacent piping.

2.2 HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS INSULATION

Provide insulation on ducts ,plenums,mixing boxes,filter boxes,casings and diffusers of Heating, Ventilating and Air Conditioning Systems (HVAC).)

2.2.1 Duct Insulation in Concealed Spaces

Blanket flexible mineral fiber insulation conforming to [ASTM C 553](#), Type 1, Class B-3, 1.0 pound per cubic foot nominal, 2.0 inches thick. Provide flexible insulation in concealed spaces only.

2.2.2 Duct Insulation Not in Concealed Spaces

Mineral fiber in accordance with [ASTM C 612](#), Class 2 (maximum surface temperature 400 degrees F), 6 pcf (pounds per cubic foot) average, one inch thick.

2.2.3 All Types of Ductwork Located Outside

Provide [ASTM C 591](#), polyisocyanurate or polyurethane board insulation, minimum density of 1.7 pcf, 1.5 inch thick, and weatherproof finish.

2.2.4 Duct Insulation Finishes

2.2.4.1 All-Purpose Jacket

Provide a factory applied all-purpose jacket with or without integral vapor barrier as required by the service. In exposed locations, provide jackets with a white surface suitable for field painting. All-purpose jacket shall have a maximum water vapor permeance of 0.05 perm per [ASTM E 96](#); a puncture resistance of not less than 50 Beach units; and a tensile strength of not less than 35 pounds-force per inch of width in accordance with [ASTM D 828](#).

2.2.4.2 Vapor-Barrier Material

ASTM C 1136, for duct in equipment room and exposed areas and Type I or II in remaining areas. Material shall be resistant to flame, moisture penetration, and shall not support mold growth. Provide vapor barrier on HVAC duct insulation, except insulation for heating only.

2.2.4.3 Metal Jackets

Provide metal jackets with moisture barrier lining for externally insulated ductwork located outside.

- a. Aluminum Jackets: ASTM B 209, Alloy 3003 or 3004, Temper H14, inch thick, smooth.
- b. Stainless Steel Jackets: ASTM A 167, Type 304, 0.010- 0.016- inch thick, smooth.

2.3 EQUIPMENT

Insulate all equipment and accessories as specified in Table II. In outside locations, provide insulation one inch thicker than specified. Increase the specified insulation thickness for equipment only where necessary to equal the thickness of angles or other structural members to make a smooth, exterior surface. Factory applied insulation shall meet the flame spread and smoke-developed rating of 25/50.

2.4 ADHESIVES, SEALANTS, AND COATING COMPOUNDS

2.4.1 Insulation and Vapor Barrier Adhesive

Provide ASTM C 916, Type I or Type II adhesive for securing insulation to metal surfaces and for vapor barrier lap only in building interior. Provide Type I when an adhesive in which the vehicle is nonflammable in the liquid (wet) state and which will pass the edge-burning test is required. Provide Type II when an adhesive in which the vehicle is nonflammable in the liquid (wet) state and which will not pass the edge-burning test is required.

2.4.2 Lagging Adhesive

MIL-A-3316, Class 1, for bonding fibrous glass cloth to unfaced fibrous glass insulation; for bonding cotton brattice cloth to faced and unfaced fibrous glass insulation board; for sealing edges of and bounding fibrous glass tape to joints of fibrous glass board; or for bonding lagging cloth to thermal insulation, or Class 2, for attaching fibrous glass insulation to metal surfaces.

2.4.3 Mineral Fiber Insulation Cement

ASTM C 195, thermal conductivity 0.85 maximum at 200 degrees F mean when tested in accordance with ASTM C 177.

2.4.4 Vapor Barrier Coating

MIL-C-19565, Type II, indoor only above surface temperature 60 degrees F, color white.

2.4.5 Weatherproof Coating

For outside applications provide a weatherproof coating recommended by the manufacturer of the insulation and jackets.

2.4.6 Flexible Unicellular Insulation Adhesive

MIL-A-24179, Type II, Class 1 or Type III.

2.5 ACCESSORY MATERIALS

2.5.1 Staples

ASTM A 167, Type 304 stainless steel outside-clinch type.

2.5.2 Insulation Bands

1/2 inch wide; 0.24 gage galvanized steel or 0.26 gage stainless steel or 0.24 gage aluminum.

2.5.3 Bands for Metal Jackets

3/8-inch minimum width; 0.26 gage stainless steel or 0.24 gage aluminum.

2.5.4 Anchor Pins

Provide anchor pins and speed washers recommended by insulation manufacturer.

2.5.5 Glass Cloth and Tape

MIL-C-20079, Type I, Class 1 or Class 3 cloth, and Type II, Class 1 or tape; 20 by 20 maximum size mesh. Tape shall be 4-inch wide rolls. Class 3 tape shall be 4.5 ounces per square yard. In lieu of glass cloth and tape, open weave glass membrane may be provided.

2.5.6 Wire

Soft annealed stainless steel, 0.047-inch nominal diameter.

2.5.7 PVC Pipe Fitting Cover

FS L-P-535, Composition A, Type II, Grade GU, factory premolded, one-piece.

PART 3 EXECUTION

3.1 PREPARATION

Do not insulate materials until system tests have been completed and surfaces to be insulated have been cleaned of dirt, rust, and scale and dried. Insulate return ducts, outside air intakes and supply ducts to the room outlets, flexible runouts, plenums, casings, mixing boxes, filter boxes, coils, fans, and the portion of air terminals not in the conditioned spaces. Ensure full range of motion of equipment actuators. Modify insulation to avoid obstruction with valve handles, safety relief's, and other such items. Allow adequate space for pipe expansion. Install insulation with jackets drawn tight and cement down on longitudinal and end laps. Do not use scrap pieces where a full length section will fit.

Insulation shall be continuous through sleeves, wall and ceiling openings, except at fire dampers in duct systems. Extend surface finishes to protect surfaces, ends, and raw edges of insulation. Apply coatings and adhesives at the manufacturer's recommended coverage per gallon. Individually insulate piping and ductwork. Provide a moisture and vapor seal where insulation terminates against metal hangers, anchors and other projections through the insulation on surfaces for which a vapor seal is specified. Keep insulation dry during application of finish. Bevel and seal the edges of exposed insulation. Unless otherwise indicated, do not insulate the following:

- a. Factory preinsulated flexible ductwork;
- b. Vertical portion of interior roof drain pipelines, chrome plated pipes, and fire protection pipes;
- c. Vibration isolating connections;
- d. Adjacent insulation;
- e. ASME stamps;
- f. Fan name plates; and
- g. Access plates in fan housings.

3.2 PIPING INSULATION

3.2.1 Mineral Fiber Pipe Insulation

Place sections of insulation around the pipe and joints tightly butted into place. The jacket laps shall be drawn tight and smooth. Secure jacket with fire resistant adhesive factory applied self sealing lap, or stainless steel outward clinching staples spaced not over 4 inches on centers and 1/2 inch minimum from edge of lap. Cover circumferential joints with butt strips, not less than 3 inches wide, of material identical to the jacket material. Overlap longitudinal laps of jacket material not less than 1 1/2 inches. Adhesive used to secure the butt strip shall be the same as used to secure the jacket laps. Apply staples to both edges of the butt strips. Patch damaged jacket material by wrapping a strip of jacket material around the pipe and cementing, stapling, and coating as specified for butt strips. Extend the patch not less than 1 1/2 inches past the break in both directions. At penetrations by pressure gages and thermometers, fill the voids with the vapor barrier coating for outside service. Seal with a brush coat of the same coating. Where penetrating roofs, insulate piping to a point flush with the top of the flashing and seal with the vapor barrier coating. Butt tightly the exterior insulation to the top of the flashing and interior insulation. Extend the exterior metal jacket 2 inches down beyond the end of the insulation. Seal the flashing and counterflashing underneath with the vapor barrier coating.

3.2.2 Flexible Unicellular Insulation

Bond cuts, butt joints, ends, and longitudinal joints with adhesive. Miter 90-degree turns and elbows, tees, and valve insulation. Where pipes penetrate fire walls, provide mineral-fiber insulation inserts and sheet-metal sleeves. Insulate flanges, unions, valves, and fittings in accordance with manufacturer's published instructions. Finish all unicellular insulation as follows:

- (1) Coat entire surface of insulation with MIL-A-3316
- (2) While the adhesive is tacky, apply a layer of MIL-C-20079 glass cloth. Stretch tightly and overlap all joints by a minimum of 2-inches. Glass cloth at elbows and fittings shall be mitered.
- (3) Apply a final coat of MIL-A-3316 adhesive.

3.2.3 Calcium Silicate Pipe Insulation

Secure insulation with stainless steel metal bands on 12-inch maximum centers; unless single layer insulation is recommended by the manufacturer, apply insulation in two layers with the joints tightly butted and staggered a minimum of 3 inches. Secure the inner layer of insulation with 14-gage soft annealed stainless steel wire on 12-inch maximum centers. The outer layer shall be secured with stainless steel metal bands on 12-inch maximum centers. Apply a skim coat of hydraulic setting cement directly to the insulation. When dry, apply a flooding coat of adhesive over the hydraulic setting cement. Press a layer of MIL-C-20079 glass cloth or tape into adhesive and seal laps and edges with adhesive. Coat cloth with adhesive cut at a ratio of one part water to five parts adhesive in color other than white for the purpose of visual inspection to ensure sizing of entire surface.

3.2.4 Cellular Glass, Cellular Phenolic, and Polyisocyanurate

Secure outer most layer of insulation with metal bands 12-inch on center. If a factory installed all service jacket is used, the metal bands shall be applied to the outside of the all service jacket. If two or more layers are applied, the inner layers may be secured with fiber reinforced tape. For cold or chilled piping all joints both longitudinal and circumferential shall be sealed. Use the manufacturer's recommended cement or sealant. Apply all-purpose jacket, vapor barrier if required by Table I, and metal jacket if outside. Elbows shall be four piece miter if field fabricated. Pre-manufactured elbows can be held in place with metal bands. All elbows shall be finished as follows: Apply a skim coat of hydraulic setting cement directly to the insulation. When dry, apply a flooding coat of adhesive over the hydraulic setting cement. Press a layer of MIL-C-20079 glass cloth or tape into adhesive and seal laps and edges with adhesive. Coat cloth with adhesive cut at a ratio of one part water to five parts adhesive in color other than white for the purpose of visual inspection to ensure sizing of entire surface. Insulate flexible connection at pumps and other equipment with unicellular plastic insulation, unless otherwise indicated. Factory-fabricated removable and reusable insulated covers shall be provided for all valves, circuit setters, unions and flow control devices. The insulation cover shall be reusable without the need for special material or tools. Insulation shall be two piece molded cellular to fit the valve or device. Flexible unicellular insulation may be used in lieu of molded cellular insulation.

3.2.5 Hangers and Anchors

Pipe insulation shall be continuous through pipe hangers. Where pipe is supported by the insulation, provide galvanized steel shields protection saddles. Band and secure insulation protection shields without damaging pipe insulation. Where shields are used on pipes 2 inches and larger, provide insulation inserts at points of hangers and supports. Insulation inserts shall be of calcium silicate, cellular glass (minimum 8 pcf),

molded glass fiber (minimum 8 pcf), or other approved material of the same thickness as adjacent insulation. Inserts shall have sufficient compressive strength to adequately support the pipe without compressing the inserts to a thickness less than the adjacent insulation. Insulation inserts shall cover the bottom half of the pipe circumference 180 degrees and be not less in length than the protection shield. Vapor-barrier facing of the insert shall be of the same material as the facing on the adjacent insulation. Seal inserts into the insulation with vapor barrier coating, Type II or for exterior work, manufacturer's recommended weatherproof coating, as applicable. Where protection saddles are used, fill all voids with the same insulation material as used on the adjacent pipe. Where anchors are secured to chilled piping that is to be insulated, insulate the anchors the same as the piping for a distance not less than four times the insulation thickness to prevent condensation. Vapor seal insulation around anchors.

3.2.6 Sleeves and Wall Chases

Where penetrating interior walls, extend a metal jacket 2 inches out on either side of the wall and secure on each end with a band. Where penetrating floors, extend a metal jacket from a point below the back-up material to a point 10 inches above the floor with one band at the floor and one not more than one inch from end of metal jacket. Where penetrating exterior walls, extend the metal jackets through the sleeve to a point 2 inches beyond the interior surface of the wall.

3.2.7 Flanges, Unions, Valves and Fittings for Hot Piping

Flanges, Unions, Valves, and Fittings Insulation (Except Flexible Unicellular) for Hot Piping: Factory fabricated removable and reusable insulation covers may be used. For inside domestic hot water, heating hot water, A/C condensate drains, high temperature hot water, steam and condensate return systems; exposed hot water piping and drains in handicap areas, place factory premolded, precut or field-fabricated segmented insulation of the same thickness and conductivity as the adjoining pipe insulation around the flange, union, valve, and fitting abutting the adjoining pipe insulation. If nesting size insulation is used, overlap 2 inches or one pipe diameter, whichever is larger. Use insulating cement to fill voids. Elbows insulated using segments shall have not less than three segments per elbow. Place and joint the segments with manufacturer's recommended water-vapor resistant, fire retardant, and adhesive appropriate for the temperature limit of the service. Upon completion of installation of insulation, apply two coats lagging adhesive with glass tape embedded between coats. Overlap tape seams one inch. Extend adhesive onto adjoining insulation not less than two inches. The total dry film thickness shall be not less than 1/16 inch. Where unions are indicated not to be insulated, taper the insulation to the union at a 45 degree angle. Coat the insulation and all purpose jacket with two coats of lagging adhesive and with glass tape embedded between coats. The total dry film thickness shall be not less than 1/16 inch. At the option of the Contractor, factory premolded one-piece PVC fitting covers may be provided in lieu of two coats of adhesive with tape embedded between coats. Factory premolded field-fabricated segment or blanket insert insulation shall be provided under the fitting covers. Install factory premolded one-piece PVC fitting covers over the insulation and secure by stapling, taping with PVC vapor barrier tape, or with metal or plastic tacks made for securing PVC fitting covers. Do not provide PVC fitting covers where exposed to the weather. Provide PVC fitting covers only in ambient temperatures below 150 degrees F.

3.2.8 Piping Exposed to Weather

3.2.8.1 Metal Jackets

Install over the insulation. Metal jackets shall have side and end lap at least 2 inches wide with the cut edge of the side lap turned inside one inch to provide a smooth edge. Overlap the jacket not less than 2 inches at longitudinal and circumferential joints and secure with metal bands at not more than 9-inch centers or with screws at not more than 5-inch centers. Overlap longitudinal joints down to shed water. Seal circumferential joints with a coating recommended by the insulation manufacturer for weatherproofing.

3.2.8.2 Flanges, Unions, Valves, Fittings, and Accessories

Insulate and finish as specified for the applicable service. Apply two coats of an emulsion type weatherproof mastic for hot service and vapor barrier mastic for cold service recommended by the insulation manufacturer. Embed glass tape in the first coat. Overlap tape not less than one inch and the adjoining metal jacket not less than 2 inches. Factory preformed metal jackets may be provided in lieu of the above for hot service.

3.3 DUCTS PLENUMS AND CASINGS (HVAC) INSULATION

3.3.1 Rigid Insulation

Secure rigid insulation by impaling over pins or anchors located not more than 3 inches from joint edges of boards, spaced not more than 12 inches on centers and secure with washers and clips. Spot weld anchor pins or attach with a waterproof adhesive especially designed for use on metal surfaces. Apply insulation with joints tightly butted. Neatly bevel insulation around name plates and access plates and doors. Each pin or anchor shall be capable of supporting a 20-pound load. Cut off protruding ends of pins, after clips are sealed with coating compound for inside work or manufacturer's recommended weatherproof coating for outside work, and reinforced with open weave glass membrane.

3.3.2 Flexible Blanket Insulation

Apply insulation with all joints tightly butted. Secure insulation to ductwork with adhesive in 6-inch wide strips on 12-inch centers. Staple laps of jacket with outward clinching staples. Sealing shall be in accordance with paragraph 3.3.3 below. For ductwork over 24 inches on horizontal duct runs, provide pins, washers and clips. Provide pins on sides of vertical ductwork being insulated. Space pins and clips on 18-inch centers and not more than 18 inches from duct corners. Carry insulation over standing seams and trapeze-type hangers. Install speed washers with pins and pin trimmed to washer. Sagging of flexible duct insulation will not be permitted. Cut off protruding ends of pins after clips are secured and sealed with coating compound for inside work. For warm air ducts, overlap insulation not less than 2 inches at joints and secure the laps with outward clinch staples on 4-inch centers. In cold air ducts, vapor seal all joints and staple as specified.

3.3.3 Insulation Finishes and Joint Sealing

Fill all breaks, punctures, and voids with vapor barrier coating compound for inside work or manufacturer's recommended weatherproof coating for outside service. Vapor seal all joints by embedding a single layer of

3-inch wide open weave glass membrane, 20 by 20 mesh maximum size between two 1/16-inch wet film thickness coats of vapor barrier coating compound. Draw glass fabric smooth and tight with a 1 1/2-inch overlap. At jacket penetrations such as hangers, thermometers, and damper operating rods, fill voids in the insulation with vapor barrier coating. Brush a coat of vapor barrier coating where required on HVAC ducts. Provide vapor barrier jacket continuous across seams, reinforcing, and projections. Where height of projections is greater than insulation thickness, carry insulation and jacket over the projection. For joints for heating only systems, provide insulation with two coats of fire resistant adhesive with glass fabric mesh embedded between coats.

3.3.4 Metal Jackets for Outside Ductwork

Ensure metal-jacket side and end laps at least 2 inches wide, with the cut edge of the side lap turned under one inch to provide a smooth edge. Place horizontal laps to shed water. Seal vertical laps with insulation manufacturer's recommended weatherproof coating. Secure jackets in place with aluminum or stainless steel bands on 9-inch centers aluminum or stainless steel screws on 5-inch centers. Where ducts penetrate exterior walls, continue the increased thickness required for ductwork exposed to weather and the metal jackets through the sleeve to a point 2 inches beyond the interior surface of the wall. Where metal jacket abuts an uninsulated surface, seal joints with a weatherproof mastic recommended by the insulation manufacturer. For rectangular ducts, provide corner angles to exposed corners of the insulation. Apply two coats of weatherproof coating recommended by the insulation manufacturer to the entire surface with a layer of glass cloth embedded between coats. Ensure glass cloth overlaps not less than 2 inches at joints and adjoining surface. Each coat of weatherproof coating shall be 1/16-inch minimum thickness.

3.3.5 Access Plates and Doors

On acoustically lined ducts, plenums, and casings, provide insulation on access plates and doors. On externally insulated ducts, plenums, and casings, provide insulation-filled hollow steel panels and doors for access openings. Bevel insulation around access plates and doors.

3.4 EQUIPMENT INSULATION

3.4.1 General Procedures

Apply equipment insulation suitable for temperature and service in rigid block or semirigid board or flexible form to fit as closely as possible to equipment. Groove or score insulation where necessary to fit the contours of equipment. Stagger end joints where possible. Bevel the edges of the insulation for cylindrical surfaces to provide tight joints. Join sections of cellular glass insulation with bedding compound. After the cellular glass insulation is in place on areas to be insulated, except where metal-encased, fill joints, seams, chipped edges, or depressions with bedding compound to form a smooth surface. Fill mineral fiber joints with insulating cement. Bevel insulation around name plates, ASME and access plates. For insulation on equipment that must be opened periodically for inspection, cleaning, or repair, construct insulation to be removable and replaceable without damage. Protect exposed insulation corners with corner angles under wires and bands.

3.4.2 Heating Equipment (Except Pumps)

Insulate shell and tube heat exchangers for the temperature of the shell medium indicated on the drawings. Insulation on heads of heat exchangers shall be removable. Fabricate a male-female shiplap type joint for the removable section. Use 16-gage stainless steel wire or 3/4-inch wide 20-gage stainless steel bands spaced on 12-inch centers. Seal joints with bedding compound for cellular glass or for mineral fiber with insulating cement and cover insulation with a smoothing coat of insulating cement. Apply two coats of adhesive with a layer of glass cloth embedded between coats. The dry film thickness of the finish shall be 1/32-inch minimum. On cylindrical equipment a metal jacket may be provided instead of the adhesive and glass cloths on the cylinder, ends must have adhesive and glass cloth.

3.4.3 Cold Equipment (Except Pumps)

Secure insulation with 16-gage, galvanized steel or copper clad wire or with 3/4-inch wide 20-gage stainless steel bands spaced on 12-inch centers. Seal joints with joint sealer. Cover non-removable irregular surfaces such as corner angles with a smoothing coat of insulating cement. Provide removable heat exchanger head covers with a male-female shiplap type joint. Apply two coats of vapor barrier coating with a layer of glass cloth embedded between coats. The dry film thickness of the finish shall be 1/32-inch minimum.

3.4.4 Pumps

Insulate pumps used for hot service with 2-inch thick rigid mineral fiber insulation and pumps used for chilled water and brine service with 2-inch thick flexible unicellular sheets as follows: Insulate pumps by forming a box around the pump housing, drive shaft, and piping. Apply insulation to inside surfaces of 20-gage galvanized or stainless steel sheet-metal boxes having openings for drive shaft and pipes. Construct the box by forming the bottom and sides using joints which do not leave raw ends of insulation exposed. Band bottom and sides to form a rigid housing that does not rest on the pump. Between top cover and sides, fit joints tightly forming a female shiplap joint on the side pieces and a male joint on the top cover to make the top cover removable. Secure insulation to the box with adhesive. Allow clearance for draining and adjustment of pump shaft seal.

3.5 PAINTING AND IDENTIFICATION

Paint in accordance with Section 09 90 00, "Paints and Coatings." Piping identification shall be as specified in other sections.

3.6 REPLACEMENT OF EXISTING ASBESTOS INSULATION

Remove existing asbestos insulation in accordance with Section 02 82 16, "Removal and Disposal of Asbestos Materials". When existing asbestos insulation is to be replaced, provide new asbestos-free insulation. Label or stencil new insulation "Asbestos-Free" after final finishing and painting.

3.7 FIELD INSPECTION

Visually inspect to ensure that materials provided conform to specifications. Inspect installations progressively for compliance with requirements.

TABLE IPiping Insulation Wall Thickness

<u>Service</u>	<u>Material</u>	<u>Tube And Pipe Size (Inches)</u>							<u>Vapor Barrier Required</u>
		<u>1/4-1 1/4</u>	<u>1 1/2-3</u>	<u>3 1/2-5</u>	<u>6-& Larger</u>				
Chilled Water & Dual Temperature & Refrigerant Suction Pipe	Cellular Glass	1.5 (2.0)	1.5 (2.0)	2.0 (2.5)	2.0 (2.5)	2.0 (2.5)	2.0 (2.5)	Yes	
	Polyisocyanurate	1 (1)	1 (1.0)	1.5 (2.0)	1.5 (2.0)	1.5 (2.0)	1.5 (2.0)	Yes	
Domestic Cold Water, Drains and Horizontal Roof Drains	Polyisocyanurate	1	1	1	1	1	1	Yes	
	Cellular Glass	1.5	1.5	1.5	1.5	1.5	1.5	Yes	
Domestic Hot Water	Polyisocyanurate	1	1	1.5	1.5	1.5	1.5	No	
	Calcium Silicate	1.5	1.5	1.5	1.5	1.5	1.5	No	
Heating Hot Water & Pipes (150 to 200 Degrees F)	Polyisocyanurate	1 (1.5)	1 (1.5)	1.5 (2.0)	1.5 (2.0)	1.5 (2.0)	1.5 (2.0)	No	
	Cellular Glass	1.5 (2.5)	1.5 (2.5)	2 (2.5)	2 (2.5)	2.5 (3.0)	2.5 (3.0)	No	
High Temp- erature Hot Water and (5.0) No Steam (251 to 350 Degrees F)	Calcium Silicate	2 (3.0)	2.5 (3.5)	2.5 (3.5)	3 (4.0)	3 (4.0)	3 (4.0)	No	
	Cellular Glass	2.5 (3.5)	3 (4.0)	3 (4.0)	3 (4.0)	4 (4.0)	4 (4.0)	No	

NOTE: Thickness in parenthesis are for:

- (1) Cold piping - crawl spaces, mechanical rooms, and outside locations
- (2) Hot Piping - outside locations, not including tunnels and crawl spaces.
- (3) NP - Not permitted.

TABLE IIInsulation For Equipment

<u>Material</u>	<u>Spec</u>	<u>Type</u>	<u>Class</u>	<u>Vapor Barrier Required</u>
Flexible Mineral Fiber,	ASTM C 553	I	B-3	Yes*/No
Rigid Mineral Fiber,	ASTM C 612		2	Yes*/No
or Cellular Glass	ASTM C 552	I		No

*Yes for chilled water and brine service and no for other services.

<u>Equipment</u>	<u>Recommended Wall Thickness</u>	<u>Vapor Barrier Required</u>
Heat Exchangers Systems	2"	For Chilled Water and Brine
Expansion Tanks Systems	2"	For Chilled Water and Brine
Air Separators Systems	2"	For Chilled Water and Brine
All Pumps Systems	2"	For Chilled Water and Brine
Hot Water Storage Tanks	2"	No
Hot Water Heat Exchangers or Steam to Hot Water Convector		
Up to 249	2"	No
250 to 400oF	3-1/2"	No
Hot Water Duct Mounted Coils	2"	No
Drain Pans	2"	For Chilled Water Systems
Pneumatic Water Tanks	2"	For Chilled Water Systems
Water Boxes and Headers	2"	For Chilled Water Systems

*Exact insulation thickness may be determined by proposed condition of use.

-- End of Section --

SECTION 23 08 00.00 20

HVAC TESTING/ADJUSTING/BALANCING

08/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL (AMCA)

AMCA 203 (1990) Field Performance Measurements of Fan Systems

ASSOCIATED AIR BALANCE COUNCIL (AABC)

AABC MN-4 (1996) Test and Balance Procedures

NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB)

NEBB MASV (2006) Procedural Standards for Measurements and Assessment of Sound and Vibration

NEBB PROCEDURAL STANDARDS (2005) Procedural Standards for TAB (Testing, Adjusting and Balancing) Environmental Systems

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA HVACTAB (2002, 3rd Ed) HVAC Systems - Testing, Adjusting and Balancing

SMACNA Leakage Test Mnl (1985, 1st Ed) HVAC Air Duct Leakage Test Manual

1.2 MODIFICATIONS TO REFERENCES

Accomplish work in accordance with referenced publications of AABC or NEBB or TABB except as supplemented or modified by this section. In the references referred to herein, consider the advisory or recommended provisions to be mandatory, as though the word "shall" had been substituted for the words "should" or "could" or "may" wherever they appear. Interpret reference to the "authority having jurisdiction," the "Administrative Authority," the "Owner," or the "Design Engineer" to mean the "Contracting Officer."

1.3 DEFINITIONS

- a. AABC: Associated Air Balance Council.

- b. COTR: Contracting Officer's Technical Representative.
- c. DALT: Duct air leakage test or testing.
- d. DALT'd: Duct air leakage testing performed.
- e. HVAC: Heating, ventilating, and air conditioning; or heating, ventilating, and cooling.
- f. HVAC field check group: As related to the TAB Field Checks, an HVAC field check group is a group of HVAC system components of the same basic type, as determined by the Contracting Officer. For example, a field check group could be all of the VAV boxes for an air handling unit, or all of the fan coil units on a building floor, or all of the ceiling supply diffusers in a large office.
- g. NEBB: National Environmental Balancing Bureau.
- h. Out-of-tolerance data: This term relates to the field checking of data provided in the submitted DALT Report and the submitted TAB report. With regard to DALT, this phrase means a leakage rate measured during DALT field checking which exceeds the allowable leakage rate. With regard to TAB, this phrase means a measurement taken during TAB field checking which falls outside the range of plus or minus 5 percent of the original measurement reported."
- i. Season of maximum heating load: The time of year when the outdoor temperature at the project site remains within **plus or minus 30 degrees Fahrenheit** of the project site's winter outdoor design temperature, throughout the period of TAB data recording.
- j. Season of maximum cooling load: The time of year when the outdoor temperature at the project site remains within **plus or minus 5 degrees Fahrenheit** of the project site's summer outdoor design temperature, throughout the period of TAB data recording.
- k. Season 1, Season 2: Depending upon when the project HVAC is completed and ready for TAB, Season 1 is defined, thereby defining Season 2. Season 1 could be the season of maximum heating load, or the season of maximum cooling load.
- l. TAB: Testing, adjusting, and balancing (of HVAC Systems).
- m. TAB'd: Testing, adjusting, and balancing procedures performed.
- n. TAB Agency: TAB Firm
- o. TAB supervisor: TAB engineer
- p. TAB technician: TAB assistant
- q. TAB team field leader: TAB technician that is in charge of the TAB team in the field when the TAB supervisor is not at the project site.
- r. TABB: Testing Adjusting and Balancing Bureau.

1.4 DESCRIPTION OF WORK

The work includes duct air leakage testing (DALT) and test, adjust, and balance (TAB) of heating, ventilating, and cooling (HVAC) air and water distribution systems including equipment, ducts, and piping which are located within, on, under, between, and adjacent to buildings.

1.4.1 Air Distribution Systems

Systems shall be tested, adjusted, and balanced (TAB'd) in compliance with this section. Obtain Contracting Officer's written approval before applying insulation to exterior of air distribution systems under Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

1.4.2 Water Distribution Systems

Systems shall be TAB'd in compliance with this section. Obtain Contracting Officer's written approval before applying insulation to water distribution systems under Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEM. At Contractor's option and with Contracting Officer's written approval, the piping systems may be insulated before systems are TAB'd.

Piping insulation shall terminate immediately adjacent to each flow control valve, automatic control valve, or device. The ends of pipe insulation and the space between ends of pipe insulation and piping shall be sealed with waterproof vapor barrier coating. After completion of work under this section, the flow control valves and devices shall be insulated under Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

1.5 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-06 Test Reports

DALT and TAB Work Execution Schedule

DALT and TAB Procedures Summary

Design review report

Pre-Final DALT report

Final DALT report

TAB report for Season 1

TAB report for Season 2

SD-07 Certificates

Independent TAB agency and personnel qualifications

Advance notice of Pre-Final DALT field work

Completed Pre-Final DALT Work Checklist

Advance Notice of Season 1 TAB Field Work

Completed Season 1 Pre-TAB Work Checklist

Advance Notice of Season 2 TAB Field Work

Completed Season 2 Pre-TAB Work Checklist

1.6 DALT AND TAB SUBMITTAL AND WORK SCHEDULE

Comply with additional requirements specified in UFGS-23 08 00.00 20
Appendix C DALT AND TAB SUBMITTAL AND WORK SCHEDULE

1.7 RELATED REQUIREMENTS

Requirements for price breakdown of HVAC TAB work are specified in Section
01 20 00 PRICE AND PAYMENT PROCEDURES.

1.8 SUBCONTRACTOR SPECIAL REQUIREMENTS

Perform all work in this section in accordance with the paragraph entitled
"Subcontractor Special Requirements" in Section 01 30 00 ADMINISTRATIVE
REQUIREMENTS. The paragraph specifies that all contract requirements of
this section shall be accomplished directly by a first tier subcontractor.
No work required shall be accomplished by a second tier subcontractor.

1.9 INDEPENDENT TAB AGENCY AND PERSONNEL QUALIFICATIONS

For agency proposed for approval, submit information certifying that the
TAB agency is a first tier subcontractor who is not affiliated with any
other company participating in work on this contract, including design,
furnishing equipment, or construction. Further, submit the following, for
the agency, to Contracting Officer for approval:

a. Independent AABC or NEBB or TABB certified TAB agency:

TAB agency: AABC registration number and expiration date of
current certification; or NEBB certification number and expiration
date of current certification; or TABB certification number and
expiration date of current certification.

TAB team supervisor: Name and copy of AABC or NEBB or TABB TAB
supervisor certificate and expiration date of current
certification.

TAB team field leader: Name and documented evidence that the team
field leader shall have satisfactorily performed full-time
supervision of TAB work in the field for not less than 3 years
immediately preceding this contract's bid opening date.

TAB team field technicians: Names and documented evidence that
each field technician shall have satisfactorily assisted a TAB
team field leader in performance of TAB work in the field for not
less than one year immediately preceding this contract's bid
opening date.

Current certificates: Registrations and certifications shall be
current, and valid for the duration of this contract.
Certifications which expire prior to completion of the TAB work,
shall be renewed in a timely manner so that there is no lapse in

registration or certification. TAB agency or TAB team personnel without a current registration or current certification shall not perform TAB work on this contract.

- b. TAB Team Members: TAB team approved to accomplish work on this contract shall be full-time employees of the TAB agency. No other personnel shall do TAB work on this contract.
- c. Replacement of TAB team members: Replacement of members may occur if each new member complies with the applicable personnel qualifications and each is approved by the Contracting Officer.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 WORK DESCRIPTIONS OF PARTICIPANTS

Comply with requirements specified in UFGS-23 08 00.00 20 Appendix A WORK DESCRIPTIONS OF PARTICIPANTS

3.2 PRE-DALT/TAB MEETING

Meet with the Contracting Officer's technical representative (COTR) to develop a mutual understanding relative to the details of the DALT work and TAB work requirements. Ensure that the TAB supervisor is present at this meeting. Requirements to be discussed include required submittals, work schedule, and field quality control.

3.3 DALT PROCEDURES

3.3.1 Instruments, Consumables and Personnel

Provide instruments, consumables and personnel required to accomplish the DALT field work. Follow the same basic procedures specified below for TAB work for instruments and consumables, including maintenance of and calibration of instruments, accuracy of measurements, preliminary procedures, field work, workmanship and treatment of deficiencies. Calibrate and maintain instruments in accordance with manufacturer's written procedures.

3.3.2 Advance Notice of Pre-Final DALT Field Work

On completion of the installation of each duct system indicated to be DALT'd, the Contractor shall notify the Contracting Officer in writing prior COTR's duct selection field visit.

3.3.3 Ductwork To Be DALT'd

From each duct system indicated as subject to DALT, the COTR shall randomly select sections of each completed duct system for testing by the Contractor. The sections selected shall not exceed 20 percent of the total measured linear footage of the duct systems indicated as subject to DALT. Sections of duct systems to be tested may include main ducts, branch-main ducts, branch ducts, or plenums serving supply, return, exhaust, or outside air intake ductwork.

It will be acceptable for an entire duct system to be DALT'd instead of disassembling that system in order to DALT only the 20 percent portion specified above.

3.3.4 DALT Testing

Perform DALT on the duct sections selected by the COTR. Using the duct class, seal class, leakage class, and leak test pressure data indicated on the drawings, comply with the procedures specified in [SMACNA Leakage Test Mnl](#). Testing shall be in accordance with the procedures specified in [SMACNA Leakage Test Mnl](#), except as supplemented and modified by this section.

In spite of specifications of [SMACNA Leakage Test Mnl](#) to the contrary, ductwork of construction class of 3-inch water gauge static pressure and below shall be DALT'd if indicated to be DALT'd. Complete DALT work on the COTR selected ductwork within 48 hours after the particular ductwork was selected for DALT. DALT work shall be conducted separately for large duct systems to enable the DALT work to be completed in 48 hours.

3.3.5 Pre-Final DALT Report

After completion of the DALT work, prepare a Pre-final DALT Report meeting the additional requirements specified in UFGS-23 08 00.00 20 Appendix B REPORTS - DALT and TAB. Data required by those data report forms shall be furnished by the TAB team. Prepare the report neatly and legibly; the Pre-final DALT report shall provide the basis for the Final DALT Report.

TAB supervisor shall review, approve and sign the Pre-Final DALT Report and submit this report within one day of completion of DALT field work. Verbally notify the Contracting Officer's TAB representative that the field check of the Pre-Final DALT Report data can commence.

3.3.6 Quality Assurance - COTR DALT Field Checks

Field check for accuracy selected Pre-Final DALT Report data in the presence of the Contracting Officer's TAB representative (COTR). For each duct system, conduct field checks on 50 percent of the duct sections DALT'd. The TAB team field leader shall be present full-time when DALT field checking is conducted.

3.3.7 Additional COTR Field Checks

If any of the duct sections checked for a given system are determined to be out-of-tolerance, data checking for that section shall be terminated and the associated Pre-final DALT Report data for the given system shall be disapproved. The Contractor shall make the necessary corrections and prepare a revised Pre-Final DALT Report. A field check of the revised report data shall then be rescheduled with the Contracting Officer's TAB representative.

Further, if any data on the Pre-Final DALT report form for a given duct section is out-of-tolerance, then data for one additional duct section, preferably in the same duct system, shall be field checked as specified herein. The DALT'd duct section to be field checked shall be in addition to the original 50 percent of duct sections to be field checked.

3.3.8 Final DALT Report

On successful completion of all field checks of the Pre-Final DALT Report data for all systems, the TAB Supervisor shall assemble, review, approve, sign and submit the Final DALT Report in compliance with UFGS-23 08 00.00 20 Appendix B REPORTS - DALT and TAB to the Contracting Officer for approval.

3.3.9 Prerequisite for TAB Field Work

No TAB field work shall commence prior to the completion and approval, for all systems, of the Final DALT Report.

3.4 TAB PROCEDURES

3.4.1 TAB Field Work

Perform TAB in accordance with the requirements of the TAB procedural standard recommended by the TAB trade association that approved the TAB Firm's qualifications. That is, comply with requirements of **AABC MN-4**, **NEBB PROCEDURAL STANDARDS**, or **SMACNA HVACTAB** (used by TABB) as supplemented and modified by this specification section. All recommendations and suggested practices contained in the TAB procedural standards are considered mandatory.

Test, adjust, and balance the listed HVAC systems to the state of operation indicated on and specified in the contract design documents. Conduct TAB work, including measurement accuracy, and sound measurement work in conformance with the **AABC MN-4** and **AABC MN-4**, or **NEBB PROCEDURAL STANDARDS**, and **NEBB MASV**, or **SMACNA HVACTAB** (used by TABB) and TABB sound measurement procedures, except as supplemented and modified by this section. Provide instruments and consumables required to accomplish the TAB work. Calibrate and maintain instruments in accordance with manufacturer's written procedures.

Air systems and water systems shall be proportionately balanced and reported in the Season 1 TAB report. The only water flow and air flow reporting which can be deferred until the Season 2 will be that data which would be affected in terms of accuracy due to outside ambient conditions.

3.4.2 Preliminary Procedures

Use the approved pre-field engineering report as instructions and procedures for accomplishing TAB field work. Test ports required for testing by the TAB engineer shall be located in the field by the TAB engineer during TAB field work. It shall be the responsibility of the sheet metal contractor to provide and install test ports as required by the TAB engineer.

3.4.3 TAB Air Distribution Systems

3.4.3.1 Units With Coils

Heating and cooling performance capacity tests shall be reported for hot water, chilled water, DX and steam coils for the purpose of verifying that the coils meet the indicated design capacity. Submit the following data and calculations with the coil test reports:

- a. For air handlers with capacities greater than 7.5 tons (90,000 Btu)

cooling, such as factory manufactured units, central built-up units and rooftop units, capacity tests shall be conducted in accordance with AABC MN-4, procedure 3.5, "Coil Capacity Testing."

Entering and leaving wet and dry bulb temperatures shall not be determined by single point measurement, but shall be the average of multiple readings in compliance with paragraph 3.5-5, "Procedures", (in subparagraph d.) of AABC MN-4, Procedure 3.5, "Coil Capacity Testing."

Submit part-load coil performance data from the coil manufacturer converting test conditions to design conditions; the data shall be used for the purpose of verifying that the coils meet the indicated design capacity in compliance with AABC MN-4, Procedure 3.5, "Coil Capacity Testing," paragraph 3.5.7, "Actual Capacity Vs. Design Capacity" (in subparagraph c.).

- b. For units with capacities of 7.5 tons (90,000 Btu) or less, such as fan coil units, duct mounted reheat coils associated with VAV terminal units, and unitary units, such as through-the-wall heat pumps:

The apparent coil capacity shall be determined by calculations using single point measurement of entering and leaving wet and dry bulb temperatures; the calculations shall be submitted with the coil reports.

3.4.3.2 Air Handling Units

Air handling unit systems including fans (air handling unit fans, exhaust fans and winter ventilation fans), coils, ducts, plenums, mixing boxes, terminal units, variable air volume boxes, and air distribution devices for supply air, return air, outside air, mixed air relief air, and makeup air.

3.4.3.3 Rooftop Air Conditioning

Rooftop air conditioning systems including fans, coils, ducts, plenums, and air distribution devices for supply air, return air, and outside air.

For refrigeration compressors/condensers/condensing units/evaporators, report data as required by NEBB, AABC, and TABB standard procedures, including refrigeration operational data.

3.4.3.4 Heating and Ventilating Units

Heating and ventilating unit systems including fans, coils, ducts, plenums, roof vents, registers, diffusers, grilles, and louvers for supply air, return air, outside air, and mixed air.

3.4.3.5 Makeup Air Units

Makeup air unit systems including fans, coils, ducts, plenums, registers, diffusers, grilles, and louvers for supply air, return air, outside air, and mixed air.

3.4.3.6 Return Air Fans

Return air fan system including fan ducts, plenums, registers, diffusers, grilles, and louvers for supply air, return air, outside air, and mixed air.

3.4.3.7 Fan Coils

Fan coil unit systems including fans, coils, ducts, plenums, and air distribution devices for supply air, return air, and outside air.

3.4.3.8 Exhaust Fans

Exhaust fan systems including fans, ducts, plenums, grilles, and hoods for exhaust air.

3.4.4 TAB Water Distribution Systems

3.4.4.1 Chilled Water

Chilled water systems including chillers, condensers, cooling towers, pumps, coils, system balance valves and flow measuring devices.

For water chillers, report data as required by NEBB, AABC, and TABB standard procedures, including refrigeration operational data.

3.4.4.2 Heating Hot Water

Heating hot water systems including boilers, hot water converters (e.g., heat exchangers), pumps, coils, heater coils, system balancing valves and flow measuring devices.

3.4.5 TAB Work on Performance Tests Without Seasonal Limitations

3.4.5.1 Performance Tests

In addition to the TAB proportionate balancing work on the air distribution systems and the water distribution systems, accomplish TAB work on the HVAC systems which directly transfer thermal energy. TAB the operational performance of the heating systems and cooling systems.

3.4.5.2 Ambient Temperatures

On each tab report form used for recording data, record the outdoor and indoor ambient dry bulb temperature range and the outdoor and indoor ambient wet bulb temperature range within which the report form's data was recorded. That is, record these temperatures at beginning and at the end of data taking.

3.4.6 TAB Work on Performance Tests With Seasonal Limitations

3.4.6.1 Performance Tests

Accomplish proportionate balancing TAB work on the air distribution systems and water distribution systems, in other words, accomplish adjusting and balancing of the air flows and water flows, any time during the duration of this contract, subject to the limitations specified elsewhere in this section. However, accomplish, within the following seasonal limitations, TAB work on HVAC systems which directly transfer thermal energy.

3.4.6.2 Season Of Maximum Load

Visit the contract site for at least two TAB work sessions for TAB field measurements. Visit the contract site during the season of maximum heating

load and visit the contract site during the season of maximum cooling load, the goal being to TAB the operational performance of the heating systems and cooling systems under their respective maximum outdoor environment-caused loading. During the seasonal limitations, TAB the operational performance of the heating systems and cooling systems.

3.4.6.3 Ambient Temperatures

On each tab report form used for recording data, record the outdoor and indoor ambient dry bulb temperature range and the outdoor and indoor ambient wet bulb temperature range within which the report form's data was recorded. That is, record these temperatures at beginning and at the end of data taking.

3.4.7 Workmanship

Conduct TAB work on specified HVAC systems until measured parameters are within plus 10 percent and minus 5 percent of the design values, that is, the values specified or indicated on the contract documents.

3.4.8 Deficiencies

Strive to meet the intent of this section to maximize the performance of the equipment as designed and installed. However, if deficiencies in equipment design or installation prevent TAB work from being accomplished within the range of design values specified in the paragraph entitled "Workmanship", TAB Supervisor shall provide written notice as soon as possible, at most within three working days, to the Contractor describing the deficiency and recommended correction.

Responsibility for correction of installation deficiencies is the Contractor's. If a deficiency is in equipment design, call the TAB team supervisor for technical assistance. Responsibility for reporting design deficiencies to Contractor is the TAB Supervisor's.

3.4.9 TAB Reports

Additional requirements for TAB Reports are specified in 23 08 00.00 20 Appendix B REPORTS - DALT and TAB

3.4.10 Quality Assurance - COTR TAB Field Checks

3.4.10.1 Initial TAB Field Check

During initial field check, the Contractor shall check, in the presence of the Contracting Officer's TAB representative, random selections of data (water, air quantities, air motion, sound level readings) recorded in the TAB Report. Points and areas of field checks shall be selected by the Contracting Officer's TAB representative. Measurement and test procedures shall be the same as approved for TAB work for the TAB Report. Selections for recheck will not exceed 25 percent of the total number of reported data entries tabulated in the report.

3.4.10.2 Additional TAB Field Checks

If any of the data checked for a given HVAC field check group are determined to be out-of-tolerance, data checking for all affected data for that group shall be terminated and the affected TAB report data for the given group shall be disapproved. The Contractor shall make the necessary

corrections and prepare a revised TAB Report. A field check of the revised report data shall then be rescheduled with the Contracting Officer's TAB representative.

Further, if any data on the TAB Report for a given field check group is out-of-tolerance, then data for one additional field check group shall be field checked as specified herein. This increase field check work shall continue until out-of-tolerance data ceases to be found. This additional field checking is up and above the original 25 percent of the of reported data entries to be field checked.

If there are no more of the similar field check group, additional field checking from another, but different, type of field check group shall be checked.

3.4.10.3 Prerequisite for Approval

Compliance with the field checking requirements of this section is a prerequisite for the final Contracting Officer approval of the TAB report submitted.

3.5 MARKING OF SETTINGS

Upon the final TAB work approval, permanently mark the settings of HVAC adjustment devices including valves, splitters, and dampers so that adjustment can be restored if disturbed at any time. The permanent markings shall indicate the settings on the adjustment devices which result in the data reported on the submitted TAB report.

3.6 MARKING OF TEST PORTS

The TAB team shall permanently and legibly mark and identify the location points of the duct test ports. If the ducts have exterior insulation, these markings shall be made on the exterior side of the duct insulation. The location of test ports shall be shown on the as-built mechanical drawings with dimensions given where the test port is covered by exterior insulation.

3.7 APPENDICES

UFGS-23 08 00.00 20 Appendix A WORK DESCRIPTIONS OF PARTICIPANTS
UFGS-23 08 00.00 20 Appendix B REPORTS - DALT and TAB
UFGS-23 08 00.00 20 Appendix C DALT AND TAB SUBMITTAL AND WORK SCHEDULE

UFGS-23 08 00.00 20 Appendix A

WORK DESCRIPTIONS OF PARTICIPANTS

The Contractor shall be responsible for ensuring compliance with all requirements of this specification section. However, the following delineation of specific work items is provided to facilitate and co-ordinate execution of the various work efforts by personnel from separate organizations.

1. Contractor

a. HVAC documentation: Provide pertinent contract documentation to the TAB Firm, to include the following: the contract drawings and specifications; copies of the approved submittal data for all HVAC equipment, air distribution devices, and air/water measuring/balancing devices; the construction work schedule; and other applicable documents requested by the TAB Firm. Provide the TAB Firm copies of contract revisions and modifications as they occur.

b. Schedules: Ensure the requirements specified under the paragraph "DALT and TAB Schedule" are met.

c. Pre-DALT and TAB meeting: Arrange and conduct the Pre-DALT and TAB meeting. Ensure that a representative is present for the sheet metal contractor, the mechanical contractor, the electrical contractor, and the automatic temperature controls contractor.

d. Coordinate Support: Provide and coordinate support personnel required by the TAB Firm in order to accomplish the DALT and TAB field work. Support personnel may include factory representatives, HVAC controls installers, HVAC equipment mechanics, sheet metal workers, pipe fitters, and insulators. Ensure support personnel are present at the work site at the times required.

e. Correct Deficiencies: Ensure the notifications of Construction Deficiencies are provided as specified herein. Refer to the paragraph entitled "Construction Deficiencies." Correct each deficiency as soon as practical with the Contracting Officer, and submit revised schedules and other required documentation.

f. Pre-TAB Work Checklists: Complete check out and debugging of HVAC equipment, ducts, and controls prior to the TAB engineer arriving at the project site to begin the TAB work. Debugging includes searching for and eliminating malfunctioning elements in the HVAC system installations, and verifying all adjustable devices are functioning as designed. Include as pre-TAB work checklist items, the deficiencies pointed out by the TAB team supervisor in the design review report.

Prior to the TAB field team's arrival, ensure completion of the applicable inspections and work items listed in the TAB team supervisor's DALT and TAB Work Procedures Summary. Do not allow the TAB team to commence TAB field work until all of the following are completed.

g. Give Notice of Testing: Submit advance notice of TAB field work accompanied by completed prerequisite HVAC Work List

h. Insulation work: Ensure that no insulation is shall not be installed on ducts to be DALT'd until DALT work on the subject ducts is complete.

Ensure the duct and piping systems are properly insulated and vapor sealed upon the successful completion and acceptance of the DALT and TAB work.

2. TAB Team Supervisor

a. Overall management: Supervise and manage the overall TAB team work effort, including preliminary and technical DALT and TAB procedures and TAB team field work.

b. Schedule: Ensure the requirements specified under the paragraph "DALT and TAB Schedule" are met.

Submittals: Provide the submittals specified herein.

Pre-DALT/TAB meeting: Attend meeting with Contractor. Ensure TAB personnel that will be involved in the TAB work under this contract attend the meeting.

Design Review Report: Submit typed report describing omissions and deficiencies in the HVAC system's design that would preclude the TAB team from accomplishing the duct leakage testing work and the TAB work requirements of this section. Provide a complete explanation including supporting documentation detailing the design deficiency. State that no deficiencies are evident if that is the case.

Support required: Specify the technical support personnel required from the Contractor other than the TAB agency; such as factory representatives for temperature controls or for complex equipment. Inform the Contractor in writing of the support personnel needed and when they are needed. Furnish the notice as soon as the need is anticipated, either with the design review report, or the DALT and TAB Procedures Summary, the during the DALT or TAB field work.

Ensure the Contractor is properly notified and aware of all support personnel needed to perform the TAB work. Maintain communication with the Contractor regarding support personnel throughout the duration of the TAB field work, including the TAB field checking.

Ensure all inspections and verifications for the Pre-Final DALT and Pre-TAB Checklists are completely and successfully conducted before DALT and TAB field work is performed.

Monitor the completion of the duct system installations and provide the Advance Notice for Pre-Final DALT field work as specified herein.

Provide technical assistance to the DALT and TAB field work.

Ensure the notifications of Construction Deficiencies are provided as specified herein. Comply with requirements of the paragraph

entitled "Construction Deficiencies." Resolve each deficiency as soon as practical and submit revised schedules and other required documentation.

Develop the required TAB procedures for systems or system components not covered in the TAB Standard.

3. TAB Team Field Leader

a. Field manager: Manage, in the field, the accomplishment of the work specified in Part 3, "Execution."

b. Full time: Be present at the contract site when DALT field work or TAB field work is being performed by the TAB team; ensure day-to-day TAB team work accomplishments are in compliance with this section.

c. Prerequisite HVAC work: Do not bring the TAB team to the contract site until a copy of the prerequisite HVAC work list, with all work items certified by the Contractor to be working as designed, reaches the office of the TAB Agency.

UFGS-23 08 00.00 20 Appendix B

REPORTS - DALT and TAB

All submitted documentation must be typed, neat, and organized. All reports must have a waterproof front and back cover, a title page, a certification page, sequentially numbered pages throughout, and a table of contents. Tables, lists, and diagrams must be titled. Generate and submit for approval the following documentation:

1. [DALT and TAB Work Execution Schedule](#)

Submit a detailed schedule indicating the anticipated calendar date for each submittal and each portion of work required under this section. For each work entry, indicate the support personnel (such as controls provider, HVAC mechanic, etc.) that are needed to accomplish the work. Arrange schedule entries chronologically.

2. [DALT and TAB Procedures Summary](#)

Submit a detailed narrative describing all aspects of the DALT and TAB field work to be performed. Clearly distinguish between DALT information and TAB information. Include the following:

- a. A list of the intended procedural steps for the DALT and TAB field work from start to finish. Indicate how each type of data measurement will be obtained. Include what Contractor support personnel are required for each step, and the tasks they need to perform.
- b. A list of the project's submittals that are needed by the TAB Firm in order to meet this Contract's requirements.
- c. The schematic drawings to be used in the required reports, which may include building floor plans, mechanical room plans, duct system plans, and equipment elevations. Indicate intended TAB measurement locations, including where test ports need to be provided by the Contractor.
- d. The data presentation forms to be used in the report, with the preliminary information and initial design values filled in.
- e. A list of DALT and TAB instruments to be used, edited for this project, to include the instrument name and description, manufacturer, model number, scale range, published accuracy, most recent calibration date, and what the instrument will be used for on this project.
- f. A thorough checklist of the work items and inspections that need to be accomplished before DALT field work can be performed. The Contractor must complete, submit, and receive approval of the [Completed Pre-Final DALT Work Checklist](#) before DALT field work can be accomplished.
- g. A thorough checklist of the work items and inspections that need to be accomplished before the Season 1 TAB field work can be performed. The Contractor must complete, submit, and receive approval of the [Completed Season 1 Pre-TAB Work Checklist](#) before the Season 1 TAB field work can be accomplished.

h. A thorough checklist of the work items and inspections that need to be accomplished before the Season 2 TAB field work can be performed. The Contractor must complete, submit, and receive approval of the [Completed Season 2 Pre-TAB Work Checklist](#) before the Season 2 TAB field work can be accomplished.

i. The checklists specified above shall be individually developed and tailored specifically for the work under this contract. Refer to [NEBB PROCEDURAL STANDARDS](#), Section III, "Preliminary TAB Procedures" under the paragraphs titled, "Air Distribution System Inspection" and "Hydronic Distribution System Inspection" for examples of items to include in the checklists.

3. [Design Review Report](#)

Submit report containing the following information:

a. Review the contract specifications and drawings to verify that the TAB work can be successfully accomplished in compliance with the requirements of this section. Verify the presence and location of permanently installed test ports and other devices needed, including gauge cocks, thermometer wells, flow control devices, circuit setters, balancing valves, and manual volume dampers.

b. Submit a typed report describing omissions and deficiencies in the HVAC system's design that would preclude the TAB team from accomplishing the DALT work and the TAB work requirements of this section. Provide a complete explanation including supporting documentation detailing the design deficiency. If no deficiencies are evident, state so in the report.

4. [Pre-Final DALT Report](#) for COTR DALT Field Checks

Report the data for the Pre-Final DALT Report meeting the following requirements:

a. A copy of the approved DALT and TAB Procedures Summary. Provide notations describing how actual field procedures differed from the procedures listed.

b. Report format: Submit a comprehensive report for the DALT field work data using data presentation forms equivalent to the "Air Duct Leakage Test Summary Report Forms" located in the [SMACNA Leakage Test Mnl](#). In addition, submit in the report, a marked duct shop drawing which identifies each section of duct tested with assigned node numbers for each section. Node numbers shall be included in the completed report forms to identify each duct section.

c. Include a copy of all calculations prepared in determining the duct surface area of each duct test section. In addition, the DALT reports shall contain copy(s) of the calibration curve for each of the DALT test orifices used for testing.

d. Instruments: List the types of instruments actually used to measure the data. Include in the listing each instrument's unique identification number, calibration date, and calibration expiration date. Instruments shall have been calibrated within one year of the date of use in the field. Instrument calibration shall be traceable to the measuring standards of the National Institute of Standards and

Technology.

e. TAB Supervisor Approval: Include on the submitted report the typed name of the TAB supervisor and the dated signature of the TAB supervisor.

5. Final DALT Report

On successful completion of all COTR field checks of the Pre-final DALT Report data for all systems, the TABS Supervisor shall assemble, review, sign and submit the Final DALT Report to the Contracting Officer for approval.

6. Submit TAB Report for Season 1 and TAB Report for Season 2 in the following manner:

a. A copy of the approved DALT and TAB Procedures Summary. When applicable, provide notations describing how actual field procedures differed from the procedures listed.

b. Report format: Submit the completed data forms approved in the pre-field TAB Engineering Report completed by TAB field team, reviewed, approved and signed by the TAB supervisor. Bind the report with a waterproof front and back cover. Include a table of contents identifying by page number the location of each report. Report forms and report data shall be typewritten. Handwritten report forms or report data are not acceptable.

c. Temperatures: On each TAB report form reporting TAB work accomplished on HVAC thermal energy transfer equipment, include the indoor and outdoor dry bulb temperature range and indoor and outdoor wet bulb temperature range within which the TAB data was recorded. Include in the TAB report continuous time versus temperature recording data of wet and dry bulb temperatures for the rooms, or zones.

(1) Data shall be measured and compiled on a continuous basis for the period in which TAB work affecting those rooms is being done.

(2) Data shall be measured/recorded only after the HVAC systems installations are complete, the systems fully balanced and the HVAC systems controls operating in fully automatic mode. Provide a detailed explanation wherever a final measurement did not achieve the required value.

(3) Data may be compiled using direct digital controls trend logging where available. Otherwise, the Contractor shall temporarily install calibrated time versus temperature/humidity recorders for this purpose. The HVAC systems and controls shall have been fully operational a minimum of 24 hours in advance of commencing data compilation. The specified data shall be included in the Season I TAB Report Season I and Season 2 TAB Report.

d. Air System Diagrams: Provided updated diagrams with final installed locations of all terminals and devices, any numbering changes, and actual test locations.

e. Air Static Pressure Profiles: Report static pressure profiles for air duct systems including: AHU-1 ERV. Report static pressure data for all supply, return, relief, exhaust and outside air ducts for the

systems listed. The static pressure report data shall include, in addition to AABC or NEBB or TABB required data, the following:

- (1) Report supply fan, return fan, relief fan, and exhaust fan inlet and discharge static pressures.
- (2) Report static pressure drop across chilled water coils, DX coils, hot water coils, steam coils, electric resistance heating coils and heat reclaim devices installed in unit cabinetry or the system ductwork.
- (3) Report static pressure drop across outside air, return air, and supply air automatic control dampers, both proportional and two-position, installed in unit cabinetry.
- (4) Report static pressure drop across air filters, acoustic silencers, moisture eliminators, air flow straighteners, air flow measuring stations or other pressure drop producing specialty items installed in unit cabinetry, or in the system ductwork. Examples of these specialty items are smoke detectors, white sound generators, RF shielding, wave guides, security bars, blast valves, small pipes passing through ductwork, and duct mounted humidifiers.

Do not report static pressure drop across duct fittings provided for the sole purpose of conveying air, such as elbows, transitions, offsets, plenums, manual dampers, and branch takes-offs.

- (5) Report static pressure drop across outside air and relief/exhaust air louvers.
- (6) Report static pressure readings of supply air, return air, exhaust/relief air, and outside air in duct at the point where these ducts connect to each air moving unit.

f. Duct Traverses: Report duct traverses for main supply, return, exhaust, relief and outside air ducts. This shall include all ducts, including those which lack 7 1/2 duct diameters upstream and 2 1/2 duct diameters downstream of straight duct unobstructed by duct fittings/offsets/elbows. The TAB Agency shall evaluate and report findings on the duct traverses taken. Evaluate the suitability of the duct traverse measurement based on satisfying the qualifications for a pitot traverse plane as defined by [AMCA 203](#), "Field Measurements", Section 8, paragraph 8.3, "Location of Traverse Plane".

g. Instruments: List the types of instruments actually used to measure the tab data. Include in the listing each instrument's unique identification number, calibration date, and calibration expiration date.

Instrumentation, used for taking wet bulb temperature readings shall provide accuracy of plus or minus 5 percent at the measured face velocities. Submit instrument manufacturer's literature to document instrument accuracy performance is in compliance with that specified.

h. Performance Curves: The TAB Supervisor shall include, in the TAB Reports, factory pump curves and fan curves for pumps and fans TAB'd on the job.

i. Calibration Curves: The TAB Supervisor shall include, in the TAB Reports, a factory calibration curve for installed flow control balancing valves, flow venturis and flow orifices TAB'd on the job.

j. Data From Tab Field Work: After completion of the TAB field work, prepare the TAB field data for TAB supervisor's review and approval signature, using the reporting forms approved in the pre-field engineering report. Data required by those approved data report forms shall be furnished by the TAB team. Except as approved otherwise in writing by the Contracting Officer, the TAB work and thereby the TAB report shall be considered incomplete until the TAB work is accomplished to within the accuracy range specified in the paragraph entitled "Workmanship."

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DALT AND TAB SUBMITTAL AND WORK SCHEDULE

Perform the following items of work in the order listed adhering to the dates schedule specified below.

Submit TAB Agency and TAB Personnel Qualifications: Within 42 calendar days after date of contract award.

Submit the DALT and TAB Work Execution Schedule: within 14 days after receipt of the TAB agency and TAB personnel qualifications approval. Revise and re-submit this schedule 28 days prior to commencement of DALT work and 28 days prior to the commencement of TAB Season 1 work and TAB Season 2 work.

Submit the DALT and TAB Work Procedures Summary: within 14 days after receipt of the initial approved DALT and TAB Work Execution Schedule.

Meet with the COTR at the Pre-DALT/TAB Meeting: Within 28 calendar days after receipt of the approved initial DALT/TAB Execution Schedule.

Submit Design Review Report: Within 56 calendar days after the receipt of the approved initial DALT and TAB Work Execution Schedule.

Advance Notice of Pre-Final DALT Field Work: After the completed installation of the HVAC duct system to be DALT'd, submit to the Contracting Officer an [Advance Notice of Pre-Final DALT Field Work](#) accompanied by the [completed Pre-Final DALT Work Checklist](#) checklist for the subject duct system.

Ductwork Selected for DALT: Within 14 calendar days after receiving an acceptable completed Pre-Final DALT Work Checklist, the Contracting Officer's technical representative (COTR) will select the project ductwork sections to be DALT'd.

DALT Field Work: Within 48 hours of COTR's selection, complete DALT field work on selected project ductwork.

Submit Pre-Final DALT Report: Within two working days after completion of DALT field work, submit Pre-final DALT Report. Separate Pre-final DALT reports may be submitted to allow phased testing from system to system.

Quality Assurance - COTR DALT Field Checks: Upon approval of the Pre-final DALT Report, the COTR's DALT field check work shall be scheduled with the Contracting Officer.

Submit Final DALT Report: Within 14 calendar days after completion of successful DALT Work Field Check, submit Season 1 TAB report.

[Advance Notice of Season 1 TAB Field Work](#): At a minimum of 14 calendar days prior to Season 1 TAB Field Work, submit advance notice of TAB field work accompanied by [completed Season 1 Pre-TAB Work Checklist](#).

Season 1 TAB Field Work: At a minimum of 84 calendar days prior to

CCD, and when the ambient temperature is within Season 1 limits, accomplish Season 1 TAB field work.

Submit Season 1 TAB Report: Within 14 calendar days after completion of Season 1 TAB field work, submit initial Season 1 TAB report.

Season 1 Quality Assurance - COTR TAB Field Check: 30 calendar days after initial Season 1 TAB report is approved by the Contracting Officer, conduct Season 1 field check.

Complete Season 1 TAB Work: Prior to CCD, complete all TAB work except Season 2 TAB work and submit final.

Receive the approved TAB report: Within 21 calendar days, receive the report from Contracting Officer approved TAB report.

[Advance Notice of Season 2 TAB Field Work](#): At a minimum of 126 calendar days after CCD, submit advance notice of Season 2 TAB field work accompanied by [completed Season 2 Pre-TAB Work Checklist](#).

Season 2 TAB Field Work: Within 14 calendar days after date of advance notice of Season 2 TAB field work and when the ambient temperature is within Season 2 limits, accomplish Season 2 TAB field work.

Submit Season 2 TAB Report: Within 14 calendar days after completion of Season 2 TAB field work, submit Season 2 TAB report.

Season 2 Quality Assurance - COTR TAB Field Checks: 28 calendar days after the Season 2 TAB report is approved by the Contracting Officer, conduct Season 2 field check.

Complete Season 2 TAB Work: Within 14 calendar days after the completion of Season 2 TAB field data check, complete all TAB work.

Receive the approved TAB report: Within calendar 21 days, receive the report from Contracting Officer.

-- End of Section --

SECTION 23 09 54

DIRECT DIGITAL CONTROL SYSTEMS

06/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL (AMCA)

AMCA 500-D (1998) Laboratory Methods of Testing Dampers for Rating

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 33 (2000) Method of Testing Forced Circulation Air Cooling and Air Heating Coils

ASME INTERNATIONAL (ASME)

ASME/ANSI B16.5 (1996) Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24

ASME B16.34 (2004) Valves - Flanged, Threaded and Welding End

ASME B31.1 (2007; Addenda 2008) Power Piping

ASME B40.100 (2005) Pressure Gauges and Gauge Attachments

ASME BPVC (2004) Boiler and Pressure Vessel Codes

ASTM INTERNATIONAL (ASTM)

ASTM A 126 (1995) Gray Iron Castings

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2007; AMD 1 2008) National Electrical Code - 2008 Edition

NFPA 90A (2008) Standard for the Installation of Air Conditioning and Ventilating Systems

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA DCS (1995; Addendum 1997) HVAC Duct

Construction Standards - Metal and Flexible

SMACNA HVACTAB

(2002, 3rd Ed) HVAC Systems - Testing, Adjusting and Balancing

UNDERWRITERS LABORATORIES (UL)

UL 506

(1994; R 1994, Bul. 1994, 1995, and 1996) Specialty Transformers

UL 916

(1994; Bul. 1994 and 1996, R 1996) Energy Management Equipment

UL 1449

(2006) Surge Protective Devices

1.2 RELATED REQUIREMENTS

Section 15050N, "Basic Mechanical Materials and Methods," applies to this section, with the additions and modifications specified herein.

1.3 DEFINITIONS

1.3.1 Digital Controller

A control module which is microprocessor based, programmable by the user, has integral input/output within the module or on network connected modules, and performs stand-alone operations.

1.3.2 Direct Digital Control (DDC)

Digital controls, as defined in this specification, performing control logic. The controller directly senses building environment and makes control decisions based on user defined, controller resident programs. The controller outputs control signals that directly operate valves, dampers, and motor controllers. No conventional control devices, pneumatic or electronic, such as receiver-controllers, thermostats, and logic units are present within or interface with a direct digital control loop. Actuators are electric or pneumatic, and the controller output is converted to the appropriate type of signal.

1.3.3 DDC System

A system made up of one or more digital controllers which communicate on a network.

1.3.4 Distributed Control

The intent of distributed control is to install the controllers near their respective controlled equipment. The control system consists of stand-alone controllers, with the total number of input and output points limited to 48 or less per controller. Failure of any single controller will not cause the loss of more than 48 control points.

1.3.5 Dynamic Control

A process that optimizes energy efficiency of HVAC systems (air handling units, converters, chillers, and boilers) by increasing and decreasing set points or starting and stopping equipment in response to heating and cooling needs of the facility. A requirement of dynamic control is knowing

the heating/cooling demand status of the process. Therefore dynamic control requires controllers connected in a communications network.

1.3.6 Firmware

Firmware is software programmed into read only memory (ROM) and erasable programmable read only memory (EPROM) chips. Software may not be changed without physically altering the chip.

1.3.7 Hand-Held Terminal

A hand-held terminal is a manufacturer specific device connected directly to a communications port on a controller, through which the controller is accessed and, in some cases, programmed.

1.3.8 Input/Output (I/O) Points

I/O points refer to analog inputs (AI), digital inputs (DI), analog outputs (AO), and digital outputs (DO) in a digital controller. Another term for digital inputs and outputs is binary inputs and outputs. Inputs are from analog sensors (temperature, pressure, humidity, flow) and digital sensors (motor status, flow switches, switch position, and pulse output devices). Outputs operate modulating and on/off control devices.

1.3.9 I/O Expansion Unit

An I/O expansion unit provides additional point capacity to a digital controller and communicates with the stand-alone digital controller on a LAN. An I/O unit is not stand-alone because the control program does not reside in the I/O unit. An I/O expander which connects directly to a stand alone controller through a multi-line microprocessor bus is restricted to reside within 3 feet of the stand alone controller and is considered part of the stand alone controller.

1.3.10 Local Area Network (LAN)

- a. A communications bus that interconnects digital controllers for peer-to-peer (see "peer-to-peer" below) communications. Different levels of LANs are possible within a single DDC system. In this case, a digital controller on a higher level LAN acts as a network controller to the controllers on the lower level LAN. The network controller, then, has at least two LAN communications ports. One port supports peer-to-peer communications with other digital controllers on the higher level LAN. The other port supports communications with the digital controllers on the lower level LAN.
- b. LANs permit sharing global information. This allows building and site wide control strategies such as peak demand limiting, dynamic control strategies, coordinated response to alarm conditions, and remote monitoring and programming of digital controllers.

1.3.11 Microprocessor

A microprocessor refers to the central processing unit (CPU) that contains all registers and logic circuitry that allow digital controllers to function.

1.3.12 Output Signal Conversion

Output signal conversion refers to changing one kind of control output into a proportionally related signal appropriate for direct actuation of the controlled device. An example is converting a 4 to 20 mA or 0 to 10 VDC signal to a proportional 3 to 15 psig signal to operate a pneumatic actuator.

1.3.13 Optimum Start

Optimum start is a method of starting HVAC equipment prior to scheduled occupancy in order to have the building at set point when occupied. Optimum start is based on the zone temperatures, zone set points, and outdoor temperature.

1.3.14 Peer-to-Peer

Peer-to-peer refers to controllers connected on a communications LAN that act independently, as equals, and communicate with each other to pass information.

1.3.15 PID

PID refers to proportional, integral, and derivative control; the three types of action that are used in controlling modulating equipment.

1.3.16 Resolution

Refers to the number of possible states an input value or output value can take and is a function of the digital controller I/O circuitry; the A/D converter for input and the D/A converter for output. Ten bit resolution has 1024 possible states.

1.3.17 Stand-Alone Control

Refers to the digital controller performing required climate control, and energy management functions without connection to another digital controller or computer. Requirements for stand-alone control are a time clock, a microprocessor, resident control programs, PID control, and I/O. All stand-alone controllers have a communication port and firmware for direct connection and interrogation with a laptop computer or similar hand-held device. This interrogation includes parameter changes and program downloads.

1.3.18 Site Building Controller (SBC)

The SBC is an interface controller between the "Sitenet" central server and the DDC system installed in the building. Unless otherwise specified there is one SBC located in each building.

1.3.19 SiteNet

Connection to Base Wide EMCS The control system specified must interface to and shall be completely incorporated into the Camp Lejeune base wide Energy Management and Control System (EMCS) located in Bldg 24 by the contractor. The contractor is responsible for all work inside the project building. Camp Lejeune will make all modifications to the EMCS servers. All points listed on the Mechanical Drawings, such as; AI, BI, AO, BO, setpoint adjustments, alarms, equipment start/stop schedules and

load management shedding objects for mechanical equipment shall communicate via BACNet protocol and be displayed and managed by the Camp Lejeune EMCS server. The Camp Lejeune EMCS system utilizes the Johnson Controls, Inc. Metasys Extended Architecture ADX platform. The contractor shall be responsible for maintaining consistency on object identifier names, descriptions, and graphical presentation of the data. The contractor shall work with the base energy manager to define the load groups to be incorporated into the EMCS load management program. At a minimum all major mechanical systems shall be incorporated into the load reduction program such as chillers, electric boilers, and air handling units. The load reduction program incorporates the base wide demand limiting / load rolling (DLLR) program. The DLLR program limits peak energy usage by monitoring real time energy consumption from six (6) electrical substations serving the base and shedding the appropriate electrical loads to meet target set points. Building DDC supervisory controllers must have the ability to send /receive/ program load shed object information to the EMCS utilizing BACnet/ IP protocol. The EMCS system resides on a LAN managed by Camp Lejeune Marine Corps Base. This requires all I/P devices connected and utilizing this network to be certified by the Defense Information Systems Agency (DISA), in coordination with the National Security Agency (NSA) and the Services and Agencies throughout the Department of Defense (DoD). The standard process known as DoD Information Technology Security Certification and Accreditation Process (DITSCAP), integrates security directly into the system lifecycle and is applied uniformly across DoD. As part of the DITSCAP process vendors I/P devices must be listed on the EMCS System Security Authorization Agreement (SSAA). This is a living document that provides information related to the certification and accreditation (C&A) of a system in accordance with the DITSCAP. This SSAA is tailored to meet the requirements of the system under review. It also provides the Certification Authority (CA) and the Designated Approving Authority (DAA) or DAA at each echelon with a source document for information on the system. It is a user document to assist in establishing sound security policies and practices. Personnel responsible for the security of the system will be familiar with the contents of this document. The SSAA must be completed prior to final acceptance of the HVAC controls construction under this section. It is the contractor's responsibility to ensure acceptable equipment is proposed and installed. Final approval of the proposed equipment will not be given until the SSAA is complete and Approval to Operate (ATO) is granted from Marine Corps Base Camp Lejeune DAA. To avoid construction delays early submission is advised as the approval process can be lengthy.

1.3.20 Terminal Control Unit (TCU)

An off-the-shelf, stand-alone digital controller equipped for communication on a lower level LAN. TCUs may deviate from stand-alone only in receiving energy management and time information from a stand alone digital controller. A TCU is commonly application specific and is used for distributed control of specific HVAC subsystems. A TCU communicates with other digital controllers. Typically, a TCU communicates on a lower level LAN. Examples where TCUs are used include small air handling units (AHUs), variable air volume (VAV) boxes, fan coil units, and heat pumps.

1.3.21 Workstation

The workstation is a computer with installed software to provide an interface for monitoring, troubleshooting, and making adjustments to the program or operating parameters of all DDC controllers, including TCU's.

1.4 DDC SYSTEM DESCRIPTION

- a. Remove existing and provide new and modify existing DDC systems including associated equipment and accessories. Manufacturer's products, including design, materials, fabrication, assembly, erection, examination, inspection, and testing shall be in accordance with ASME B31.1 and NFPA 70, except as modified herein or indicated otherwise.
- b. Provide the DDC systems to maintain stable temperature control and all other conditions as indicated. The end-to-end accuracy of the system, including temperature sensor error, wiring error, A/D conversion, and display, shall be 1 degree F or less.
- c. Provide a DDC system with a new workstation and workstation software. If working with an existing DDC system of the same manufacturer, upgrade the existing workstation software with the manufacturers' latest software version.

1.4.1 Design Requirements

1.4.1.1 Control System Schematic

Provide control system schematic that includes the following:

- a. Location of each input and output device
- b. Flow diagram of each HVAC component, for instance flow through coils, fans, dampers
- c. Name or symbol for each component such as V-1, DM-2, and T-1 for a valve, damper motor, and temperature sensor, respectively
- d. Set points
- e. Sensor range
- f. Actuator range
- g. Valve and damper schedules and normal position
- h. Switch points on input switches
- i. Written sequence of operation for each schematic
- j. Schedule identifying each sensor and controlled device with the following information:
 - (1) LAN and Software point name with send and receive address if applicable
 - (2) Point type (AO, AI, DO, DI)
 - (3) Point range
 - (4) Digital controller number for each point

1.4.1.2 Electrical Equipment [Ladder Diagrams](#)

Submit diagrams showing electrical equipment interlocks, including voltages and currents.

1.4.1.3 [Component Wiring Diagrams](#)

Submit a wiring diagram for each type of input device and each type of output device. Diagram shall show how the device is wired and powered; showing typical connections at the digital controller and each power supply, as well as at the device itself. Show for all field connected devices, including, but not limited to, control relays, motor starters, electric or electronic actuators, and temperature, pressure, flow, proof, and humidity sensors and transmitters.

1.4.1.4 [Terminal Strip Diagrams](#)

Submit a diagram of each terminal strip, including digital controller terminal strips, terminal strip location, termination numbers and the associated point names.

1.4.1.5 [Communication Architecture Schematic](#)

Submit a schematic showing communication networks used for all DDC system controllers, workstations, and field interface devices.

1.5 SUBMITTALS

Submit manufacturers' specification sheets for each type of equipment to show compliance with the project specification. For each type of equipment highlight each compliance item and reference each item to the relevant specification paragraph number. Submit sufficient manufacturers' information to allow verification of compliance by the reviewing authority. Equipment and software for which specification compliance data shall be submitted includes but is not limited to the following:

[SD-02 Shop Drawings](#)

[List of Symbols and Abbreviations Used on Drawings](#)

[List of I/O Points](#)

[Equipment Components List](#)

[AC Power Table](#)

[Control system schematic](#)

[Ladder diagrams](#)

[Component wiring diagrams](#)

[Terminal strip diagrams](#)

[Communication architecture schematic](#)

After initial submittal and approval, submit the following:

Drawing of operating program in the un-compiled form

Copy of the graphic pages of the operating interface program

SD-03 Product Data

DDC hardware

DDC capabilities

Variable frequency drive hardware

Workstation software

Input devices

Output devices

Surge and transient protection

Hand-held terminal

Smoke detectors

SD-06 Test Reports

Field tests

Performance verification tests

SD-07 Certificates

Contractors Qualifications

Training

Pressure Tank Certification

SD-10 Operation and Maintenance Data

Controls and HVAC System Operators Manual

DDC Manufacturer's Hardware and Software Manuals

SD-11 Closeout Submittals

Posted operating instructions:

Provide administrative and closeout submittals:

Training course documentation

Service organizations

Contractor certification

1.6 OPERATING ENVIRONMENT

Protect components from humidity and temperature variations, dust, and other contaminants, within limits published by the manufacturer.

1.7 QUALITY ASSURANCE

1.7.1 Standard Products

- a. Material and equipment shall be standard products of manufacturer regularly engaged in the manufacturing of such product, using similar materials, design and workmanship. The standard products shall have been in commercial or industrial use for 2 years prior to bid opening. The 2-year use shall include applications of similarly sized equipment and materials used under similar circumstances and sold on the commercial market through advertisements, manufacturers' catalogs, or brochures.
- b. Products are supported by a local service organization.

1.7.1.1 DDC Hardware

- a. I/O type and characteristics
- b. Resident programs
- c. Communications ports
- d. Protected memory
- e. Operating temperature limits

1.7.1.2 DDC Capabilities

- a. Communications; baud rates, communication ports, hierarchy
- b. Trending capabilities
- c. Alarming capabilities; capable of alarm generation as defined in this specification
- d. Messaging capabilities
- e. Self diagnostic capabilities
- e. PID control capabilities

1.7.1.3 Workstation Software

- a. Mouse and keyboard operation
- b. Communications
- c. DDC Program download capability
- d. Dynamic point update
- e. Program modification
- f. Database modification
- g. Graphics and graphics modification

- h. Penetration of graphics

1.7.1.4 Input Devices

- a. Transmitters
- b. Temperature sensors
- c. Humidity sensors
- d. Pressure sensors
- e. Flow or motor proof
- f. Sensor wells

1.7.1.5 Output Devices

- a. Dampers
- b. Valves
- c. Actuators
- d. Control relays
- e. Solenoid air valves
- f. Electronic to pneumatic transducer

1.7.1.6 Surge and Transient Protection

- a. Power line
- b. Communications lines
- c. Controller I/O

1.7.2 Nameplates and Tags

- a. Nameplates and tags bearing device unique identifiers shall be engraved or stamped. Permanently attach nameplates to HVAC control panel doors and back plates.
- b. For each field mounted piece of equipment attach a plastic or metal tag with equipment name and point identifier.

1.7.3 Verification of Dimensions

The contractor shall verify all dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing work.

1.7.4 Drawings

Because of the small scale of the drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. The Contractor shall carefully investigate the mechanical, electrical, and finish conditions that could affect the work, and shall furnish all work necessary to meet such conditions.

1.7.4.1 List of Drawings

Provide a list of drawings.

1.7.4.2 List of Symbols and Abbreviations Used on Drawings

Provide an index of symbols and abbreviations used on the drawings.

1.7.4.3 List of I/O Points

For each input and output physically connected to a digital controller provide, on a controller by controller basis, provide the following:

- a. Point description: for example: mixed air temperature, supply fan start/stop, etc.
- b. Point type: AO, AI, DO, or DI.
- c. Point range
- d. Sensor range associated with point range:
- e. Software name(s) associated with point, if any.
- f. Point connection terminal number

1.7.4.4 Equipment Components List

Submit a listing of controllers and connected devices shown on control system schematic. List the following:

- a. Control system schematic name
- b. Description
- c. Manufacturer of controller
- d. Controller's name
- e. Equipment part numbers
- f. Cv for valves
- g. For actuators:
 - (1) Motive force (such as pneumatic, or electric)
 - (2) Normal position
 - (3) Nominal operating range (such as 3 to 7 psi, 4 to 8 mA)

1.7.4.5 AC Power Table

Submit a table listing each controller and the circuit breaker number, panel box number, and physical location of each controller's source of AC power.

1.7.5 Contractors Qualifications

- a. The Contractor or subcontractor performing the work shall have completed at least three DDC systems installations of a similar design and have successfully operated a similar sequence of operation for at least three years.

1.7.6 Pressure Tank Certification

Provide certification stating pressure tanks are constructed and labeled in accordance with ASME BPVC SEC VIII for a minimum of 125 psig working pressure.

1.7.7 Training Course Documentation

Training course documentation shall include a manual for each trainee plus two additional copies and two copies of audiovisual training aids, if used. Documentation shall include an agenda, defined objectives for each lesson and detailed description of the subject matter of each lesson.

1.7.8 Service Organizations

Qualified service organization list that shall include the names and telephone numbers of organizations qualified to service the HVAC control systems.

1.7.9 Contractor Certification

Provide certification that the installation of the control system is complete and meets the technical requirements of this section.

1.7.10 Controls and HVAC System Operators Manual

Provide two copies of a Control and HVAC Systems Operators Manual. Provide in a 3 ring binder with a minimum of the following 7 sections. Use tabs to divide each section.

- a. Description of HVAC Systems: Provide a description of the HVAC system components and control system. Include sequence of operation and a complete points list.
- b. Controls Drawings: Provide drawings as specified in submittal paragraph.
- c. Control Program Listings: Provide listing of all control programs, including terminal equipment controller setup pages if used.
- d. Current Operating Parameters: Provide printouts of input and output setup information, (database setups). This section provides information such as point addresses, slopes and offsets for all points, database of points, etc.
- e. Design Information: Provide tab, but leave this section blank.
- f. Control Equipment Technical Data Sheets: Provide technical data sheets for all controller hardware and accessories.

1.7.11 Software delivered to the Owner

In addition to software loaded into the controllers provide on separate CDs and loaded into the laptop workstation:

- a) One registered copy of all software used to program control sequences in direct digital controllers, LAN controllers and field configurable smart controllers.
- b) One un-compiled copy in editable format of the final version of all operating software installed on all direct digital controllers.
- c) One compiled copy of the final version of all operating software installed on all direct digital controllers.

Additionally:

- d) Where specially programmed factory configured smart controllers are used in the system, provide the minimum factory programming tools and specialized controller programs ready for download to replacement controllers.

Provide any access keys which restrict programming language software functions or the ability to compile or prepare programming for download to controllers.

1.7.12 DDC Manufacturer's Hardware and Software Manuals

Provide the following manuals.

- a. Installation and Technical Manuals for all digital controller hardware.
- b. Installation and Technical Manuals for workstation.
- c. Operator Manuals for all digital controllers.
- d. Operator Manuals for all workstation software.
- e. Programming Manuals for all digital controllers.
- f. Programming Manuals for workstation software.

1.7.13 Modification of References

The advisory provision in **ASME B31.1** and **NFPA 70** are mandatory. Substitute the word "shall" for "should" wherever it appears and interpret all references to the "authority having jurisdiction" and "owner" to mean the Contracting Officer.

PART 2 PRODUCTS

2.1 DDC SYSTEM

- a. Provide a DDC system as a distributed control system. The system shall have stand-alone digital controllers, a communications Network, and a separate workstation computer with workstation software.

- b. Provide an operator programmable system to perform closed-loop, modulating control of building equipment. Connect all digital controllers through the communication network to share common data and report to workstation computers. Provide workstation DDC software capable of programming and monitoring the digital controllers. The control system shall be capable of downloading programs between the workstation and digital controllers.
- c. Provide the quantity of digital controllers indicated on the drawings to perform required climate control, energy management, and alarm functions. The quantity of controllers shall be no less than the number shown on drawings. All material used shall be currently in production.

2.1.1 Direct Digital Controllers

DDC hardware shall be UL 916 rated.

2.1.2 Distributed Control

Apply digital controllers in a distributed control manner.

2.1.3 I/O Point Limitation

Total number of I/O hardware points, including those communicated over a LAN, used by a single stand-alone digital controller, including I/O expansion units shall not exceed 48.

2.1.4 Environmental Operating Limits

Provide digital controllers that operate in environmental conditions between 32 and 120 degrees F.

2.1.5 Stand-Alone Control

Provide stand-alone digital controllers.

2.1.6 Internal Clock

Provide a clock with each stand-alone controller. Each controller shall have its clock backed up by a battery or capacitor with sufficient capacity to maintain clock operation for a minimum of 72 hours during power outage.

2.1.7 Memory

- a. Provide sufficient memory for each controller to support required control, communication, trends, alarms, and messages
- b. Memory Protection: Programs residing in memory shall be protected either by using EEPROM, flash memory, or by an uninterruptible power source (battery or uninterruptible power supply (UPS)). The backup power source shall have sufficient capacity to maintain volatile memory during an AC power failure. Where the uninterruptible power source is rechargeable (a rechargeable battery), provide sufficient back-up capacity for a minimum of seventy-two hours. The rechargeable power source shall be constantly charged while the controller is operating under normal line power. Where a non-rechargeable power source is used, provide sufficient capacity for a minimum of two years accumulated power

failure. Batteries shall be replaceable without soldering.

2.1.8 Inputs

Provide input function integral to the direct digital controller. Provide input type(s) as required by the DDC design. For each type of input used on high-level controllers, provide at least one similar spare input point per controller.

- a. Analog Inputs: Allowable input types are 100 ohm (or higher) platinum RTDs, thermistors, 4 to 20 mA, and 0-10 VDC. Thermistor and direct RTD inputs must have appropriate conversion curves stored in controller software or firmware. Analog to digital (A/D) conversion shall have 10-bit minimum resolution.
- b. Digital Inputs: Digital inputs shall sense open/close, on/off, or other two state indications.

2.1.9 Outputs

Provide output function integral to the direct digital controller. Provide output type(s) as required by the DDC design. For each type of output used on high-level controllers, provide at least one similar spare output point per controller.

- a. Analog Outputs: Provide controllers with a minimum output resolution of 10 bits. Output shall be 4 to 20 mA, 0 to 10 VDC, or 0 to 20 psig. Each pneumatic output shall have feedback for monitoring of the actual pneumatic signal.
- b. Digital Outputs: Provide contact closure with contacts rated at a minimum of 1 ampere at 24 volts.

2.1.10 PID Control

Provide controllers with proportional, integral, and derivative control capability. Terminal controllers are not required to have the derivative component.

2.1.11 Digital Controller Networking Capabilities

The upper level digital controllers shall be capable of networking with other similar upper level controllers. Upper level controllers shall also be capable of communicating to the Site Building Controller.

2.1.12 Communications Ports

- a. Controller-to-Controller LAN Communications Ports: Controllers in the building DDC system shall be connected in a communications network. Controllers shall have controller to controller communication ports to both peer controller (upper level controllers) and terminal controllers (lower level controllers). Network may consist of more than one level of local area network and each level may have multiple drops. Communications network shall permit sharing information between controllers, allowing execution of dynamic control strategies, and coordinated response to alarm conditions. Minimum baud rate for the lowest level LAN shall be 9600 Baud. Minimum baud rate for the highest level LAN shall be 9600 Baud. Minimum baud rate for a DDC system consisting

of a single LAN shall be 9600 Baud.

b. On-Site Interface Ports:

(1) All Controllers: Provide a RS-232, RS-485, USB, or RJ-11 (Lon/Bacnet) communications port for each digital controller that allows direct connection of a computer or hand held terminal and through which the controller may be fully accessed. Controller access shall not be limited to access through another controller. On-site interface communication ports shall be in addition to the communications port(s) supporting controller to controller communications. Communication rate shall be 9600-Baud minimum.

(2) highest Level LAN: Every controller on the highest level LAN shall have a communications port supporting direct connection of the workstation computer; a hand held terminal port is not sufficient. By connecting the workstation computer to this port, every controller in the direct digital control system shall be able to be fully accessed and programmed. The following operations shall be available: downloading and uploading control programs, modifying programs and program data base, modifying set points, and retrieving or accepting trend reports, status reports, messages, and alarms.

c. SiteNet Interface Port: Provide one additional communications port in each DDC system permitting remote communications via the Site Building controller.

2.1.13 Digital Controller Cabinet

Each indoor digital controller cabinet shall protect the controller from dust and shall be rated NEMA 1, unless specified otherwise. Each outdoor digital controller cabinet shall protect the controller from all outside conditions and shall be rated NEMA 4. Cabinets for high level controllers shall be hinged door, lockable, and have offset removable metal back plate.

2.1.14 Main Power Switch

Each controller on the highest level LAN or each control cabinet shall have a main external power switch for isolation of the controller from AC power. The switch shall be located in the DDC cabinet.

2.2 TERMINAL CONTROL UNITS

- a. The same company as the digital controllers shall manufacture TCUs.
- b. TCUs shall automatically start-up on return of power after a failure, and previous operating parameters shall exist or shall be automatically downloaded from a digital controller on a higher level LAN.
- c. TCUs do not require an internal clock, if they get time information from a higher level digital controller.

2.3 DDC SOFTWARE

2.3.1 Programming Software

All controllers except TCU's shall be programmable. The operating software shall be created using a windows based drag and drop graphical programming software. TCU's may have permanently installed un-modifiable programs with modifiable parameters.

2.3.2 Sequence of Control

Provide, in the digital controllers, software to execute the sequence of control. At minimum, controllers must be capable of performing programming functions outlined in the following "Parameter Modification" section.

2.3.2.1 Parameter Modification

Provide software to modify control parameters. Parameter modification shall be accomplished for all controllers (high level and low level application specific) through the laptop workstation computer or keypad terminal directly at each controller. Modifications shall be accomplished without having to make changes directly in un-compiled programming. Database parameters in the following list that take real number values shall require assignment of variable names so parameters can be changed without modifying programming. Alternatively, block programming languages shall provide for modification of these database parameters in fill-in-the-blank screens. Parameters of like type, including those in different high level and low level controllers, may be grouped together for a single, global change. For example, an operator may group all second floor space temperature set points into a group and raise the set point by two degrees with a single command. The following parameters shall be modifiable in this way:

- a. Set points
- b. Dead band limits and spans
- c. Reset schedules
- d. Switchover points
- e. PID gains and time between control output changes
- f. Time
- g. Timed local override time
- h. Occupancy schedules
- i. Holidays
- j. Alarm points, alarm limits, and alarm messages
- k. Point definition database
- l. Point enable, disable, and override
- m. Trend points, trend intervals, trend reports
- n. Analog input default values

- o. Passwords
- p. Communications parameters including network and telephone communications setups

2.3.2.2 Differential

Where set point is in response to some analog input such as temperature, pressure, or humidity, include a set point differential for the control loop to prevent short cycling of control devices.

2.3.3 Motor and Flow Status Delay

Provide an adjustable delay between when a motor is commanded on or off and when the control program looks to the motor or flow status input for confirmation of successful command execution.

2.3.4 Runtime Accumulation

Provide re-settable run time accumulation for each controlled digital output.

2.3.5 Timed Local Override

Provide user definable adjustable run time for each push of a momentary contact timed local override. Pushes shall be cumulative reset clock with each push designating the same length of time. Provide a user definable limit on the number of contact closures summed, such as 6, before the contact closures are ignored. Timed local overrides are disabled during occupancy periods.

2.3.6 Time Programs

Provide programs to automatically adjust for leap years, and make daylight savings time and standard time adjustments.

2.3.7 Scheduling

- a. Individual controlled equipment shall be schedulable with schedule based on time of day, day of week, and day of year. Equipment may be associated into groups. Each group may be associated with a different schedule. Changing the schedule of a group shall change the schedule of all equipment in the group. Groups may be modified, created and deleted by the operator.
- b. Provide capability that will allow current schedules to be viewed and modified in a seven-day week format. When control program does not automatically compute holidays, provide capability to enter holiday schedules one full year at a time.

2.3.8 Point Override

I/O and virtual points shall accept software overrides to any possible value.

2.3.9 Alarming

I/O points and software points shall be alarmable. Alarms may be enabled

and disabled for every point. Alarm limits shall be adjustable on analog points. Controllers connected to an external communications device such as a printer, terminal, or computer, shall download alarm and alarm message when alarm occurs. When a computer workstation is connected to a DDC system with a modem, operator selected alarm conditions will initiate a call and report to the computer or an alphanumeric pager. Otherwise alarms will be stored and automatically downloaded when a communications link occurs. The following conditions shall generate alarms:

- a. Motor is commanded on or off but the motor status input indicates no change
- b. Temperature, humidity, or pressure strays outside selectable limits
- c. An analog input takes a value indicating sensor failure
- d. A module is not communicating on the LAN
- e. A power outage occurs

2.3.10 Messages

Messages shall be operator defined and assigned to alarm or status conditions. Messages shall be displayed on the workstation or printer when these conditions occur.

2.3.11 Trending

DDC system shall have the capability to trend all I/O and virtual points. Points may be associated into groups. A trend report may be set up for each group. The period between logging consecutive trend values shall range from one minute to 60 minutes at a minimum. The minimum number of consecutive trend values stored at one time shall be 30 per variable. When trend memory is full, the most recent data shall overwrite the oldest data. Trend data shall be capable of being uploaded to computer. Trend data shall be available on a real time basis; trend data shall appear numerically and graphically on a connected computer's screen as the data is processed from the DDC system. Trend reports shall be capable of uploading to computer for storage.

2.3.12 Status Display

Current status of I/O and virtual points shall be displayed on command. Points shall be associated into functional groups, such as all the I/O and virtual points associated with control of a single air handling unit, and displayed as a group, so the status of a single mechanical system can be readily checked. A group shall be selectable from a menu of groups having meaningful names; such as AHU-4, Second Floor, Chiller System, and other such names.

2.3.13 Diagnostics

Each controller shall perform self-diagnostic routines and provide messages to an operator when errors are detected. The DDC system shall be capable of recognizing a non-responsive module on a LAN. The remaining, responsive modules on a LAN shall not operate in a degraded mode.

2.3.14 Power Loss

During a power outage, each controller shall assume a disabled status and outputs shall go to a user definable state. Upon restoration of power, DDC system shall perform an orderly restart, with sequencing of outputs.

2.3.15 Program Transfer

Provide software for download of control programs and database from a computer to controllers and upload of same to computer from controllers. Every digital controller in the DDC system shall be capable of being downloaded and uploaded to through a single controller on the highest level LAN.

2.3.16 Password Protection

Provide at least three levels of password protection to the DDC system permitting different levels of access to the system. The lowest level allows monitoring only. The highest level allows full control of all functions, including setting new passwords.

2.3.17 Network Variable Instance Chart

The "Network Variable Instance Chart" is a graphical listing of all the points and how they are seen electronically by their respective networks. The two Network Variable Instance Charts below are examples of the type of information required for each point. The first chart is for the Bacnet Protocol. The second chart is for the LonWorks protocol (SNVT).

POINT NAME	POINT DESCRIPTION	Object Type	Instance	BacNet Network
BAC ChillWtrSYS	Chilled Water System Controller	Device	1000	95
BAC CrsOvrLpFlw	Cross Over Loop Chill Wtr Flow	Analog Input	1001	95
BAC CrsOvrLpTmp	Cross Over Loop Chill Wt Temp	Analog Input	1002	95
BAC CT1Amps	Cooling Tower #1 Amps	Analog Input	1003	95
BAC CT2Amps	Cooling Tower #2 Amps	Analog Input	1004	95
BAC CT3Amps	Cooling Tower #3 Amps	Analog Input	1005	95
BAC FL1.DA11	Flr1 Zone #11 Discharge Air T	Analog Input	1006	95
BAC FL1.DA12	Flr1 Zone #12 Discharge Air T	Analog Input	1007	95
BAC FL1.DA2	Flr1 Zone #02 Discharge Air T	Analog Input	1008	95

POINT NAME	POINT DESCRIPTION	Object Type	Instance	BacNet Network
BAC LL1.DA3	Flr1 Zone #03 Discharge Air T	Analog Input	1009	95
BAC LL1.RA	Lower Lev1 Return Air Temp	Analog Input	1010	95
BAC LL1.RHUM	Lower Lev1 Ret Air Humidity	Analog Input	1011	95
BAC LL1.RS	Lower Lev1 Ret Static Pressure	Analog Input	1012	95
BAC LL1RLOAD	Lower Lev1 Return Fan Amps	Analog Input	1013	95
BAC LL1SLOAD	Lower Lev1 Supply Fan Amps	Analog Input	1014	95
BAC LL2.CO2	Lower Lev2 CO2 Sensor	Analog Input	1015	95
BAC LL2.DA	Lower Lev2 Supply Air Temp	Analog Input	1016	95
BAC OCCMD	Chilled water System Enable	Binary Output	1017	95
BAC CHWSSP	Chilled Water Supply Setpoint	Analog Output	1018	95
BAC CDWDiffPrs	Condenser Loop Diff Pressure	Analog Input	1019	95

SNVT NAME	POINT DESCRIPTION	SNVT TYPE
NviSetPoint	Space Setpoint	SNVT temp p
NvoHeatOutput	Heat Output Percent	SNVT lev percent
NvoCoolOutput	Cool Output Percent	SNVT lev percent
NvoFanSpeed	Fan Speed Position	SNVT switch
NviOccCmd	Occupied Command	SNVT occupancy
NviApplicMode	HVAC Mode	SNVT hvac mode
NvoSetpointOffset	Setpoint Offset	SNVT temp p
NvoDischAirTemp	Discharge Air Temperature	SNVT temp p
NvoSpaceTemp	Space Temperature	SNVT temp p
NvoEffectSetpt	Effective Setpoint	SNVT temp p
NvoOccCmd	Occupied Command Feedback	SNVT occupancy
NvoUnitStatus	Unit Run Status	SNVT hvac status

The following chart is a listing of all points required on this project. Provide the Network Variable Instance Chart in the appropriate format for this project. Make all of these point available to SiteNet. Ensure proper communications between the DDC system installed and the Site Building Controller.

POINT DESCRIPTION	Object Type
Chilled Water System Controller	Device
Cross Over Loop Chill Wtr Flow	Analog Input
Cross Over Loop Chill Wt Temp	Analog Input
Cooling Tower #1 Amps	Analog Input
Cooling Tower #2 Amps	Analog Input
Cooling Tower #3 Amps	Analog Input
Flr1 Zone #11 Discharge Air T	Analog Input
Flr1 Zone #12 Discharge Air T	Analog Input
Flr1 Zone #02 Discharge Air T	Analog Input
Flr1 Zone #03 Discharge Air T	Analog Input
Lower Lev1 Return Air Temp	Analog Input
Lower Lev1 Ret Air Humidity	Analog Input
Lower Lev1 Ret Static Pressure	Analog Input
Lower Lev1 Return Fan Amps	Analog Input
Lower Lev1 Supply Fan Amps	Analog Input
Lower Lev2 CO2 Sensor	Analog Input
Lower Lev2 Supply Air Temp	Analog Input
Chilled water System Enable	Binary Output
Chilled Water Supply Setpoint	Analog Output
Condenser Loop Diff Pressure	Analog Input

2.4 Workstation

- a. Provide a workstation computer with installed software to provide an interface for monitoring, troubleshooting, and making adjustments to the program or operating parameters of all DDC controllers, including TCUs. The workstation shall also be capable of programming all controllers, including TCUs.
- b. DDC system shall routinely operate continuously without connection to the workstation. Information at the workstation is not required for day to day operations of the direct digital controllers.

2.4.1 Software

Workstation software shall be recommended and supported by the DDC system manufacturer and configured to operate according to the DDC system manufacturer's specifications. Software shall be resident in the workstation computer and permit monitoring and troubleshooting of the DDC system. Workstation software permits modification of controller parameters and control for all controllers, both high level and low level application specific. Operations shall be menu selected. Menu selections shall be made with a mouse.

- a. Menu System: Menu system shall allow an operator to select a particular function or access a particular screen through successive menu penetration.
- b. Controller Parameter Modification: The workstation software shall be an interface for performance specified in paragraph entitled "Parameter Modification" and available through direct connection of a computer to a digital controller. Parameter modification shall require only that an operator "fill in the blank" for a parameter on a screen requesting the information in plain

language. Parameter modifications shall download to the appropriate controllers at operator request.

- c. Program modification: For systems using block programming languages provide a capability for linking blocks together to create new programs or modify existing programs. Program modifications shall download to appropriate controllers at operator request.
- d. Trending: Trend data shall be displayed graphically, with control variable and process variable plotted as functions of time on the same chart. Graphic display of trend data shall be internal to the workstation software and not resulting from download of trend data into a third-party spreadsheet program such as Excel, unless such transfer is automatic and transparent to the operator, and the third-party software is included with the workstation software package. At the operator's discretion, trend data shall be plotted real time.

2.5 Maintenance Personnel Interface Tools

Provide a handheld terminal if required to communicate directly with the Terminal control Units(TCU). If the workstation laptop is not capable, or is not set up to communicate with TCUs except through the DDC LAN, a handheld terminal is required.

2.6 SENSORS AND INPUT HARDWARE

2.6.1 Field Installed Temperature Sensors and Transmitters

2.6.1.1 Thermistors

Precision thermistors may be used in temperature sensing applications below 200 degrees F. Sensor accuracy over the application range shall be 0.36 degree F or less between the range of 32 to 150 degrees F. Stability error of the thermistor over five years shall not exceed 0.25 degree F cumulative. Sensor element and leads shall be encapsulated. Bead thermistors are not allowed. A/D conversion resolution error shall be kept to 0.1 degree F. Total error for a thermistor circuit shall not exceed 0.5 degree F, which includes sensor error and digital controller A/D conversion resolution error. Provide 18 gage twisted and shielded cable for thermistors.

2.6.1.2 Resistance Temperature Detectors (RTDs)

Provide RTD sensors with 1000 ohm, or higher, platinum elements that are compatible with the digital controllers. Sensors shall be encapsulated in epoxy, series 300 stainless steel, anodized aluminum, or copper. Temperature sensor accuracy shall be 0.1 percent (1 ohm) of expected ohms (1000 ohms) at 32 degrees F. Temperature sensor stability error over five years shall not exceed 0.25 degree F cumulative. Direct connection of RTDs to digital controllers, without transmitters, is preferred provided controller supports direct connection of RTDs. When RTDs are connected directly to the controller, keep lead resistance error to 0.25 degree F or less. Total error for a RTD circuit shall not exceed 0.5 degree F, which includes sensor error, lead resistance error or 4 to 20 mA or 0 to 10 VDC transmitter error, and A/D conversion resolution error.

2.6.1.3 Temperature Sensor Details

- a. Room Type: Conceal element behind protective cover matched to the room interior. Room temperature sensors connected directly to application specific controllers shall have integral pushbutton, system override digital input button, and a setpoint adjustment lever
- b. Duct Averaging Type: Continuous averaging RTDs for ductwork applications shall be one foot in length for each 4 square feet of ductwork cross-sectional area with a minimum length of 6 feet. Probe type duct sensors of one foot length minimum are acceptable in ducts 12 feet square and less.
- c. Immersion Type: Three inches total immersion for use with sensor wells, unless otherwise indicated.
- d. Sensor Wells: Stainless steel brass material. Provide heat-sensitive transfer agent between exterior sensor surface and interior well surface.
- e. Outside Air Type: Provide element on the buildings north side with sunshade to minimize solar effects. Mount element at least 3 inches from building outside wall. Sunshade shall not inhibit the flow of ambient air across the sensing element. Shade shall protect sensing element from snow, ice, and rain.

2.6.1.4 Temperature Transmitters

Transmitters shall have 4 to 20 mA or 0 to 10 VDC output linearly scaled to the temperature sensed. Transmitter shall be matched to the sensor, factory calibrated, and sealed. Total error shall not exceed 0.1 percent at any point across the measured span. Supply voltage shall be 24 volts ac or dc. Transmitters shall have non-interactive offset and span adjustments. For temperature sensing, transmitter stability shall not exceed 0.05 degrees C a year.

2.6.1.5 Temperature Transmitter Spans and Ranges

Transmitter spans or ranges shall meet the following:

- a. Temperature:
 - (1) 50 degrees F span: Room, chilled water, cooling coil discharge air, return air sensors
 - (2) 100 degrees F span: Outside air, hot water, heating coil discharge air, mixed air sensors
 - (3) 200 degrees F span: High temperature hot water, heating hot water, chilled/hot water system sensors.

2.6.2 Relative Humidity Transmitters

Provide integral humidity transducer and transmitter. Output of relative humidity instrument shall be a 4 to 20 mA or 0 to 10 VDC signal proportional to full range of relative humidity input. Accuracy shall be 2 percent of full scale, long-term stability shall be less than one percent drift per year. Range shall be 10 to 90 percent minimum relative humidity.

Sensing element shall be polymer or thin film polymer type.

2.6.3 Pressure Transmitters

Provide integral pressure transducer and transmitter. Output of pressure instrument shall be a 4 to 20 mA signal proportional to the pressure span. Accuracy shall be 1.0 percent. Linearity shall be 0.1 percent. Span shall be as follows:

- (1) -0.5 to 0.5 inches water differential range: static pressure control of rooms
- (2) 0 to 5 inches water differential range: Duct static pressure
- (3) 0 to 60 psig differential: Water differential pressure

2.6.4 Current Transducers

Provide current transducers to monitor amperage of motors. Select current transducer for normal measured amperage to be near 50 percent of full-scale range. Current transducers shall have an accuracy of one percent and 4 to 20 mA or 0 to 10 VDC output signal.

2.6.5 Air Quality Sensors

2.6.5.1 CO2 Sensor

Provide CO2 sensors with integral transducers where shown. Output signal shall be 4 to 20 mA or 0 to 10 VDC. Accuracy shall be +5 percent of full scale.

2.6.5.2 Air Quality Sensor

Provide full spectrum air quality sensors with filters utilizing hot wire element based on the Taguchi principle. The sensor monitors a wide range of gaseous organic materials which are common components of indoor air contaminants. These gaseous materials include paints and solvents, cooking and cigarette smoke, and car exhaust. The Sensor must compensate for temperature and humidity, have span and calibration potentiometers, operate on 24 VDC power with output of 0-10 VDC and operating between 32 to 140 degrees F and 5 to 95 percent RH. Provide isolation power supply for each sensor.

2.6.6 Input Switches

2.6.6.1 Insertion Freeze Protection Switch

Electric switch shall be capillary type. Provide special purpose insertion thermostats with flexible elements a minimum of 20 feet in length for coil face areas up to 40 square feet. Switch contacts shall be rated for motor starter circuit voltage being interrupted. Switch shall be equipped with auxiliary set of contacts for input of switch status to digital controller. Provide additional elements or longer elements for larger coils at the rate of 1-foot of element per 4 square feet of coil. Serpentine capillaries perpendicular to the air flow to uniformly sense the entire airflow. A freezing condition at 18-inch increments along the sensing element shall activate the thermostatic switch. Switch shall require manual reset after activation.

2.6.6.2 Electronic Airflow Measurement Stations and Transmitters

- a. Station - Each station shall contain an array of velocity sensing elements and straightening vanes inside a flanged sheet metal casing. The velocity sensing elements shall be of the RTD or thermistor type. The sensing elements shall be distributed across the duct cross section in the quantity and pattern set forth for measurements and instruments of [ASHRAE 33](#) and [SMACNA HVACTAB](#) for the traversing of ducted air flows. The resistance to airflow through the airflow measurement station shall not exceed 0.08 inch water gage at an airflow of 2,000 fpm. Station construction shall be suitable for operation at airflow of up to 5,000 fpm over a temperature range of 40 to 120 degrees F, and accuracy shall be plus or minus 3 percent over a range of 125 to 2,500 fpm scaled to air volume.
- b. Each transmitter shall produce a linear, temperature compensated 4 to 20 mA or 0 to 10 VDC output corresponding to the actual air flow. The transmitter shall be a 2-wire, loop powered device. The output error of the transmitter shall not exceed 0.5 percent of the calibrated measurement.

2.6.7 Energy Metering

2.6.7.1 Steam Meters

Provide vortex steam meters as shown on drawings. Steam meters, on pressure lines below 100 psig, or where pressures may fluctuate, shall be pressure compensated. All steam meters shall have a minimum turndown ratio of 10 to 1. Meter signal output must be compatible with DDC input. DDC shall measure both instantaneous and accumulated steam flow.

2.7 OUTPUT HARDWARE

2.7.1 Dampers

Damper shall conform to [SMACNA DCS](#).

- a. A single damper section shall have blades no longer than 48 inches and shall be no higher than 72 inches. Maximum damper blade width shall be 8 inches. Larger sized damper shall be made from a combination of sections.
- b. Dampers shall be steel, or other materials where shown. Flat blades shall be made rigid by folding the edges. Blades shall be provided with compressible seals at points of contact. The channel frames of the dampers shall be provided with jamb seals to minimize air leakage. Dampers shall not leak in excess of 20 cfm per square foot at 4 inches water gage static pressure when closed. Seals shall be suitable for an operating temperature range of minus 40 degrees F to 200 degrees F. Dampers shall be rated at not less than 2000 fpm air velocity. All blade-operating linkages shall be within the frame so that blade-connecting devices within the same damper section will not be located directly in the air stream. Damper axles shall be 0.5 inch (minimum) plated steel rods supported in the damper frame by stainless steel or bronze bearings. Blades mounted vertically shall be supported by thrust bearings. Pressure drop through dampers shall not exceed 0.04 inch water gage at 1000 fpm in the wide-open position. Frames shall not

be less than 2 inches in width. Dampers shall be tested in accordance with [AMCA 500-D](#).

- c. Operating links external to dampers (such as crankarms, connecting rods, and line shafting for transmitting motion from damper actuators to dampers) shall withstand a load equal to twice the maximum required damper-operating force. Rod lengths shall be adjustable. Links shall be brass, bronze, zinc-coated steel, or stainless steel. Moving parts in contact with one another shall be of different materials. Working parts of joints and clevises shall be brass, bronze, or stainless steel. Adjustments of crankarms shall control the open and closed position of dampers.

2.7.2 Valves

2.7.2.1 Valve Assembly

Valves shall have stainless steel stems. Valve bodies shall be designed for not less than 125 psig working pressure or 150 percent of the system operating pressure, whichever is greater. Valve leakage rating shall be 0.01 percent of rated Cv. Class 125 copper alloy valve bodies and Class 150 steel or stainless steel valves shall conform to [ASME/ANSI B16.5](#) as a minimum. Cast iron valve components shall conform to [ASTM A 126](#) Class B or C as a minimum.

2.7.2.2 Butterfly Valve Assembly

Butterfly valves shall be threaded lug type suitable for dead-end service and for modulation to the fully closed position, with noncorrosive discs, stainless steel shafts supported by bearing, and EPDM seats suitable for temperatures from minus 20 degrees F to plus 250 degrees F. Valves shall have a manual means of operation independent of the actuator.

2.7.2.3 Two-Way Valves

Two-way modulating valves shall have equal percentage characteristics.

2.7.2.4 Three-Way Valves

Three-way valves shall have equal percentage characteristics.

2.7.2.5 Duct Coil and Terminal Unit Coil Valves

Provide control valves with either flare-type or solder-type ends provided for duct or terminal-unit coils. Provide flare nuts for each flare-type end valve.

2.7.2.6 Valves for Chilled Water, Condenser Water and Glycol Service

- a. Bodies for valves 1 1/2 inches and smaller shall be brass or bronze, with threaded or union ends. Bodies for valves from 2 inches to 3 inches inclusive shall be of brass, bronze or iron. Bodies for 2 inch valves shall have threaded ends. Bodies for valves from 2 1/2 to 3 inches shall have flanged-end connections. Internal valve trim shall be brass or bronze except that valve stems may be Type 316 stainless steel. Water valves shall be sized for a 3 psi differential through the valve at rated flow, except as indicated otherwise. Select valve flow coefficient (Cv) for an actual pressure drop not less than 50 percent or greater than 125

percent of the design pressure drop at design flow.

- b. Valves 4 inches and larger shall be butterfly valves.

2.7.2.7 Valves for Hot Water Service

Valves for hot water service below 250 Degrees F:

- a. Bodies for valves 1 1/2 inches and smaller shall be brass or bronze with threaded or union ends. Bodies for valves larger than 2 inches shall have flanged-end connections. Water valves shall be sized for a 3 psi differential through the valve at rated flow, except as indicated otherwise. Select valve flow coefficient (Cv) for an actual pressure drop not less than 50 percent or greater than 125 percent of the design pressure drop at design flow.
- b. Internal trim, including seats, seat rings, modulation plugs, and springs, of valves controlling water hotter than 210 degrees F shall be Type 316 stainless steel.
- c. Internal trim for valves controlling water 210 degrees F or less shall be brass or bronze.
- d. Non-metallic parts of hot water control valves shall be suitable for a minimum continuous operating temperature of 250 degrees F or 50 degrees F above the system design temperature, whichever is higher.
- e. Valves 4 inches and larger shall be butterfly valves.

2.7.2.8 Valves for Steam Service

Entire bodies for valves 1 1/2 inches and smaller shall be brass or bronze, with threaded or union ends. Bodies for valves from 2 to 3 inches inclusive shall be of brass, bronze, or iron. Bodies for valves 4 inches and larger shall be iron. Bodies for 2 inch valves shall have threaded ends. Provide bodies for valves 2 1/2 inches and larger shall with flanged-end connections. Steam valves shall be sized for 15 psig inlet steam pressure with a maximum 13 psi differential through the valve at rated flow, except as indicated otherwise.

2.7.2.9 Valves for High Temperature Hot Water Service

Valves for high temperature hot water service above 250 Degrees F. Valve bodies shall conform to [ASME B16.34](#) Class 300. Valve and actuator combination shall be normally closed. Bodies shall be carbon steel, globe type with welded ends on valves 1 inch and larger. Valves smaller than 1 inch shall have socket-weld ends. Packing shall be virgin polytetrafluoroethylene (PTFE). Internal valve trim shall be Type 316 stainless steel. Water valves shall be sized for a 3 psi through the valve at rated flow, except as indicated otherwise. Select valve flow coefficient (Cv) for an actual pressure drop not less than 50 percent or greater than 125 percent of the design pressure drop at design flow.

2.7.3 Actuator

2.7.3.1 Electric Actuators

Provide direct drive electric actuators for all control applications. When

operated at rated voltage, each actuator shall be capable of delivering torque required for continuous uniform motion and shall have end switch to limit travel, or shall withstand continuous stalling without damage. Actuators shall function properly with range of 85 to 110 percent of line voltage. Provide gears of steel or copper alloy. Fiber or reinforced nylon gears may be used for torque less than 16 inch pounds. Provide hardened steel running shafts in sleeve bearing of copper alloy, hardened steel, nylon, or ball bearing. Provide two-position actuators of the single direction, spring return, or reversing type. Provide proportioning actuators capable of stopping at all points in the cycle and starting in either direction, from any point. Provide reversing and proportioning actuators with limit switches to limit travel in either direction unless operator is stall type. Actuators shall have a simple switch for reversing direction, and a button to disengage clutch for manual adjustments. Provide reversible shaded pole, split capacitor, synchronous, or stepper type electric motors.

2.7.3.2 Pneumatic Actuators

Provide piston or diaphragm type actuator with full range or split range springs to provide required sequence specified and fail safe operation.

2.7.4 Output Signal Conversion

2.7.4.1 Electronic to Pneumatic Transducer

Electronic to pneumatic transducer shall convert 4 to 20 mA or 0 to 10 VDC digital controller output signal to a proportional 0 to 20 psig pressure signal (operator scaleable). Accuracy shall be 1.0 percent or better. Linearity shall be 0.1 percent. Transducer shall have feedback circuit that converts pneumatic signal to a proportional 4 to 20 mA or 0 to 10 VDC signal.

2.7.4.2 Pneumatic to Electronic Pressure Transducer

Pneumatic to electronic transducer shall convert 0 to 20 psig signal to a proportional 4 to 20 mA or 0 to 10 VDC signal (operator scaleable). Supply voltage shall be 24 VDC. Accuracy shall be 1.0 percent or better. Linearity shall be 0.1 percent.

2.7.5 Output Switches

2.7.5.1 Control Relays

Shall be double pole, double throw (DPDT), UL listed, with contacts rated to the application, indicator light, and dust proof enclosure. Light indicator is lit when coil is energized and is off when coil is not energized. Relays shall be socket type, plug into a fixed base, and replaceable without need of tools or removing wiring. Encapsulated "PAM" type relays are permissible for terminal control applications.

2.7.5.2 Solenoid Air Valves

Each valve shall have three port operation: common, normally open, and normally closed. Internal parts shall be brass, bronze, or stainless steel. Valves shall be rated at 50 psig minimum when used in a control system operating at 25 psig or less, or 150 psig when used in a control system operating in the range 25 to 100 psig.

2.8 ELECTRICAL POWER AND DISTRIBUTION

For control power provide a new, dedicated source 120 volts or less, 60 Hz, three wire (black, white, and green). Run green ground wire to panel ground; conduit grounds are not sufficient.

2.8.1 Transformers

Transformers shall conform to [UL 506](#). Power digital controllers and terminal control units (TCU's) from dedicated circuit breakers with surge protection specified. Transformers for digital controllers serving terminal equipment on lower level LANs may be grouped to have specified surge protection sized for the number of controllers on a single transformer. Provide a fuse on the secondary side of the transformer.

2.8.2 Surge Protection

Surge and transient protection consist of devices installed externally to digital controllers.

2.8.2.1 Power Line Surge Protection

Surge suppressors external to digital controller, shall be installed on all incoming AC power. Surge suppressor shall be rated by [UL 1449](#), have a fault indicating light, and have clamping voltage ratings below the following levels:

- a. Unit is a transient voltage surge suppressor 120 VAC/1 phase/2 wire plus ground, hard wire individual equipment protector.
- b. Unit must react within 5 nanoseconds and automatically reset.
- c. Voltage protection threshold, line to neutral, starts at no more than 211 volts peak on the 120 VAC line.
- d. The transient voltage surge suppressor must have an independent secondary stage equal to or greater than the primary stage joule rating.
- e. The primary suppression system components must be pure Silicon Avalanche Diodes.
- f. Silicon Avalanche Diodes or Metal Oxide Varistors are acceptable in the independent secondary suppression system.
- g. The Transient Suppression System shall incorporate an indication light which denotes whether the primary and/or secondary transient protection components is/are functioning.
- h. All system functions of the Transient Suppression System must be individually fused and not short circuit the AC power line at any time.
- i. The Transient Suppression System shall incorporate an EMI/RFI noise filter with a minimum attenuation of 13 dB at 10 kHz to 300 MHz.
- j. The system must comply with IEEE C62.41, Class "B" requirements and be tested according to IEEE C62.45.

- k. The system shall operate at -20 degrees C to +50 degrees C.

2.8.2.2 Controller Input/Output Protection

Controller input/output points shall surge protection with optical isolation, metal oxide varistors (MOV), or silicon avalanche devices. Fuses are not permitted for surge protection.

2.8.3 Wiring

Provide complete electric wiring for DDC System, including wiring to transformer primaries. Control circuit wiring shall not run in the same conduit as power wiring over 100 volts. Circuits operating at more than 100 Volts shall be in accordance with Section 16402N, "Interior Distribution System." Circuits operating at 100 Volts or less shall be defined as low voltage and shall be run in rigid or flexible conduit, metallic tubing, metal raceways or wire trays, armored cable, or multi-conductor cable. Provide circuit and wiring protection as required by [NFPA 70](#). Aluminum-sheathed cable or aluminum conduit may be used but shall not be buried in concrete. Use conduit or plenum-rated cable in HVAC plenums. HVAC plenums include the space between a drop ceiling and the architectural ceiling, within walls, and within ductwork. Protect exposed wiring from abuse and damage.

2.8.3.1 AC Control Wiring

- a. Control wiring for 24 V circuits shall be insulated copper 18 AWG minimum and rated for 300 VAC service.
- b. Wiring for 120 V shall be 14 AWG minimum and rated for 600 V service.

2.8.3.2 Analog Signal Wiring

Analog signal wiring shall be 18 AWG single or multiple twisted pair. Each cable shall be 100 percent shielded, and have 20 AWG drain wire. Each wire shall have insulation rated to 300 V ac. Cables shall have an overall aluminum-polyester or tinned-copper (cable-shield tape). Install analog signal wiring in conduit separate from AC power circuits.

2.9 FIRE PROTECTION DEVICES

Provide smoke detectors in return and supply air ducts on downstream side of filters in accordance with [NFPA 90A](#), except as otherwise indicated. Provide UL listed or FM approved detectors for duct installation.

2.9.1 [Smoke Detectors](#)

Provide in systems having air handling capacity over 15,000 cfm in accordance with [NFPA 90A](#). Furnish detectors under Section 13852N, "Interior Fire Alarm System," and install under this section. Smoke control and exhaust systems shall have provision for automatic and manual operation by means of a key operated switch to override any other shut down features and shall be located adjacent to the fire alarm system control panel.

2.10 INDICATORS

2.10.1 Thermometers

Provide bi-metal thermometers in locations as indicated. Bi-metal thermometers shall have either 9 inch scales or 3.5 inch dials and shall have insertion, immersion or averaging elements as indicated. Provide thermowells for liquid sensing applications. Select thermometer ranges so normal temperatures are approximately equal to midpoint readings on the scale.

2.10.2 Pressure Gages

- a. Provide pressure gages for all pneumatic outputs. Select gage range so normal pressures are approximately equal to the midpoint readings on the scale, unless otherwise specified. Accuracy shall be plus or minus 2 percent of the range. Gages shall conform to [ASME B40.100](#).
- b. Gages indicating pneumatic outputs shall have 2 inch diameter faces. Scale shall be 0 to 30 psi, with 1 psi graduations.
- c. Gages for low differential pressure measurements shall be 4 1/2 inch (nominal) size with two sets of pressure taps, and shall have a diaphragm actuated pointer, white dial with black figures, and pointer zero adjustment. Gage shall have ranges and graduations as shown. Accuracy shall be plus or minus 2 percent of scale range.

2.11 VARIABLE FREQUENCY MOTOR DRIVES

The variable frequency drive (VFD) shall convert 240 or 460 volt (+/- 10%), three phase, 60 hertz (+/- 2Hz), utility grade power to adjustable voltage/frequency, three phase, AC power for stepless motor control from 5% to 105% of base speed.

2.11.1 Description

The variable frequency drive (VFD) shall produce an adjustable AC voltage/frequency output for complete motor speed control. The VFD must meet all of the following criteria.

- a. The VFD shall use sinecoded PWM technology. The sinecoded PWM calculations are performed by the VFD microprocessor.
- b. The VFD shall use IGBT transistors for the inverter's three phase output.
- c. The VFD shall use a three phase diode bridge converter to charge the VFD constant voltage capacitor buss.
- d. The VFD shall have the ability for control by either a remote 4-20 mA 0 to 10 VDC control signal or from a local control panel located on the VFD itself.
- e. The VFD shall use microprocessor technology for VFD control. The VFD shall be programmable with a permanently mounted keypad included with each VFD.
- f. The VFD shall be fully self diagnostic. No external programmers,

analyzers, interrogators, or diagnostic boards, shall be needed to annunciate VFD faults or drive internal status.

2.11.2 Code Standards

VFD shall be UL listed as delivered to the end user. The VFD shall meet current National Electrical Code.

2.11.3 VFD Quality Assurance

To ensure quality, each and every VFD shall be subject to a series of in-plant quality controlled inspections before approval for shipment from the manufacture's facilities.

- a. All components shall be tested prior to assembly and the complete unit shall be tested under full load conditions to ensure maximum product reliability.
- b. The VFDs shall be the current standard production unit with at least 10 identical units already in the field.
- c. Engineering support shall be available from the factory of the VFD. Phone support shall be free of charge to the end user for the life of the equipment. Factory support shall be available in the English language.

2.11.4 VFD Service

The VFD shall be supplied with:

- a. 24 month parts and labor warranty. The warranty shall start when the system is accepted by the end user or 30 months from date of shipment.
- b. Installation, operation, and troubleshooting guide(s).

2.11.5 Basic VFD Features

The VFD shall have the following basic features with no more than three separate internal electronic boards.

- a. VFD mounted operator control keypad capable of:
 - (1) Remote/Local operator selection with password access.
 - (2) Run/Stop and manual speed commands.
 - (3) All programming functions.
 - (4) Scrolling through all display functions.
- b. Digital display capable of indicating:
 - (1) VFD status.
 - (2) Frequency.
 - (3) RPM of motor.

- (4) Phase current.
 - (5) Fault diagnostics in descriptive text.
 - (6) All programmed parameters.
- c. Standard PI loop controller with input terminal for controlled variable and parameter settings made while inverter running.
 - d. User interface terminals for end-user remote control of VFD speed, speed feedback, and isolated form C SPDT relay energized on drive fault condition.
 - e. An isolated form C SPDT auxiliary relay energized on run command.
 - f. The VFD shall have a NEMA 1 enclosure for inside installation and NEMA 3R for exterior installation.
 - g. The VFD shall have an adjustable carrier frequency with 16 KHz minimum upper limit.
 - h. The VFD shall have a built in or external line reactor with 3% minimum impedance to protect DC bus capacitors and rectifier section diodes.

2.11.6 Programmable Parameters

The VFD shall include the following operator programmable parameters:

- a. Upper limit frequency.
- b. Lower limit frequency.
- c. Acceleration rate.
- d. Deceleration rate.
- e. Variable torque volts per Hertz curve.
- f. Starting voltage level.
- g. Starting frequency level.
- h. Display speed scaling.
- i. Enable/disable auto-restart feature.
- j. Enable/disable softstall feature.
- k. Motor overload level.
- l. Motor stall level.
- m. Jump frequency and hysteresis band.
- n. PWM carrier frequency.

2.11.7 Protective Circuits and Features

- a. An electronic adjustable inverse time current limit with consideration for additional heating of the motor at frequencies below 45Hz, for the protection of the motor.
- b. An electronic adjustable soft stall feature, allowing the VFD to lower the frequency to a point where the motor will run at FLA when an overload condition exists at the requested frequency. The VFD will automatically return to the requested frequency when load condition permit.
- c. The VFD will have a separate electronic stall at 110% VFD rated current and a separate hardware trip at 190% current.
- d. The VFD shall have ground fault protection that protects output cables and motor from grounds during both starting and continuous running conditions.
- e. The VFD shall have the ability to restart after the following faults:
 - (1) Overcurrent (drive or motor).
 - (2) Power outage.
 - (3) Phase loss.
 - (4) Overvoltage/Undervoltage.
- f. The VFD shall restart into a rotating load without tripping or damaging the VFD or the motor.
- g. The VFD shall keep a log of a minimum of four previous fault conditions, indicating type and time of occurrence in descriptive text.
- h. The VFD shall be able to sustain 110% rated current for 60 sec.
- i. The VFD shall respond to and record the following fault conditions:
 - (1) Over current (and have an indication if the over current was during acceleration, deceleration, or running).
 - (2) Overcurrent internal to the drive.
 - (3) Motor overload at start-up.
 - (4) Over voltage from the utility power.
 - (5) Motor running overload.
 - (6) Overvoltage during deceleration.
 - (7) VFD over heat.
 - (8) Load end ground fault.
 - (9) Abnormal parameters or data in VFD EEPROM.

2.11.8 Operational Conditions

The VFD shall be designed and constructed to operate within the following service conditions.

- a. Ambient Temperature Range, 0 to 120 deg. F.
- b. Non-condensing relative humidity to 90%.

2.11.9 Available Options

Provide Allow for future capability of the following options:

- a. RFI/EMI filters
- b. RS232 or RS422/485 interface card with application software which can both control and monitor the VFD from a attached computer.

PART 3 EXECUTION

3.1 INSTALLATION

Perform installation under supervision of competent technicians regularly employed in the installation of DDC systems.

3.1.1 Wiring Criteria

- a. Input/output identification: Permanently label each field wire, cable, or pneumatic tube at each end with unique descriptive identification.
- b. Rigid or flexible conduit shall be terminated at all sensors and output devices.
- c. Surge Protection: Install surge protection per manufacturer's specification.
- d. Grounding: Ground controllers and cabinets to a good earth ground. Ground controller to a ground in accordance with Section 16402N, "Interior Distribution System." Grounding of the green ac ground wire, at the breaker panel, alone is not adequate. Run metal conduit from controller panels to adequate building grounds. Ground sensor drain wire shields at controller end.
- e. Contractor is responsible for correcting all associated ground loop problems.
- d. Wiring in panel enclosures shall be run in covered wire track.

3.1.2 Digital Controllers

- a. Do not divide control of a single mechanical system such as an air handling unit, boiler, chiller, or terminal equipment between two or more controllers. A single controller shall manage control functions for a single mechanical system. It is permissible, however, to manage more than one mechanical system with a single controller.

- b. Provide digital control cabinets that protect digital controller electronics from dust, at locations shown on the drawings.

3.1.3 Temperature Sensors

Provide temperature sensors in locations to sense the appropriate condition. Provide sensor where they are easy to access and service without special tools. Calibrate sensors to accuracy specified. In no case will sensors designed for one application be installed for another application.

3.1.3.1 Room Temperature Sensors

Provide on interior walls to sense average room temperature conditions. Avoid locations near heat sources or which may be covered by office furniture. Room temperature sensors should not be mounted on exterior walls when other locations are available. Mount center of sensor at 5 feet above finished floor.

3.1.3.2 Duct Temperature Sensors

- a. Provide sensors in ductwork in general locations as indicated. Select specific sensor location within duct to accurately sense appropriate air temperatures. Do not locate sensors in dead air spaces or positions obstructed by ducts or equipment. Install gaskets between the sensor housing and duct wall. Seal duct and insulation penetrations.
- b. String duct averaging sensors between two rigid supports in a serpentine position to sense average conditions. Insulate temperature sensing elements from supports. Provide hinged duct access doors to install averaging sensors if needed.
- c. Locate freeze protection sensors in appropriate locations to sense lowest temperatures, to avoid potential problems with air stratification.

3.1.3.3 Immersion Temperature Sensors

Provide thermowells for sensors measuring temperatures in liquid applications or pressure vessels. Locate wells to sense continuous flow conditions. Do not install wells using extension couplings. Where piping diameters are smaller than the length of the wells, provide wells in piping at elbows to sense flow across entire area of well. Wells shall not restrict flow area to less than 70 percent of pipe area. Increase piping size as required to avoid restriction. Provide thermowells with thermal transmission material within the well.

3.1.3.4 Outside Air Temperature Sensors

Provide outside air temperature sensor in weatherproof enclosure on north side of the building, away from exhaust hoods, air intakes and other areas that may affect temperature readings. Provide sunshields to from direct sunlight.

3.1.4 Damper Actuators

Actuators shall not be mounted in the air stream.

3.1.5 Thermometers

Provide thermometers at locations indicated. Mount thermometers to allow reading when standing on the floor.

3.1.6 Pressure Sensors

3.1.6.1 Differential Pressure

- a. Duct Static Pressure Sensing: Locate duct static pressure tip approximately two-thirds of distance from supply fan to end of duct with the greatest pressure drop.
- b. Pumping Proof with Differential Pressure Switches: Install high pressure side between pump discharge and check valve.
- c. Steam Pressure Sensing: Install snubbers and isolation valves on steam pressure sensing applications.

3.1.7 Pressure Gages

Pneumatic output lines shall have pressure gages mounted near the digital controllers.

3.1.8 Pneumatic Tubing

Run concealed tubing in finished areas, and run exposed tubing in unfinished areas such as mechanical equipment rooms. For tubing to be enclosed in concrete, provide rigid metal conduit or intermediate metal conduit. Provide tubing parallel and perpendicular to building walls throughout. Maximum spacing between tubing supports shall be 5 feet. With the compressor turned off, test each tubing system pneumatically at 1.5 times the working pressure, with a maximum pressure drop of 1 psig. Correct leaks. Caulking of joints will not be permitted. Do not run tubing and electrical power conductors in the same conduit.

3.1.9 Control Drawings

- a. Post laminated copies of as-built control system drawings in each mechanical room.
- b. Provide 3 sets of as-built control drawings to the Contracting Officer.

3.2 TEST AND BALANCE SUPPORT

Controls contractor will coordinate with and provide full time on-site technical support to test and balance (TAB) personnel specified under Section 15950N or any other documents in the project specification. This support shall include:

- a. On-site operation of control systems for proper operating modes during all phases of balancing and testing.
- b. Control setpoint adjustments for proper balancing of all relevant mechanical systems, including VAV boxes.
- c. Setting all control loops with setpoints and adjustments determined by TAB personnel.

3.3 FIELD QUALITY CONTROL

3.3.1 General

- a. Demonstrate compliance of the heating, ventilating, and air conditioning control system with the contract documents. Furnish personnel, equipment, instrumentation, and supplies necessary to perform calibration and site testing. Ensure that test personnel are regularly employed in the testing and calibration of DDC systems.
- b. Testing will include the field tests and the performance verification tests. Field tests shall demonstrate proper calibration of input and output devices, and the operation of specific equipment. Performance verification test shall ensure proper execution of the sequence of operation and proper tuning of control loops.
- c. Obtain approval of the field test plan and performance verification test plan for each phase of testing before beginning that phase of testing. Give to the Contracting Officer written notification of planned testing at least 30 days prior to test. Notification shall be accompanied by the proposed test procedures. In no case will the Contractor be allowed to start testing without written Government approval of field test plan and performance verification test plan.
- d. Before scheduling the performance verification test, furnish field test documentation and written Certified Statement of Field Test Completion to the Contracting Officer for approval. The statement, certified by the DDC system provider, states that the installed system has been calibrated, tested, and is ready for the performance verification test. Do not start the performance verification test prior to receiving written permission from the Government.
- e. Tests are subject to oversight and approval by the Contracting Officer. The testing shall not be run during scheduled seasonal off-periods of heating and cooling systems.

3.3.2 Test Reporting for Field Testing and Performance Verification Tests

- a. During and after completion of the Field Tests, and again after the Performance Verification Tests, identify, determine causes, replace, repair or calibrate equipment that fails to meet the specification, and submit a written report to the Government.
- b. Document all tests with detailed test results. Explain in detail the nature of each failure and corrective action taken. Provide a written report containing test documentation after the Field Tests and again after the Performance Verification Tests. Convene a test review meeting at the job site to present the results to the Government. As part of this test review meeting, demonstrate by performing all portions of the field tests or performance verification test that each failure has been corrected. Based on the report and test review meeting, the Government will determine either the restart point or successful completion of testing. Do not retest until after receipt of

written notification by the Government. At the conclusion of retest, assessment will be repeated.

3.3.3 Contractor's Field Tests

Field tests shall include the following:

3.3.3.1 System Inspection

Observe the HVAC system in its shutdown condition. Check dampers and valves for proper normal positions. Document each position for the test report.

3.3.3.2 Calibration Accuracy and Operation of Inputs Test

Verify correct calibration and operation of input instruments. For each sensor and transmitter, including those for temperature, pressure, humidity, and air quality, record the reading at the sensor or transmitter location using calibrated test equipment. On the same table, record the corresponding reading at the digital controller for the test report. The test equipment shall have been calibrated within one year of use. Test equipment calibration shall be traceable to the measurement standards of the National Institute of Standards and Technology.

3.3.3.3 Actuator Range Adjustment Test

With the digital controller, apply a control signal to each actuator and verify that the actuator operates properly from its normal position to full range of stroke position. Record actual spring ranges and normal positions for all modulating control valves and dampers. Include documentation in the test report.

3.3.3.4 Digital Controller Startup and Memory Test

Demonstrate that programming is not lost after a power failure, and digital controllers automatically resume proper control after a power failure.

3.3.3.5 Surge Protection Test

Show that surge protection, meeting the requirements of this specification, has been installed on incoming power to the digital controllers and on communications lines.

3.3.3.6 Application Software Operation Test

Test compliance of the application software for:

- a. Ability to communicate with the digital controllers, uploading and downloading of control programs
- b. Text editing program: Demonstrate the ability to edit the control program off line.
- c. Reporting of alarm conditions: Force alarms conditions for each alarm, and ensure that workstation receives alarms.
- d. Reporting trend and status reports: Demonstrate ability of software to receive and save trend and status reports.

3.3.4 Performance Verification Tests

Conduct the performance verification tests to demonstrate control system maintains setpoints, control loops are tuned, and controllers are programmed for the correct sequence of operation. Conduct performance verification test during seven days of continuous HVAC and DDC systems operation and before final acceptance of work. Specifically the performance verification test shall demonstrate the following:

3.3.4.1 Execution of Sequence of Operation

Demonstrate the HVAC system operates properly through the complete sequence of operation, for example seasonal, occupied/unoccupied, and warm-up. Demonstrate proper control system response for abnormal conditions by simulating these conditions. Demonstrate hardware interlocks and safeties work. Demonstrate the control system performs the correct sequence of control after a loss of power.

3.3.4.2 Control Loop Stability and Accuracy

Furnish the Government graphed trends of control loops to demonstrate the control loop is stable and that setpoint is maintained. Control loop response shall respond to setpoint changes and stabilize in 3 minutes. Control loop trend data shall be real time and the time between data points shall not be greater than one minute. The contractor shall provide a printer at the job site for printing graphed trends. The printer shall remain on the job site throughout Performance Verification Testing to allow printing trends.

3.4 TRAINING

Submit a training course schedule, syllabus, and training materials 14 days prior to the start of training. Furnish a qualified instructor to conduct training courses for designated personnel in the maintenance and operation of the HVAC and DDC system. Orient training to the specific system being installed under this contract. Use operation and maintenance manual as the primary instructional aid in contractor provided activity personnel training. Base training on the Operations and Maintenance manuals and a DDC training manual. Manuals shall be delivered for each trainee with two additional sets delivered for archiving at the project site. Training manuals shall include an agenda, defined objectives and a detailed description of the subject matter for each lesson. Furnish audio-visual equipment and all other training materials and supplies. A training day is defined as 8 hours of classroom or lab instruction, including two 15 minute breaks and excluding lunch time, Monday through Friday, during the daytime shift in effect at the training facility. For guidance, the Contractor should assume the attendees will have a high school education and are familiar with HVAC systems.

3.4.1 DDC Training Phase I

The first class shall be taught for a period of 2 consecutive training days at least 2 weeks prior to the scheduled Performance Verification Test. The first course shall be taught in a government provided facility on base. Training shall be classroom, but have hands-on operation of similar digital controllers. A maximum of 5 personnel will attend this course. Upon completion of this course, each student, using appropriate documentation, should be able to perform elementary operations, with guidance, and describe the general hardware architecture and functionality of the system.

This course shall include but not be limited to:

- a. Theory of operation
- b. Hardware architecture
- c. Operation of the system
- d. Operator commands
- e. Control sequence programming
- f. Data base entry
- g. Reports and logs
- h. Alarm reports
- i. Diagnostics

3.4.2 DDC Training Phase II

The second course shall be taught in the field, using the operating equipment at the project sites for a total of 2 consecutive days. A maximum of 5 personnel will attend the course. The course shall consist of hands-on training under the constant monitoring of the instructor. Course content should duplicate DDC Training Phase I course as applied to the installed system. The instructor shall determine the level of the password to be issued to each student before each session. Upon completion of this course, students should be fully proficient in the operation of each system function.

-- End of Section --

SECTION 23 73 33

HEATING, VENTILATING, AND COOLING SYSTEM

01/07

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z21.22 (1999; 2001) Relief Valves for Hot Water Supply Systems

AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE (AHRI)

AHRI DCUP (Online) Directory of Certified Unitary Products

AHRI 410 (2001; Addendum 2002) Standard for Forced-Circulation Air-Cooling and Air-Heating Coils

AHRI 430 (1999) Standard for Central-Station Air-Handling Units

AHRI 550/590 (2003) Standard for Water-Chilling Packages Using the Vapor Compression Cycle

AHRI 710 (2004) Standard for Performance Rating of Liquid-Line Driers

AHRI 880 (1998; Addendum 2002) Standard for Air Terminals

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 52.2 (2007; Addenda B 2008) Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size

ASME INTERNATIONAL (ASME)

ASME B16.3 (1998) Malleable Iron Threaded Fittings

ASME B16.5 (2003) Standard for Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24

ASME B16.9 (2007) Standard for Factory-Made Wrought Steel Buttwelding Fittings

ASME B16.11	(2005) Forged Fittings, Socket-Welding and Threaded
ASME B16.18	(2001; R 2005) Cast Copper Alloy Solder Joint Pressure Fittings
ASME/ANSI B16.22	(1995) Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
ASME B16.23	(1992) Cast Copper Alloy Solder Joint Drainage Fittings - DWV
ASME/ANSI B16.26	(1988) Cast Copper Alloy Fittings for Flared Copper Tubes
ASME B16.34	(2004) Valves - Flanged, Threaded and Welding End
ASME/ANSI B16.39	(1998) Malleable Iron Threaded Pipe Unions
ASME B31.1	(2007; Addenda 2008) Power Piping
ASME/ANSI B31.5	(2001) Refrigeration Piping and Heat Transfer Components

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)

ASSE 1003	(2001; Errata, 2003) Performance Requirements for Water Pressure Reducing Valves
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ASTM INTERNATIONAL (ASTM)

ASTM A 53/A 53M	(2007) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 106	(1999e1) Seamless Carbon Steel Pipe for High-Temperature Service
ASTM A 193/A 193M	(2008b) Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
ASTM A 194/A 194M	(2001a) Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service
ASTM A 525	(1991; Rev. B) Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
ASTM A 653/A 653M	(2008) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM B 32	(2008) Standard Specification for Solder Metal

ASTM B 42	(1998) Seamless Copper Pipe, Standard Sizes
ASTM B 88	(2003) Standard Specification for Seamless Copper Water Tube
ASTM B 280	(1999e1) Seamless Copper Tube for Air Conditioning and Refrigeration Field Service
ASTM B 306	(1999) Copper Drainage Tube (DWV)
FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC RESEARCH (FCCCHR)	
FCCCHR-USC	(2002) List of Approved Backflow Prevention Assemblies
MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)	
MSS SP-58	(2002) Standard for Pipe Hangers and Supports - Materials, Design and Manufacture
MSS SP-67	(2002a; R 2004) Standard for Butterfly Valves
MSS SP-69	(2003; R 2004) Standard for Pipe Hangers and Supports - Selection and Application
MSS SP-70	(2006) Standard for Cast Iron Gate Valves, Flanged and Threaded Ends
MSS SP-71	(2005) Standard for Gray Iron Swing Check Valves, Flanged and Threaded Ends
MSS SP-80	(2003) Bronze Gate, Globe, Angle and Check Valves
MSS SP-85	(2002) Standard for Cast Iron Globe & Angle Valves, Flanged and Threaded Ends
NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)	
NEMA ICS 6	(1993; R 2006) Standard for Industrial Controls and Systems Enclosures
NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)	
NFPA 70	(2007; AMD 1 2008) National Electrical Code - 2008 Edition
NFPA 90A	(2008) Standard for the Installation of Air Conditioning and Ventilating Systems
SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)	
SMACNA HVAC Duct Const Stds	(1995; Addenda Nov 1997; 6th Printing)

2001) HVAC Duct Construction Standards -
Metal and Flexible

SMACNA Leakage Test Mn1 (1985; 6th Printing 1997) HVAC Air Duct
Leakage Test Manual

UNDERWRITERS LABORATORIES (UL)

UL Bld Mat Dir (2008) Building Materials Directory

UL 181 (1996; Rev Dec 1998) Factory-Made Air
Ducts and Air Connectors

UL 507 (1999; Rev thru Sep 2001) Electric Fans

UL 555 (1999; Rev thru Jan 2002) Fire Dampers

1.2 SYSTEM DESCRIPTION

Provide new and modify existing heating, ventilating, and cooling (HVAC) systems complete and ready for operation. HVAC systems include equipment, ducts, and piping which is located within, on, under, and adjacent to buildings.

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00, "Submittal Procedures."

SD-02 Shop Drawings

Temperature control systems

Automatic Flow Control Valves (AFCV)

Equipment layout drawings for:

- (1) Chiller

SD-03 Product Data

Packaged air-handling units

Energy Recovery Ventilator

Air-cooled water chillers

Series variable air volume (VAV) terminals

Hot water converters

Pumps, including performance curves for each impeller size

Fire dampers

Expansion tanks

Air separators

Pipe hangers and supports
Flexible pipe connectors
Dampers
Diffusers, registers, and grilles
Filter boxes
Flexible round ducts
Valves
Pipe and fittings
Solids-from-water separator

SD-06 Test Reports

Packaged air-handling units: greater than 2,000 cfm.
Energy Recovery Ventilator
Air-cooled water chillers: greater than 180,000 Btuh.
Series variable air volume (VAV) terminals and related air handling unit.

SD-07 Certificates

Certification of welders' qualifications
Equipment field test plans

SD-08 Manufacturer's Instructions

Installation manual

SD-10 Operation and Maintenance Data

Packaged air-handling units, Data Package 3
Energy Recovery Ventilator
Air-cooled water chillers, Data Package 3
Series variable air volume (VAV) terminals, Data Package 3. Submit with respective air handling unit.
Pumps, Data Package 2
Fire dampers, Data Package 1
Submit in accordance with Section 01 78 23, "Operation and Maintenance Data."

SD-11 Closeout Submittals

Air-cooled water chillers start-up report

Air filter inventory

1.3.1 Temperature Control Systems

Drawings shall include point-to-point electrical wiring diagrams.

1.3.2 Automatic Flow Control Valves (AFCV)

Submit drawings showing location and model of each AFCV. Show HVAC equipment and requirements, piping, and pressure drops across the AFCV. Show gpm, size and spring ranges of AFCV.

1.3.3 Equipment layout drawings

Submit drawings showing equipment layout including foot print, piping, conduit, control cabinets, door swings, and power disconnects.

1.3.4 Installation Manual

Provide for each item of equipment.

1.3.5 Certification of Welders' Qualifications

Submit copy of Welder Qualification Tests (Form QW-482) prior to site welding.

1.3.6 Equipment Field Test Plans

Submit within 120 calendar days after contract award for the following equipment.

- a. Air conditioners: packaged and split-system; greater than 180,000 Btuh.
- b. Heat pumps: packaged, split-system, and water-source; greater than 60,000 Btuh.
- c. Air-handling units: packaged and multi-zone; greater than 2,000 cfm.
- d. Air-cooled water chillers: greater than 180,000 Btuh.
- e. Variable air volume (VAV) terminals and related air handling unit.
- f. Computer room air conditioners.

1.3.7 Air Filter Inventory

Submit an inventory of sizes and quantity of air filters required to be replaced. Inventory shall indicate location of each piece of equipment. Include sketches of drawings.

PART 2 PRODUCTS

2.1 EQUIPMENT

Dehydrate, purge, and charge refrigerant circuit with refrigerant and oil

at factory. Factory oil and refrigerant charge shall be full amount required for operation, if within limits permitted by the Department of Transportation; otherwise, a holding charge shall be furnished. Field charging, where only a holding charge is shipped, shall be accomplished without breaking permanent refrigerant connections. Equipment using R-11, R-12, R-13, R-113, R-114, R-115, R-500, or R-502 as a refrigerant will not be permitted. Refrigerants shall have an Ozone Depletion Factor (ODF) of 0.05 or less. The ODF shall be in accordance with the "Montreal Protocol On Substances That Deplete The Ozone Layer," September 1987, sponsored by the United Nations Environment Program. Refrigerants that operate anywhere in the cycle below 20 psia will not be permitted. Efficiency of equipment shall meet the minimum's of Table 15701-1.

2.1.1 Air-Handling Units

Provide units factory assembled, designed, tested, and rated in accordance with AHRI 430. Units shall be ARI certified for cooling. Provide heating and cooling units including hot water coils chilled water coils. Unit shall include fan section, coil section with drain pan, variable frequency motor controller, filter section and access panels. Insulate interior of casing with manufacturer's standard insulation. Provide nylon bushings for dampers.

- a. Fan section: Provide draw-through fan section including motor, starter, and drives. Provide adjustable sheaves to permit fan capacity variation from 5 percent above to 5 percent below rated capacity.
- b. Coil section: Provide AHRI 410 coils and slope for drainage. Provide insulated drain pans under cooling coils and valves.
- c. Filter section: Provide UL listed throwaway 1 inch thick fiberglass filters, standard dust-holding capacity, 350 fpm maximum face velocity. Provide gasketed hinged access panel with quick opening half-twist latches at end of filter rack.
- d. Space temperature controls: Provide controls under Section 23 09 54, "Direct Digital Control Systems."
- e. Equipment selection: Air-handling unit (AHU) manufacturer shall certify the capability of the AHU to perform between the cumulative design minimum and maximum airflows of the variable air volume (VAV) terminals. The AHU submittal selection shall be supported by fan curves clearly annotated showing operating points of the minimum and maximum airflow of connected VAV terminals.

2.1.2 Air-Cooled Water Chillers

Provide single package units factory assembled, designed, tested, and rated in accordance with AHRI 550/590 with air-cooled condensers. Provide not less than two independent refrigerant circuits for multicompressor units. Provide direct expansion shell and tube design, refrigerant circuits, including electric-motor-driven refrigerant compressors with integral crankcase heater, air-cooled condenser, receiver, chiller, piping, controls, and accessories mounted in a cabinet. Provide refrigerant, internal pressure relief device, solenoid valve, combination liquid-line strainer-drier, expansion valve, and service valves. Condenser discharge air shall be in vertical direction. Provide guards to protect condenser fins from mechanical damage. Provide equipment guards around base of unit.

Crankcase heaters are not required when scroll compressors are provided.

- a. Controls: Provide factory-wired digital electronic controls including adjustable programmable thermostat for chilled water temperature control, high-low pressure control, low water temperature safety thermostat, ON-OFF unit switch, and nonrecycling pump-down relay. Controls shall also include maximum operating pressure expansion valves and programming of microprocessor chiller controls or high temperature controller for operation of compressors in cool down mode for start-up or changeover when entering water temperature is in 60 to 90 degree F range. Provide electrical interlock between water chiller and chilled water pump to prevent chiller from operating unless pump is running. Provide flow switch or flow sensors in chilled water return piping to stop compressor in event of water flow failure. Condenser fan electric motors shall be drip-proof, with built-in three-phase overload protection, mounted inside the casing. Compressor motor stoppage due to thermal and pressure overload shall require manual restart. Provide control and interlock wiring. Provide thermostat controlled electric heater cable around chiller and exterior piping for freeze protection down to 0 degree F air temperature, to operate when ambient exterior air temperature falls below 40 degrees F. Provide low ambient control to 0 degrees F and hot-gas bypass.
- b. Weatherproof casing: Provide removable gasketed panels designed to exclude driving rain for access to compressors, motors, and controls.
- c. Special corrosion protection: Provide aluminum fins on copper tubes with coating that passes the ASTM B117-90 3000 hour salt spray resistance test.

2.1.1.3 Series Variable Air Volume (VAV) Terminals

Provide units factory assembled, designed, tested, and rated in accordance with AHRI 880. Units shall be ARI certified and listed in the AHRI DCUP. Units shall provide a supply air discharge mix by modulation of conditioned primary air and recirculating of return air. Units shall include casing, primary VAV damper or valve, electronic volume regulator, discharge air damper, primary air inlet cone with high and low pressure flow sensors, recirculating air filter frames, filter, and electrical disconnect. Provide hot water heating coils.

- a. Casing: Provide removable full bottom access panels for servicing internal components without disturbing duct connections. Insulate inside of casing with manufacturer's standard insulation. Units shall have recirculating air inlet equipped with filter frame, round primary damper or valve, and unit mounting brackets.
- b. Flow sensor: Sensor shall be ring or cross type with minimum of two pickup points which average the velocity across the inlet. Flow measurement shall be within plus or minus 5 percent of rated airflow with 1.5 diameters of straight duct upstream of unit and inlet static variation of 0.5 to 5.0 inches W.G. Flow measuring taps and calibration flow chart shall be supplied with each unit for field balancing airflows.
- c. Primary VAV damper or valve: Galvanized steel damper blade shall

close against gasket inside unit. Connect damper to operating shaft with a positive mechanical connection. Provide nylon bearing for damper shaft. Cylindrical die cast aluminum valve inlet tapered to fit round flexible ducts with integral flow diffuser and beveled self-centering disc. Damper or valve leakage at shutoff shall not exceed 2 percent of capacity at 1-inch W.G. pressure.

- d. Regulator: Volume regulator shall be electronic. Electronic controls contained in **NEMA ICS 6**, electric Type 1 enclosure sealed from airflow. Controls shall be mounted on side of unit or on air valve. System powered regulators shall not be permitted. Volume regulator shall reset primary air volume as determined by thermostat, within upstream static pressure variation noted in paragraph entitled "Flow Sensor." Volume regulators shall be field adjustable and factory set and calibrated to indicated maximum and minimum primary airflows. Volume regulators shall be direct acting and normally closed upon loss of power or pneumatic pressure.
- e. Electrical: Unit shall incorporate single point electrical connection with electrical disconnect. Electrical components shall be UL listed and installed in accordance with **NFPA 70**. Electrical components shall be mounted in control box. Units UL listed as an assembly do not require airflow switch interlock with electric heating coil when factory assembled.
- f. Filters: Provide UL listed throwaway one-inch thick fiberglass filters, standard dust-holding capacity.

2.1.4 Hot Water Converters

See drawings and details for hot water converter requirements. Provide submittals for all system components.

2.1.5 Pumps

- a. In-Line pumps: Provide pumps constructed of manufacturer's standard materials suitable for chilled water and hot water heating systems. Pumps shall have mechanical seals and drip-proof electric motors.
- b. Pump suction diffuser: Casing shall include an angle type body of cast iron. Unit shall have internal straightening vanes, strainer with minimum 0.25-inch openings, and auxiliary disposable fine mesh strainer which shall be removed 30 days after start-up. Provide warning tag for operator indicating scheduled date for removal. Casing shall have connection sizes to match pump suction and pipe sizes, and be provided with adjustable support foot or support foot boss to relieve piping strains at pump suction. Blowdown port and plug shall be provided on unit casing. Provide a magnetic insert to remove debris from system.

2.1.6 Bathroom Exhaust Fans

UL 507 and UL listed for ceiling installation, HVI (Home Ventilating Institute) certified, with AMCA seal. Unit shall be 2.5 zones or less at rated cfm and static pressure.

2.1.7 Energy Recovery Ventilator

Unit shall include outdoor supply fan, exhaust air fan, recovery wheel, 2-inch thick outdoor air and exhaust air filters, outdoor and exhaust shut off dampers, and hot water and chilled water coils as scheduled.

2.1.7.1 Exhaust Discharge and Outside Air Intake

Exhaust discharge and outside air intake shall not be located on the same side on roof top units. Units shall be UL listed and bear the UL label. Energy transfer ratings shall be in accordance with ASHRAE Standard 84. Performance to be as scheduled on plans. Unit casing to be insulated with 1-inch 3# rigid board fiberglass with fire-resistant Foil-Scrim-Kraft facing. All components shall be easily accessible through removable access doors for both exhaust and supply compartments.

2.1.7.2 Energy Recovery Wheel

Energy recovery wheel shall be in cassette form mounted on slide out track and include a total energy recovery wheel for sensible and latent energy recovery, wheel drive motor with permanently sealed ball bearings and electrical disconnect. The total enthalpy wheel shall be constructed of a light weight polymer material in removable sections with a permanently bonded silica gel desiccant coating. The unit shall not require a condensation pan. Sensible only energy recovery devices are not acceptable.

2.1.7.3 Exterior Installations

Unit shall be of internal frame type construction of G90 galvanized steel. All panels exposed to the weather shall be a minimum of 20 gauge galvanized steel. Where top panels are joined there shall be a standing seam to insure positive weather protection. Provide weather hoods of the same finish as the unit. Supply weather hood shall be louvered to stop wind driven rain and incorporate a moisture eliminator and bird screen. Exhaust hood shall include an automatic back draft damper and bird screen.

- a. Weatherproof casing: Provide removable gasketed panels designed to exclude driving rain for access to fans, coils, filters, compressors, motors, and controls. Provide weatherproof outside air intake louvers or weatherproof hoods with moisture eliminators.
- b. Special corrosion protection: Provide aluminum fins on copper tubes with coating that passes the ASTM B117-90 3000 hour salt spray resistance test. Rating of units shall be after application of phenolic coating.

2.2 ELECTRICAL

2.2.1 Electrical Motors, Controllers, Contactors, and Disconnects

Furnish with respective pieces of equipment. Motors, controllers, contactors, and disconnects shall conform to Section 26 20 00, "Interior Wiring Systems." Provide electrical connections under Section, 26 20 00, "Interior Wiring Systems." Provide controllers and contactors with maximum of 120-volt control circuits, and auxiliary contacts for use with controls furnished. When motors and equipment furnished are larger than sizes indicated, the cost of providing additional electrical service and related work shall be included under this section.

2.2.2 Electrical Work

Provide under Section 26 20 00, "Interior Wiring Systems." Provide control wiring under Section 23 09 54, "Direct Digital Control Systems."

2.3 METAL DUCT SYSTEMS

Provide shop-fabricated, zinc-coated steel ducts conforming to ASTM A 525 or ASTM A 653/A 653M coating designation G60. Fabricate, construct, brace, reinforce, install, support, and seal ducts and accessories, and test ducts in accordance with SMACNA HVAC Duct Const Stds and SMACNA Leakage Test Mn1. Cover duct transverse joints with single component synthetic rubber type compound suitable for use with passivated coating on zinc-coated steel. Lap joints in direction of flow. Provide ducts straight and smooth on inside with neatly finished airtight joints. Provide air supply and return openings in ducts with air diffusers, registers, or grilles.

2.3.1 Flexible Duct Connectors

Provide airtight flexible duct connectors at duct connections to each air-conditioning unit, air-handling unit, exhaust fan, and ventilating fan. Support connectors at each end with metal angle frame bands, securely bolt in place. Provide not less than 20 ounce glass fabric duct connectors coated on both sides with neoprene.

2.3.2 Turning Vanes

Provide fabricated tees and square elbows with turning vanes in accordance with SMACNA HVAC Duct Const Stds for vanned elbows. Turning vanes shall be single wall with trailing edges.

2.3.3 Dampers

Provide factory manufactured opposed blade adjustable manual dampers where indicated for duct heights of 12 inches and larger. Provide factory manufactured single leaf dampers for duct heights less than 12 inches. Provide damper shafts with 2 inch standoffs to clear 2 inches of duct insulation with bearings at both ends of the shafts. Provide adjustment quadrant with indicator and locking devices. Provide galvanized steel dampers one gage heavier than duct in which dampers are installed.

Provide automatic dampers under Section 23 09 54, "Direct Digital Control Systems."

2.3.4 Diffusers, Registers, and Grilles

Provide factory-fabricated metal units with edges rolled or rounded where exposed to view, and factory primed with white enamel finish. Provide each diffuser and register with factory-fabricated, group-operated, adjustable, opposed-blade, air-volume-control dampers, key or screwdriver operated from the face of unit without the use of a tool. Provide each unit with rubber or plastic installation gaskets. Diffusers in same room shall have same face design.

- a. Diffusers: Provide round, square, or rectangular diffusers as indicated. Ceiling diffusers shall be designed to deliver air in a horizontal direction. Provide baffles or other devices as required

for proper air distribution pattern.

- b. Registers: Provide double deflection supply registers arranged to control air direction, throw, and drop. Exhaust and return air registers shall have single set of nondirectional face bars or vanes having the same appearance as supply registers. Provide face bars or vanes spaced not more than 0.75 inch on center and not less than 0.62 inch depth.
- c. Grilles: Provide as specified for registers without air-volume-control dampers.

2.3.5 Access Doors

Provide for access to volume dampers, fire dampers, plenum chambers, and where indicated. Provide each door with double wall zinc-coated steel construction, gasketed airtight, with continuous hinges and cam latches. Insulate access doors with one-inch thick rigid insulation. Provide 12 inch by 12 inch door, except where larger sizes are indicated, or provide 12 inches by height of duct when duct is less than 12 inches high.

2.3.6 Fire Dampers

UL 555 and NFPA 90A. Dampers shall be listed in UL Bld Mat Dir. Dampers when open shall not protrude into the ducts.

2.3.7 Filter Boxes

Provide when filters are not provided integral with the air-conditioning units or air-handling units. Construct filter boxes of zinc-coated steel with track, hinged access doors with latches, seal gaskets between frame, and filters. Arrange filters to filter outside air intake and return air. Filter assemblies shall be removable from filter box and replaceable without use of tools. Replaceable filter rack shall be designed to accept 2 inch thick filters.

- a. Replaceable filters: Provide UL listed throwaway 1 inch thick fiberglass filters, standard dust-holding capacity, 350 fpm maximum face velocity.
- b. High efficiency filters: Provide UL Class 2, mean efficiency of 30 percent when tested in accordance with ASHRAE 52.2. Filter assembly shall include holding frame and fastener assembly, filter cartridge, and mounting frame and retainer assembly. High efficiency filters shall be preceded by replaceable filter.

2.3.8 Flexible Round Ducts

UL 181 and NFPA 90A with factory-applied insulation, vapor barrier, and end connections. Fire hazard rating of duct assembly shall not exceed 25 for flame spread and 50 for smoke developed. Provide ducts designed for working pressures of 2 inches W.G. positive and 1.5 inches W.G. negative. Flexible round duct length shall not exceed 5 feet. Secure connections by applying adhesive for 2 inches over rigid duct, apply flexible duct 2 inches over rigid duct, apply metal clamp, and provide minimum of three No. 8 sheet metal screws through clamp and rigid duct.

- a. Inner duct core: Flexible core shall be interlocking spiral or helically corrugated and constructed of zinc-coated steel,

aluminum, or stainless steel; or shall be constructed of inner liner of continuous galvanized spring steel wire helix fused to continuous, fire-retardant, flexible vapor barrier film, inner duct core.

- b. Insulation: Inner duct core shall be insulated with mineral fiber blanket type flexible insulation, minimum of one inch thick. Insulation shall be covered on exterior with manufacturer's standard fire retardant vapor barrier jacket for flexible round duct.

2.4 PIPING SYSTEMS

Provide the following [pipe and fittings](#). Provide dielectric fittings, unions or flanges between steel piping and copper tubing for all piping sizes; except that copper alloy valves and strainers may be used without dielectric fittings, unions or flanges. Water piping sizes 4 inches and smaller shall be copper tubing. Water piping sizes larger than 4 inches shall be copper tubing or steel piping. If steel piping is provided, provide a solids-from-water separator.

2.4.1 Soldered Joint Copper Tubing

Provide [ASTM B 88](#), Type L for aboveground piping, Type K for buried piping, with [ASME B16.18](#) or [ASME/ANSI B16.22](#) solder joint fittings, unions, and flanges; provide adapters as required. Provide [ASTM B 42](#) copper pipe nipples with threaded end connections. Provide [ASTM B 32](#), 95-5 tin-antimony solder, or provide Plumbing Code approved lead-free solder.

2.4.2 Copper Tubing Piping Systems

Provide copper tubing for the following piping systems, except water piping sizes larger than 4 inches shall be copper tubing or steel piping.

- a. Chilled water, chilled-hot water, and hot water piping.
- b. Cold drain piping from drain pans.
- c. Fuel oil supply and return piping with [ASME/ANSI B16.26](#) flared fittings or compression type fittings.

2.4.3 Copper Cold Drain Piping

Provide copper tubing in accordance with paragraph entitled "Copper Tubing" for piping sizes one inch and smaller. Provide [ASTM B 306](#) copper tubing and [ASME B16.23](#) solder joint fittings for piping sizes larger than one inch. In lieu of copper tubing, 1.25 inch Schedule 40 polyvinyl chloride (PVC) plastic pipe, fittings, and solvent cement may be provided.

2.4.4 Copper Refrigerant Tubing

Provide [ASTM B 280](#), cleaned, dehydrated, and sealed. Provide [ASME/ANSI B16.22](#) solder joint refrigerant fittings and adapters. Provide silver brazing alloy solder and silver brazing alloy flux. During brazing operations bleed a small amount of dry oil-free nitrogen continuously through the refrigerant tubing. Provide [ASME/ANSI B16.26](#) flared fittings.

2.4.5 Buried Preinsulated Water Piping

Provide buried preinsulated water piping in conduit complete and ready for operation. Install in accordance with fabricator's published literature. Provide copper tubing for carrier piping; carrier piping sizes larger than 4 inches may be steel piping. Minimum depth of cover shall be 2 feet.

- a. Factory-applied insulation: Provide polyurethane or polyisocyanate insulation, rated for not less than 250 degrees F service, completely filling the space between carrier pipe and conduit.
- b. Factory-applied conduit: Provide each section of carrier pipe with insulation and conduit complete with waterproof conduit caps at both ends. Mark each section of conduit with fabricator's name, product identification, and publications to which the items conform. Provide same type of insulation and conduit material over field-insulated joints and fittings; provide waterproof shrink sleeves over field-insulated joints to overlap not less than 6 inches of each conduit section.
- c. Bedding: Accurately grade trench bedding with minimum of 6 inches of sand. Backfill sand to minimum of 6 inches above and below conduit. Lay bedding to firmly support conduit along entire length.
- d. Buried utility warning tape: Provide detectable tape for warning of buried piping.

2.4.6 Steel Piping Systems

2.4.6.1 Steel Pipe

Provide [ASTM A 53/A 53M](#) Type E or Type S, or [ASTM A 106](#) steel pipe; except [ASTM A 53/A 53M](#), Type F steel pipe may be provided for water pipe sizes larger than 4 inches and for steam pipe less than 100 psig. Provide Weight Class STD or Schedule No. 40 black steel pipe for welding end connections. Provide Weight Class XS or Schedule No. 80 black steel pipe for threaded end connections and for condensate piping.

2.4.6.2 Steel Pipe Fittings

Provide [ASME B16.3](#) or [ASME B16.11](#) threaded fittings, and [ASME/ANSI B16.39](#) threaded unions. Provide [ASME B16.9](#) butt welding fittings of the same material and weight as the piping in which fittings are installed; provide backing rings compatible with piping materials being butt welded. Provide [ASME B16.11](#) socket welding fittings.

2.4.6.3 Steel Pipe Unions

Provide [ASME/ANSI B16.39](#), Class 150, unions with threaded end connections on one side of threaded valve in steel piping systems.

2.4.6.4 Steel Pipe Flanges

Provide [ASME B16.5](#), Class 150 welding neck flanges. Extend bolts no less than two full threads beyond the nut with the bolts tightened to the required torque.

- a. Gaskets: Provide one piece factory cut gaskets suitable for the intended service. Provide full-face gaskets for flat-face flanged joints, and ring gaskets for raised-face flanged joints.
- b. Bolts: Provide [ASTM A 193/A 193M](#), Grade B7 bolts.
- c. Nuts: [ASTM A 194/A 194M](#), Grade 7.
- d. Washers: Provide steel flat circular washers under bolt heads and nuts.

2.4.6.5 Direct Buried Steel Piping

Provide pipe and fittings with exterior coal tar epoxy painting system.

2.4.7 Valves

Valves shall have flanged end connections, except valves smaller than 2.5 inches may have threaded end connections with a union on one side of the valve. Solder end connections may be used for connections between copper alloy valves and copper tubing.

2.4.7.1 Gate Valves

[MSS SP-80](#), Class 125, except sizes 2.5 inches and larger shall conform to [MSS SP-70](#), Class 125.

2.4.7.2 Globe and Angle Valves

[MSS SP-80](#), Class 125, except sizes 2.5 inches and larger shall conform to [MSS SP-85](#), Class 125.

2.4.7.3 Check Valves

[MSS SP-80](#), Class 125, swing check; except sizes 2.5 inches and larger shall conform to [MSS SP-71](#), Class 125.

2.4.7.4 Butterfly Valves

[MSS SP-67](#), except sizes 2.5 inches and larger shall have lugged or wafer body designed for installation between ASME Class 150 flanges. Valves shall have two-position lever handles, except when infinite position lever handles are indicated.

2.4.7.5 Ball Valves

Full port design, copper alloy body, except sizes 2.5 inches and larger shall be cast-iron body. Valves shall have two-position lever handles. Ball valves may be provided in lieu of gate valves.

2.4.7.6 Square Head Cocks

Provide copper alloy or cast-iron body with copper alloy plugs, suitable for 125 psig water working pressure.

2.4.7.7 Air Venting Valves

Provide copper alloy body valves with automatic or manual air vent as

indicated.

2.4.7.8 Combination Pressure and Temperature Relief Valves

ANSI Z21.22, copper alloy body, automatic reseating, test lever, and discharge capacity based on AGA temperature steam rating.

2.4.7.9 Water Pressure Reducing Valves

ASSE 1003, copper alloy body, automatic reseating, with test lever.

2.4.7.10 Water Temperature Regulating Valves

Provide copper alloy body, direct acting, pilot operated, for the intended service.

2.4.7.11 Automatic Flow Control Valves

Valve shall be tamperproof, factory calibrated, direct acting, automatic pressure compensating valve which limits flow rates to within range of plus or minus 10 percent accuracy, regardless of system pressure fluctuations. Select each valve for mid-range control of indicated capacity. Flow control mechanism includes self-cleaning spring loaded cut with open chambers and unobstructed flow passages. Valves shall be furnished by same manufacturer. Valve body shall have flow direction arrow. Provide strainer and union connection on inlet to valve. Copper alloy or cast-iron body, copper alloy or stainless internal working parts. Valves shall be suitable for 125 psig at 190 degrees F hot water. Valve body shall have factory-installed tappings for differential pressure meter connections for verification of pressure differential across valve orifice. Meter connections shall have positive check valves or shutoff valves.

2.4.7.12 Backflow Prevention Assemblies

Provide reduced pressure principle type backflow prevention assemblies which are approved by and has a current "Certificate of Approval" from the **FCCCHR-USC**. Listing of the particular make, model/design, and size in the current **FCCCHR-USC** will be acceptable as the required proof.

2.4.8 Valves for Steam 100 psig and Greater

Provide piping to and including the main steam pressure regulating valves, bypass valves, safety relief valves, and high pressure traps within each building under this section.

- a. Gate valves, globe valves, angle valves, and check valves:
ASME B16.34, steel body, minimum of ASME Class 150.
Provide swing check valves.
- b. Steam pressure regulating valves: Steel body, minimum of ASME Class 150, except as modified herein. Valve seats and disc shall be of replaceable heat-treated stainless steel. Valves shall be single seated; seat tight under dead end conditions, and move to the closed position in the event of pressure failure of the operating (controlling) medium. Provide strainer in inlet from external operating (controlling) medium. Valves shall be controlled by pilot valve with strainer at inlet from external pressure sensing piping. Valves shall be internally or externally steam traced for freeze protection. Valves shall be piston

operated type or spring loaded diaphragm operated type with stainless steel springs.

- c. Safety-relief valves: Minimum of ASME Class 150, with test lever. Valves shall have steel or copper alloy body. Valves shall have flanged inlet and outlet connections or threaded connections attached to threaded ASME Class 150 flanges. Valves shall be ASME rated for capacity indicated.

2.5 PIPING ACCESSORIES

2.5.1 Pipe Hangers and Supports

Provide MSS SP-58 and MSS SP-69, Type 1 with adjustable type steel support rods, except as specified or indicated otherwise. Attach to steel joists with Type 19 or 23 clamps and retaining straps. Attach to Steel W or S beams with Type 21, 28, 29, or 30 clamps. Attach to steel angles and vertical web steel channels with Type 20 clamp with beam clamp channel adapter. Attach to horizontal web steel channel and wood with drilled hole on centerline and double nut and washer. Attach to concrete with Type 18 insert or drilled expansion anchor. Provide Type 40 insulation protection shield for insulated piping.

2.5.2 Strainers

Pressure and temperature range shall be for the intended service. Provide blowoff outlet with pipe nipple, gate valve, and discharge pipe nipple. Provide stainless steel strainer element with perforations of 0.047 inch for water, 0.031 inch for steam mixed with condensate, and 0.016 inch for steam. Provide copper alloy or cast-iron body strainers in steam and condensate systems up to 100 psig. Provide steel body strainers in steam and condensate systems 100 psig and greater.

2.5.3 Traps

Provide traps of the types indicated with stainless steel internals. Pressure and temperature range shall be for the intended service. Traps for steam at 100 psig and greater shall be minimum of ASME Class 150.

2.5.4 Pressure Gages

Provide single style pressure gage with 4.5-inch dial, brass or aluminum case, bronze tube, gage cock, pressure snubber, and syphon. Provide scale range for intended service.

2.5.5 Thermometers

Provide bi-metal dial type thermometers with stainless steel case, stem, and fixed thread connection; 3 inch diameter dial with glass face gasketed within the case; and accuracy within 2 percent of scale range. Provide scale range for intended service.

2.5.6 Pipe Sleeves

Provide where piping passes entirely through walls, ceilings, roofs, and floors. Secure sleeves in position and location during construction. Provide sleeves of sufficient length to pass through entire thickness of walls, ceilings, roofs, and floors. Provide one-inch minimum clearance between exterior of piping or pipe insulation, and interior of sleeve or

core-drilled hole. Firmly pack space with mineral wool insulation. Seal space at both ends of sleeve or core-drilled hole with plastic waterproof cement which will dry to a firm but pliable mass, or provide a mechanically adjustable segmented elastomeric seal. In fire walls and fire floors, seal both ends of sleeves or core-drilled holes with UL listed fill, void, or cavity material.

2.5.6.1 Sleeves in Masonry and Concrete

Provide steel pipe sleeves or schedule 40 PVC plastic pipe sleeves. Sleeves are not required where drain, waste, and vent (DWV) piping passes through concrete floor slabs located on grade. Core drilling of masonry and concrete may be provided in lieu of pipe sleeves when cavities in the core-drilled hole are completely grouted smooth.

2.5.6.2 Sleeves not in Masonry and Concrete

Provide 26 gage galvanized steel sheet or PVC plastic pipe sleeves.

2.5.7 Flexible Pipe Connectors

Provide flexible bronze or stainless steel piping connectors with single braid where indicated. Connectors shall be suitable for the intended service.

2.5.8 Sight Glass and Refrigerant Drier

AHRI 710. Provide in refrigerant liquid piping.

2.5.9 Expansion Tanks

Construct of steel for minimum working pressure of 125 psig. Tank shall have polypropylene or butyl lined diaphragm which keeps the air charge separated from the water.

2.5.10 Air Separators

Provide tangential inlet and outlet connections, blowdown connections, and internal perforated stainless steel air collector tube to direct released air to automatic air vent. Construct of steel for minimum working pressure of 125 psig.

2.5.11 Flash Tanks

Construct of steel for minimum working pressure of 125 psig. Provide tank with vent and valved drain.

2.5.12 Escutcheon Plates

Provide one piece or split hinge metal plates for piping entering floors, walls, and ceilings in exposed spaces. Provide polished stainless steel plates or chromium-plated finish on copper alloy plates in finished spaces. Provide paint finish on metal plates in unfinished spaces.

2.5.13 Solids-From-Water Separator

Provide tangential inlet and top outlet connections, solids centrifugal separator with collector and blowdown sections. Construct of steel for minimum working pressure of 125 psig. Provide vertical separator capable

of removing solids of 75 microns and larger with specific gravity of 1.2 and greater. Provide wall or floor-mounted separator as indicated.

2.6 HEAT TAPE FOR FREEZE PROTECTION OF PIPING

Provide parallel conduction type that is composed of two copper conductors separated by conductive material and all encased in an insulating jacket. The heat tape shall be self-regulating that decreases heat output as temperature increases at each point along the length of tape. Provide voltage as indicated. Provide heat tape complete with fittings, adapters, and fittings, adapters, and other devices to connect tape to standard rigid steel conduit junction boxes, switches, or other devices as indicated. Provide tape sealants and jumper connectors up to 5-inches in length for connecting multiple runs. Provide a thermostat that activates the heat tape on drop of outside air temperature at 38 F. Thermostat shall have maximum tolerance of plus or minus 5 degrees F and maximum operating differential of 6 degrees F within temperature operating range. Wattage per foot of pipe at 50 F shall be as follows. This wattage may be achieved by spiraling the tape around the pipe.

Pipe Diameter (Inches)	1/2	3/4	1	1.25	1.5	2	3	4	6	8
Watt/Foot	2	2	2.5	2.5	3	3.5	4	6	7	8

2.6.1 Pressure/Temperature Test Ports (Plugs)

Provide solid bras test plugs where indicated. Test plug shall be capable of receiving a pressure or temperature probe 1/8-inch o.d. Dual seal core shall be rated zero leakage from vacuum to 200 psig and 0 F to 220 F. Each plug shall be extended through pipe insulation and be capped. Provide 2 each, pressure gauge adapters with 1/8-inch o.d. probe, 5-inch stem pocket testing thermometers for 25 F to 125 F, .

2.7 ACCESS DOORS FOR VALVES

Provide factory-prefabricated and primed flush face steel access doors including steel door frame for with continuous hinges and turn-screw-operated latch. Provide door frame installation in plaster and masonry walls. Furnish doors under this section; install doors under appropriate section of this specification.

2.8 CHEMICAL FEED TANK

Construct of steel for minimum working pressure of 125 psig. Provide chemical pipe, fittings, and valves as specified for water piping. Add borate-nitrite corrosion inhibitors to initial fill water for heating and cooling water systems in concentrations of one-half ounce per gallon of system water.

2.9 RADIO SWITCH

Provide a load management VHF FM radio controlled switch which shall stop unit compressor upon activation while air conditioning unit fan motor continues to run. Switch shall be mounted within unit control compartment or attached to condensing unit within a weatherproof enclosure, switch shall operate at 139.650 mhz and shall be 23-bit digital format compatible

with motorala protocol. Switch shall have two address/functions.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 HVAC System

Installation of HVAC system including equipment, materials, installation, workmanship, fabrication, assembly, erection, examination, inspection, and testing shall be in accordance with ASME B31.1, ASME/ANSI B31.5, NFPA 70, and in accordance with the manufacturer's recommendations.

3.1.2 Connections to Existing Systems

Notify the Contracting Officer in writing at least 15 calendar days prior to the date the connections are required. Obtain approval before interrupting service. Furnish materials required to make connections into existing systems and perform excavating, backfilling, compacting, and other incidental labor as required. Furnish labor and tools for making actual connections to existing systems.

3.2 PIPING

Test, inspect, and approve piping before burying, covering, or concealing. Provide fittings for changes in direction of piping and for connections. Make changes in piping sizes through tapered reducing fittings; bushings will not be permitted. Install valves with stems horizontal or above. Provide flanges or unions at valves, traps, strainers, and connections to equipment; unions are not required in copper tubing piping systems.

- a. Threaded connections: Provide Teflon pipe thread paste on male threads. Do not thread metal pipe into plastic piping.
- b. Pipe hangers and supports: Provide additional pipe hangers and supports at in-line water pumps and flanged valves.
- c. Piping to receive insulation: Provide temporary wood spacers between the pipe hangers and supports, and the pipe in order to properly slope the piping and establish final elevations. Provide temporary wood spacers of same thickness as insulation to be provided under Section 23 07 00, "Insulation Of Mechanical Systems." Support plastic piping every 4 feet. Support metal piping as follows.

MAXIMUM SPACING (FEET)

Nominal Pipe Size (inches)	One and under	1.25	1.5	2	2.5	3	3.5	4	5	6
Copper Tubing	6	7	8	8	9	10	11	12	13	14
Steel Pipe	7	8	9	10	11	12	13	14	16	17

- d. Cleaning of piping: Keep interior and ends of new piping and existing piping affected by Contractor's operations, cleaned of water and foreign matter during installation by using plugs or other approved methods. When work is not in progress, securely close open ends of pipe and fittings to prevent entry of water and

foreign matter. Inspect piping before placing into position.

- e. Demolition: Remove materials so as not to damage materials which are to remain. Replace existing work damaged by Contractor's operations with new work of same construction.
- f. Tee Joints: Extracted tee joints may be made in copper tube. Make joint with an appropriate tool by drilling a pilot hole and drawing out the tube surface to form a collar having a minimum height of three times the thickness of the tube wall. To prevent the branch tube from being inserted beyond the depth of the extracted joint, provide dimpled depth stops. Notch the branch tube for proper penetration into fitting to assure a free flow joint. Braze extracted joints using a copper phosphorous classification brazing filler metal. Soldered joints shall not be permitted.

3.3 ADJUSTMENTS

Adjust controls and equipment so as to give satisfactory operation. Adjust entire water temperature control system and place in operation so that water quantities circulated are as indicated. Air duct systems shall be adjusted and balanced so that air quantities at outlets are as indicated and so that distribution from supply outlets is free from drafts and has uniform velocity over the face of each outlet.

3.4 PUMPS

After testing, adjusting, and balancing, trim the impellers on all pumps 10 hp and greater to actual flow conditions plus 10 percent discharge head. Readjust throttling device to correct flow rate.

3.5 INSTRUCTING OPERATING PERSONNEL

Upon completion of work and at time designated by Contracting Officer, provide services of competent technician for period of not less than one 8-hour working day for instruction of Government operating personnel in proper operation and maintenance of equipment.

3.6 FIELD QUALITY CONTROL

Upon completion and before final acceptance of work, test each system in service to demonstrate compliance with the contract requirements. Adjust controls and balance systems prior to final acceptance of completed systems. Test controls through every cycle of operation. Test safety controls to demonstrate performance of required function. Correct defects in work provided by Contractor and repeat tests. Furnish steam, fuel, water, electricity, instruments, connecting devices, and personnel for tests. Flush and clean piping before placing in operation. Clean equipment, piping, strainers, ducts, and filters.

3.6.1 Air Ducts

Obtain approval before applying insulation.

3.6.2 Equipment

3.6.2.1 Field Testing

Test each item of equipment in operation for continuous period of not less than 24 hours under every condition of operation in accordance with each equipment manufacturer's recommendation. Verify that the equipment operating parameters are within limits recommended by the manufacturer.

3.6.2.2 Equipment Requiring Field Test Plans

Furnish equipment field test plans developed by each equipment manufacturer detailing recommended field test procedures for each item of equipment. Field test plans developed by the installing Contractor, or the equipment sales agency furnishing the equipment will not be acceptable. The Contracting Officer will review and approve the field test plan for each item of equipment prior to commencement of field testing of the equipment.

- a. Equipment Items to Test: Equipment requiring field test plans are listed in paragraph "SD-08, Statements."
- b. Coordinated Testing: Indicate in each field test plan when work required by this section requires coordination with test work required by other specification sections. Furnish test procedures for the simultaneous or integrated testing of equipment controls which interlock and interface with controls factory prewired or external controls for the equipment provided under Section 23 09 54, "Direct Digital Control Systems".
- c. Prerequisite Testing: Equipment for which performance testing is dependent upon the completion of the work covered by Section 23 08 00.00 20, "HVAC Testing/Adjusting/Balancing: Heating/Ventilating/Cooling Systems" must have that work completed as a prerequisite to testing work under this section. Indicate in each field test plan when such prerequisite work is required.
- d. Test Procedure: Indicate in each field test plan each equipment manufacturers published installation, start-up, and field acceptance test procedures. Include in each test plan a detailed step-by-step procedure for testing all automatic controls provided by the manufacturer. Each test plan shall include the required test reporting forms to be completed by the Contractor's testing representatives. Procedures shall be structured to test the controls through all modes of control to confirm that the controls are performing with the intended sequence of control. Controllers shall be verified to be properly calibrated and have the proper set point to provide stable control of their respective equipment.
- e. Performance Variables: Each test plan shall list performance variables that are required to be measured or tested as part of the field test. Include in the listed variables performance requirements indicated on the equipment schedules on the design drawings. Manufacturer shall furnish with each test procedure a description of acceptable results that have been verified. Manufacturer shall identify the acceptable limits or tolerances within which each tested performance variable shall acceptably operate.
- f. Job Specific: Each test plan shall be job specific and shall

address the particular item of equipment and particular conditions which exist with this contract. Generic or general preprinted test procedures are not acceptable.

- g. Specialized Components: Each test plan shall include procedures for field testing and field adjusting specialized components, such as hot gas bypass control valves, or pressure valves.

3.6.2.3 Equipment Requiring Field Test Reports:

- a. Equipment Items for Reports: Equipment requiring field test reports are listed in paragraph "SD-12, Field Test Reports."
- b. Manufacturer's Recommended Test: Conduct the manufacturer's recommend field testing in compliance with the approved test plan. Furnish a factory trained field representative authorized by and to represent the equipment manufacturer at the complete execution of the field testing.
- c. Operational Test: Conduct a continuous 24 hour operational test for each item of equipment. Equipment shutdown before the test period is completed shall result in the test period being started again and run for the required duration. For the duration of the test period, compile an operational log of each item of equipment. Log required entries every two hours. Use the test report forms for logging the operational variables.
- d. Notice of Tests: Conduct the manufacturer's recommended tests and the operational tests; record the required data using the approved reporting forms. Notify the Contracting Officer in writing at least 15 calendar days prior to the testing. Within 30 calendar days after acceptable completion of testing, submit each test report for review and approval.
- e. Report Forms: Type all data entries and writing on the test report forms. Completed test report forms for each item of equipment shall be reviewed, approved, and signed by the Contractor's test director and the QC Manager. The manufacturer's field test representative shall review, approve, and sign the report of the manufacturer's recommended test. Signatures shall be accompanied by the person's name typed.
- f. Deficiency Resolution: The test requirements acceptably met; deficiencies identified during the tests shall be corrected in compliance with the manufacturer's recommendations and corrections retested in order to verify compliance.

3.6.3 Additional Field Testing

Provide testing, adjusting, and balancing (TAB) of ducts, piping, and equipment under Section 23 08 00.00 20, "HVAC Testing/Adjusting/Balancing: Heating/Ventilating/Cooling Systems."

3.6.4 Testing EMCS Equipment

- a. All EMCS equipment shall be given an operation test.
- b. Items not operating properly shall be repaired or replaced and retested.

TABLE 15701-1
EQUIPMENT MINIMUM EFFICIENCY REQUIREMENTS
Equipment must meet each rating listed

<u>Equipment Type</u>	<u>Efficiency</u>	<u>Rating Condition</u>
Air Cooled	(see schedule) Full Load kW/ton	ARI 550/590-98
Water Chiller	(see schedule) IPLV kW/ton	ARI 550/590-98

-- End of Section --

SECTION 26 00 00

BASIC ELECTRICAL MATERIALS AND METHODS

01/07

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D 709 (2001; R 2007) Laminated Thermosetting Materials

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.147 Control of Hazardous Energy (Lock Out/Tag Out)

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE Std 100 (2000) The Authoritative Dictionary of IEEE Standards Terms

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA C57.12.28 (1999) Pad-Mounted Equipment - Enclosure Integrity (Revision of ANSI C57.12.28-88)

NEMA ICS 6 (1993; R 2006) Standard for Industrial Controls and Systems Enclosures

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2007; AMD 1 2008) National Electrical Code - 2008 Edition

1.2 RELATED REQUIREMENTS

This section applies to all sections of Division 26, "Electrical," of this project specification unless specified otherwise in the individual sections.

1.3 DEFINITIONS

- a. Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, shall be as defined in IEEE Std 100.
- b. The technical sections referred to herein are those specification sections that describe products, installation procedures, and equipment operations and that refer to this section for detailed description of submittal types.

- c. The technical paragraphs referred to herein are those paragraphs in PART 2 - PRODUCTS and PART 3 - EXECUTION of the technical sections that describe products, systems, installation procedures, equipment, and test methods.

1.4 ELECTRICAL CHARACTERISTICS

Electrical characteristics for this project shall be 12.47 kV primary, three phase, four wire, 60 Hz, and 208Y/120 volts secondary, three phase, four wire. Final connections to the power distribution system at the existing underground primary conductors shall be made by the Contractor as directed by the Contracting Officer.

1.5 SUBMITTALS

Submittals required in the sections which refer to this section shall conform to the requirements of Section 01 33 00, "Submittal Procedures" and to the following additional requirements. Submittals shall include the manufacturer's name, trade name, place of manufacture, catalog model or number, nameplate data, size, layout dimensions, capacity, project specification and technical paragraph reference. Submittals shall also include applicable federal, military, industry, and technical society publication references, and years of satisfactory service, and other information necessary to establish contract compliance of each item to be provided. Photographs of existing installations are unacceptable and will be returned without approval.

1.5.1 Manufacturer's Catalog Data

Submittals for each manufactured item shall be current manufacturer's descriptive literature of cataloged products, equipment drawings, diagrams, performance and characteristic curves, and catalog cuts. Handwritten and typed modifications and other notations not part of the manufacturer's preprinted data will result in the rejection of the submittal. Should manufacturer's data require supplemental information for clarification, the supplemental information shall be submitted as specified for certificates of compliance.

1.5.2 Drawings

Submit drawings a minimum of 14 by 20 inches in size using a minimum scale of 1/8 inch per foot. Include wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure a coordinated installation. Wiring diagrams shall identify circuit terminals and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment. Drawings shall indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices.

1.5.3 Instructions

Where installation procedures or part of the installation procedures are required to be in accordance with manufacturer's instructions, submit printed copies of those instructions prior to installation. Installation of the item shall not proceed until manufacturer's instructions are received. Failure to submit manufacturer's instructions shall be cause for rejection of the equipment or material.

1.5.4 Certificates

Submit manufacturer's certifications as required for products, materials, finishes, and equipment as specified in the technical sections. Certifications from material suppliers are not acceptable. Preprinted certifications and copies of previously submitted documents will not be acceptable. The manufacturer's certifications shall name the appropriate products, equipment, or materials and the publication specified as controlling the quality of that item. Certification shall not contain statements to imply that the item does not meet requirements specified, such as "as good as"; "achieve the same end use and results as materials formulated in accordance with the referenced publications"; or "equal or exceed the service and performance of the specified material." Certifications shall simply state that the item conforms to the requirements specified. Certificates shall be printed on the manufacturer's letterhead and shall be signed by the manufacturer's official authorized to sign certificates of compliance.

1.5.4.1 Reference Standard Compliance

Where equipment or materials are specified to conform to industry and technical society reference standards of the organizations such as American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), National Electrical Manufacturers Association (NEMA), Underwriters Laboratories (UL), and Association of Edison Illuminating Companies (AEIC), submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance.

1.5.4.2 Independent Testing Organization Certificate

In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing, and approved by the Contracting Officer. The certificate shall state that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard.

1.5.5 Operation and Maintenance Manuals

Comply with the requirements of Section 01 78 23, "Operation and Maintenance Data" and the technical sections.

1.5.5.1 Operating Instructions

Submit text of posted operating instructions for each system and principal item of equipment as specified in the technical sections.

1.6 QUALITY ASSURANCE

1.6.1 Material and Equipment Qualifications

Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period. Where two or more items of the same

class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in the technical section.

1.6.2 Regulatory Requirements

Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of [NFPA 70](#).

1.6.3 Alternative Qualifications

Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished.

1.6.4 Service Support

The equipment items shall be supported by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

1.6.5 Manufacturer's Nameplate

Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

1.6.6 Modification of References

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Contracting Officer.

1.6.7 Material and Equipment Manufacturing Date

Products manufactured more than 3 years prior to date of delivery to site shall not be used, unless specified otherwise.

1.7 POSTED OPERATING INSTRUCTIONS

Provide for each system and principal item of equipment as specified in the technical sections for use by operation and maintenance personnel. The operating instructions shall include the following:

- a. Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
- b. Start up, proper adjustment, operating, lubrication, and shutdown procedures.
- c. Safety precautions.
- d. The procedure in the event of equipment failure.

- e. Other items of instruction as recommended by the manufacturer of each system or item of equipment.

Print or engrave operating instructions and frame under glass or in approved laminated plastic. Post instructions where directed. For operating instructions exposed to the weather, provide weather-resistant materials or weatherproof enclosures. Operating instructions shall not fade when exposed to sunlight and shall be secured to prevent easy removal or peeling.

1.8 NAMEPLATES

ASTM D 709. Provide laminated plastic nameplates for each panelboard, equipment enclosure, relay, switch, and device; as specified in the technical sections or as indicated on the drawings. Each nameplate inscription shall identify the function and, when applicable, the position. Nameplates shall be melamine plastic, **0.125 inch** thick, white with black center core. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core. Minimum size of nameplates shall be **one by 2.5 inches**. Lettering shall be a minimum of **0.25 inch** high normal block style.

1.9 WARNING SIGNS

Provide warning signs for the enclosures of electrical equipment including substations, pad-mounted transformers, pad-mounted switches, generators, and switchgear having a nominal rating exceeding 600 volts.

- a. When the enclosure integrity of such equipment is specified to be in accordance with **NEMA C57.12.28**, such as for pad-mounted transformers, provide self-adhesive warning signs on the outside of the high voltage compartment door(s). Sign shall be a decal and shall have nominal dimensions of **7 by 10 inches** with the legend "DANGER HIGH VOLTAGE" printed in two lines of nominal **2 inch** high letters. The word "DANGER" shall be in white letters on a red background and the words "HIGH VOLTAGE" shall be in black letters on a white background. Decal shall be Panduit No. PPS0710D72 or approved equal.

1.10 INSTRUCTION TO GOVERNMENT PERSONNEL

Where specified in the technical sections, furnish the services of competent instructors to give full instruction to designated Government personnel in the adjustment, operation, and maintenance of the specified systems and equipment, including pertinent safety requirements as required. Instructors shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory as well as practical operation and maintenance work. Instruction shall be given during the first regular work week after the equipment or system has been accepted and turned over to the Government for regular operation. The number of man-days (8 hours per day) of instruction furnished shall be as specified in the individual section.

1.11 LOCKOUT REQUIREMENTS

Provide disconnecting means capable of being locked out for machines and other equipment to prevent unexpected startup or release of stored energy in accordance with **29 CFR 1910.147**. Mechanical isolation of machines and other equipment shall be in accordance with requirements of Division 23, "Mechanical."

1.12 EQUIPMENT INVENTORY UPDATE

Submit information for each piece of equipment removed and supplied for use of Camp Lejeune to update the Maximo equipment inventory. For the purposes of this paragraph, inventoried equipment is defined as equipment listed on the Maximo Equipment Inventory Update form.

1.12.1 Requirements

The contractor shall prepare and submit one Maximo Equipment Inventory Update form for each individual item of inventoried equipment that is demolished, removed, replaced, or installed. (ex: three new condensing units would require the submission of three Equipment Inventory Update forms. The replacement of two existing air handling units with two new air handling units would require the submission of two Equipment Inventory Update forms). The contractor shall prepare and submit a VAV/TAB Room Number List for each VAV/Tab model installed in a single building. Only one Maximo Equipment Inventory Update form is required for each model of VAV or TAB in a single building.

1.12.1.1 Demolition of all equipment in a structure or facility

When all the inventoried equipment in a building or structure is demolished or removed, and not replaced, an Equipment Inventory Update form is not required.

1.12.1.2 Standards

The contractor shall provide accurate, complete, and legible information on all required forms. All required forms shall be completed and delivered to the Contracting Officer on or before the Beneficial Occupancy Date. All information on Equipment Inventory Update forms shall be obtained by visual inspection of equipment data plate(s).

1.12.1.3 Form Preparation

Each required Maximo Equipment Inventory Update form shall contain the following information:

- (1) The name and telephone number of an individual who can be contacted for clarification or additional information pertaining to the data on the form.
- (2) The date of data collection
- (3) The building or structure identification number and the specific location of the equipment within the structure (ex: 3d deck mech room)
- (4) A check adjacent to the description of the new or replacement item, and a check adjacent to the supplemental description if applicable (ex: circulating pump and HVAC or steam)
- (5) The Maximo number or serial number of the demolished or removed item, if applicable
- (6) All applicable data from the equipment data plate

Each Room Number List form shall contain the following information:

- (1) The name and telephone number of the individual providing the information
- (2) The date the form was completed
- (3) The building or structure identification number
- (4) A check in the box adjacent to each applicable room number

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 PAINTING OF EQUIPMENT

3.1.1 Factory Applied

Electrical equipment shall have factory-applied painting systems which shall, as a minimum, meet the requirements of **NEMA ICS 6** corrosion-resistance test.

3.1.2 Field Applied

Paint electrical equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria. Painting shall be as specified in the section specifying the associated electrical equipment.

3.2 NAMEPLATE MOUNTING

Provide number, location, and letter designation of nameplates as indicated. Fasten nameplates to the device with a minimum of two sheet-metal screws or two rivets.

3.3 WARNING SIGN MOUNTING

Provide the number of signs required to be readable from each accessible side, but space the signs a maximum of **30 feet** apart.

MAXIMO EQUIPMENT INVENTORY UPDATE

Employee: _____ Phone: _____ Date: ____/____/____

Bldg: _____ Specific Location: _____

- | | |
|--|---|
| <input type="checkbox"/> AC, Computer Room | <input type="checkbox"/> Heat Pump, Indoor Unit |
| <input type="checkbox"/> AC, Package | <input type="checkbox"/> Heat Pump, Outdoor Unit |
| <input type="checkbox"/> AC, Package Terminal | <input type="checkbox"/> Heat Pump, Package |
| <input type="checkbox"/> Assembly, Trap line | <input type="checkbox"/> Heat Pump, Package Terminal |
| <input type="checkbox"/> Backflow Preventer | <input type="checkbox"/> Pump, Circulating, Chilled Water |
| <input type="checkbox"/> Boiler | <input type="checkbox"/> Pump, Circulating, Domestic Water |
| <input type="checkbox"/> Chiller, Air Cooled Recip | <input type="checkbox"/> Pump, Circulating, Dual Temp Water |
| <input type="checkbox"/> Chiller, Air Cooled Screw | <input type="checkbox"/> Pump, Circulating, Heating Water |
| <input type="checkbox"/> Chiller, Air Cooled Scroll | <input type="checkbox"/> Pump, Condensate |
| <input type="checkbox"/> Chiller, Water Cooled Recip | <input type="checkbox"/> Pump, Sump |
| <input type="checkbox"/> Chiller, Water Cooled Screw | <input type="checkbox"/> Regulator, Temperature |
| <input type="checkbox"/> Compressor, Control Air | <input type="checkbox"/> Tank, Hot Water Storage |
| <input type="checkbox"/> Compressor, Industrial Air | <input type="checkbox"/> Tower, Cooling |
| <input type="checkbox"/> Dryer, Refrigerated Air | <input type="checkbox"/> Unit, Air Handling |
| <input type="checkbox"/> Exchanger, Heat | <input type="checkbox"/> Unit, AC Condensing |
| <input type="checkbox"/> Evaporator, Freezer | <input type="checkbox"/> Unit, Freezer Condensing |
| <input type="checkbox"/> Evaporator, Refrigerator | <input type="checkbox"/> Unit, Refrigerator Condensing |
| <input type="checkbox"/> Fan, Exhaust | <input type="checkbox"/> Unit, Fan Coil |
| <input type="checkbox"/> Generator | <input type="checkbox"/> Unit, TAB (Attach Room No. List) |
| <input type="checkbox"/> Heater, Space | <input type="checkbox"/> Unit, VAV (Attach Room No. List) |
| <input type="checkbox"/> Heater, Unit | <input type="checkbox"/> Valve, Pressure Reducing |
| <input type="checkbox"/> Heat Pump, Geo-Thermal | <input type="checkbox"/> Valve, Steam Pilot |
| | <input type="checkbox"/> Water Heater |

Demolished/Removed Equipment

Maximo no: _____ or Ser no: _____

New Equipment

Manufacturer: _____

Model no: _____

Ser no: _____

Type: Elec Oil LP Gas Nat Gas Steam Water Air

Motor Data: HP _____ Volts _____ Phase _____ RLA _____ RPM _____ Frame _____

Tons _____ No. of Motors _____ no. of Belts _____ Belt size(s) _____ CFM _____

KW _____ Refrig type _____ Refrig Qty _____ Filter Size(s) _____

VAV/TAB Room Number List

Employee: _____

Phone: _____

Bldg: _____

Date: _____

VAV/TAB Model Number: _____

100 <input type="checkbox"/>	130 <input type="checkbox"/>	160 <input type="checkbox"/>	200 <input type="checkbox"/>	230 <input type="checkbox"/>	260 <input type="checkbox"/>	300 <input type="checkbox"/>	330 <input type="checkbox"/>	360 <input type="checkbox"/>
101 <input type="checkbox"/>	131 <input type="checkbox"/>	161 <input type="checkbox"/>	201 <input type="checkbox"/>	231 <input type="checkbox"/>	261 <input type="checkbox"/>	301 <input type="checkbox"/>	331 <input type="checkbox"/>	361 <input type="checkbox"/>
102 <input type="checkbox"/>	132 <input type="checkbox"/>	162 <input type="checkbox"/>	202 <input type="checkbox"/>	232 <input type="checkbox"/>	262 <input type="checkbox"/>	302 <input type="checkbox"/>	332 <input type="checkbox"/>	362 <input type="checkbox"/>
103 <input type="checkbox"/>	133 <input type="checkbox"/>	163 <input type="checkbox"/>	203 <input type="checkbox"/>	233 <input type="checkbox"/>	263 <input type="checkbox"/>	303 <input type="checkbox"/>	333 <input type="checkbox"/>	363 <input type="checkbox"/>
104 <input type="checkbox"/>	134 <input type="checkbox"/>	164 <input type="checkbox"/>	204 <input type="checkbox"/>	234 <input type="checkbox"/>	264 <input type="checkbox"/>	304 <input type="checkbox"/>	334 <input type="checkbox"/>	364 <input type="checkbox"/>
105 <input type="checkbox"/>	135 <input type="checkbox"/>	165 <input type="checkbox"/>	205 <input type="checkbox"/>	235 <input type="checkbox"/>	265 <input type="checkbox"/>	305 <input type="checkbox"/>	335 <input type="checkbox"/>	365 <input type="checkbox"/>
106 <input type="checkbox"/>	136 <input type="checkbox"/>	166 <input type="checkbox"/>	206 <input type="checkbox"/>	236 <input type="checkbox"/>	266 <input type="checkbox"/>	306 <input type="checkbox"/>	336 <input type="checkbox"/>	366 <input type="checkbox"/>
107 <input type="checkbox"/>	137 <input type="checkbox"/>	167 <input type="checkbox"/>	207 <input type="checkbox"/>	237 <input type="checkbox"/>	267 <input type="checkbox"/>	307 <input type="checkbox"/>	337 <input type="checkbox"/>	367 <input type="checkbox"/>
108 <input type="checkbox"/>	138 <input type="checkbox"/>	168 <input type="checkbox"/>	208 <input type="checkbox"/>	238 <input type="checkbox"/>	268 <input type="checkbox"/>	308 <input type="checkbox"/>	338 <input type="checkbox"/>	368 <input type="checkbox"/>
109 <input type="checkbox"/>	139 <input type="checkbox"/>	169 <input type="checkbox"/>	209 <input type="checkbox"/>	239 <input type="checkbox"/>	269 <input type="checkbox"/>	309 <input type="checkbox"/>	339 <input type="checkbox"/>	369 <input type="checkbox"/>
110 <input type="checkbox"/>	140 <input type="checkbox"/>	170 <input type="checkbox"/>	210 <input type="checkbox"/>	240 <input type="checkbox"/>	270 <input type="checkbox"/>	310 <input type="checkbox"/>	340 <input type="checkbox"/>	370 <input type="checkbox"/>
111 <input type="checkbox"/>	141 <input type="checkbox"/>	171 <input type="checkbox"/>	211 <input type="checkbox"/>	241 <input type="checkbox"/>	271 <input type="checkbox"/>	311 <input type="checkbox"/>	341 <input type="checkbox"/>	371 <input type="checkbox"/>
112 <input type="checkbox"/>	142 <input type="checkbox"/>	172 <input type="checkbox"/>	212 <input type="checkbox"/>	242 <input type="checkbox"/>	272 <input type="checkbox"/>	312 <input type="checkbox"/>	342 <input type="checkbox"/>	372 <input type="checkbox"/>
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127 <input type="checkbox"/>	157 <input type="checkbox"/>		227 <input type="checkbox"/>	257 <input type="checkbox"/>		327 <input type="checkbox"/>	357 <input type="checkbox"/>	
128 <input type="checkbox"/>	158 <input type="checkbox"/>		228 <input type="checkbox"/>	258 <input type="checkbox"/>		328 <input type="checkbox"/>	358 <input type="checkbox"/>	
129 <input type="checkbox"/>	159 <input type="checkbox"/>		229 <input type="checkbox"/>	259 <input type="checkbox"/>		329 <input type="checkbox"/>	359 <input type="checkbox"/>	

Instructions

- (1) Confirm room numbers by visual inspection
- (2) Check the box next to each applicable room number

-- End of Section --

SECTION 26 06 00

GROUNDING AND BONDING

01/07

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM B 1 (2001) Hard-Drawn Copper Wire

ASTM B 8 (2004) Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 837 (1989) Permanent Connections Used in Substation Grounding

INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)

NETA ATS (1999) Electrical Power Distribution Equipment and Systems

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2007; AMD 1 2008) National Electrical Code - 2008 Edition

UNDERWRITERS LABORATORIES (UL)

UL 83 (20086) Standard for Thermoplastic-Insulated Wires and Cables

UL 467 (2007) Standard for Grounding and Bonding Equipment

1.2 SUBMITTALS

Submit the following in accordance with section 01 33 00, "Submittals Procedures."

SD-03 Product Data

Ground rods

Grounding and bonding conductors

SD-06 Test Reports

Submit report of results of acceptance checks and tests specified by paragraph entitled "Field Quality Control"

Ground resistance tests

1.2.1 Ground resistance tests

Upon completion and before final acceptance of the work, submit the measured ground resistance of each ground rod and grounding system, including the location of the rod and grounding system and soil conditions at the time the measurements were taken.

PART 2 PRODUCTS

2.1 GROUND RODS

Provide ground rods made of copper-clad steel conforming to UL 467. Provide ground rods that are not less than 3/4 inch in diameter and 10 feet in length.

2.2 GROUNDING AND BONDING CONNECTORS

IEEE 837 UL 467, pressure-type connector (bolted, compression, clamp) and exothermic weld. Provide type and size of connectors required for the installation.

2.3 GROUNDING AND BONDING CONDUCTORS

Solid bare copper wire meeting the requirements of ASTM B 1 for sizes No. 8 AWG and smaller and stranded bare copper wire meeting the requirements of ASTM B 8, for sizes No. 6 AWG and larger. Insulated conductors shall have 600-volt, Type TW insulation meeting the requirements of UL 83.

2.3.1 Flexible Jumper Cable

Welding cable, 2/0 AWG. Provide flexible cable in areas where movement or vibration requires a grounding connections.

PART 3 EXECUTION

3.1 INSTALLATION

Grounding installation shall conform to the requirements of NFPA 70.

3.1.1 Ground Rod Connections

Connect ground conductor to the upper end of ground rod by exothermic weld or by compression connector. Make exothermic welds strictly in accordance with manufacturer's written recommendations. Welds which have puffed up of which show convex surfaces indicating improper cleaning, are not acceptable. No mechanical connectors are required at exothermic weldments. Compression connectors shall be type that uses a hydraulic compression tool to provide correct pressure. Provide tools and dies recommended by compression connector manufacturer. An embossing die or similar method shall provide visible indication that a connector has been fully compressed on ground wire.

3.1.2 Grounding and Bonding

NFPA 70. Ground noncurrent carrying metal parts of equipment or enclosure, metallic raceway systems, grounding conductor in metallic and nonmetallic raceways, and neutral conductor of wiring systems. Make ground connection at main service equipment, and extend grounding conductor to point of entrance of metallic water service. Make connection to water pipe by suitable ground clamp or lug connection to plugged tee. If flange pipes are encountered, make connection with lug bolted to street side of flanged connection. Supplement metallic water service grounding system with additional made electrode in compliance with **NFPA 70**.

3.1.3 Pad-Mounted Transformer Grounding

Provide a 2/0 bare copper-ground girdle around transformer. Girdle shall be buried **one foot** deep and placed **3 feet** laterally from the equipment enclosure. Connect girdle to enclosure at two opposite places using 1/0 copper conductor. Exothermically weld joints.

3.1.4 Ground Resistance

Noncurrent-carrying metallic parts associated with electrical equipment shall have a maximum resistance to solid earth ground not exceeding the following values:

- a. Pad-mounted transformers: 5 ohms
- b. Grounded secondary distribution system neutral and noncurrent-carrying metal parts associated with distribution systems and grounds not otherwise covered: 5 ohms

When work in addition to that indicated or specified is directed in order to obtain the specified ground resistance, the provisions of the contract covering "changes" shall apply.

3.2 FIELD QUALITY CONTROL

3.2.1 Performance of **Acceptance Checks and Tests**

Perform in accordance with the manufacturer's recommendations, **NETA ATS**, and referenced standards specified herein. Include the following visual and mechanical inspections and electrical tests, performed in accordance with **NETA ATS**.

3.2.2 Grounding System

- a. Visual and mechanical inspection
 - (1) Inspect ground system for compliance with contract plan and specifications.
- b. Electrical tests
 - (1) Perform ground-impedance measurements utilizing the three-point method.

-- End of Section --

SECTION 26 12 19.10

THREE-PHASE PAD-MOUNTED TRANSFORMERS

04/04

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ACI INTERNATIONAL (ACI)

ACI 318M (2008) Metric Building Code Requirements for Structural Concrete and Commentary

ASTM INTERNATIONAL (ASTM)

ASTM A 167 (1999; R 2004) Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

ASTM C 260 (2001) Air-Entraining Admixtures for Concrete

ASTM D 92 (2005a) Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester

ASTM D 97 (2008) Pour Point of Petroleum Products

ASTM D 877 (2002; R 2007) Standard Test Method for Dielectric Breakdown Voltage of Insulating Liquids Using Disk Electrodes

ASTM D 1535 (1997) Specifying Color by the Munsell System

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 712-C-98-075 (1996) Fate, Transport and Transformation Test Guidelines - OPPTS 835.3100- "Aerobic Aquatic Biodegradation"

EPA 600/4-90/027F (1993) Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms

FM GLOBAL (FM)

FM P7825 (2005) Approval Guide

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

- IEEE Std 386 (1995; R 2001) Separable Insulated Connection
- IEEE C2 (2007; Errata 2007; INT 2008) National Electrical Safety Code
- IEEE C57.12.00 (2000) Liquid-Immersed Distribution, Power, and Regulating Transformers (IEEE)
- IEEE C57.12.80 (2002) Terminology for Power and Distribution Transformers (IEEE)
- IEEE C57.12.90 (1999) Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers (IEEE)
- IEEE C57.98 (1993; Correction 1998) Guide for Transformer Impulse Tests (IEEE)
- IEEE C62.11 (1999) Metal-Oxide Surge Arresters for AC Power Circuits (= 1 kV) (ANSI/IEEE)

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

- NEMA C12.10 (2004) Physical Aspects of Watthour Meters
- NEMA C37.47 (2000) High Voltage Current-Limiting Type Distribution Class Fuses and Fuse Disconnecting Switches
- NEMA C57.12.22 (1993; R 1998) Transformers - Pad-Mounted, Compartmental-Type, Self-Cooled, Three-Phase Distribution Transformers with High-Voltage Bushings, 2500 kVA and Smaller: High Voltage, 34 500 GrdY /19 920 Volts and Below; Low Voltage, 480 Volts and Below
- NEMA C57.12.26 (1993) Pad-Mounted, Compartmental-Type, Self-Cooled, Three-Phase Distribution Transformers for Use with Separable Insulated High-Voltage Connectors, High-Voltage, 34 500 Grd Y/19 920 Volts and Below; 2500 kVA and Smaller
- NEMA C57.12.28 (1999) Pad-Mounted Equipment - Enclosure Integrity (Revision of ANSI C57.12.28-88)
- NEMA C57.12.29 (1999; Errata 2000) Pad-Mounted Equipment - Enclosure Integrity for Coastal Environments

INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)

- NETA ATS (1999) Electrical Power Distribution Equipment and Systems

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2007; AMD 1 2008) National Electrical Code - 2008 Edition

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (OECD)

OECD Test 203 (1992) Fish Acute Toxicity Test

UNDERWRITERS LABORATORIES (UL)

UL 467 (2007) Standard for Grounding and Bonding Equipment

1.2 RELATED REQUIREMENTS

Section 26 00 00, "Basic Electrical Materials and Methods," applies to this section, with the additions and modifications specified herein.

1.3 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00
SUBMITTAL PROCEDURES:

As an exception to this paragraph, transformers manufactured by ABB in Jefferson City, MO; by Cooper Power Systems in Waukesha, WI; by GE in Shreveport, LA; or by Howard Industries in Laurel, MS need not meet the submittal requirements of this contract. Instead, the following shall be submitted:

- a. A certification, from the manufacturer, that the technical requirements of this specification shall be met.
- b. An outline drawing of the transformer with devices identified (paragraph entitled "Pad-Mounted Transformer Drawings", item a).
- c. ANSI nameplate data of the transformer (paragraph entitled "Pad-Mounted Transformer Drawings", item b).
- d. Routine and other tests (in PART 2, see paragraph entitled "Routine and Other Tests"), shall be conducted by the manufacturer and may be witnessed by the government (in Part 2, see paragraph entitled "Source Quality Control"). Provide transformer test schedule required by submittal item "SD-11 Closeout Submittals". Provide certified copies of the tests.
- e. Provide acceptance test reports required by submittal item "SD-06 Test Reports".
- f. Provide operation and maintenance manuals required by submittal item "SD-10 Operation and Maintenance Data".

SD-02 Shop Drawings

Pad-mounted transformer drawings

SD-03 Product Data

Pad-mounted transformers

SD-06 Test Reports

Acceptance checks and tests

SD-07 Certificates

Transformer losses

SD-09 Manufacturer's Field Reports

Pad-mounted transformer design tests

Pad-mounted transformer routine and other tests

SD-10 Operation and Maintenance Data

Transformer(s), Data Package 5

SD-11 Closeout Submittals

Transformer test schedule

1.4 QUALITY ASSURANCE

1.4.1 Pad-Mounted Transformer Drawings

Drawings shall indicate, but not be limited to the following:

- a. An outline drawing, with front, top, and side views.
- b. ANSI nameplate data.
- c. Elementary diagrams and wiring diagrams with terminals identified of watt-hour meter and current transformers.
- d. One-line diagram, including switch(es), current transformers, meters, and fuses.
- e. Manufacturer's published time-current curves (on full size logarithmic paper) of the transformer high side fuses.

1.4.2 Transformer Losses

Submit certification from the manufacturer indicating conformance with the paragraph entitled "Specified Transformer Losses."

1.4.3 Transformer Product Data

Submittal shall include manufacturer's information for each component, device, and accessory provided with the transformer.

1.4.4 Test Results

Submit report of test results as specified by paragraph entitled "Field Quality Control"

1.5 MAINTENANCE

1.5.1 Additions to Operation and Maintenance Data

In addition to requirements of Data Package 5, include the following on the actual transformer(s) provided:

- a. An instruction manual with pertinent items and information highlighted
- b. An outline drawing, front, top, and side views
- c. Prices for spare parts and supply list
- d. Routine and field acceptance test reports
- e. Fuse curves for primary fuses
- f. Actual nameplate diagram
- g. Date of purchase

1.5.2 Operation and Maintenance Data

Submit operation and maintenance data in accordance with Section 01 78 23, "Operation and Maintenance Data" and as specified herein.

PART 2 PRODUCTS

2.1 PRODUCT COORDINATION

Products and materials not considered to be pad-mounted transformers and related accessories are specified in Section 33 71 02, "Underground Transmission and Distribution", and Section 26 20 00, "Interior Distribution System".

2.2 THREE-PHASE PAD-MOUNTED TRANSFORMERS

NEMA C57.12.26, NEMA C57.12.22, NEMA C57.12.28, NEMA C57.12.29 and as specified herein.

2.2.1 Compartments

The high- and low-voltage compartments shall be separated by steel isolating barriers extending the full height and depth of the compartments. Compartment doors: hinged lift-off type with stop in open position and three-point latching.

2.2.1.1 High Voltage, Dead-Front

High-voltage compartment shall contain the incoming line, insulated high-voltage load-break connectors, bushing well inserts, six high-voltage bushing wells configured for loop feed application, load-break switch handle(s), access to oil-immersed fuses, dead-front surge arresters, tap changer handle, connector parking stands and ground pad.

- a. Insulated high-voltage load-break connectors: IEEE Std 386, rated 15 kV, 95 kV BIL. Current rating: 200 amperes rms continuous. Short time rating: 10,000 amperes rms symmetrical for a time duration of 0.17 seconds. Connector shall have a steel reinforced hook-stick eye,

grounding eye, test point, and arc-quenching contact material.

b. Bushing well inserts: **IEEE Std 386**, 200 amperes, 15 kV Class. Provide a bushing well insert for each bushing well unless indicated otherwise.

c. Load-break switch

Loop feed sectionalizer switches: Provide three, two-position, oil-immersed type switches to permit closed transition loop feed and sectionalizing. Each switch shall be rated at 15 kV, 95 kV BIL, with a continuous current rating and load-break rating of 200 amperes, and a make-and-latch rating of 10,000 rms amperes symmetrical. Locate the switch handles in the high-voltage compartment. Operation of switches shall be as follows:

ARRANGE- MENT NO.	DESCRIPTION OF SWITCH ARRANGEMENT	SWITCH POSITION					
		LINE A SW.		LINE B SW		XFMR. SW	
		OPEN	CLOSE	OPEN	CLOSE	OPEN	CLOSE
1	Line A connected to Line B and both lines connected to transformer		X		X		X
2	Transformer connected to Line A only		X	X			X
3	Transformer connected to Line B only	X			X		X
4	Transformer open and loop closed		X		X	X	
5	Transformer open and loop open	X		X		X	

d. Provide bayonet type, oil-immersed, expulsion fuses in series with oil-immersed, partial-range, current-limiting fuses. Bayonet fuse links shall sense both high currents and high oil temperature in order to provide thermal protection to the transformer. Coordinate transformer protection with expulsion fuse clearing low-current faults and current-limiting fuse clearing high-current faults beyond the interrupting rating of the expulsion fuse. In order to eliminate or minimize oil spills, the bayonet fuse assembly shall include an oil retention valve inside the housing which closes when the fuse holder is removed and an external drip shield. Warning shall be conspicuously displayed within the high-voltage compartment cautioning against removing or inserting fuses unless the load-break switch is in the open position and the tank pressure has been released.

Bayonet fuse assembly: 150 kV BIL.

Oil-immersed current-limiting fuses: NEMA C37.47; 50,000 rms amperes symmetrical interrupting rating at the system voltage specified.

- e. Surge arresters: IEEE C62.11, rated 10 kV, fully shielded, dead-front, metal-oxide-varistor, elbow type with resistance-graded gap, suitable for plugging into inserts. Provide three arresters for loop feed circuits.
- f. Parking stands: Provide a parking stand near each bushing well.

2.2.1.2 Low Voltage

Low-voltage compartment shall contain low-voltage bushings with NEMA spade terminals, accessories, metering, stainless steel or laser-etched anodized aluminum diagrammatic transformer nameplate, and ground pad.

- a. Accessories shall include drain valve with sampler device, fill plug, pressure relief device, liquid level gage, pressure-vacuum gage, and dial type thermometer with maximum temperature indicator.
- b. Metering: NEMA C12.10 Provide a socket-mounted electronic programmable outdoor watthour meter, surface mounted flush against the side of the low-voltage compartment as indicated. Meter shall either be programmed at the factory or shall be programmed in the field. When field programming is performed, turn field programming device over to the Contracting Officer at completion of project. Meter shall be coordinated to system requirements.
 - 1. Design: Provide meter designed for use on a 3-phase, 4-wire, 208Y/120 volt system 3 current transformers. Include necessary KYZ pulse initiation hardware for Energy Monitoring and Control System (EMCS).
 - 2. Coordination: Provide meter coordinated with ratios of current transformers and transformer secondary voltage.
 - 3. Class: 20; Form: 9S; Accuracy: +/- 1.0 percent; Finish: Class II.
 - 4. Cover: Polycarbonate and lockable to prevent tampering and unauthorized removal.
 - 5. Kilowatt-hour Register: 5 digit electronic programmable type.
 - 6. Demand Register
 - (a) Provide solid state
 - (b) Meter reading multiplier
 - (1) Indicate multiplier on the meter face.
 - (c) Demand intercal length: shall be programmed for 15 minutes with rolling demand up to six subintervals per interval.
 - 7. Meter fusing: Provide a fuse block mounted in the secondary compartment containing one fuse per phase to protect the voltage input to the watthour meter. Size fuses as recommended by the meter manufacturer.

- 8. Socket: IEEE C12.7. Provide NEMA Type 3R, box-mounted socket having automatic circuit-closing bypass and having jaws compatible with requirements of the meter. Cover unused hub openings with blank hub plates. Paint box Munsell 7GY3.29/1.5 green to match the pad-mounted transformer to which the box-mounted socket is attached. The Munsell color notation is specified in ASTM D 1535.
- 9. Current transformer: IEEE C57.13. Provide butyl-molded window type current transformer with 600-volt insulation, 10 kV BIL and mount on the low-voltage bushing. Route current transformer leads in a location as remote as possible from the power transformer secondary cable to permit current measurements to be take with hook-on-ammeters. Provide three current transformers per power transformer with characteristics listed in the following table.

<u>kVA</u>	<u>Sec. Volt</u>	<u>CT Ratio</u>	<u>RF</u>	<u>Meter Acc. Class</u>
500	208Y/120	1200/5	1.5	0.3 thru B-0.5

2.2.2 Transformer

- a. Oil-insulated, two winding, 60 hertz, 65 degrees C rise above a 30 degrees C average ambient, self-cooled type.
- b. Transformer shall be rated 500 kVA, 95 kV BIL.
- c. Transformer voltage ratings: 12,470 Delta - 208Y/120 V.
- d. Tap changer shall be externally operated, manual type for changing tap setting when the transformer is de-energized. Provide four 2.5 percent full capacity taps, two above and two below rated primary voltage. Tap changers shall clearly indicate which tap setting is in use.
- e. Minimum tested impedance shall not be less than manufacturer's typical design impedances.
- f. Audible sound levels shall comply with the following:

<u>kVA</u>	<u>DECIBELS (MAX)</u>
500	56

- g. Transformer shall include lifting lugs and provisions for jacking under base. The transformer base construction shall be suitable for using rollers or skidding in any direction. Provide transformer top with an access handhole. Transformer shall have its kVA rating conspicuously displayed on its enclosure. The transformer shall have an insulated low-voltage neutral bushing with NEMA spade terminal, and with removable ground strap.

2.2.2.1 Specified Transformer Losses

No-load losses (NLL) shall be 741 watts at 20 degrees C and load losses (LL) shall be 3017 watts at 85 degrees C. The values for the specified losses shall be used for comparison with the losses determined during the routine tests. If the routine test values for no-load losses exceed the specified no-load losses by more than 10 percent, or the total losses

exceed the specified total losses (sum of no-load and load losses) by more than 6 percent, the transformer is unacceptable.

2.2.3 Insulating Liquid

- a. Less-flammable transformer liquids: [NFPA 70](#) and [FM P7825](#) for less-flammable liquids having a fire point not less than 300 degrees C tested per [ASTM D 92](#) and a dielectric strength not less than 33 kv tested per [ASTM D 877](#). Provide identification of transformer as "non-PCB" and "manufacturer's name and type of fluid" on the nameplate. The fluid shall be a biodegradable electrical insulating and cooling liquid classified by UL and approved by FM as "less flammable" fluids. The fluid shall meet the following fluid properties:

1. Pour point: [ASTM D 97](#), less than -15 degree C
2. Aquatic biodegradation: [EPA 712-C-98-075](#), 100%
3. Trout toxicity: [OECD Test 203](#), zero mortality of [EPA 600/4-90/027F](#), pass.

2.2.3.1 Liquid-Filled Transformer Nameplates

Power transformers shall be provided with nameplate information in accordance with [IEEE C57.12.00](#) and as modified or supplemented by this section.

2.2.4 Corrosion Protection

Bases and cabinets of transformers shall be corrosion resistant and shall be fabricated of stainless steel conforming to [ASTM A 167](#), Type 304 or 304L. Base shall include any part of pad-mounted transformer that is within 3 inches of concrete pad. Paint bases, cabinets, and tanks Munsell 7GY3.29/1.5 green. Paint coating system shall comply with [NEMA C57.12.28](#) regardless of base, cabinet, and tank material. The Munsell color notation is specified in [ASTM D 1535](#).

2.3 WARNING SIGNS

Provide as specified in Section [26 00 00](#), "Basic Electrical Materials and Methods."

2.4 GROUNDING AND BONDING

[UL 467](#). Provide grounding and bonding as specified in Section [33 71 02](#), "Underground Transmission and Distribution."

2.5 CAST-IN-PLACE CONCRETE

Shall be composed of fine aggregate, coarse aggregate, portland cement, and water so proportioned and mixed as to produce a plastic, workable mixture. Fine aggregate shall be of hard, dense, durable, clean, and uncoated sand. The coarse aggregate shall be reasonably well graded from 3/16 inch to 1 inch. The fine and coarse aggregates shall be free from injurious amounts of dirt, vegetable matter, soft fragments or other deleterious substances. Water shall be fresh, clean, and free from salts, alkali, organic matter, and other impurities. Concrete associated with electrical work for other than encasement of underground ducts shall be 4000 psi minimum 28-day compressive strength unless specified otherwise. Slump shall not exceed 4

inches. Retempering of concrete will not be permitted. Exposed, unformed concrete surfaces shall be given a smooth, wood float finish. Concrete shall be cured for a period of not less than 7 days, and concrete made with high early strength portland cement shall be repaired by patching honeycombed or otherwise defective areas with cement mortar as directed by the Contracting Officer. Air entrain concrete exposed to weather using an air-entraining admixture conforming to ASTM C 260. Air content shall be between 4 and 6 percent.

2.6 SOURCE QUALITY CONTROL

2.6.1 Transformer Test Schedule

The Government reserves the right to witness tests. Provide transformer test schedule for tests to be performed at the manufacturer's test facility. Submit required test schedule and location, and notify the Contracting Officer 30 calendar days before scheduled test date. Notify Contracting Officer 15 calendar days in advance of changes to scheduled date.

a. Test Instrument Calibration

1. The manufacturer shall have a calibration program which assures that all applicable test instruments are maintained within rated accuracy.
2. The accuracy shall be directly traceable to the National Institute of Standards and Technology.
3. Instrument calibration frequency schedule shall not exceed 12 months for both test floor instruments and leased specialty equipment.
4. Dated calibration labels shall be visible on all test equipment.
5. Calibrating standard shall be of higher accuracy than that of the instrument tested.
6. Keep up-to-date records that indicate dates and test results of instruments calibrated or tested. For instruments calibrated by the manufacturer on a routine basis, in lieu of third party calibration, include the following:
 - (a) Maintain up-to-date instrument calibration instructions and procedures for each test instrument.
 - (b) Identify the third party/laboratory calibrated instrument to verify that calibrating standard is met.

2.6.2 Design Tests

IEEE C57.12.00, and IEEE C57.12.90. Section 5.1.2 in IEEE C57.12.80 states that "design tests are made only on representative apparatus of basically the same design." Submit design test reports (complete with test data, explanations, formulas, and results), in the same submittal package as the catalog data and drawings for the specified transformer(s). Design tests shall have been performed prior to the award of this contract.

- a. Tests shall be certified and signed by a registered professional

engineer.

- b. Temperature rise: "Basically the same design" for the temperature rise test means a pad-mounted transformer with the same coil construction (such as wire wound primary and sheet wound secondary), the same kVA, the same cooling type (ONAN), the same temperature rise rating, and the same insulating liquid as the transformer specified.
- c. Lightning impulse: "Basically the same design" for the lightning impulse dielectric test means a pad-mounted transformer with the same BIL, the same coil construction (such as wire wound primary and sheet wound secondary), and a tap changer, if specified. Design lightning impulse tests shall include both the primary and secondary windings of that transformer.
 - 1. IEEE C57.12.90, paragraph 10.3 entitled "Lightning Impulse Test Procedures," and IEEE C57.98.
 - 2. State test voltage levels.
 - 3. Provide photographs of oscilloscope display waveforms or plots of digitized waveforms with test report.
- d. Lifting and moving devices: "Basically the same design" requirement for the lifting and moving devices test means a test report confirming that the lifting device being used is capable of handling the weight of the specified transformer in accordance with NEMA C57.12.22.
- e. Pressure: "Basically the same design" for the pressure test means a pad-mounted transformer with a tank volume within 30 percent of the tank volume of the transformer specified.

2.6.3 Routine and Other Tests

IEEE C57.12.00. Routine and other tests shall be performed by the manufacturer on each of the actual transformer(s) prepared for this project to ensure that the design performance is maintained in production. Submit test reports, by serial number and receive approval before delivery of equipment to the project site. Required tests and testing sequence shall be as follows:

- a. Cold resistance measurements (provide reference temperature)
- b. Phase relation
- c. Ratio
- d. No-load losses (NLL) and excitation current
- e. Load losses (LL) and impedance voltage
- f. Dielectric
 - 1. Impulse
 - (a) State test voltage levels
 - (b) Provide photographs of oscilloscope display waveforms or plots of digitized waveforms with test reports. As an alternative,

photographs of oscilloscope display waveforms or plots of digitized waveforms may be hand-delivered at the factory witness test.

2. Applied voltage

3. Induced voltage

g. Leak

PART 3 EXECUTION

3.1 INSTALLATION

Electrical installations shall conform to **IEEE C2**, **NFPA 70**, and to requirements specified herein. Provide new equipment and materials unless indicated or specified otherwise.

3.2 GROUNDING

NFPA 70 and **IEEE C2**, except that grounding systems shall have a resistance to solid earth ground not exceeding 5 ohms.

3.2.1 Grounding Electrodes

Provide driven ground rods as specified in Section **33 71 02**, "Underground Transmission and Distribution". Connect ground conductors to the upper end of ground rods by exothermic weld or compression connector. Provide compression connectors at equipment end of ground conductors.

3.2.2 Pad-Mounted Transformer Grounding

Provide separate copper grounding conductors and connect them to the ground loop as indicated. When work in addition to that indicated or specified is required to obtain the specified ground resistance, the provision of the contract covering "Changes" shall apply.

3.2.3 Connections

Make joints in grounding conductors and loops by exothermic weld or compression connector. Exothermic welds and compression connectors shall be installed as specified in Section **33 71 02**, "Underground Transmission and Distribution."

3.2.4 Grounding and Bonding Equipment

UL 467, except as indicated or specified otherwise.

3.3 TRANSFORMER GROUNDING

Provide a 2/0 bare copper-ground girdle around transformer. Girdle shall be buried **one foot** deep and placed **3 feet** laterally from the transformer enclosure. Connect girdle to enclosure at two opposite places using 1/0 copper. Exothermically weld joints.

3.4 INSTALLATION OF EQUIPMENT AND ASSEMBLIES

Install and connect pad-mounted transformers furnished under this section as indicated on project drawings, the approved shop drawings, and as

specified herein.

3.5 FOUNDATION FOR EQUIPMENT AND ASSEMBLIES

Mount transformer on concrete slab. Unless otherwise indicated, the slab shall be at least 8 inches thick, reinforced with a 6 by 6 - W2.9 by W2.9 mesh, placed uniformly 4 inches from the top of the slab. Slab shall be placed on a 6 inch thick, well-compacted gravel base. Top of concrete slab shall be approximately 4 inches above finished grade with gradual slope for drainage. Edges above grade shall have 1/2 inch chamfer. Slab shall be of adequate size to project at least 8 inches beyond the equipment.

Stub up conduits, with bushings, 2 inches into cable wells in the concrete pad. Coordinate dimensions of cable wells with transformer cable training areas.

3.5.1 Cast-In-Place Concrete

Cast-in-place concrete work shall conform to the requirements of ACI 318M.

3.5.2 Sealing

When the installation is complete, the Contractor shall seal all conduit and other entries into the equipment enclosure with an approved sealing compound. Seals shall be of sufficient strength and durability to protect all energized live parts of the equipment from rodents, insects, or other foreign matter.

3.6 FIELD QUALITY CONTROL

3.6.1 Performance of Acceptance Checks and Tests

Perform in accordance with the manufacturer's recommendations and include the following visual and mechanical inspections and electrical tests, performed in accordance with NETA ATS.

3.6.1.1 Pad-Mounted Transformers

- a. Visual and mechanical inspection
 1. Compare equipment nameplate information with specifications and approved shop drawings.
 2. Inspect physical and mechanical condition. Check for damaged or cracked insulators and leaks.
 3. Inspect all bolted electrical connections for high resistance using low-resistance ohmmeter, verifying tightness of accessible bolted electrical connections by calibrated torque-wrench method, or performing thermographic survey.
 4. Verify correct liquid level in tanks.
 5. Perform specific inspections and mechanical tests as recommended by manufacturer.
 6. Verify correct equipment grounding.
- b. Electrical tests

1. Perform resistance measurements through all bolted connections with low-resistance ohmmeter, if applicable.
2. Perform insulation-resistance tests.
3. Perform turns-ratio tests.
4. Perform insulation power-factor/dissipation-factor tests on windings.
5. Sample insulating liquid. Sample shall be tested for:
 - (a) Dielectric breakdown voltage
 - (b) Acid neutralization number
 - (c) Specific gravity
 - (d) Interfacial tension
 - (e) Color
 - (f) Visual condition
 - (g) Water in insulating liquid
 - (h) Measure dissipation factor or power factor
6. Perform dissolved gas analysis (DGA).
7. Test for presence of PCB.
8. Verify that the tap-changer is set at specified ratio.
9. Verify proper secondary voltage phase-to-phase and phase-to-neutral after energization and prior to loading.

3.6.1.2 Grounding System

- a. Visual and mechanical inspection
 1. Inspect ground system for compliance with contract plans and specifications.
- b. Electrical tests
 1. Perform ground-impedance measurements utilizing the fall-of-potential method. On systems consisting of interconnected ground rods, perform tests after interconnections are complete. On systems consisting of a single ground rod perform tests before any wire is connected. Take measurements in normally dry weather, not less than 48 hours after rainfall. Use a portable ground testing megger in accordance with manufacturer's instructions to test each ground or group of grounds. The instrument shall be equipped with a meter reading directly in ohms or fractions thereof to indicate the ground value of the ground rod or grounding systems under test.

2. Submit the measured ground resistance of each ground rod and grounding system, indicating the location of the rod and grounding system. Include the test method and test setup (i.e., pin location) used to determine ground resistance and soil conditions at the time the measurements were made.

3.6.2 Follow-Up Verification

Upon completion of acceptance checks and tests, the Contractor shall show by demonstration in service that circuits and devices are in good operating condition and properly performing the intended function. As an exception to requirements stated elsewhere in the contract, the Contracting Officer shall be given 5 working days advance notice of the dates and times of checking and testing.

-- End of Section --

SECTION 26 20 00

INTERIOR DISTRIBUTION SYSTEM

01/07

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

- ASTM B 1 (2001) Hard-Drawn Copper Wire
- ASTM B 8 (2004) Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

- NEMA C80.1 (1994) Rigid Steel Conduit - Zinc Coated
- NEMA C80.3 (1994) Electrical Metallic Tubing - Zinc Coated (EMT)
- NEMA FU 1 (2002) Low Voltage Cartridge Fuses
- NEMA ICS 1 (2000) Industrial Control and Systems General Requirements
- NEMA ICS 2 (2000) Industrial Control and Systems Controllers, Contactors, and Overload Relays Rated 600 Volts
- NEMA ICS 4 (2000) Industrial Automation Control Products and Systems Section Terminal Blocks
- NEMA ICS 6 (1993; R 2006) Standard for Industrial Controls and Systems Enclosures
- NEMA KS 1 (2001) Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum)
- NEMA TC 14 (2002) Filament-Wound Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
- NEMA TC 2 (2003) Standard for Electrical Polyvinyl Chloride (PVC) Tubing and Conduit
- NEMA TC 3 (1999) PVC Fittings for Use with Rigid PVC

Conduit and Tubing

- NEMA WD 1 (1999) General Color Requirements for Wiring Devices
- NEMA WD 6 (2002) Wiring Devices - Dimensional Specifications
- NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
- NFPA 70 (2007; AMD 1 2008) National Electrical Code - 2008 Edition
- UNDERWRITERS LABORATORIES (UL)
- UL 1 (2000) Flexible Metal Conduit
- UL 1242 (2006; Rev thru Jul 2007) Standard for Electrical Intermediate Metal Conduit -- Steel
- UL 1449 (2006) Surge Protective Devices
- UL 198E (1988; R 1988) Class R Fuses
- UL 20 (2000; R 2002, Bul. 2002) General-Use Snap Switches
- UL 360 (1996; R 2001, Bul. 2002) Liquid-Tight Flexible Steel Conduit
- UL 467 (2007) Standard for Grounding and Bonding Equipment
- UL 486A-486B (2003; Rev thru Aug 2006) Standard for Wire Connectors
- UL 486C (2000; R 2002) Splicing Wire Connectors
- UL 489 (2002; R 2002, Bul. 2003) Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures
- UL 498 (2001; R 2002) Attachment Plugs and Receptacles
- UL 50 (1995; R 1999, Bul. 2001) Enclosures for Electrical Equipment
- UL 508 (1999; R 2002, Bul. 2003) Industrial Control Equipment
- UL 510 (2005; Rev thru Aug 2005) Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape
- UL 514A (1996; R 2001, Bul. 2002) Metallic Outlet Boxes

UL 514B	(2004; Rev thru Aug 2007) Standard for Conduit, Tubing and Cable Fittings
UL 514C	(1996; R 2002) Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
UL 6	(2007) Standard for Electrical Rigid Metal Conduit-Steel
UL 651	(2005; Rev thru May 2007) Standard for Schedule 40 and 80 Rigid PVC Conduit and Fittings
UL 67	(1993; R 2002) Panelboards
UL 797	(2000; Bul. 2002) Electrical Metallic Tubing
UL 83	(20086) Standard for Thermoplastic-Insulated Wires and Cables
UL 869A	(1998; Bul. 2002) Reference Standard for Service Equipment
UL 943	(1993; R 2002, Bul. 2002) Ground-Fault Circuit-Interrupters

1.2 RELATED REQUIREMENTS

Section 26 00 00, "Basic Electrical Materials and Methods," applies to this section with additions and modifications specified herein.

1.3 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00
SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Panelboards

SD-03 Product Data

Receptacles

Circuit breakers

Switches

Enclosed circuit breakers

Motor controllers

Combination motor controllers

Manual motor starters

Surge protective devices

SD-06 Test Reports

600-volt wiring test

Ground-fault receptacle test

SD-07 Certificates

Fuses

1.4 QUALITY ASSURANCE

1.4.1 Fuses

Submit coordination data as specified in article entitled, "FUSES" of this section.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

Materials, equipment, and devices shall, as a minimum, meet requirements of UL, where UL standards are established for those items, and requirements of NFPA 70.

2.2 CONDUIT AND FITTINGS

Shall conform to the following:

2.2.1 Rigid Metallic Conduit

2.2.1.1 Rigid, Threaded Zinc-Coated Steel Conduit

NEMA C80.1, UL 6.

2.2.2 Rigid Nonmetallic Conduit

PVC Type EPC-40, in accordance with NEMA TC 2, UL 651, or fiberglass conduit, in accordance with NEMA TC 14.

2.2.3 Intermediate Metal Conduit (IMC)

UL 1242, zinc-coated steel only.

2.2.4 Electrical, Zinc-Coated Steel Metallic Tubing (EMT)

UL 797, NEMA C80.3.

2.2.5 Flexible Metal Conduit

UL 1.

2.2.5.1 Liquid-Tight Flexible Metal Conduit, Steel

UL 360.

2.2.6 Fittings for Metal Conduit, EMT, and Flexible Metal Conduit

UL 514B. Ferrous fittings shall be cadmium- or zinc-coated in accordance

with UL 514B.

2.2.6.1 Fittings for Rigid Metal Conduit and IMC

Threaded-type. Split couplings unacceptable.

2.2.6.2 Fittings for EMT

Steel compression type.

2.2.7 Fittings for Rigid Nonmetallic Conduit

NEMA TC 3, UL 514B.

2.3 OUTLET BOXES AND COVERS

UL 514A, cadmium- or zinc-coated, if ferrous metal. UL 514C, if nonmetallic.

2.4 WIRES AND CABLES

Wires and cables shall meet applicable requirements of NFPA 70 and UL for type of insulation, jacket, and conductor specified or indicated. Wires and cables manufactured more than 12 months prior to date of delivery to site shall not be used.

2.4.1 Conductors

Conductors No. 8 AWG and larger diameter shall be stranded. Conductors No. 10 AWG and smaller diameter shall be solid, except that conductors for remote control, alarm, and signal circuits, classes 1, 2, and 3, shall be stranded unless specifically indicated otherwise. Conductor sizes and ampacities shown are based on copper, unless indicated otherwise. All conductors shall be copper.

2.4.1.1 Minimum Conductor Sizes

Minimum size for branch circuits shall be No. 12 AWG; for Class 1 remote-control and signal circuits, No. 14 AWG; for Class 2 low-energy, remote-control and signal circuits, No. 16 AWG; and for Class 3 low-energy, remote-control, alarm and signal circuits, No. 22 AWG.

2.4.2 Color Coding

Provide for service, feeder, branch, control, and signaling circuit conductors. Color shall be green for grounding conductors and white for neutrals; except where neutrals of more than one system are installed in same raceway or box, other neutral shall be white with colored (not green) stripe. Color of ungrounded conductors in different voltage systems shall be as follows:

a. 208/120 volt, three-phase

- (1) Phase A - black
- (2) Phase B - red
- (3) Phase C - blue

2.4.3 Insulation

Unless specified or indicated otherwise or required by [NFPA 70](#), power and lighting wires shall be 600-volt, Type THWN/THHN conforming to [UL 83](#), except that grounding wire may be type TW conforming to [UL 83](#); remote-control and signal circuits shall be Type TW or TF, conforming to [UL 83](#). Where lighting fixtures require 90-degree Centigrade (C) conductors, provide only conductors with 90-degree C insulation or better.

2.4.4 Bonding Conductors

[ASTM B 1](#), solid bare copper wire for sizes No. 8 AWG and smaller diameter; [ASTM B 8](#), Class B, stranded bare copper wire for sizes No. 6 AWG and larger diameter.

2.5 SPLICES AND TERMINATION COMPONENTS

[UL 486A-486B](#) for wire connectors and [UL 510](#) for insulating tapes. Connectors for No. 10 AWG and smaller diameter wires shall be insulated, pressure-type in accordance with [UL 486A-486B](#) or [UL 486C](#) (twist-on splicing connector). Provide solderless terminal lugs on stranded conductors.

2.6 DEVICE PLATES

Provide UL listed, one-piece device plates for outlets to suit the devices installed. For metal outlet boxes, plates on unfinished walls shall be of zinc-coated sheet steel or cast metal having round or beveled edges. For nonmetallic boxes and fittings, other suitable plates may be provided. Plates on finished walls shall be satin finish stainless steel or brushed-finish aluminum, minimum [0.03 inch](#) thick. Screws shall be machine-type with countersunk heads in color to match finish of plate. Sectional type device plates will not be permitted. Plates installed in wet locations shall be gasketed and UL listed for "wet locations."

2.7 SWITCHES

2.7.1 Toggle Switches

[NEMA WD 1](#), [UL 20](#), single pole, three-way, and totally enclosed with bodies of thermoplastic and/or thermoset plastic and mounting strap with grounding screw. Handles shall be white thermoplastic. Wiring terminals shall be screw-type, side-wired. Contacts shall be silver-cadmium and contact arm shall be one-piece copper alloy. Switches shall be rated quiet-type ac only, 120/277 volts, with current rating and number of poles indicated.

2.7.2 Disconnect Switches

[NEMA KS 1](#). Provide heavy duty-type switches. Fused switches shall utilize Class R fuseholders and fuses, unless indicated otherwise. Switches serving as motor-disconnect means shall be horsepower rated. Provide switches in NEMA, enclosure as indicated per [NEMA ICS 6](#).

2.8 RECEPTACLES

[UL 498](#), hard use, heavy-duty, grounding-type. Ratings and configurations shall be as indicated. Bodies shall be of white as per [NEMA WD 1](#). Face and body shall be thermoplastic supported on a metal mounting strap. Dimensional requirements shall be per [NEMA WD 6](#). Provide screw-type, side-wired wiring terminals. Connect grounding pole to mounting strap. The

receptacle shall contain triple-wipe power contacts and double or triple-wipe ground contacts.

2.8.1 Weatherproof Receptacles

Provide in cast metal box with gasketed, weatherproof, cast-metal cover plate and gasketed cap over each receptacle opening. Provide caps with a spring-hinged flap. Receptacle shall be UL listed for use in "wet locations with plug in use."

2.8.2 Ground-Fault Circuit Interrupter Receptacles

UL 943, duplex type for mounting in standard outlet box. Device shall be capable of detecting current leak of 6 milliamperes or greater and tripping per requirements of UL 943 for Class A GFI devices. Provide screw-type, side-wired wiring terminals or pre-wired (pigtail) leads.

2.9 PANELBOARDS

UL 67 and UL 50 having a short-circuit current rating as indicated. Panelboards for use as service disconnecting means shall additionally conform to UL 869A. Panelboards shall be circuit breaker-equipped. Design shall be such that individual breakers can be removed without disturbing adjacent units or without loosening or removing supplemental insulation supplied as means of obtaining clearances as required by UL. "Specific breaker placement" is required in panelboards to match the breaker placement indicated in the panelboard schedule on the drawings. Use of "Subfeed Breakers" is not acceptable unless specifically indicated otherwise. Main breaker shall be "separately" mounted "above" branch breakers. Where "space only" is indicated, make provisions for future installation of breakers. Panelboard locks shall be keyed same. Directories shall indicate load served by each circuit in panelboard. Directories shall also indicate source of service to panelboard (e.g., Panel PA served from Panel MDP). Type directories and mount in holder behind transparent protective covering. Panelboards shall be listed and labeled for their intended use.

2.9.1 Panelboard Buses

Support bus bars on bases independent of circuit breakers. Main buses and back pans shall be designed so that breakers may be changed without machining, drilling, or tapping. Provide isolated neutral bus in each panel for connection of circuit neutral conductors. Provide separate ground bus identified as equipment grounding bus per UL 67 for connecting grounding conductors; bond to steel cabinet. Buses are to be constructed of hard drawn copper of 98 percent conductivity.

2.9.2 Circuit Breakers

UL 489, thermal magnetic-type having a minimum short-circuit current rating equal to the short-circuit current rating of the panelboard in which the circuit breaker shall be mounted. Breaker terminals shall be UL listed as suitable for type of conductor provided. Series rated circuit breakers and plug-in circuit breakers are unacceptable.

2.9.2.1 Multipole Breakers

Provide common trip-type with single operating handle. Breaker design shall be such that overload in one pole automatically causes all poles to open.

Maintain phase sequence throughout each panel so that any three adjacent breaker poles are connected to Phases A, B, and C, respectively.

2.9.2.2 Circuit Breakers for HVAC Equipment

Circuit breakers for HVAC equipment having motors (group or individual) shall be marked for use with HACR type and UL listed as HACR type.

2.10 ENCLOSED CIRCUIT BREAKERS

UL 489. Individual molded case circuit breakers with voltage and continuous current ratings, number of poles, overload trip setting, and short circuit current interrupting rating as indicated. Enclosure type as indicated.

2.11 FUSES

NEMA FU 1. Provide complete set of fuses for each fusible switch. Time-current characteristics curves of fuses serving motors or connected in series with circuit breakers shall be coordinated for proper operation. Submit coordination data for approval. Fuses shall have voltage rating not less than circuit voltage.

2.11.1 Cartridge Fuses, Current Limiting Type (Class R)

UL 198E, Class RK-5 time-delay type. Associated fuseholders shall be Class R only.

2.12 MOTOR CONTROLLERS

UL 508, NEMA ICS 1, and NEMA ICS 2. Controllers shall have thermal overload protection in each phase and shall have one spare normally open and one spare normally closed auxiliary contact. Magnetic-type motor controllers shall have undervoltage protection when used with momentary-contact pushbutton stations or switches and shall have undervoltage release when used with maintained-contact pushbutton stations or switches. When used with pressure, float, or similar automatic-type or maintained-contact switch, controller shall have hand/off/automatic selector switch. Connections to selector switch shall be such that only normal automatic regulatory control devices are bypassed when switch is in "hand" position. Safety control devices, such as low and high pressure cutouts, high temperature cutouts, and motor overload protective devices, shall be connected in motor control circuit in "hand" and "automatic" positions. Control circuit connections to hand/off/automatic selector switch or to more than one automatic regulatory control device shall be made in accordance with indicated or manufacturer's approved wiring diagram. For each motor not in sight of controller or where controller disconnecting means is not in sight of motor location and driven machinery location, controller disconnecting means shall be capable of being locked in open position. As an alternative, provide a manually operated, lockable, nonfused switch which disconnects motor from supply source within sight of motor. Overload protective devices shall provide adequate protection to motor windings; be thermal inverse-time-limit type; and include manual reset-type pushbutton on outside of motor controller case. Cover of combination motor controller and manual switch or circuit breaker shall be interlocked with operating handle of switch or circuit breaker so that cover cannot be opened unless handle of switch or circuit breaker is in "off" position.

2.12.1 Enclosures for Motor Controllers

NEMA ICS 6.

2.12.2 Terminal Blocks

NEMA ICS 4.

2.13 MANUAL MOTOR STARTERS (MOTOR RATED SWITCHES)

Single pole designed for surface mounting with overload protection.

2.14 GROUNDING AND BONDING EQUIPMENT

UL 467. Ground rods shall be copper-clad steel, with minimum diameter of 3/4 in and minimum length of 10 ft.

2.15 NAMEPLATES

Provide as specified in Section 26 00 00, "Basic Electrical Materials and Methods."

2.16 FIRESTOPPING MATERIALS

Provide firestopping around electrical penetrations.

2.17 SURGE PROTECTIVE DEVICES

Provide parallel type surge protective devices which comply with UL 1449 at the service entrance, load centers, panelboards, MCC. Provide surge protectors in a NEMA 1 enclosure per NEMA ICS 6. Provide the following modes of protection:

FOR SINGLE PHASE AND THREE PHASE WYE CONNECTED SYSTEMS-
Each phase to neutral (L-N)
Neutral to ground (N-G)
Phase to ground (L-G)

Surge protective devices at the service entrance shall have a minimum surge current rating of 80,000 amperes per mode minimum and downstream protectors shall be rated 40,000 amperes per mode minimum. The maximum line to neutral (L-N) Suppressed Voltage Rating (SRV) shall be:

500V for 208Y/120V, three phase system

The minimum MCOV (Maximum Continuous Operating Voltage) rating shall be:

300/150V for 208Y/120V, three phase system

EMI/RFI filtering shall be provided for each mode with the capability to attenuate high frequency noise. Minimum attenuation shall be 20db.

PART 3 EXECUTION

3.1 INSTALLATION

Electrical installations shall conform to requirements of NFPA 70 and to requirements specified herein.

3.1.1 Service Entrance Identification

Service entrance disconnect devices, switches, and enclosures shall be labeled and identified as such.

3.1.1.1 Labels

Wherever work results in service entrance disconnect devices in more than one enclosure, as permitted by NFPA 70, each enclosure, new and existing, shall be labeled as one of several enclosures containing service entrance disconnect devices. Label, at minimum, shall indicate number of service disconnect devices housed by enclosure and shall indicate total number of enclosures that contain service disconnect devices. Provide laminated plastic labels conforming to paragraph entitled "Nameplates." Use lettering of at least 0.25 in in height, and engrave on black-on-white matte finish. Service entrance disconnect devices in more than one enclosure, shall be provided only as permitted by NFPA 70.

3.1.2 Wiring Methods

Provide insulated conductors installed in rigid steel conduit, IMC, rigid nonmetallic conduit, or EMT, except where specifically indicated or specified otherwise or required by NFPA 70 to be installed otherwise. Grounding conductor shall be separate from electrical system neutral conductor. Provide insulated green equipment grounding conductor for circuit(s) installed in conduit and raceways. Minimum conduit size shall be 1/2 in in diameter for low voltage lighting and power circuits. Conduit which penetrates fire-rated walls, fire-rated partitions, or fire-rated floors shall be firestopped.

3.1.2.1 Restrictions Applicable to EMT

- a. Do not install underground.
- b. Do not encase in concrete, mortar, grout, or other cementitious materials.
- c. Do not use in areas subject to severe physical damage including but not limited to mechanical equipment rooms where moving or replacing equipment could physically damage the EMT.
- e. Do not use outdoors.

3.1.2.2 Restrictions Applicable to Nonmetallic Conduit

- a. PVC Schedule 40 and PVC Schedule 80
 - (1) Do not use in areas where subject to severe physical damage, including but not limited to, mechanical equipment rooms, electrical equipment rooms, hospitals, power plants, missile magazines, and other such areas.
 - (2) Do not use in penetrating fire-rated walls or partitions, or fire-rated floors.
 - (3) Do not use above grade, except where allowed in this section for rising through floor slab or indicated otherwise.

3.1.2.3 Restrictions Applicable to Flexible Conduit

Use only as specified in paragraph entitled "Flexible Connections."

3.1.2.4 Underground Conduit Other Than Service Entrance

PVC, Type EPC-40.

3.1.3 Conduit Installation

Unless indicated otherwise, conceal conduit under floor slabs and within finished walls, ceilings, and floors. Keep conduit minimum 6 in away from parallel runs of flues and steam or hot water pipes. Install conduit parallel with or at right angles to ceilings, walls, and structural members where located above accessible ceilings and where conduit will be visible after completion of project.

3.1.3.1 Conduit Support

Support conduit by pipe straps, wall brackets, hangers, or ceiling trapeze. Fasten by wood screws to wood; by toggle bolts on hollow masonry units; by concrete inserts or expansion bolts on concrete or brick; and by machine screws, welded threaded studs, or spring-tension clamps on steel work. Threaded C-clamps may be used on rigid steel conduit only. Do not weld conduits or pipe straps to steel structures. Load applied to fasteners shall not exceed one-fourth proof test load. Fasteners attached to concrete ceiling shall be vibration resistant and shock-resistant. Holes cut to depth of more than 1 1/2 in in reinforced concrete beams or to depth of more than 3/4 in in concrete joints shall not cut main reinforcing bars. Fill unused holes. In suspended-ceiling construction, run conduit above ceiling. Do not support conduit by ceiling support system. Supporting means shall not be shared between electrical raceways and mechanical piping or ducts. Installation shall be coordinated with above-ceiling mechanical systems to assure maximum accessibility to all systems. Spring-steel fasteners may be used for lighting branch circuit conduit supports in suspended ceilings in dry locations.

3.1.3.2 Directional Changes in Conduit Runs

Make changes in direction of runs with symmetrical bends or cast-metal fittings. Make field-made bends and offsets with hickey or conduit-bending machine. Do not install crushed or deformed conduits. Avoid trapped conduits. Prevent plaster, dirt, or trash from lodging in conduits, boxes, fittings, and equipment during construction. Free clogged conduits of obstructions.

3.1.3.3 Pull Wire

Install pull wires in empty conduits. Pull wire shall be plastic having minimum 200-lb tensile strength. Leave minimum 36 in of slack at each end of pull wire.

3.1.3.4 Locknuts and Bushings

Fasten conduits to sheet metal boxes and cabinets with two locknuts where required by NFPA 70, where insulated bushings are used, and where bushings cannot be brought into firm contact with the box; otherwise, use at least minimum single locknut and bushing. Locknuts shall have sharp edges for digging into wall of metal enclosures. Install bushings on ends of

conduits, and provide insulating type where required by **NFPA 70**.

3.1.3.5 Flexible Connections

Provide flexible steel conduit between **3 and 6 ft** in length for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for motors. Install flexible conduit to allow 20 percent slack. Minimum flexible steel conduit size shall be **1/2 in** diameter. Provide liquidtight flexible conduit in wet and damp locations for equipment subject to vibration, noise transmission, movement or motors. Provide separate ground conductor across flexible connections.

3.1.4 Boxes, Outlets, and Supports

Provide boxes in wiring and raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures. Boxes for metallic raceways shall be cast-metal, hub-type when located in wet locations, when surface mounted on outside of exterior surfaces, and when specifically indicated. Boxes in other locations shall be sheet steel. Each box shall have volume required by **NFPA 70** for number of conductors enclosed in box. Boxes for mounting lighting fixtures shall be minimum **4 in** square, or octagonal, except that smaller boxes may be installed as required by fixture configurations, as approved. Provide gaskets for cast-metal boxes installed in wet locations and boxes installed flush with outside of exterior surfaces. Provide separate boxes for flush or recessed fixtures when required by fixture terminal operating temperature; fixtures shall be readily removable for access to boxes unless ceiling access panels are provided. Support boxes and pendants for surface-mounted fixtures on suspended ceilings independently of ceiling supports. Fasten boxes and supports with bolts and expansion shields on concrete or brick, with toggle bolts on hollow masonry units, and with machine screws or welded studs on steel. Threaded studs driven in by powder charge and provided with lockwashers and nuts may be used in lieu of wood screws, expansion shields, or machine screws. In open overhead spaces, cast boxes threaded to raceways need not be separately supported except where used for fixture support; support sheet metal boxes directly from building structure or by bar hangers.

3.1.4.1 Boxes

Boxes for use with raceway systems shall be minimum **1 1/2 in** deep, except where shallower boxes required by structural conditions are approved. Boxes for other than lighting fixture outlets shall be minimum **4 in** square, except that **4 by 2 in** boxes may be used where only one raceway enters outlet.

3.1.4.2 Extension Rings

Extension rings are not permitted for new construction. Use only on existing boxes in concealed conduit systems where wall is furred out for new finish.

3.1.5 Mounting Heights

Mount panelboards, enclosed circuit breakers, motor controller and disconnecting switches so height of operating handle at its highest position is maximum **78 in** above floor. Mount lighting switches **48 in** above finished floor, receptacles **18 in** above finished floor unless otherwise indicated, and other devices as indicated. Measure mounting heights of

wiring devices and outlets to center of device or outlet.

3.1.6 Conductor Identification

Provide conductor identification within each enclosure where tap, splice, or termination is made. For conductors No. 6 AWG and smaller diameter, color coding shall be by factory-applied, color-impregnated insulation. For conductors No. 4 AWG and larger diameter, color coding shall be by plastic-coated, self-sticking markers; colored nylon cable ties and plates; or heat shrink-type sleeves.

3.1.7 Splices

Make splices in accessible locations. Make splices in conductors No. 10 AWG and smaller diameter with insulated, pressure-type connector. Make splices in conductors No. 8 AWG and larger diameter with solderless connector, and cover with insulation material equivalent to conductor insulation.

3.1.8 Covers and Device Plates

Install with edges in continuous contact with finished wall surfaces without use of mats or similar devices. Plaster fillings are not permitted. Install plates with alignment tolerance of $1/16$ in. Use of sectional-type device plates are not permitted. Provide gasket for plates installed in wet locations.

3.1.9 Electrical Penetrations

Seal openings around electrical penetrations through fire resistance-rated walls, partitions, floors.

3.1.10 Grounding and Bonding

In accordance with NFPA 70. Ground exposed, non-current-carrying metallic parts of electrical equipment, metallic raceway systems, grounding conductor in metallic and nonmetallic raceways, and neutral conductor of wiring systems.

3.1.10.1 Resistance

Maximum resistance-to-ground of grounding system shall not exceed 5 ohms under dry conditions. Where resistance obtained exceeds 5 ohms, contact Contracting Officer for further instructions.

3.1.11 Equipment Connections

Provide power wiring for the connection of motors and control equipment under this section of the specification. Except as otherwise specifically noted or specified, automatic control wiring, control devices, and protective devices within the control circuitry are not included in this section of the specifications but shall be provided under the section specifying the associated equipment.

3.1.12 Repair of Existing Work

Repair of existing work, demolition, and modification of existing electrical distribution systems shall be performed as follows:

3.1.12.1 Workmanship

Lay out work in advance. Exercise care where cutting, channeling, chasing, or drilling of floors, walls, partitions, ceilings, or other surfaces is necessary for proper installation, support, or anchorage of conduit, raceways, or other electrical work. Repair damage to buildings, piping, and equipment using skilled craftsmen of trades involved.

3.1.12.2 Existing Concealed Wiring to be Removed

Existing concealed wiring to be removed shall be disconnected from its source. Remove conductors; cut conduit flush with floor, underside of floor, and through walls; and seal openings.

3.1.12.3 Removal of Existing Electrical Distribution System

Removal of existing electrical distribution system equipment shall include equipment's associated wiring, including conductors, cables, exposed conduit, surface metal raceways, boxes, and fittings, back to equipment's power source as indicated.

3.1.13 Surge Protective Devices

Connect the surge protective devices in parallel to the power source, keeping the conductors as short and straight as practically possible.

3.2 FIELD QUALITY CONTROL

Furnish test equipment and personnel and submit written copies of test results. Give Contracting Officer 5 working days notice prior to each test.

3.2.1 Devices Subject to Manual Operation

Each device subject to manual operation shall be operated at least five times, demonstrating satisfactory operation each time.

3.2.2 600-Volt Wiring Test

Test wiring rated 600 volt and less to verify that no short circuits or accidental grounds exist. Perform insulation resistance tests on wiring No. 6 AWG and larger diameter using instrument which applies voltage of approximately 500 volts to provide direct reading of resistance. Minimum resistance shall be 250,000 ohms.

3.2.3 Ground-Fault Receptacle Test

Test ground-fault receptacles with a "load" (such as a plug in light) to verify that the "line" and "load" leads are not reversed.

3.2.4 Grounding System Test

Test grounding system to ensure continuity, and that resistance to ground is not excessive. Test each ground rod for resistance to ground before making connections to rod; tie grounding system together and test for resistance to ground. Make resistance measurements in dry weather, not earlier than 48 hours after rainfall. Submit written results of each test to Contracting Officer, and indicate location of rods as well as resistance and soil conditions at time measurements were made.

-- End of Section --

SECTION 26 51 00

INTERIOR LIGHTING

04/04

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM A 641/A 641M (2003) Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire

ILLUMINATING ENGINEERING SOCIETY OF NORTH AMERICA (IESNA)

IESNA HB-9 (2000) Lighting Handbook, Reference and Application

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C62.41 (1991; R 1995) Surge Voltages in Low-Voltage AC Power Circuits (ANSI/IEEE)

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA C82.11 (2002) High-Frequency Fluorescent Lamp Ballasts

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2007; AMD 1 2008) National Electrical Code - 2008 Edition

NFPA 101 (2008) Life Safety Code, 2006 Edition

UNDERWRITERS LABORATORIES (UL)

UL 773 (1995; R 2002, Bul. 2002) Plug-In, Locking Type Photocontrols for Use with Area Lighting

UL 773A (1995; R 1999) Nonindustrial Photoelectric Switches for Lighting Control

UL 924 (1995; R 2001, Bul. 2001 and 2002) Emergency Lighting and Power Equipment

UL 935 (2001; Bul. 2001) Fluorescent-Lamp Ballasts

UL 1598 (2000; Bul. 2001 and 2002) Luminaires

1.2 RELATED REQUIREMENTS

Section 26 00 00, "Basic Electrical Materials and Methods," applies to this section, with the additions and modifications specified herein. Materials not considered to be lighting equipment or lighting fixture accessories are specified in Section 26 20 00, "Interior Distribution System." Lighting fixtures and accessories mounted on exterior surfaces of buildings are specified in this section.

1.3 DEFINITIONS

1.3.1 Average Life

Time after which 50 percent will have failed and 50 percent will have survived under normal conditions.

1.3.2 Total Harmonic Distortion (THD)

The root mean square (RMS) of all the harmonic components divided by the total fundamental current.

1.4 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

Data, drawings, and reports shall employ the terminology, classifications, and methods prescribed by the IESNA HB-9, as applicable, for the lighting system specified.

SD-03 Product Data

Fluorescent lighting fixtures

Fluorescent electronic ballasts

Exit signs

Emergency lighting equipment

1.5 QUALITY ASSURANCE

1.5.1 Fluorescent Electronic Ballasts

Submit ballast catalog data as required in the paragraph entitled "Fluorescent Lamp Electronic Ballasts" contained herein. As an option, submit the fluorescent fixture manufacturer's electronic ballast specification information in lieu of the actual ballast manufacturer's catalog data. This information shall include published specifications and sketches, which covers the information required by the paragraph entitled "Fluorescent Lamp Electronic Ballasts" herein. This information may be supplemented by catalog data if required, and shall contain a list of vendors with vendor part numbers.

1.6 ELECTRONIC BALLAST WARRANTY

Furnish the electronic ballast manufacturer's warranty. The warranty period shall not be less than 5 years from the date of manufacture of the electronic ballast. Ballast assembly in the lighting fixture,

transportation, and on-site storage shall not exceed 12 months, thereby permitting 4 years of the ballast 5 year warranty to be in service and energized. The warranty shall state that the malfunctioning ballast shall be exchanged by the manufacturer and promptly shipped to the using Government facility. The replacement ballast shall be identical to, or an improvement upon, the original design of the malfunctioning ballast.

PART 2 PRODUCTS

2.1 FLUORESCENT LIGHTING FIXTURES

UL 1598. Fluorescent fixtures shall have electronic ballasts unless specifically indicated otherwise.

2.1.1 Fluorescent Lamp Electronic Ballasts

The electronic ballast shall as a minimum meet the following characteristics:

- a. Ballast shall comply with **UL 935**, **NEMA C82.11**, and **NFPA 70** unless specified otherwise. Ballast shall provide transient immunity as recommended by **IEEE C62.41**. Ballast shall be designed for the wattage of the lamps used in the indicated application. Ballasts shall be designed to operate on the voltage system to which they are connected.
- b. Power factor shall be 0.95 (minimum).
- c. Ballast shall operate at a frequency of 20,000 Hertz (minimum). Ballast shall be compatible with and not cause interference with the operation of occupancy sensors or other infrared control systems.
- d. Ballast shall have light regulation of plus or minus 10 percent lumen output with a plus or minus 10 percent input voltage regulation. Ballast shall have 10 percent flicker (maximum) using any compatible lamp.
- e. Ballast shall be UL listed Class P with a sound rating of "A."
- f. Ballast shall have circuit diagrams and lamp connections displayed on the ballast.
- g. Ballasts shall be instant start unless otherwise indicated. Ballasts shall be programmed start where indicated. Instant start ballasts shall operate lamps in a parallel circuit configuration that permits the operation of remaining lamps if one or more lamps fail or are removed. Programmed start ballasts may operate lamps in a series circuit configuration. Provide series/parallel wiring for programmed start ballasts where available.
- h. Ballasts for compact fluorescent fixtures shall be programmed start.
- i. Ballast shall be capable of starting and maintaining operation at a minimum of **0 degrees F** unless otherwise indicated.
- j. Electronic ballast shall have a full replacement warranty of 5 years from date of manufacture as specified in paragraph entitled "Electronic Ballast Warranty" herein.

2.1.1.1 T-8 Lamp Ballast

- a. Total harmonic distortion (THD): Shall be 20 percent (maximum).
- b. Input wattage.
 1. 62 watts (maximum) when operating two F32T8 lamps
 2. 114 watts (maximum) when operating four F32T8 lamps

2.1.1.2 F17T8 Lamp Ballast

- a. Total harmonic distortion (THD): Shall be 25 percent (maximum).
- b. Input wattage:
 1. 34 watts (maximum) when operating two F17T8 lamps.

2.1.2 Fluorescent Lamps

- a. T-8 rapid start lamps shall be rated 32 watts (maximum), 2800 initial lumens (minimum), CRI of 75 (minimum), color temperature of 3500 K, and an average rated life of 20,000 hours.
- b. T-8 rapid start lamp, 17 watt (maximum), nominal length of 24 inches, 1300 initial lumens, CRI of 75 (minimum), color temperature of 3500 K, and an average rated life of 20,000 hours.

Average rated life is based on 3 hours operating per start.

2.2 RECESS- AND FLUSH-MOUNTED FIXTURES

Provide type that can be relamped from the bottom. Access to ballast shall be from the bottom. Trim for the exposed surface of flush-mounted fixtures shall be as indicated.

2.3 SUSPENDED FIXTURES

Provide hangers capable of supporting twice the combined weight of fixtures supported by hangers. Rods shall be a minimum 0.18 inch diameter.

2.4 PHOTOCELL SWITCH

UL 773 or UL 773A, hermetically sealed cadmium-sulfide or silicon diode type cell rated 120 volts ac, 60 Hz with single-throw contacts. Switch shall turn on at or below 3 footcandles and off at 2 to 10 footcandles. A time delay shall prevent accidental switching from transient light sources. Provide switch:

- a. In a cast weatherproof aluminum housing with adjustable window slide, rated 1800 VA, minimum.

2.5 EXIT SIGNS

UL 924, NFPA 70, and NFPA 101. Exit signs shall be self-powered type.

2.5.1 Self-Powered LED Type Exit Signs (Battery Backup)

Provide with automatic power failure device, test switch, pilot light, and

fully automatic high/low trickle charger in a self-contained power pack. Battery shall be sealed electrolyte type, shall operate unattended, and require no maintenance, including no additional water, for a period of not less than 5 years. LED exit sign shall have emergency run time of 1 1/2 hours (minimum). The light emitting diodes shall have rated lamp life of 70,000 hours (minimum).

2.6 EMERGENCY LIGHTING EQUIPMENT

UL 924, NFPA 70, and NFPA 101. Provide lamps in wattage indicated. Provide accessories required for remote-mounted lamps where indicated. Remote-mounted lamps shall be as indicated.

2.6.1 Emergency Lighting Unit

Provide as indicated.

2.7 SUPPORT HANGERS FOR LIGHTING FIXTURES IN SUSPENDED CEILINGS

2.7.1 Wires

ASTM A 641/A 641M, galvanized regular coating, soft temper, 0.1055 inches in diameter (12 gage).

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Lamps

Lamps of the type, wattage, and voltage rating indicated shall be delivered to the project in the original cartons and installed just prior to project completion. Lamps installed and used for working light during construction shall be replaced prior to turnover to the Government if more than 15 percent of their rated life has been used. Lamps shall be tested for proper operation prior to turn-over and shall be replaced if necessary with new lamps from the original manufacturer. Provide 10 percent spare lamps of each type from the original manufacturer.

3.1.2 Lighting Fixtures

Set lighting fixtures plumb, square, and level with ceiling and walls, in alignment with adjacent lighting fixtures, and secure in accordance with manufacturers' directions and approved drawings. Installation shall meet requirements of NFPA 70. Mounting heights specified or indicated shall be to the bottom of fixture for ceiling-mounted fixtures and to center of fixture for wall-mounted fixtures. Obtain approval of the exact mounting for lighting fixtures on the job before commencing installation and, where applicable, after coordinating with the type, style, and pattern of the ceiling being installed. Recessed and semi-recessed fixtures shall be independently supported from the building structure by a minimum of four wires per fixture and located near each corner of each fixture. Ceiling grid clips are not allowed as an alternative to independently supported light fixtures. Provide wires for lighting fixture support in this section. Lighting fixtures installed in suspended ceilings shall also comply with the requirements of Section 09 51 00, "Acoustical Ceilings."

3.1.3 Exit Signs and Emergency Lighting Units

Wire exit signs and emergency lighting units ahead of the switch to the normal lighting circuit located in the same room or area.

3.1.4 Photocell Switch Aiming

Aim switch according to manufacturer's recommendations.

-- End of Section --

SECTION 27 10 00

BUILDING TELECOMMUNICATIONS CABLING SYSTEM

03/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA)

TIA/EIA-606-A (2002) Administration Standard for the Telecommunications Infrastructure

ELECTRONIC INDUSTRIES ALLIANCE (EIA)

TIA/EIA-492AAAA-A (1998) 62.5-um Core Diameter/125-um Cladding Diameter Class 1a Graded-Index Multimode Optical Fibers (ANSI/TIA/EIA-492AAAA-A)

TIA/EIA-526-7 (1988) OFSTP-7 Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant (ANSI/TIA/EIA-526-7)

TIA/EIA-568-B.1 (2001; Addendum 2001) Commercial Building Telecommunications Cabling Standard - Part 1: General Requirements (ANSI/TIA/EIA-568-B.1)

TIA/EIA-568-B.2 (2001) Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted Pair Cabling Components (ANSI/TIA/EIA-568-B.2)

TIA/EIA-568-B.3 (2000; Addendum 2002) Optical Fiber Cabling Components Standard (ANSI/TIA/EIA-568-B.3)

TIA/EIA-569-A (1998; Addenda 2000, 2001) Commercial Building Standards for Telecommunications Pathways and Spaces (ANSI/TIA/EIA-569-A)

TIA J-STD-607-A (2002) Commercial Building Grounding (Earthen) and Bonding Requirements for Telecommunications

EIA/TIA TSB-75 (1996) Additional Horizontal Cabling Practices for Open Offices

INSULATED CABLE ENGINEERS ASSOCIATION (ICEA)

ICEA S-80-576 Standards Publication for Communications Wire and Cable for Wiring of Premises

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA WC 63.1 (2000) Twisted Pair Premise Voice and Data Communications Cables

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2007; AMD 1 2008) National Electrical Code - 2008 Edition

U.S. DEPARTMENT OF AGRICULTURE (USDA)

RUS TECM 823 (1980) Electrical Protection by Use of Gas Tube Connectors

UNDERWRITERS LABORATORIES (UL)

UL 1666 (2000; Rev thru Jul 2002) Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts

UL 1863 (2000) Communication Circuit Accessories

UL 444 (2002; Rev thru Aug 2002) Communications Cables

UL 467 (2007) Standard for Grounding and Bonding Equipment

UL 497 (2001) Protectors for Paired Conductor Communication Circuits

UL 1286 (1993; Bul. 1998, R 1998) Office Furnishings

UL 514C (1996; R 2002) Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers

UL 969 (1995; Rev thru Nov 2001) Marking and Labeling Systems

1.2 RELATED REQUIREMENTS

Section 26 00 00, "Basic Electrical Materials and Methods"; Section 26 20 00, "Interior Distribution System" and Section 33 82 00 "Telecommunications Outside Plant (OSP) apply to this section with additions and modifications specified herein.

1.3 DEFINITIONS

1.3.1 Main Distribution Frame (MDF)

A physical structure at a central location for terminating permanent

backbone cables to interconnect with service provider (SP) equipment at the activity minimum point of presence. The MDF generally includes vendor specific components to support voice and data circuits, building surge protector assemblies, main cross connect blocks, equipment support frames, and wood backboard (if MDF is wall mounted). Depending upon local site conditions, the MDF and BDF may be identical.

1.3.2 Building Distribution Frame (BDF)

A structure with terminations for connecting backbone, campus, and horizontal cabling. The BDF generally includes a cross connect, equipment support frame, and wooden backboard or terminal cabinet. The BDF shall include building protector assemblies when used for campus backbone or SP cabling.

1.3.3 Intermediate Distribution Frame (IDF)

An intermediate termination point for horizontal wiring and cross-connections within telecommunications rooms or wiring closets.

1.3.4 Telecommunications Room

An enclosed space for telecommunications equipment, terminations, and cross-connect wiring for horizontal cabling, minimum size shall be 8' x 10'. Telecommunications Rooms should be centrally located unless multiple rooms are used. Access to Telecommunications Rooms should be from a common area such as a hallway and the door should swing out. Multiple Telecommunications Rooms are required if the usable floor space to be served exceeds 10,000 square feet, or the cable length between the horizontal cross-connect and the telecommunications outlet, including slack, exceeds 295 feet. Multiple telecommunications rooms will be connected by a minimum of two 75mm (3 inch) conduits. The minimum ceiling height will be eight and one half feet. The flooring shall be bare concrete instead of carpet or tile to reduce dust and static electricity. Two separately dedicated 20 amp double gang electrical outlets will be installed on the same wall as the backboard. There should not be an electrical panel within the telecommunications room. The lock on the door shall be keyed to a P4 key.

1.4 ENVIRONMENTAL REQUIREMENTS

Connecting hardware shall be rated for operation under ambient conditions of 0 to 60 degrees C (32 to 140 degrees F) and in the range of 0 to 95 percent relative humidity, non-condensing. Provide HVAC that will maintain continuous and dedicated environmental control (24 hours per day, 365 days per year). If emergency power is available, consider connecting it to the HVAC system.

1.5 SYSTEM DESCRIPTION

The structured telecommunications pathway system shall include permanently installed horizontal and backbone pathways, service entrance facilities, work area pathways, telecommunications outlet assemblies, conduit, and raceway, and hardware for splicing, terminating, and interconnecting. The horizontal system includes the pathway between the telecommunications room and the work area telecommunications outlet. The horizontal system shall be suitable for star topology with the IDF at the center or hub of the star. The backbone pathway system includes intrabuilding and interbuilding inter-connecting pathway to provide connectivity between the MDF's, BDF's,

and IDF's. The backbone system shall be suitable for star topology with the MDF at the center or hub of the star.

1.6 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 "Submittal Procedures":

SD-02 Shop Drawings

Telecommunications drawings

Distribution frames

SD-03 Product Data

Telecommunications cabling (backbone and horizontal)

Patch panels

Telecommunications outlet/connector assemblies

Equipment support frame

Building protector assemblies

Connector blocks

Protector modules

SD-06 Test Reports

Telecommunications cabling testing

Factory reel tests

Furnish factory reel tests for optical fiber cables.

SD-07 Certificates

Contractor Qualifications

Manufacturer Qualifications

Test plan

SD-10 Operation and Maintenance Data

Telecommunications cabling and pathway system Data Package 5

Submit operations and maintenance data in accordance with Section 01 78 23, Operation and Maintenance Data and as specified herein.

1.7 ADDITIONAL SUBMITTAL REQUIREMENTS

1.7.1 Telecommunications Drawings

Provide registered communications distribution designer (RCDD) approved drawings complete with wiring diagrams and details required to prove that

the distribution system shall properly support connectivity from the telecommunications equipment room to telecommunications work area outlets. Show the entrance facility and layout of cabling and pathway runs, cross connect points, MDF, BDF, IDF, grounding system, terminating block arrangements and type. Drawings shall depict final telecommunications cabling configuration, including location, color coding, gage, pair assignment, polarization, and terminating blocks layout at cross connect points and patch panels after telecommunications cable installation. Provide a plastic laminated schematic of the as-installed telecommunications cable system showing cabling, MDF's, BDF's, IDF's, and equipment rooms keyed to floor plans by room number. Mount the laminated schematic near the MDF as directed by the Contracting Officer. The Telecommunications Contractor will receive design approval from the Base Telephone Officer prior to installation.

1.7.2 Distribution Frames

Provide shop drawing showing layout of applicable equipment including incoming cable stub or connector blocks, building protector assembly, outgoing cable connector blocks and equipment spaces and racks.

1.7.3 Qualifications

1.7.3.1 Minimum Contractor Qualifications

Prior to installation, submit data of provider's experience and qualifications. All work under this section shall be performed by and all equipment shall be provided by a certified Telecommunications Contractor, hereinafter referred to as the Contractor. The Contractor shall have the following qualifications in Telecommunications Systems installation:

- a. Contractor shall have a minimum of 3 years experience in the application, installation and testing of the specified systems and equipment.
- b. All supervisors and installers assigned to the installation of this system or any of its components shall have factory certification from each equipment manufacturer that they are qualified to install and test the provided products.
- c. All installers assigned to the installation of this system or any of its components shall be Building Industry Consulting Services International (BICSI) Certified Cabling Installation Technicians, Installer Level 2, or have a minimum of 3 years experience in the installation of the specified copper and fiber optic cable and components. Include names and locations of two projects successfully completed using optical fiber and copper communications cabling systems. Include written certification from users that systems have performed satisfactorily for not less than 18 months. Include specific experience in installing and testing structured telecommunications distribution systems using optical fiber and Category 5e cabling systems.

1.7.3.2 Minimum Manufacturer Qualifications

The equipment and hardware provided under this contract will be from manufacturers that have a minimum of 3 years experience in producing the types of systems and equipment specified.

1.7.4 Test Plan

Provide a complete and detailed test plan for the telecommunications cabling system including a complete list of test equipment for the UTP and optical fiber components and accessories 60 days prior to the proposed test date. Include procedures for certification, validation, and testing.

1.7.5 Additions to Operation and Maintenance Manuals

In addition to requirements of Data package 5 for the telecommunications cabling and pathway system, include the requirements of paragraph entitled "Telecommunications Drawings."

1.8 DELIVERY AND STORAGE

Provide protection from weather, moisture, dirt, dust, and other contaminants for telecommunications cabling and pathway equipment placed in storage.

PART 2 PRODUCTS

2.1 PATHWAYS (BACKBONE AND HORIZONTAL)

TIA/EIA-569-A. Pathway shall be conduit, cable tray, under floor duct, access floor, and wireway, installations. Provide grounding and bonding as required by **TIA J-STD-607-A**. Cable tray wiring shall comply with **NFPA 70**. All conduits entering the Telecommunications Room will be home run conduits and shall either extend up from the floor 3 to 4 inches or down from the ceiling 3 to 4 inches and will be bonded to the TMGB or TGB by a minimum number 6 green sheathed conductor. All penetrations will be sealed in accordance with code (fire-stopping). A minimum of two 3 inch conduits will be installed between the Main Telecommunications Room and any sub closets.

2.1.1 Work area Pathways

Comply with **TIA/EIA-569-A**, except 1-inch diameter conduit. System furniture pathways shall comply with **UL 1286**. Horizontal cabling for open offices shall comply with **EIA/TIA TSB-75**.

2.1.2 Pull Boxes

Construct of galvanized sheet steel with screw-fastened covers. Minimum size of boxes shall be not less than 4-inches wide by 4-inches in length by 3-inches deep for individual 1-inch diameter conduit; minimum size of boxes shall be not less than 12-inches wide by 60-inches long by 12-inches deep for 4-inch conduit. Provide pull boxes where length of conduit exceeds 100 feet or where there are more than two 90 degree bends, or equivalent. Align conduit ends on opposite side of pull boxes. Provide pull boxes in straight lengths of conduit; neither pull boxes nor conduit bodies shall be permitted in lieu of bends.

2.2 BENDS

Inside radius of conduit bend shall be at least 6 times the internal diameter of conduit.

2.3 TELECOMMUNICATIONS OUTLET BOXES

Telecommunications outlet boxes should be placed 6" to the left or right of

every electrical outlet box in workable office areas or any area that could be converted into workable office area such as storage closet; also any conference room should have one floor and one ceiling box. Boxes shall be standard type 4 inches square by 2 1/8 inches deep with 1-inch diameter side knock-outs, with a single gang plaster ring. Mount flush in finished walls at height indicated. Outlet boxes for wall-mounted telephones shall be 2 by 4 2 1/8 inches deep with 1 CAT5E/6 cable terminated in a standard wall phone plate; mounted at 54 inches above finished floor for classrooms or open spaces shall be telecommunications floor boxes large enough to support a surge of users with proper cable management. Floor boxes should not be used in wet areas. Tele electric poles or furniture managed pathways fed from above the wet area should be used. Multi-user Telecommunications Outlet Assembly i.e. Multimedia Outlet Assemblies (MUTOA) should be placed where best suited for the furniture used in the room.

2.3.1 Telecommunications Cabling

Cabling shall be UL listed for the application and shall comply with TIA/EIA-568-B.1, TIA/EIA-568-B.2, TIA/EIA-568-B.3 and NFPA 70. Provide a labeling system for cabling as required by TIA/EIA-606-A and UL 969. Cabling manufactured more than 12 months prior to date of installation shall not be used.

2.3.1.1 Backbone Copper

ICEA S-80-576, TIA/EIA-568-B.1, TIA/EIA-568-B.2 and UL 444, copper backbone cable shall be solid conductor, 24 AWG, 100 ohm, 25-pair UTP (Unshielded twisted pair), NFPA 70 CMR rated formed into 25 pair binder groups covered with a thermoplastic jacket. NFPA 70 type CMP may be substituted for type CMR. Pair twist-lengths and frequency per unit length shall be determined by the manufacturer. A minimum of two conductor twists per foot is required. Color coding shall comply with industry standards for 25 pair cables. Cable shall be third party verified to comply with EIA/TIA Category 5e requirements. Two 4 pair 24 AWG Category 5e/6 riser (CMR) rated cable will be installed between the MDF and each of the IDF's and terminated in the patch panel.

2.3.1.2 Backbone Optical Fiber

TIA/EIA-492AAAA-A, TIA/EIA-568-B.3, UL 1666, NFPA 70. Optical fiber cable shall be 62.5/125-um, 12-fiber multimode, terminated on ST type connectors, with a non-conductive optical fiber riser cable (OFNR) rating. Nonconductive optical fiber Plenum (OFNP) cable may be substituted for type nonconductive optical fiber riser cable (OFNR). The cable jacket shall be orange.

2.3.2 Horizontal Cabling

Comply with NFPA 70, NEMA WC 63.1, ICEA S-80-576 and performance characteristics in TIA/EIA-568-B.1.

2.3.2.1 Horizontal Copper

TIA/EIA-568-B.2, NFPA 70, UTP (unshielded twisted pair), 100 ohm. Provide four each individually twisted pair, 24 AWG conductors, Category 5e/6 general purpose cable, with a white or gray PVC jacket for jack one and a blue PVC jacket for jack two. Plenum (CMP) or riser (CMR) cable may be substituted for general purpose cable. If the cabling passes thru a plenum air space then plenum (CMP) rated cable is required.

2.3.2.2 Horizontal Optical Fiber

TIA/EIA-492AAAA-A, TIA/EIA-568-B.3, NFPA 70. Optical fiber cable shall be 62.5/125-um, 2-fiber multimode, rated nonconductive optical fiber cable (OFN). Plenum (OFNP) or riser (OFNR) cable may be substituted for general purpose cable. The cable jacket shall be orange and be of single jacket construction.

2.4 DISTRIBUTION FRAMES

Provide building distribution frames (BDF's), intermediate distribution frames (IDF's), and main distribution frames (MDF's) as shown on design drawings for terminating and cross connecting permanent cabling.

2.4.1 Equipment Support Frame

EIA-310-D.

- a. Bracket, wall mounted, 8 gauge aluminum. Provide hinged bracket compatible with 482.6 mm panel mounting.
- b. Rack, wall mounted, 16 gauge steel construction treated to resist corrosion. Shall be CPI 15320-724 or equivalent.
- c. Racks, floor mounted modular type, 16 gauge steel construction treated to resist corrosion. Provide rack with vertical and horizontal cable management channels, top cable troughs and grounding lug. Rack shall be compatible with 482.6 mm panel mounting.

2.4.2 Building Protector Assemblies

Building protector assembly shall have connector blocks for connection to the exterior cable at full capacity.

2.4.2.1 Protector Modules

UL 497, RUS TECM 823, three-electrode gas tube or solid state type rated for the application. Provide the number of surge protection modules equal to the number of pairs of exterior cable of the building protector assembly.

2.4.3 Connector Blocks

Insulation displacement type, Krone' 6652-1-880-10, for Category 5e and higher systems. Provide blocks for the number of backbone cables terminated on the block plus 25 percent spare.

2.4.4 Patch Panels

Provide ports for the number of horizontal cables terminated on the panel plus 25 percent spare. Provide pre-connectorized Optical fiber and copper patch cords for patch panels. Provide patch cords with connectors specified. Patch cords shall meet minimum performance requirements specified in TIA/EIA-568-B.1, TIA/EIA-568-B.2, TIA/EIA-568-B.3 for cables and hardware specified.

2.4.4.1 Modular to Patch Panel

TIA/EIA-568-B.1, TIA/EIA-568-B.2, TIA/EIA-568-B.3. Panels shall be third party verified and shall comply with EIA/TIA Category 5e/6 requirements. Panel shall be constructed of 2.2 mm minimum aluminum and shall be compatible with an EIA 482.6 mm equipment rack. Panel shall provide 48 non-keyed, RJ-45 ports. Patch panels shall terminate the building cabling on 110-style insulation displacement connectors and shall utilize a printed circuit board interface. The rear of each panel shall have incoming cable strain-relief and routing guides. Panels shall have each port factory numbered and be equipped with laminated plastic nameplates above each port.

2.4.4.2 Fiber Optic Patch Panel

Provide panel for maintenance and cross-connecting of optical fiber cables. Panel shall be constructed of 2.2 mm minimum aluminum and shall be compatible with EIA 482.6 mm equipment racks. Each panel terminating backbone fiber optic cable shall provide either 6 or 12 ST multimode adapters. Each panel terminating horizontal multi-mode fiber optic cable shall provide 6 multi-mode MTRJ type adapters. Adapters shall utilize metallic alignment sleeves. Provide dust cover for all unused adapters. The rear of each panel shall have a cable management tray a minimum of 203 mm deep with removable cover, incoming cable strain-relief and routing guides. Panels shall have each adapter factory numbered and be equipped with laminated plastic nameplates above each adapter.

2.5 TELECOMMUNICATIONS OUTLET BOXES

Standard type 100 mm square by 54 mm deep with a single gang plaster ring. Mount flush in finished walls at height indicated. Depth of boxes shall be large enough to allow manufacturer's recommended conductor bend radii for fiber.

2.6 TELECOMMUNICATIONS OUTLET/CONNECTOR ASSEMBLIES

2.6.1 Outlet/Connector Copper

Outlet/connectors shall comply with FCC Part 68.5, TIA/EIA-568-B.1, and TIA/EIA-568-B.2. UTP Outlet/connectors shall be UL 1863 listed, non-keyed, 4-pair, constructed of high impact rated thermoplastic housing and shall be third party verified and shall comply with EIA/TIA Category 5e/6 requirements. Outlet/connectors provided for Category 5e/6 UTP cabling shall meet or exceed the requirements for the cable provided. Outlet/connectors shall be terminated using a 110-style PC board connector, color-coded for both T568A and T568B wiring. Each jack shall be wired T568A as indicated. UTP outlet/connectors shall comply with TIA-455-21-A for 500 mating cycles.

2.6.2 Cover Plates

Telecommunications cover plates shall comply with UL 514C, and TIA/EIA-568-B.1, TIA/EIA-568-B.2, TIA/EIA-568-B.3; flush or oversized design constructed of high impact thermoplastic. Stenciled lettering for voice and data circuits shall be provided using thermal ink transfer process.

2.6.3 Optical Fiber Distribution Panel

Wall or rack mounted optical fiber distribution panel (OFDP) shall be

constructed of 2.2 mm minimum anodized aluminum. Panel shall be divided into two sections, distribution and user. Distribution section shall have strain relief, routing guides and shall be lockable, user section shall have a cover for patch cord protection. Each distribution panel shall provide 6 or 12 ST adapters. Adapters shall utilize metallic alignment sleeves. Provide dust covers for all adapters. User panels shall have MTRJ type connectors with dust covers.

2.7 BACKBOARDS

Provide void-free, interior grade plywood 19 mm (3/4 inch) thick as indicated. Backboards shall be fire rated, with the fire stamp visible, or covered with two coats of gray or a lighter color, nonconductive, fire-retardant paint. Boards should be installed 4' width by 8' height and cover at least one wall in the telecommunications room.

2.8 GROUNDING AND BONDING PRODUCTS

Comply with [UL 467](#), [TIA J-STD-607-A](#), and [NFPA 70](#). Components shall be identified as required by [TIA/EIA-606-A](#). Ground rods shall be in accordance with Section 16402N, "Interior Distribution System." The preferred ground for the Telephone Main Grounding Bus (TMGB) bar will be to the Main Distribution Panel (MDP). All grounding and bonding conductors within the Telecommunications room will be green sheathed copper conductor, either stranded or solid, and labeled as suitable for use as such and tagged "DO NOT REMOVE". The minimum size of the TMGB shall be no smaller than 4" by 10" by 1/4 inch thick.

2.9 FIRESTOPPING MATERIAL

Provide asbestos free fire stopping system capable of maintaining an effective barrier against flame and gases. System shall be UL listed and comply with ASTM E 814. Include UL system number UL listed print from manufacturer for each type of floor, wall, and ceiling penetration.

2.10 NAMEPLATES

Provide nameplates for equipment rooms and telecommunications rooms doors in accordance with schedule provided on drawings. Provide equipment nameplates in accordance with Section 26 00 00, "Basic Electrical Materials and Methods".

PART 3 EXECUTION

3.1 INSTALLATION

Telecommunications pathway systems, including the horizontal and backbone pathway systems, telecommunications outlet/connector assemblies, and associated hardware shall be installed in accordance with [TIA/EIA-568-A](#), [TIA/EIA-569-A](#), [NFPA 70](#), and UL standards as applicable. Metal raceway bases, covers, and dividers shall be bonded and grounded in accordance with [TIA J-STD-607-A](#). Pathways shall be installed in accordance with the following minimum clearance distances of 1.2 meters (4 feet) from motors, generators, frequency converters, transformers, x-ray equipment or uninterruptible power system, 300 mm (12 in) from power conduits and cable systems, 125 mm (5 inches) from fluorescent or high frequency lighting system fixtures.

3.1.1 Cabling

Install Category 5e/6 UTP and optical fiber telecommunications cabling and pathway system as detailed in TIA/EIA-568-B.1, TIA/EIA-568-B.2, and TIA/EIA-568-B.3. Screw terminals shall not be used except where specifically indicated on plans. Use an approved insulation displacement connection (IDC) tool kit for copper cable terminations. Do not untwist Category 5e/6 UTP cables more than 12 mm from the point of termination to maintain cable geometry. Provide service loop on each end of the cable, 3 meters in the telecommunications closet, 1 meter in the work area outlet for optical fiber and 150 mm (6 inch) for UTP. Do not exceed manufacturers' cable pull tensions for copper and optical fiber cables. Provide a device to monitor cable pull tensions. Do not exceed 110 Newton pull tension for four pair copper cables. Do not chafe or damage outer jacket materials. Use only lubricants approved by cable manufacturer. Do not over cinch cables, or crush cables with staples. Only Velcro type cable straps are allowed on Category 5e cable and optical fiber cable. For UTP cable bend radii shall not be less than four times the cable diameter.

3.1.1.1 Backbone Cable

- a. Copper Backbone Cable. Install backbone copper cable between MDF, BDF, and IDF equipment as indicated on drawings.
- b. Optical fiber Backbone Cable. Install backbone optical fiber in indicated pathways. Do not exceed manufacturer's recommended bending radii and pull tension. Prepare cable for pulling by cutting outer jacket 250 mm leaving strength members exposed for approximately 250 mm. Twist strength members together and attach to pulling eye. Vertical cable support intervals shall be in accordance with Manufacturer's recommendations.

3.1.1.2 Horizontal Cabling

Install horizontal cabling and pathway as indicated on drawings between MDF, BDF, IDF, and telecommunications outlet assemblies at workstations.

3.1.2 Pathway Installations

Comply with TIA/EIA-569-A, except 1-inch diameter conduit to each outlet from telecommunication room backboard. Conceal conduit under floor slabs and within finished walls, ceilings, and floors. Keep conduit minimum 150 mm (6 inches) away from parallel runs of electrical power equipment, flues, steam, and hot water pipes. Install conduit parallel with or at right angles to ceilings, walls, and structural members where located above accessible ceilings and where conduit is visible after completion of project. Run conduits in crawl spaces and under floor slabs as if exposed. Install no more than two 1.57 radii (90 degree) bends for a single horizontal cable run. All bends/turns in conduits will be in straight runs of conduit; in no case will a turn be made within a pull box. The minimum size for a pull box in a one inch home run conduit will be 4" long by 4" wide by 3" deep, and for a four inch conduit 60" long by 12" wide by 12" deep.

3.1.2.1 Service Entrance Conduit, Underground

PVC Type EPC-40, galvanized rigid steel, or steel IMC. Underground portion shall be encased in minimum of 75 mm (3 inches) of concrete extending from the building entrance to 1500 mm (5 feet) out from the building and shall

be a minimum of 450 mm (18 inches) below slab or grade.

3.1.2.2 Work Area Outlets

All work area faceplates will contain either four category 5e/6 jacks, or two category 5e/6 jacks.

3.1.2.3 Terminations

Terminate UTP cable in accordance with [TIA/EIA-568-B.1](#), [TIA/EIA-568-B.2](#), [TIA/EIA-568-B.3](#) and wiring configuration as specified, T568A.

3.1.2.4 Faceplates

As a minimum, each jack shall be labeled as to its function and a unique number to identify cable link.

3.1.3 Cables

Unshielded twisted pair shall have a minimum of 152 mm (6 inch) slack cable and fiber optic cables shall have a minimum of 1 m of slack cable loosely coiled into the telecommunications outlet boxes. Minimum manufacturer's bend radius for each type of cable shall not be exceeded.

3.1.3.1 Pull Cords

Pull cords shall be installed in all conduit serving telecommunications outlets which do not initially have cable installed.

3.1.3.2 Telecommunications Room Termination

Install termination hardware required for Category 5e/6 and optical fiber system. An insulation displacement tool shall be used for terminating copper cable to insulation displacement connectors.

3.1.4 Equipment Support Frame

Install in accordance with [TIA/EIA-569-A](#):

- a. Bracket, wall mounted. Mount bracket to plywood backboard per manufacturer's recommendations. Mount rack so height of highest panel does not exceed 1980 mm (76 inches) above floor.
- b. Racks, floor mounted modular type. Permanently anchor rack to the floor per manufacturer's recommendations.

3.1.5 Electrical Penetrations

Seal openings around electrical penetrations through fire resistance-rated wall, partitions, floors, or ceilings.

3.1.6 Grounding and Bonding

Will be conducted in accordance with [TIA J-STD-607-A](#), and [NFPA 70](#).

3.1.7 Fire Stopping

Seal openings around raceway penetrations through fire resistance rated walls, partitions, floors and ceiling utilizing proper fire stopping

materials to maintain fire resistive integrity.

3.2 LABELING

3.2.1 Labels

All labels shall be in accordance with TIA/EIA-606-A. The jacks will be numbered in a logical, sequential, clockwise numbering system.

3.2.2 Cable

All cables shall be labeled using color labels on both ends with encoded identifiers per TIA/EIA-606-A.

3.2.3 Termination Hardware

All workstation outlets and patch panel connections shall be labeled using color coded labels with encoded identifiers as per TIA/EIA-606-A.

3.3 TESTING

3.3.1 Telecommunications Cabling Testing

Perform telecommunications cabling inspection, verification, and performance tests in accordance with TIA/EIA-568-B.1, TIA/EIA-568-B.2, TIA/EIA-568-B.3.

3.3.1.1 Inspection

Visually inspect cabling jacket materials for UL or third party certification markings. Visually inspect UTP and optical fiber jacket materials for UL or third party certification markings. Inspect cabling terminations in telecommunications rooms and at workstations to confirm color code for tip and ring pin assignments, and inspect cabling connections to confirm compliance with TIA/EIA-568-B.1, TIA/EIA-568-B.2, and TIA/EIA-568-B.3. Visually confirm Category 5e marking of outlets, wallplates, outlet/ connectors, and patch panels.

3.3.1.2 Verification Tests

UTP backbone copper cabling shall be tested for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors, and between conductors and shield, if cable has overall shield. Test operation of shorting bars in connection blocks. Test cables after termination but not cross connected. Perform 100 MHz near-end-cross-talk (NEXT) and attenuation tests for Category 5e systems installations. Perform optical fiber end to end attenuation tests using an optical time domain reflectometer (OTDR) and manufacturer's recommended test procedures.

Perform tests in accordance with TIA/EIA-526-14-A, Method B for horizontal, multimode optical fiber and TIA/EIA-526-7, Method B for backbone, single mode optical fiber. Perform verification acceptance tests and factory reel tests.

3.3.1.3 Performance Tests

- a. Category 5e/6 Links. Perform UTP link tests in accordance with TIA/EIA-568-B.1, TIA/EIA-568-B.2, TIA/EIA-568-B.3. Tests shall include wire map, length, attenuation, NEXT, and propagation delay.

- b. Optical Fiber Links. Perform optical fiber end-to-end attenuation tests and reel tests at jobsite.
- c. As built drawings showing all telecommunications outlets and their numbers.

3.3.1.4 Final Verification Tests

Perform verification tests for UTP and optical fiber systems after the complete telecommunications cabling and workstation outlet/connectors are installed. These tests assume that dial tone service has been installed. Connect to the network interface device at the demarcation point. Go off-hook and listen and receive a dial tone. If a test number is available, make and receive a local, long distance, and DSN telephone call. The final QC and certification of installation will be performed by Base Telephone after the contractor has provided the test results to the government contract representative.

3.3.1.5 Records

- a. Records to be provided for copper shall include the cable specification sheets from the manufacturer, the cable routing and locations, all splice point locations, patch panel and jack locations, cable length, cable reel numbers and installation location, the test results in both hard copy and electronic version.
- b. Records to be provided for fiber shall include the cable specification sheets from the manufacturer, the cable routing and locations, all splice point locations, patch panel and jack locations, cable length, cable reel numbers and installation location, the test results in both hard copy and electronic version.
- c. As built drawings showing all telecommunications outlets and their numbers.

3.4 SCHEDULE

Some metric measurements in this section are based on mathematical conversion of inch-pound measurements, and not on metric measurement commonly agreed to by the manufacturers or other parties. The inch-pound and metric measurements are as follows:

PRODUCTS	INCH- POUND	METRIC
Outlet Boxes		
1. Standard		
- Length/width	4 inches (square)	100 mm (square)
- Depth	2 1/8 inches	55 mm
2. Telephone Outlet		
- Length	4 inches	100 mm
- Width	2 inches	50 mm
- Depth	2 1/8 inches	55 mm
- Depth	1 1/2 inches	38 mm

-- End of Section --

SECTION 28 31 76

INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM

04/06

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. The latest edition of each publication in print at time of design approval shall apply to this work.

AMERICANS WITH DISABILITIES ACT (ADA)

ACOUSTICAL SOCIETY OF AMERICA (ASA)

ASA S3.2 (1989; R 1999) Method for Measuring the Intelligibility of Speech Over Communication Systems (ASA 85)

FM GLOBAL (FM)

FM P7825a (2005) Approval Guide Fire Protection

INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC)

IEC 60268-16 Sound System Equipment - Part 16: Objective Rating Of Speech Intelligibility By Speech Transmission Index

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 7240-16 Fire Detection And Alarm Systems - Part 16: Sound System Control And Indicating Equipment

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 170 Fire Safety Symbols

NFPA 241 (2004) Safeguarding Construction, Alteration, and Demolition Operations

NFPA 70 (2007; AMD 1 2008) National Electrical Code - 2008 Edition

NFPA 72 (2006) National Fire Alarm Code

UNDERWRITERS LABORATORIES (UL)

UL 1480 Standard for Safety Speakers for Fire Alarm, Emergency, and Commercial and Professional Use

UL 1638	Visual Signaling Appliances - Private Mode Emergency and General Utility Signaling
UL 1971	Signaling Devices for the Hearing Impaired
UL 2017	Standard for Safety for General-Purpose Signaling Devices and Systems
UL 228	(2006; Rev thru Nov 2008) Door Closers-Holders, With or Without Integral Smoke Detectors
UL 268	Standard for Smoke Detectors for Fire Alarm Signaling Systems
UL 464	Standard for Audible Signal Appliances
UL 864	Control Units and Accessories for Fire Alarm Systems
UL Electrical Constructn	Electrical Construction Equipment Directory
UL Fire Prot Dir	(2008) Fire Protection Equipment Directory

1.2 RELATED REQUIREMENTS

Section 26 00 00 BASIC ELECTRICAL MATERIALS AND METHODS, applies to this section, with the additions and modifications specified herein.

1.3 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00
SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Include annotated catalog data, in table format on the drawings, showing manufacturer's name, model, voltage, and catalog numbers for equipment and components. Submitted shop drawings shall not be smaller than ISO A1.

Wiring Diagrams

Provide point-to-point wiring diagrams showing the points of connection and terminals used for electrical field connections in the system, including interconnections between the equipment or systems that are supervised or controlled by the system. Diagrams shall show connections from field devices to the FACP and remote fire alarm control units, initiating circuits, switches, relays and terminals.

Provide complete riser diagrams indicating the wiring sequence of devices and their connections to the control equipment. Include a color code schedule for the wiring. Include floor plans showing the locations of devices and equipment.

System Layout

Provide plan view drawing showing device locations, terminal cabinet locations, junction boxes, other related equipment, conduit routing, wire counts, circuit identification in each conduit, and circuit layouts for all floors. Drawings shall comply with the requirements of NFPA 170, Fire Safety Symbols.

System Operation

Provide a complete list of device addresses and corresponding messages.

Notification Appliances

Provide data on each circuit to indicate that there is at least 25 percent spare capacity for notification appliances, 25 percent spare capacity for initiating devices. Annotate data for each circuit on the drawings.

Amplifiers

Provide data to indicate that the amplifiers have sufficient capacity to simultaneously drive all notification speakers at the maximum rating plus 50 percent spare capacity. Annotate data for each circuit on the drawings.

As-Built Drawings

Prepare and submit to the Contracting Officer six sets of detailed as-built drawings. Furnish one set of full size paper as-built drawings and schematics. The drawings shall be prepared on uniform sized mylar sheets not less than 30 by 42 inches with 8 by 4 inch title block similar to contract drawings. Furnish one set of CD or DVD discs containing software back-up and CAD based drawings in latest version of AutoCadd and DXF format of as-built drawings and schematics. The drawings shall include complete wiring diagrams showing connections between devices and equipment, both factory and field wired. Include a riser diagram and drawings showing the as-built location of devices and equipment. The drawings shall show the system as installed, including deviations from both the project drawings and the approved shop drawings. These drawings shall be submitted within two weeks after the final acceptance test of the system. At least one set of as-built (marked-up) drawings shall be provided at the time of, or prior to the final acceptance test. As-built drawings shall be approved by a Registered Fire Protection Engineer.

SD-03 Product Data

Include UL or FM listing cards for equipment provided.

Technical Data And Computer Software

Fire alarm control panel (FACP)

Fire Alarm And Mass Notification Control Panel (FACP/FMCP)

Manual stations

Batteries

Battery chargers

Smoke sensors

Wiring and cable

Notification appliances

Amplifiers

Tone generators

Digitalized voice generators

Waterflow detectors

Tamper switches

ELECTROMAGNETIC DOOR HOLDERS

Digital Alarm Communicator Transmitter (DACT); G

SD-05 Design Data

System Operation

Provide a complete description of the system operation on the drawings.

Battery power

Provide battery calculations as required in paragraph Battery Power Calculations.

SD-06 Test Reports

Field Quality Control test reports

Testing Procedures

Smoke sensor testing procedures

SD-07 Certificates

Installer Qualifications

SD-09 Manufacturer's Field Reports

Mass Notification System

Include the control panel and initiating and indicating devices, a unique identifier for each device with an indication of test results, and signature of the factory-trained technician of the control panel manufacturer and equipment installer. With reports on preliminary tests, include printer information. The Contractor shall include the NFPA 72 Record of Completion and NFPA 72 Inspection and Testing Form, with the appropriate test reports.

SD-10 Operation and Maintenance Data

Operation and Maintenance (O&M) Instructions

Six copies of the Operation and Maintenance Instructions, indexed and in booklet form shall be submitted. The Operation and Maintenance Instructions shall be a single volume or in separate volumes, and may be submitted as a Technical Data Package. Manuals shall be approved prior to training.

Original and backup copies of all software delivered for this project shall be provided, on each type of CD/DVD media utilized.

Instruction of Government Employees

Submit the installers training history for the employees involved with this contract.

1.4 DESCRIPTION OF WORK

1.4.1 Scope

This work includes completion of design and providing a new, complete, analog/addressable fire alarm and mass notification system as described herein and on the contract drawings. The system shall include wiring, raceways, pull boxes, terminal cabinets, outlet and mounting boxes, control equipment, alarm, and supervisory signal initiating devices, alarm notification appliances, supervising station fire alarm system transmitter, and other accessories and miscellaneous items required for a complete operating system even though each item is not specifically mentioned or described. Provide systems complete and ready for operation. Equipment, materials, installation, workmanship, inspection, and testing shall be in strict accordance with the required and advisory provisions of **NFPA 72**, **ISO 7240-16**, **IEC 60268-16**, except as modified herein. The fire alarm system shall be a Class "A" addressable system with all addressable initiating devices. Each alarm initiating device shall have an individual identity, reporting back to the panel for alarm, trouble, open, short, appliance missing/failed remote detector, and, (for smoke detectors), sensitivity adjustment. Each alarm initiating device shall be capable of being individually enabled or disabled at the panel.

1.4.2 Definitions

Wherever mentioned in this specification or on the drawings, the equipment, devices, and functions shall be defined as follows:

- a. Analog/Addressable System: A system where multiple signals are transmitted via the same conduction path to a remote fire alarm control unit and fire alarm control panel, decoded and separated so that each signal will initiate the specified response.
- b. Fire Alarm and Mass Notification Control Panel (FACP/FMCP): A master control panel having the features of a fire alarm and mass notification control unit and fire alarm and mass notification control units are interconnected. The panel has central processing, memory, input and output terminals.

1.5 QUALITY ASSURANCE

Equipment and devices shall be compatible and operable with existing station fire alarm system and shall not impair reliability or operational functions of existing supervising station fire alarm system.

1.5.1 Qualifications

1.5.1.1 Design Services

Installations requiring completion of installation drawings and specification or modifications of fire detection, fire alarm, mass notification system, fire suppression systems or mass notification systems shall require the services and review of a qualified engineer. For the purposes of meeting this requirement, a qualified engineer is defined as an individual meeting one of the following conditions:

- a. A registered professional engineer (P.E.) in fire protection engineering.

1.5.1.2 Supervisor

The installing Contractor shall provide the following: Fire Alarm Technicians to perform the installation of the system. A Fire Alarm Technician with a minimum of 8 years of experience shall perform/supervise the installation of the fire alarm system/mass notification system. The Fire Alarm technicians supervising the installation of equipment shall be factory trained in the installation, adjustment, testing, and operation of the equipment specified herein and on the drawings. The supervisor shall be a minimum NICET Level III Fire Alarm Technician.

1.5.1.3 Technician

The installing Contractor shall provide the following: Fire Alarm Technicians with a minimum of four years of experience shall be utilized to assist in the installation and terminate fire alarm/mass notification devices, cabinets and panels. The Fire Alarm technicians installing the equipment shall be factory trained in the installation, adjustment, testing, and operation of the equipment specified herein and on the drawings. The technician shall be a minimum NICET Level II Fire Alarm Technician.

1.5.1.4 Installer

The installing Contractor shall provide the following: Fire Alarm installer with a minimum of two years of experience shall be utilized to assist in the installation of fire alarm/mass notification devices, cabinets and panels. An electrician shall be allowed to install wire or cable and to install conduit for the fire alarm system/mass notification system. The Fire Alarm installer shall be factory trained in the installation, adjustment, testing, and operation of the equipment specified herein and on the drawings.

1.5.1.5 Test Personnel

The installing Contractor shall provide the following: Fire Alarm Technicians with a minimum of eight years of experience shall be utilized to test and certify the installation of the fire alarm/mass notification devices, cabinets and panels. The Fire Alarm technicians testing the

equipment shall be factory trained in the installation, adjustment, testing, and operation of the equipment specified herein and on the drawings.

1.5.2 Manufacturer Qualifications

Components shall be of current design and shall be in regular and recurrent production at the time of installation. Provide design, materials, and devices for a protected premises fire alarm system, complete, conforming to [NFPA 72](#), except as otherwise or additionally specified herein.

1.5.3 Regulatory Requirements

Devices and equipment for fire alarm service shall be listed by [UL Fire Prot Dir](#) or approved by [FM P7825a](#).

1.5.3.1 Requirements for Fire Protection Service

Equipment and material shall have been tested by UL and listed in [UL Fire Prot Dir](#) or approved by FM and listed in [FM P7825a](#). Where the terms "listed" or "approved" appear in this specification, they shall mean listed in [UL Fire Prot Dir](#) or [FM P7825a](#). The omission of these terms under the description of any item of equipment described shall not be construed as waiving this requirement. All listings or approval by testing laboratories shall be from an existing ANSI or UL published standard.

1.5.3.2 Mass Notification System

The equipment furnished shall be compatible and be UL listed, FM approved, or approved or listed by a nationally recognized testing laboratory for the intended use. All listings or approval by testing laboratories shall be from an existing ANSI or UL published standard.

1.5.3.3 Testing Services or Laboratories

Fire alarm and fire detection equipment shall be constructed in accordance with [UL Fire Prot Dir](#), [UL Electrical Constructn](#), or [FM P7825a](#).

1.5.4 Standard Products

Provide materials, equipment, and devices that have been tested by a nationally recognized testing laboratory, such as UL or FM, and listed or approved for fire protection service when so required by [NFPA 72](#) or this specification. Select material from one manufacturer, where possible, and not a combination of manufacturers, for any particular classification of materials. Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products for at least two years prior to bid opening.

1.5.5 Modification of References

a. In NFPA publications referred to herein, consider advisory provisions to be mandatory, as though the word "shall" had been substituted for "should" wherever it appears; interpret reference to "authority having jurisdiction" to mean the Naval Facilities Engineering Command, Fire Protection Engineer.

b. The recommended practices stated in the manufacturer's literature or documentation shall be considered as mandatory requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

Protect equipment delivered and placed in storage from the weather, humidity, and temperature variation, dirt and dust, and other contaminants.

1.7 OPERATION AND MAINTENANCE (O&M) INSTRUCTIONS

1.7.1 System and System Equipment

The Interior Fire Alarm And Mass Notification System Operation and Maintenance Instructions shall include:

- a. "Manufacturer Data Package 5" as specified in Section 01 78 23 OPERATION AND MAINTENANCE DATA.
- b. Operating manual outlining step-by-step procedures required for system startup, operation, and shutdown. The manual shall include the manufacturer's name, model number, service manual, parts list, and complete description of equipment and their basic operating features.
- c. Maintenance manual listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guide. The manuals shall include conduit layout, equipment layout and simplified wiring, and control diagrams of the system as installed.
- d. The manuals shall include complete procedures for system revision and expansion, detailing both equipment and software requirements.
- e. Software delivered for this project shall be provided, on each type of CD/DVD media utilized.
- f. Printouts of configuration settings for all devices.
- g. Routine maintenance checklist. The routine maintenance checklist shall be arranged in a columnar format. The first column shall list all installed devices, the second column shall state the maintenance activity or state no maintenance required, the third column shall state the frequency of the maintenance activity, and the fourth column for additional comments or reference.

1.7.2 Technical Data and Computer Software

Lesson plans, operating instructions, maintenance procedures, and training data, furnished in manual format, for the training courses. The operations training shall familiarize designated government personnel with proper operation of the installed system. The maintenance training course shall provide the designated government personnel adequate knowledge required to diagnose, repair, maintain, and expand functions inherent to the system.

1.8 SPARE PARTS AND TOOLS

1.8.1 Repair Service/Replacement Parts

Repair services and replacement parts for the system shall be available for a period of 10 years after the date of final acceptance of this work by the Contracting Officer. During guarantee period, the service technician shall be on-site within 24 hours after notification. All repairs shall be completed within 24 hours of arrival on-site.

1.8.2 Interchangeable Parts

Spare parts furnished shall be directly interchangeable with the corresponding components of the installed system. Spare parts shall be suitably packaged and identified by nameplate, tagging, or stamping. Spare parts shall be delivered to the Contracting Officer at the time of the final acceptance testing.

1.8.3 Special Tools

Software, connecting cables and proprietary equipment, necessary for the maintenance, testing, and reprogramming of the equipment shall be furnished to the Contracting Officer.

1.9 TECHNICAL DATA AND COMPUTER SOFTWARE

Technical data and computer software (meaning technical data that relates to computer software) that is specifically identified in this project, and may be defined/required in other specifications, shall be delivered, strictly in accordance with the CONTRACT CLAUSES. Data delivered shall be identified by reference to the particular specification paragraph against which it is furnished. Data to be submitted shall include complete system, equipment, and software descriptions. Descriptions shall show how the equipment will operate as a system to meet the performance requirements of this contract. The data package shall also include the following:

- (1) Identification of programmable portions of system equipment and capabilities.
- (2) Description of system revision and expansion capabilities and methods of implementation detailing both equipment and software requirements.
- (3) Provision of operational software data on all modes of programmable portions of the fire alarm and detection system.
- (4) Description of [Fire Alarm Control Panel](#) equipment operation.
- (5) Description of auxiliary and remote equipment operations.
- (6) Library of application software.
- (7) Operation and maintenance manuals.

1.10 KEYS

Keys and locks for equipment shall be identical. Provide not less than six keys of each type required. All keys and locks shall be mastered to a single key as required by the local AHJ.

PART 2 PRODUCTS

2.1 GENERAL PRODUCT REQUIREMENT

All fire alarm and mass notification equipment shall be listed for use under the applicable reference standards. Interfacing of Listed [UL 864](#) or similar approved industry listing with Mass Notification Panels listed to UL Standard 2017 or equal shall be done in a laboratory listed

configuration, if the software programming features can not provide a listed interface control. If field modification such as adding equipment such as relays, then the manufacturer of the panels being same or different brand of manufacturer shall provide the installing contractor for review and confirmation by the installing contractor. The installing contractor shall as part of his submittal documents provide this information.

2.2 SYSTEM OPERATION

The Addressable Interior Fire Alarm and Mass Notification System shall be a complete, supervised, noncoded, analog/addressable fire alarm and mass notification system conforming to NFPA 72, UL 864 Ninth Edition, and UL 2017. The system shall be activated into the alarm mode by actuation of any alarm initiating device. The system shall remain in the alarm mode until the initiating device is reset and the fire alarm control panel is reset and restored to normal. The system maybe placed in the alert mode by local microphones or remotely from authorized locations/users.

2.2.1 Alarm Initiating Devices

Alarm initiating devices shall be connected to initiating device circuits (IDC), Style B and installed in accordance with NFPA 72. Alarm notification appliances shall be connected to notification appliance circuits (NAC) Voice Notification System, Style B in accordance with NFPA 72. A looped conduit system shall be provided so that if the conduit and all conductors within are severed or exposed to fire at any point, all IDC, NAC and SLC will remain functional. Should the design or building layout preclude separation then a fire rated separation shall be provided in accordance with NFPA 72. The return portion of the loop shall be remote from the supply portion of the loop. The system shall operate in the alarm mode upon actuation of any alarm initiating device. The system shall remain in the alarm mode until initiating device(s) are reset and the fire alarm control panel is manually reset and restored to normal. The conduit loop requirement is not applicable to the signal transmission link from the local panels (at the protected premises) to the Supervising Station (fire station, fire alarm central communication center). Audible, and visual appliances and systems shall comply with NFPA 72. Fire alarm system/mass notification system components requiring power, except for the control panel power supply, shall operate on 24 Volts dc.

2.2.2 Functions and Operating Features

The system shall provide the following functions and operating features:

- a. The FACP/FMCP and fire alarm and mass notification control units, if used, shall provide power, annunciation, supervision, and control for the system. Addressable systems shall be microcomputer (microprocessor or microcontroller) based with a minimum word size of eight bits with sufficient memory to perform as specified.
- b. Provide Style B initiating device circuits.
- c. Provide Style B notification appliance circuits. The visual alarm notification appliances shall have the flash rates synchronized.
- d. Provide electrical supervision of the primary power (AC) supply, presence of the battery, battery voltage, and placement of system modules within the control panel.

- e. Provide an audible and visual trouble signal to activate upon a single break or open condition, or ground fault. The trouble signal shall also operate upon loss of primary power (AC) supply, absence of a battery supply, low battery voltage, or removal of alarm or supervisory panel modules. Provide a trouble alarm silence feature that shall silence the audible trouble signal, without affecting the visual indicator. After the system returns to normal operating conditions, the trouble signal shall again sound until the trouble is acknowledged. A smoke sensor in the process of being verified for the actual presence of smoke shall not initiate a trouble condition.
- f. Provide a notification appliance silencing switch, that when activated, will silence the audible signal appliance, but will not affect the visual alarm indicator, the liquid crystal display, or the automatic notification of the fire department. This switch shall be overridden upon activation of a subsequent alarm.
- g. Provide alarm verification capability for smoke sensors. Alarm verification shall initially be set for 30 seconds.
- h. Alarm, supervisory, and/or trouble signals shall be automatically transmitted to the fire department.
- i. Alarm functions shall override trouble or supervisory functions. Supervisory functions shall override trouble functions.
- j. The system shall be capable of being programmed from the panels keyboard. Programmed information shall be stored in non-volatile memory.
- k. The system shall be capable of operating, supervising, and/or monitoring both addressable and non-addressable alarm and supervisory devices.
- l. There shall be no limit, other than maximum system capacity, as to the number of addressable devices, that may be in alarm simultaneously.
- m. An alarm signal shall automatically initiate the following functions:
 - (1) Transmission of an alarm signal to the fire department.
 - (2) Continuous actuation of all alarm notification appliances.
 - (3) Recording of the event via the system printer and electronically in the history log of the fire control system unit.
- n. A supervisory signal shall automatically initiate the following functions:
 - (1) Visual indication of the device operated on the FACP, and on the graphic annunciator, and sound the audible alarm at the respective panel.
 - (2) Transmission of a supervisory signal to the fire department.
 - (3) Recording of the event via the system printer and electronically in the history log of the fire control system unit.
- o. A trouble condition shall automatically initiate the following

functions:

(1) Visual indication of the system trouble on the FACP, and on the graphic annunciator, and sound the audible alarm at the respective panel.

(2) Transmission of a trouble signal to the fire department.

p. The maximum permissible elapsed time between the actuation of an initiating device and its indication at the FACP shall be 10 seconds.

q. The maximum elapsed time between the occurrence of the trouble condition and its indication at the FACP shall not exceed 200 seconds.

2.3 SYSTEM MONITORING

2.3.1 Valves

Each valve affecting the proper operation of a fire protection system, including automatic sprinkler control valves, standpipe control valves, sprinkler service entrance valve, valves at fire pumps, isolating valves for pressure type waterflow or supervision switches, and valves at backflow preventers, whether supplied under this contract or existing, shall be electrically monitored to ensure its proper position. Each tamper switch shall be provided with a separate address.

2.4 MASS NOTIFICATION SYSTEM FUNCTIONS

2.4.1 Notification Appliance Network

The notification appliance network consists of audio speakers located to provide intelligible instructions at areas as indicated on the drawings. The Mass Notification System announcements shall take priority over all other function of the system including the audible and visual output of the fire alarm system in a normal or alarm state. All fire alarm system functions shall continue in an alarm state except for the output signals of the audible and visual notification appliances.

2.4.2 Strobes

Strobes are also provided to alert hearing-impaired occupants.

2.4.3 Giant Voice

The Giant Voice system (if available) in the area of the building shall be activated to provide a pre-recorded live voice message.

2.4.4 Voice Notification

An autonomous voice notification control unit is used to monitor and control the notification appliance network and provide consoles for local operation. Using a console, personnel in the building can initiate delivery of pre-recorded voice messages, provide live voice messages and instructions, and initiate visual strobe and (optional) textual message notification appliances. The autonomous voice notification control unit will temporarily override audible fire alarm notification while delivering Mass Notification messages to ensure they are intelligible.

2.4.5 Base-Wide Control

If a base-wide control system for mass notification exists on the base, the autonomous control unit shall communicate with the central control unit of the base-wide system. The autonomous control unit shall receive commands/messages from the central control unit and provide status information.

2.5 SMOKE SENSORS

2.5.1 Photoelectric Smoke Sensors

Provide addressable photoelectric smoke sensors as follows:

- a. Provide analog/addressable photoelectric smoke sensors utilizing the photoelectric light scattering principle for operation in accordance with [UL 268](#). Smoke sensors shall be listed for use with the fire alarm control panel.
- b. Provide self-restoring type sensors that do not require any readjustment after actuation at the FACP to restore them to normal operation. Sensors shall be UL listed as smoke-automatic fire sensors.
- c. Components shall be rust and corrosion resistant. Vibration shall have no effect on the sensor's operation. Protect the detection chamber with a fine mesh metallic screen that prevents the entrance of insects or airborne materials. The screen shall not inhibit the movement of smoke particles into the chamber.
- d. Provide twist lock bases for the sensors. The sensors shall maintain contact with their bases without the use of springs. Provide companion mounting base with screw terminals for each conductor. Terminate field wiring on the screw terminals. The sensor shall have a visual indicator to show actuation.
- e. The sensor address shall identify the particular unit, its location within the system, and its sensitivity setting. Sensors shall be of the low voltage type rated for use on a 24 VDC system.
- f. An operator at the control panel, having a proper access level, shall have the capability to manually access the following information for each initiating device.
 - (1) Primary status
 - (2) Device type
 - (3) Present average value
 - (4) Present sensitivity selected
 - (5) Sensor range (normal, dirty, etc.)

2.5.2 Smoke Sensor Testing

Smoke sensors shall be tested in accordance with [NFPA 72](#) and manufacturer's recommended calibrated test method. Submit smoke sensor testing procedures for approval.

2.6 ELECTRIC POWER

2.6.1 Primary Power

Power shall be 120 VAC service for the FACP from the normal AC service to the building.

2.7 EMERGENCY POWER SUPPLY

Provide for system operation in the event of primary power source failure. Transfer from normal to auxiliary (secondary) power or restoration from auxiliary to normal power shall be automatic and shall not cause transmission of a false alarm.

2.7.1 Batteries

Provide sealed, maintenance-free, lead-calcium batteries as the source for emergency power to the FACP. Batteries shall contain suspended electrolyte. The battery system shall be maintained in a fully charged condition by means of a solid state battery charger. Provide an automatic transfer switch to transfer the load to the batteries in the event of the failure of primary power.

2.7.1.1 Capacity

Provide the batteries with sufficient capacity to operate the system under supervisory and trouble conditions, including audible trouble signal devices for 48 hours and audible and visual signal devices under alarm conditions for an additional 15 minutes.

2.7.1.2 Battery Power Calculations

a. Verify that battery capacity exceeds supervisory and alarm power requirements.

1). Substantiate the battery calculations for alarm, alert, and supervisory power requirements. Ampere-hour requirements for each system component and each panel component, and the battery-recharging period shall be included.

2). Provide complete battery calculations for both the alarm, alert, and supervisory power requirements. Ampere-hour requirements for each system component shall be submitted with the calculations.

3). A voltage drop calculation to indicate that sufficient voltage is available for proper operation of the system and all components, at the minimum rated voltage of the system operating on batteries.

b. For battery calculations use the following assumptions:

Assume a starting voltage of 24 VDC for starting the calculations to size the batteries. Calculate the required Amp-Hours for the specified standby time, and then calculate the required Amp-Hours for the specified alarm time. Calculate the nominal battery voltage after operation on batteries for the specified time period. Using this voltage perform a voltage drop calculation for circuit containing device and/or appliances remote from the power

sources. Required battery calculations are to be based on a minimum rated voltage of 21.6V for 24V systems.

2.7.2 Battery Chargers

Provide a solid state, fully automatic, variable charging rate battery charger. The charger shall be capable of providing 150 percent of the connected system load and shall maintain the batteries at full charge. In the event the batteries are fully discharged (18 Volts dc), the charger shall recharge the batteries back to 95 percent of full charge within 48 hours. Provide pilot light to indicate when batteries are manually placed on a high rate of charge as part of the unit assembly if a high rate switch is provided.

2.8 FIRE ALARM AND MASS NOTIFICATION CONTROL PANEL (FACP/FMCP)

Provide a complete control panel fully enclosed in a lockable steel enclosure as specified herein. Operations required for testing or for normal care and maintenance of the systems shall be performed from the front of the enclosure. If more than a single unit is required at a location to form a complete control panel, the unit enclosures shall match exactly. Each control unit shall provide power, supervision, control, and logic for the entire system, utilizing solid state, modular components, internally mounted and arranged for easy access. Each control unit shall be suitable for operation on a 120 volt, 60 hertz, normal building power supply. Provide each panel with supervisory functions for power failure, internal component placement, and operation. Visual indication of alarm, supervisory, or trouble initiation on the fire alarm control panel shall be by liquid crystal display or similar means with a minimum of 80 characters, that at least 32 are field changeable. The MNS Control panel shall have the capability of temporarily deactivate the fire alarm audible notification appliances while delivering voice messages. Provide conductor integrity monitoring for strobe, display, temporary deactivation of fire alarm audible notification appliances and speaker wiring. Provide secure operator console for initiating recorded messages, strobes and displays; and for delivering live voice messages. Provide capacity for at least four pre-recorded messages. Provide the ability to automatically repeat pre-recorded messages. Provide a secure microphone for delivering live messages. Provide adequate discrete outputs to temporarily deactivate fire alarm audible notification, and initiate/synchronize strobes. Provide a complete set of self-diagnostics for controller and appliance network. Provide local diagnostic information display and local diagnostic information and system event log file.

2.8.1 Cabinet

Install control panel components in cabinets that are red in color and large enough to accommodate all components and also to allow ample gutter space for interconnection of panels as well as field wiring. The enclosure shall be identified by an engraved laminated phenolic resin nameplate. Lettering on the nameplate shall say "Fire Alarm and Mass Notification Control Panel" and shall not be less than one inch high. Provide prominent rigid plastic or metal identification plates for lamps, circuits, meters, fuses, and switches. The cabinet shall be provided in a sturdy steel housing, complete with back box, hinged steel door with cylinder lock, and surface mounting provisions.

2.8.2 Control Modules

Provide power and control modules to perform all functions of the FACP. Provide audible signals to indicate any alarm, supervisory, or trouble condition. The alarm signals shall be different from the trouble signal. Connect circuit conductors entering or leaving the panel to screw-type terminals with each terminal marked for identification. Locate diodes and relays, if any, on screw terminals in the FACP. Circuits operating at 24 VDC shall not operate at less than 21.6 volts. Circuits operating at any other voltage shall not have a voltage drop exceeding 10 percent of nominal voltage.

2.8.3 Silencing Switches

a. Alarm Silencing Switch: Provide an alarm silencing switch at the FACP that shall silence the audible signal but not affect the visual alarm indicator. This switch shall be overridden upon activation of a subsequent alarm.

b. Supervisory/Trouble Silencing Switch: Provide supervisory and trouble silencing switch that shall silence the audible trouble and supervisory signal, but not extinguish the visual indicator. This switch shall be overridden upon activation of a subsequent alarm, supervision, or trouble condition. Audible trouble indication must resound automatically every 24 hours after the silencing feature has been operated.

2.8.4 Non-Interfering

Power and supervise each circuit such that a signal from one device does not prevent the receipt of signals from any other device. Circuits shall be manually reset by switch from the FACP after the initiating device or devices have been restored to normal.

2.8.5 Voice Notification System

The Voice Notification System shall comply with the requirements of NFPA 72 for Emergency Voice/Alarm Communications System requirements ISO 7240-16, IEC 60268-16, except as specified herein. The system shall be a one-way multi-channel voice notification system incorporating user selectability of a minimum 8 distinct sounds for tone signaling, and the incorporation of a voice module for delivery of prerecorded messages. Textual audible appliances shall produce a slow whoop tone for three cycles followed by a voice message that is repeated until the control panel is reset or silenced. The visual strobes and audible message shall automatically be broadcast on the floor of fire alarm origin. A live voice message shall override the automatic audible output through use of a microphone input at the control panel. When using the microphone, live messages shall be broadcast through speakers in stairs, in elevator cabs, and throughout a selected floor or floors. The system shall be capable of operating all speakers at the same time. The digitalized voice message shall consist of a non-volatile (EPROM) microprocessor based input to the amplifiers. The microprocessor shall actively interrogate circuitry, field wiring, and digital coding necessary for the immediate and accurate rebroadcasting of the stored voice data into the appropriate amplifier input. Loss of operating power, supervisory power, or any other malfunction that could render the digitalized voice module inoperative shall automatically cause the slow whoop tone to take over all functions assigned to the failed unit. The Mass Notification functions shall override the manual or automatic fire

alarm notification or Public Address (PA) functions. The system shall have the capability of utilizing a remote microphone station with redundant controls of the notification system control panel. Class "A" Notification Appliance Circuits (NAC) shall be provided for the activation of strobe appliances. The activation of the NAC Circuits shall follow the operation of the speaker NAC circuits. Audio output shall be selectable for line level (600 ohms), 25, 70.7 or 100 volt output. The audio amplifier outputs shall be not greater than 100 watts RMS output. The strobe NAC Circuits shall provide at least 2 amps of 24 VDC power to operate strobes and have the ability to synchronize all strobes. A hand held microphone shall be provided and, upon activation, shall take priority over any tone signal, recorded message or PA microphone operation in progress, while maintaining the strobe NAC Circuits activation. All outputs and operational modules shall be fully supervised with on-board diagnostics and trouble reporting circuits. Form "C" contacts shall be provided for system alarm and trouble conditions. Circuits shall be provided for operation of auxiliary appliance during trouble conditions. During a Mass Notification event the panel shall not generate nor cause any trouble alarms to be generated with the Fire Alarm system. The Control Panel for the Voice Notification System shall be independent of the Fire alarm system and shall be capable of autonomous operation. The system shall be housed in a separate panel that contains an independent power supply and batteries, as specified above. Mass Notification functions shall take precedence over all other function performed by the Voice Notification System. Messages shall utilize a male voice and shall be similar to the following:

- 1) 1000 Hz tones (1 sec on, 1/2 second off, 1 second on, 1/2 second off, 1 second on)

"May I have your attention, please. May I have your attention, please. A fire has been reported that may affect your floor. Please walk to the nearest exit and evacuate the building."
(Provide a 2 second pause.) "May I have your attention, please...(repeat the message)."

- 2) 1000 Hz tones (1 sec on, 1/2 second off, 1 second on, 1/2 second off, 1 second on)

"May I have your attention please. May I have your attention please. A fire emergency has been reported in the building. Please leave the building by the nearest exit or exit stairway. Do not use the elevators." (Provide a 2 second pause.) "May I have your attention please..(repeat the message)."

- 3) 1000 Hz tones (1 sec on, 1/2 second off, 1 second on, 1/2 second off, 1 second on)

"Alert! This is the Mass Notification System.
There is an emergency situation.
DO NOT evacuate the building! Stay in your current location!
Stay tuned for further instructions."
(repeat message 2 times)

- 4) 1000 Hz tones (1 sec on, 1/2 second off, 1 second on, 1/2 second off, 1 second on)

"Alert, This is the Mass Notification System.
There is a chemical gas emergency.
Turn off all HVAC equipment, seal all doors and windows with wet

fabric, Don protective gear.
DO NOT evacuate the building, Act now!
Listen to the MNS system for further instructions".
(repeat message 2 times)

5) 1000 Hz tones (1 sec on, 1/2 second off, 1 second on, 1/2 second off, 1 second on)

"Alert, this is the Mass Notification System.
There is a explosive blast risk along the South wall of your building.
Quietly move towards the north side of the building, and exit from the north stairs.
Move away from the building heading north to the north parking area.
(repeat message 2 times).

a. The Remote Microphone station shall incorporate a Push-To-Talk (PTT) microphone, redundant controls and system status indicators of/for the system. The unit shall incorporate microphone override of any tone generation or prerecorded messages. The unit shall be fully supervised from the control panel. The housing shall contain a lock that is keyed identical to the fire alarm system for the building.

b. Auxiliary Input Module shall be designed to be an outboard expansion module to either expand the number of optional remote microphone stations, or allow a telephone interface.

2.8.6 Memory

Provide each control unit with non-volatile memory and logic for all functions. The use of long life batteries, capacitors, or other age-dependent devices shall not be considered as equal to non-volatile processors, PROMS, or EPROMS.

2.8.7 Field Programmability

Provide control units and control panels that are fully field programmable for control, initiation, notification, supervisory, and trouble functions of both input and output. The system program configuration shall be menu driven. System changes shall be password protected and shall be accomplished using personal computer based equipment. Any proprietary equipment and proprietary software needed by qualified technicians to implement future changes to the fire alarm system shall be provided as part of this contract.

2.8.8 Input/Output Modifications

The FACP shall contain features that allow the bypassing of input devices from the system or the modification of system outputs. These control features shall consist of a panel mounted keypad. Any bypass or modification to the system shall indicate a trouble condition on the FACP.

2.8.9 Resetting

Provide the necessary controls to prevent the resetting of any alarm, supervisory, or trouble signal while the alarm, supervisory or trouble condition on the system still exists.

2.8.10 Instructions

Provide a typeset printed or typewritten instruction card mounted behind a Lexan plastic or glass cover in a stainless steel or aluminum frame. Install the frame in a conspicuous location observable from the FACP. The card shall show those steps to be taken by an operator when a signal is received as well as the functional operation of the system under all conditions, normal, alarm, supervisory, and trouble. The instructions shall be approved by the Contracting Officer before being posted.

2.8.11 History Logging

In addition to the required printer output, the control panel shall have the ability to store a minimum of 400 events in a log. These events shall be stored in a battery-protected memory and shall remain in the memory until the memory is downloaded or cleared manually. Resetting of the control panel shall not clear the memory.

2.8.12 RS-232-C Output

Each local control panel shall be capable of operating remote service type cathode ray tubes (CRTs), printers, and/or modems. The output shall be paralleled ASCII from an EIA RS-232-C connection with a baud rate of 1200 or 2400 to allow use of any commonly available CRT, printer, or modem.

2.9 AMPLIFIERS, PREAMPLIFIERS, TONE GENERATORS

Any amplifiers, preamplifiers, tone generators, digitalized voice generators, and other hardware necessary for a complete, operational, textual audible circuit conforming to NFPA 72 shall be housed in a fire alarm control unit, terminal cabinet, or in the fire alarm control panel. The system shall automatically operate and control all building fire alarm speakers except those installed in the stairs and within elevator cabs. The speakers in the stairs and elevator cabs shall operate only when the microphone is used to deliver live messages. Each amplifier shall be single output channel.

2.9.1 Construction

Amplifiers shall utilize computer grade solid state components and shall be provided with output protection devices sufficient to protect the amplifier against any transient up to 10 times the highest rated voltage in the system.

2.9.2 Inputs

Each system shall be equipped with separate inputs from the tone generator, digitalized voice driver and panel mounted microphone. Microphone inputs shall be of the low impedance, balanced line type. Both microphone and tone generator input shall be operational on any amplifier.

2.9.3 Tone Generator

The tone generator shall be of the modular, plug-in type with securely attached labels to identify the component as a tone generator and to identify the specific tone it produces. The tone generator shall produce a slow whoop tone, that shall slowly ascend from low (500 hertz) to high (1200 hertz), and shall be constantly repeated until interrupted by either the digitalized voice message, the microphone input, or the alarm silence mode as specified. Each slow whoop cycle shall last approximately 4

seconds. The tone generator shall be single channel with an automatic backup generator per channel such that failure of the primary tone generator causes the backup generator to automatically take over the functions of the failed unit and also causes transfer of the common trouble relay.

2.9.4 Protection Circuits

Each amplifier shall be constantly supervised for any condition that could render the amplifier inoperable at its maximum output. Failure of any component shall cause automatic transfer to a designated backup amplifier, illumination of a visual "amplifier trouble" indicator on the control panel, appropriate logging of the condition on the system printer, and other actions for trouble conditions as specified.

2.10 SYSTEM PRINTERS

Provide a system printer to record alarm, supervisory, and trouble conditions without loss of any signal or signals. Printout shall be by circuit, device, and function as provided in the FACP. Printer shall operate on a 120 VAC, 60 Hz power supply. The printer shall have at least 40 characters per line and have a 96 ASCII character set. The printer shall have a microprocessor-controlled, bi-directional, logic seeking head capable of printing 120 characters per second. Printer shall not contain internal software that is essential for proper operation. When the FACP receives a signal, the alarm, supervisory, and trouble condition shall be printed. The printout shall include the type of signal, the circuit or device reporting, the date, and the time of the occurrence. The printer shall differentiate alarm signals from other printed indications. When the system is reset, this condition shall also be printed including the same information concerning device, location, date, and time. Provide a means to automatically print a list of existing alarm, supervisory, and trouble conditions in the system. If a printer is off-line when an alarm is received, the system shall have a buffer to retain the data and it shall be printed when the printer is restored to service. The printer shall have an indicator to alert the operator that the paper has run out.

2.11 MANUAL STATIONS

Provide metal or plastic, semi-flush mounted, double action, addressable manual stations, that are not subject to operation by jarring or vibration. Stations shall be equipped with screw terminals for each conductor. Stations that require the replacement of any portion of the device after activation are not permitted. Stations shall be finished in fire-engine red with molded raised lettering operating instructions of contrasting color. The use of a key or wrench shall be required to reset the station. Manual stations shall be mounted in accordance with ADA standards. Stations shall have a separate screw terminal for each conductor.

2.12 NOTIFICATION APPLIANCES

2.12.1 Mass Notification Speakers

Audible appliances shall conform to the applicable requirements of [UL 464](#). Appliances shall be connected into notification appliance circuits. Audible appliances shall generate a unique audible sound from other devices provided in the building and surrounding area. Surface mounted audible appliances shall be painted white. Recessed audible appliances shall be installed with a grill that is painted white with a factory finish to match

the surface to which it is mounted.

a. Speakers shall conform to the applicable requirements of [UL 1480](#). Speakers shall have six different sound output levels and operate with audio line input levels of 100 Vac, 70 Vac, 7 Vac, and 25 Vac, by means of selectable tap settings. Tap settings shall include taps of 1/4, 1/2, 1, 2, and 8 watt. Speakers shall incorporate a high efficiency speaker for maximum output at minimum power across a frequency range of 400Hz to 4000Hz, and shall have a sealed back construction. Speakers shall be capable of installation on standard [4 inch](#) square electrical boxes. Where speakers and strobes are provided in the same location, they may be combined into a single wall mounted unit. All inputs shall be polarized for compatibility with standard reverse polarity supervision of circuit wiring via the Voice Notification System.

b. Provide speaker mounting plates constructed of cold rolled steel having a minimum thickness of [16 gauge](#) and equipped with mounting holes and other openings as needed for a complete installation. Fabrication marks and holes shall be ground and finished to provide a smooth and neat appearance for each plate. Each plate shall be primed and painted.

2.12.2 Visual Notification Appliances

Visual notification appliances shall conform to the applicable requirements of [UL 1971](#) and conform to the Americans With Disabilities Act (ADA). Colored lens such as amber, the notifications appliances shall comply with [UL 1638](#). The manufacturer shall have the color lens tested to the full [UL 1971](#) polar plotting criteria, voltage drop, and temperature rise as stated in 1971. Fire Alarm Notification Appliances shall have clear high intensity optic lens, xenon flash tubes, and output white light and be marked "Fire" in red letters. Mass Notification Appliances shall have amber high intensity optic lens, xenon flash tubes, and output white light and be marked "ALERT" in red letters. The light pattern shall be disbursed so that it is visible above and below the strobe and from a 90 degree angle on both sides of the strobe. Strobe flash rate shall be 1 flash per second and a minimum of 75 candela (actual output after derating for tinted lens) based on the [UL 1971](#) test. Strobe shall be surface mounted. Where more than two appliances are located in the same room or corridor, provide synchronized operation.

2.12.3 Fire Alarm Horns

Provide surface mounted electronic multi-tone horns that produce a minimum of four distinct sounds, suitable for use in an electrically supervised circuit. Horns shall have a rating of 90 dBA at [10 feet](#) when tested in accordance with [UL 464](#) while emitting a three pulse temporal pattern. Output from the horn shall be three-pulse temporal pattern. Where horns and strobes are provided in the same location, they may be combined into a single unit. Horns used in exterior locations shall be specifically listed or approved for outdoor use and be provided with metal housing and protective grilles.

2.12.4 Connections

Provide screw terminals for each notification appliance. Terminals shall be designed to accept the size conductors used in this project without modification.

2.13 VALVE MONITOR SWITCHES (TAMPER SWITCHES)

Provide a tamper switch for each fire protection system control valve. Tamper switches shall be UL listed as "Extinguishing System Attachment" for the location and type of valve supervised. The device shall contain double pole, double throw contacts. Operation of the switch shall cause a supervisory signal to be transmitted to the FACP upon not more than two complete turns of the valve wheel or a closure of 10 percent, whichever is less. Tamper switches shall be equipped with screw terminals for each conductor.

2.14 WATERFLOW DETECTORS

a. Provide vane type waterflow detectors for wet pipe sprinkler systems. The device shall contain double pole, double throw contacts. Equip the detector with a pneumatic time delay, field adjustable from 0 to 90 seconds. The time delay shall be set initially to 30 seconds. The device shall be a UL listed extinguishing system attachment rated for the particular pressure and location that it is installed. Flow switches shall be equipped with screw terminals for each conductor.

2.15 ELECTROMAGNETIC DOOR HOLDERS

Where indicated on the drawings, provide magnetic fire door hold open devices. The electromagnetic holding devices shall be designed to operate on 120 VAC, and require not more than 3 watts of power to develop 25 psi of holding force. Under normal conditions, the magnets shall attract and hold the doors open. The initiation of any fire alarm shall cause the release of the electromagnetic door holding device permitting the door to be closed by the door closer. Operation shall be fail safe with no moving parts. Electromagnetic door hold-open devices shall not be required to be held open during building power failure. The device shall be UL listed based on [UL 228](#) tests.

2.16 INTERFACE TO THE BASE WIDE MASS NOTIFICATION NETWORK

2.16.1 Wide Area Network/Local Area Network (WAN/LAN)

The Wide Area Network/Local Area Network (WAN/LAN) Interface shall be a 10BASE-T/100BASE-TX Category 6. The ANSI/TIA/EIA 568 wiring method of the RJ-45 outlet shall be as specified in Section [27 10 00 BUILDING TELECOMMUNICATIONS CABLING SYSTEM](#). The WAN/LAN Interface shall support sensitive data at rated data transmission speeds with DES/3DES encryption, MD5 and SHA-1 hashing, RFS 2402 authentication and meet security features of FIPS 140-2 criteria. The WAN/LAN Interface shall have the following characteristics:

- a. 10BASE-T/100BASE-TX, autonegotiation
- b. WAN/LAN Connection: RJ-45
- c. Cabling: as specified in Section [27 10 00 BUILDING TELECOMMUNICATIONS CABLING SYSTEM](#)
- d. Security Protocols: 168-bit 3DES, 56-bit DES, SHA-1, MD5, RFC 2402; up to 75 security associations
- e. Network protocols: TCP/IP, ISO 8802-3

2.17 AUTOMATIC FIRE TRANSMITTERS

2.17.1 Digital Alarm Communicator Transmitter (DACT)

Provide DACT that is compatible with the existing supervising station fire alarm system. Transmitter shall have a means to transmit alarm, supervisory, and trouble conditions via a single transmitter. Transmitter shall have a source of power for operation that conforms to **NFPA 72**. Transmitter shall be capable of initiating a test signal daily at any selected time. Transmitter shall be arranged to seize telephone circuits in accordance with **NFPA 72**.

2.18 NAMEPLATES

Major components of equipment shall have the manufacturer's name, address, type or style, model or serial number, catalog number, date of installation, installing Contractor's name and address, and the contract number provided on a new plate permanently affixed to the item or equipment. Major components include, but are not limited to, the following:

- a. FACPs
- b. Printer

Furnish to obtain approval by the Contracting Officer before installation. Obtain approval by the Contracting Officer for installation locations. Nameplates shall be etched metal or plastic, permanently attached by screws to panels or adjacent walls.

2.19 WIRING

Provide wiring materials under this section as specified in Section **26 20 00 INTERIOR DISTRIBUTION SYSTEM** with the additions and modifications specified herein.

2.19.1 Alarm Wiring

The SLC wiring shall be copper cable in accordance with the manufacturers requirements. Copper signaling line circuits and initiating device circuit field wiring shall be No. 14 AWG size conductors at a minimum. Notification appliance circuit conductors, that contain audible alarm devices, other than speakers, shall be solid copper No. 14 AWG size conductors at a minimum. Speaker circuits shall be copper No. 16 AWG size conductors at a minimum. Wire size shall be sufficient to prevent voltage drop problems. Circuits operating at 24 VDC shall not operate at less than 21.6 volts. Circuits operating at any other voltage shall not have a voltage drop exceeding 10 percent of nominal voltage. Power wiring, operating at 120 VAC minimum, shall be a minimum No. 12 AWG solid copper having similar insulation.

PART 3 EXECUTION

3.1 INSTALLATION OF FIRE ALARM INITIATING AND INDICATING DEVICES

- a. FACP/FMCP: Locate the FACP/FMCP where indicated on the drawings. Surface mount the enclosure with the top of the cabinet **6 feet** above the finished floor or center the cabinet at **5 feet**, whichever is lower. Conductor terminations shall be labeled and a drawing containing conductors, their labels, their circuits, and their interconnection

shall be permanently mounted in the FACP.

b. Manual Stations: Locate manual stations where shown on the drawings. Mount stations so that their operating handles are 4 feet above the finished floor. Mount stations so they are located no farther than 5 feet from the exit door they serve, measured horizontally.

c. Notification Appliance Devices: Locate notification appliance devices where shown on the drawings. Mount assemblies on walls 90 inches above the finished floor or 6 inches below the ceiling whichever is lower.

d. Smoke and Heat Sensors: Locate sensors as required by NFPA 72 and their listings as shown on the drawings on a 4 inch mounting box. Sensors located on the ceiling shall be installed not less than 4 inches from a side wall to the near edge. Those located on the wall shall have the top of the sensor at least 4 inches below the ceiling, but not more than 12 inches below the ceiling. In raised floor spaces, the smoke sensors shall be installed to protect 225 square feet per sensor. Install smoke sensors no closer than 5 feet from air handling supply outlets.

e. Water Flow Detectors and Tamper Switches: Locate water flow detectors and tamper switches where shown on the drawings.

f. The modification of any fire alarm system and the procedures shall comply with the requirements of NFPA 241.

3.2 SYSTEM FIELD WIRING

3.2.1 Wiring within Cabinets, Enclosures, Boxes, Junction Boxes, and Fittings

Provide wiring installed in a neat and workmanlike manner and installed parallel with or at right angles to the sides and back of any box, enclosure, or cabinet. Conductors that are terminated, spliced, or otherwise interrupted in any enclosure, cabinet, mounting, or junction box shall be connected to terminal blocks. Mark each terminal in accordance with the wiring diagrams of the system. Make connections with approved pressure type terminal blocks, that are securely mounted. The use of wire nuts or similar devices shall be prohibited. Wiring shall conform to NFPA 70. All wiring within cabinets shall be clearly and permanently marked for ease of troubleshooting.

3.2.2 Alarm Wiring

Provide all wiring in 3/4 inch nominal diameter conduit. Voltages shall not be mixed in any junction box, housing, or device, except those containing power supplies and control relays. Electrical metallic tubing conduit is acceptable in dry locations not enclosed in concrete or where not subject to mechanical damage. Conceal conduit in finished areas of new construction and wherever practicable in existing construction. The use of flexible conduit not exceeding a 6 foot length shall be permitted in initiating device circuits. Run conduit or tubing concealed unless specifically shown otherwise on the drawings. Shielded wiring shall be utilized where recommended by the manufacturer. For shielded wiring, the shield shall be grounded at only one point, that shall be in or adjacent to the FACP. Pigtail or T-tap connections to signal line circuits, initiating device circuits, supervisory alarm circuits, and notification appliance circuits

are prohibited. Color coding is required for circuits and shall be maintained throughout the circuit. Conductors used for the same functions shall be similarly color coded. Wiring shall conform to **NFPA 70**.

3.2.3 Conductor Terminations

Labeling of conductors at terminal blocks in terminal cabinets, FACP, and remote fire alarm control units shall be provided at each conductor connection. Each conductor or cable shall have a shrink-wrap label to provide a unique and specific designation. Each terminal cabinet, FACP, and fire alarm control unit shall contain a laminated drawing that indicates each conductor, its label, circuit, and terminal. The laminated drawing shall be neat, using 12 point lettering minimum size, and mounted within each cabinet, panel, or unit so that it does not interfere with the wiring or terminals. Maintain existing color code scheme where connecting to existing equipment.

3.3 FIRESTOPPING

Provide firestopping for holes at conduit penetrations through floor slabs, fire rated walls, partitions with fire rated doors and corridor walls.

3.4 PAINTING

Paint exposed electrical, fire alarm conduit, and surface metal raceway to match adjacent finishes in exposed areas.

3.5 **FIELD QUALITY CONTROL**

3.5.1 **Testing Procedures**

Detailed test procedures, prepared and signed by a Registered Professional Engineer or a NICET Level 4 Fire Alarm Technician, and signed by representative of the installing company, for the fire detection and alarm system 60 days prior to performing system tests. Detailed test procedures shall list all components of the installed system such as initiating devices and circuits, notification appliances and circuits, signaling line devices and circuits, control devices/equipment, batteries, transmitting and receiving equipment, power sources/supply, annunciators, special hazard equipment, emergency communication equipment, interface equipment, Guard's Tour equipment, and transient (surge) suppressors. Test procedures shall include sequence of testing, time estimate for each test, and sample test data forms. The test data forms shall be in a check-off format (pass/fail with space to add applicable test data) and shall be used for the preliminary testing and the acceptance testing. The test data forms shall record the test results and shall:

1. Identify the **NFPA Class and Style of all Initiating Device Circuits (IDC), Notification Appliance Circuits (NAC), Voice Notification System, and Signaling Line Circuits (SLC)**.
2. Identify each test required by **NFPA 72 Test Methods** and required test herein to be performed on each component, and describe how this test shall be performed.
3. Identify each component and circuit as to type, location within the facility, and unique identity within the installed system. Provide necessary floor plan sheets showing each component location, test location, and alphanumeric identity.

4. Identify all test equipment and personnel required to perform each test (including equipment necessary for testing smoke detectors using real smoke).

5. Provide space to identify the date and time of each test. Provide space to identify the names and signatures of the individuals conducting and witnessing each test.

3.5.2 Tests Stages

a. Preliminary Testing: Conduct preliminary tests to ensure that devices and circuits are functioning properly. Tests shall meet the requirements of paragraph entitled "Minimum System Tests." After preliminary testing is complete, provide a letter certifying that the installation is complete and fully operable. The letter shall state that each initiating and indicating device was tested in place and functioned properly. The letter shall also state that panel functions were tested and operated properly. The letter shall include the names and titles of the witnesses to the preliminary tests. The Contractor and an authorized representative from each supplier of equipment shall be in attendance at the preliminary testing to make necessary adjustments.

b. Request for Formal Inspection and Tests: When tests have been completed and corrections made, submit a signed, dated certificate with a request for formal inspection and tests to the Naval Facilities Engineering Command, Fire Protection Engineer.

c. Final Testing: Notify the Contracting Officer in writing when the system is ready for final acceptance testing. Submit request for test at least 15 calendar days prior to the test date. The tests shall be performed in accordance with the approved test procedures in the presence of the Contracting Officer. The Contractor shall furnish instruments and personnel required for the tests. A final acceptance test will not be scheduled until the operation and maintenance (O&M) manuals are furnished to the Contracting Officer and the following are provided at the job site:

- (1) The systems manufacturer's technical representative
- (2) Marked-up red line drawings of the system as actually installed
- (3) Megger test results
- (4) Loop resistance test results
- (5) Complete program printout including input/output addresses

The final tests shall be witnessed by the Naval Facilities Engineering Command, Fire Protection Engineer. At this time, any and all required tests shall be repeated at their discretion. Following acceptance of the system, [as-built drawings](#) and O&M manuals shall be delivered to the Contracting Officer for review and acceptance.

3.5.3 Minimum System Tests

Test the system in accordance with the procedures outlined in [NFPA 72](#),

ISO 7240-16, IEC 60268-16. The required tests are as follows:

- a. Loop Resistance Tests: Measure and record the resistance of each circuit with each pair of conductors in the circuit short-circuited at the farthest point from the circuit origin. The tests shall be witnessed by the Contracting Officer and test results recorded for use at the final acceptance test.
- b. Verify the absence of unwanted voltages between circuit conductors and ground. The tests shall be accomplished at the preliminary test with results available at the final system test.
- c. Verify that the control unit is in the normal condition as detailed in the manufacturer's O&M manual.
- d. Test each initiating and indicating device and circuit for proper operation and response at the control unit. Smoke sensors shall be tested in accordance with manufacturer's recommended calibrated test method. Use of magnets is prohibited. Testing of duct smoke detectors shall comply with the requirements of NFPA 72.
- e. Test the system for specified functions in accordance with the contract drawings and specifications and the manufacturer's O&M manual.
- f. Test both primary power and secondary power. Verify, by test, the secondary power system is capable of operating the system for the time period and in the manner specified.
- g. Determine that the system is operable under trouble conditions as specified.
- h. Visually inspect wiring.
- i. Test the battery charger and batteries.
- j. Verify that software control and data files have been entered or programmed into the FACP. Hard copy records of the software shall be provided to the Contracting Officer.
- k. Verify that red-line drawings are accurate.
- l. Measure the current in circuits to ensure there is the calculated spare capacity for the circuits.
- m. Measure voltage readings for circuits to ensure that voltage drop is not excessive.
- n. Disconnect the verification feature for smoke sensors during tests to minimize the amount of smoke needed to activate the sensor. Testing of smoke sensors shall be conducted using real smoke. The use of canned smoke is prohibited.
- o. Measure the voltage drop at the most remote appliance (based on wire length) on each notification appliance circuit.
- p. Audibility Intelligibility testing of the Voice Evacuation Notification System shall be accomplished iaw NFPA 72 for Voice Evacuation Systems, IEC 60268-16, and ASA S3.2.

q. Opening the circuit at not less than all alarm initiating devices and notification appliances to test the wiring supervisory feature.

r. The contractor shall demonstrate modem communications with remote sites as specified by the COR. Dial in capability shall also, be demonstrated, using specified security.

3.6 INSTRUCTION OF GOVERNMENT EMPLOYEES

Equipment manufacturer shall provide 1 day on site. Training shall allow for classroom instruction as well as individual hands on programming, troubleshooting and diagnostics exercises.

3.6.1 Instructor

Include in the project the services of an instructor, who shall have received specific training from the manufacturer for the training of other persons regarding the inspection, testing, and maintenance of the system provided. The instructor shall train the Government employees designated by the Contracting Officer, in the care, adjustment, maintenance, and operation of the fire alarm and fire detection system.

3.6.2 Qualifications

Each instructor shall be thoroughly familiar with all parts of this installation. The instructor shall be trained in operating theory as well as in practical O&M work.

3.6.3 Required Instruction Time

Provide 8 hours of instruction after final acceptance of the system. The instruction shall be given during regular working hours on such dates and times as are selected by the Contracting Officer. The instruction may be divided into two or more periods at the discretion of the Contracting Officer. The training shall allow for rescheduling for unforeseen maintenance and/or fire department responses.

-- End of Section --

SECTION 31 11 00

CLEARING AND GRUBBING

04/06

PART 1 GENERAL

1.1 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00
SUBMITTAL PROCEDURES:

SD-03 Product Data

Nonsaleable Materials

Written permission to dispose of such products on private
property shall be filed with the Contracting Officer.

SD-04 Samples

Tree wound paint

Herbicide

Submit samples in cans with manufacturer's label.

1.2 DELIVERY, STORAGE, AND HANDLING

Deliver materials to, store at the site, and handle in a manner which will
maintain the materials in their original manufactured or fabricated
condition until ready for use.

PART 2 PRODUCTS

2.1 TREE WOUND PAINT

Bituminous based paint of standard manufacture specially formulated for
tree wounds.

2.2 HERBICIDE

Comply with Federal Insecticide, Fungicide, and Rodenticide Act (Title 7
U.S.C. Section 136) for requirements on Contractor's licensing,
certification and record keeping. Contact the command Pest Control
Coordinator prior to starting work.

PART 3 EXECUTION

3.1 PROTECTION

3.1.1 Roads and Walks

Keep roads and walks free of dirt and debris at all times.

3.1.2 Trees, Shrubs, and Existing Facilities

Protection shall be in accordance with Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS. Trees and vegetation to be left standing shall be protected from damage incident to clearing, grubbing, and construction operations by the erection of barriers or by such other means as the circumstances require.

3.1.3 Utility Lines

Protect existing utility lines that are indicated to remain from damage. Notify the Contracting Officer immediately of damage to or an encounter with an unknown existing utility line. The Contractor shall be responsible for the repairs of damage to existing utility lines that are indicated or made known to the Contractor prior to start of clearing and grubbing operations. When utility lines which are to be removed are encountered within the area of operations, the Contractor shall notify the Contracting Officer in ample time to minimize interruption of the service. Refer to Section 01 30 00, ADMINISTRATIVE REQUIREMENTS and Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS for additional utility protection.

3.2 CLEARING

Clearing shall consist of the felling, trimming, and cutting of trees into sections and the satisfactory disposal of the trees and other vegetation designated for removal, including downed timber, snags, brush, and rubbish occurring within the areas to be cleared. Clearing shall also include the removal and disposal of structures that obtrude, encroach upon, or otherwise obstruct the work. Trees, stumps, roots, brush, and other vegetation in areas to be cleared shall be cut off flush with or below the original ground surface, except such trees and vegetation as may be indicated or directed to be left standing. Trees designated to be left standing within the cleared areas shall be trimmed of dead branches 1-1/2 inches or more in diameter and shall be trimmed of all branches the heights indicated or directed. Limbs and branches to be trimmed shall be neatly cut close to the bole of the tree or main branches. Cuts more than 1-1/2 inches in diameter shall be painted with an approved tree-wound paint. Apply herbicide in accordance with the manufacturer's label to the top surface of stumps designated not to be removed.

3.3 TREE REMOVAL

Where indicated or directed, trees and stumps that are designated as trees shall be removed from areas outside those areas designated for clearing and grubbing. This work shall include the felling of such trees and the removal of their stumps and roots as specified in paragraph GRUBBING. Trees shall be disposed of as specified in paragraph DISPOSAL OF MATERIALS.

3.4 PRUNING

Prune trees designated to be left standing within the cleared areas of dead branches 1 1/2 inches or more in diameter; and trim branches to heights and in a manner as indicated. Neatly cut limbs and branches to be trimmed close to the bole of the tree or main branches. Paint cuts more than 1 1/4 inches in diameter with an approved tree wound paint.

3.5 GRUBBING

Grubbing shall consist of the removal and disposal of stumps, roots larger

than 3 inches in diameter, and matted roots from the designated grubbing areas. Material to be grubbed, together with logs and other organic or metallic debris not suitable for foundation purposes, shall be removed to a depth of not less than 18 inches below the original surface level of the ground in areas indicated to be grubbed and in areas indicated as construction areas under this contract, such as areas for buildings, and areas to be paved. Depressions made by grubbing shall be filled with suitable material and compacted to make the surface conform with the original adjacent surface of the ground.

3.6 DISPOSAL OF MATERIALS

3.6.1 Saleable Timber

1. The Government shall, by separate contract, harvest all saleable timber from the project site. All remaining timber, limbs, tops, stumps, and debris shall be cleared and disposed of by the Contractor as specified.

3.6.2 Nonsaleable Materials

Logs, stumps, roots, brush, rotten wood, and other refuse from the clearing and grubbing operations, except for salable timber, shall be disposed of in the designated waste disposal area, except when otherwise directed in writing. Such directive will state the conditions covering the disposal of such products and will also state the areas in which they may be placed.

-- End of Section --

SECTION 31 23 00.00 20

EXCAVATION AND FILL

04/06

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C600 (2005) Installation of Ductile-Iron Water Mains and Their Appurtenances

ASTM INTERNATIONAL (ASTM)

ASTM C 136 (2005) Sieve Analysis of Fine and Coarse Aggregates

ASTM D 1140 (2000) Amount of Material in Soils Finer than the No. 200 (75-micrometer) Sieve

ASTM D 1556 (2000) Density and Unit Weight of Soil in Place by the Sand-Cone Method

ASTM D 1557 (2002e1) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu.m.))

ASTM D 2321 (2005) Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications

ASTM D 2487 (2006e1) Soils for Engineering Purposes (Unified Soil Classification System)

ASTM D 2922 (2004) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

ASTM D 3017 (2004) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

ASTM D 3786 (2001) Hydraulic Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method

ASTM D 4318 (2000) Liquid Limit, Plastic Limit, and Plasticity Index of Soils

ASTM D 4355 (2002) Deterioration of Geotextiles from Exposure to Light, Moisture and Heat in a

Xenon-Arc Type Apparatus

- ASTM D 4491 (1999; R 2004) Water Permeability of Geotextiles by Permittivity
- ASTM D 4533 (2004) Trapezoid Tearing Strength of Geotextiles
- ASTM D 4632 (1991; R 2003) Grab Breaking Load and Elongation of Geotextiles
- ASTM D 4759 (2002) Determining the Specification Conformance of Geosynthetics
- ASTM D 4833 (2000e1) Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
- ASTM D 698 (2000ae1) Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/cu. ft. (600 kN-m/cu. m.))

U.S. ARMY CORPS OF ENGINEERS (USACE)

- EM 385-1-1 (2008) Safety and Health Requirements Manual

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

- EPA 530/F-93/004 (1993; Rev O; Updates I, II, IIA, IIB, and III) Test Methods for Evaluating Solid Waste (Vol IA, IB, IC, and II) (SW-846)
- EPA 600/4-79/020 (1983) Methods for Chemical Analysis of Water and Wastes

1.2 DEFINITIONS

1.2.1 Degree of Compaction

Degree of compaction is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 698, for general soil types, abbreviated as percent laboratory maximum density.

1.2.2 Hard Materials

Weathered rock, dense consolidated deposits, or conglomerate materials which are not included in the definition of "rock" but which usually require the use of heavy excavation equipment, ripper teeth, or jack hammers for removal.

1.2.3 Rock

Solid homogeneous interlocking crystalline material with firmly cemented, laminated, or foliated masses or conglomerate deposits, neither of which can be removed without systematic drilling and blasting, drilling and the use of expansion jacks or feather wedges, or the use of backhoe-mounted pneumatic hole punchers or rock breakers; also large boulders, buried

masonry, or concrete other than pavement exceeding 1/2 cubic yard in volume. Removal of hard material will not be considered rock excavation because of intermittent drilling and blasting that is performed merely to increase production.

1.3 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Shoring and Sheeting Plan

Dewatering work plan

Submit 15 days prior to starting work.

SD-06 Test Reports

Borrow Site Testing

Fill and backfill test

Select material test

Density tests

Moisture Content Tests

Copies of all laboratory and field test reports within 24 hours of the completion of the test.

1.4 DELIVERY, STORAGE, AND HANDLING

Perform in a manner to prevent contamination or segregation of materials.

1.5 CRITERIA FOR BIDDING

Base bids on the following criteria:

- a. Surface elevations are as indicated.
- b. Pipes or other artificial obstructions, except those indicated, will not be encountered.
- c. Hard materials and rock will not be encountered.
- d. Borrow material in the quantities required is available on Government property at the French Creek Borrow Pit.
- e. Blasting will not be permitted. Remove material in an approved manner.

1.6 REQUIREMENTS FOR OFF SITE SOIL

Soils brought in from off site for use as backfill shall be tested for TPH, BTEX and full TCLP including ignitability, corrosivity and reactivity. Backfill shall contain less than 100 parts per million (ppm) of total

petroleum hydrocarbons (TPH) and less than 10 ppm of the sum of Benzene, Toluene, Ethyl Benzene, and Xylene (BTEX) and shall not fail the TCPL test. TPH concentrations shall be determined by using EPA 600/4-79/020 Method 418.1. BTEX concentrations shall be determined by using EPA 530/F-93/004 Method 5030/8020. TCLP shall be performed in accordance with EPA 530/F-93/004 Method 1311. Provide Borrow Site Testing for TPH, BTEX and TCLP from a composite sample of material from the borrow site, with at least one test from each borrow site. Material shall not be brought on site until tests have been approved by the Contracting Officer.

1.7 QUALITY ASSURANCE

1.7.1 Shoring and Sheet Piling Plan

Submit drawings and calculations, certified by a registered professional engineer, describing the methods for shoring and sheet piling of excavations. Drawings shall include material sizes and types, arrangement of members, and the sequence and method of installation and removal. Calculations shall include data and references used.

The Contractor is required to hire a Professional Geotechnical Engineer to provide inspection of excavations and soil/groundwater conditions throughout construction. The Geotechnical Engineer shall be responsible for performing pre-construction and periodic site visits throughout construction to assess site conditions. The Geotechnical Engineer shall update the excavation, sheet piling and dewatering plans as construction progresses to reflect changing conditions and shall submit an updated plan if necessary. A written report shall be submitted, at least monthly, informing the Contractor and Contracting Officer of the status of the plan and an accounting of the Contractor's adherence to the plan addressing any present or potential problems. The Geotechnical Engineer shall be available to meet with the Contracting Officer at any time throughout the contract duration.

1.7.2 Dewatering Work Plan

Submit procedures for accomplishing dewatering work.

1.7.3 Utilities

Movement of construction machinery and equipment over pipes and utilities during construction shall be at the Contractor's risk. Perform work adjacent to non-Government utilities as indicated in accordance with procedures outlined by utility company. Excavation made with power-driven equipment is not permitted within two feet of known Government-owned utility or subsurface construction. For work immediately adjacent to or for excavations exposing a utility or other buried obstruction, excavate by hand. Start hand excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured. Support uncovered lines or other existing work affected by the contract excavation until approval for backfill is granted by the Contracting Officer. Report damage to utility lines or subsurface construction immediately to the Contracting Officer.

PART 2 PRODUCTS

2.1 SOIL MATERIALS

2.1.1 Satisfactory Materials

Any materials classified by [ASTM D 2487](#) as GW, GP, SW, SP free of debris, roots, wood, scrap material, vegetation, refuse, soft unsound particles, and frozen, deleterious, or objectionable materials. Unless specified otherwise, the maximum particle diameter shall be one-half the lift thickness at the intended location.

2.1.2 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials. Unsatisfactory materials also include man-made fills, trash, refuse, or backfills from previous construction. Unsatisfactory material also includes material classified as satisfactory which contains root and other organic matter, frozen material, and stones larger than [1/2 inches](#). The Contracting Officer shall be notified of any contaminated materials.

2.1.3 Cohesionless and Cohesive Materials

Cohesionless materials include materials classified in [ASTM D 2487](#) as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM, GP-GM, GW-GM, SW-SM, SP-SM, and SM shall be identified as cohesionless only when the fines are nonplastic (plasticity index equals zero). Materials classified as GM and SM will be identified as cohesive only when the fines have a plasticity index greater than zero.

2.1.4 Common Fill

Approved, unclassified soil material with the characteristics required to compact to the soil density specified for the intended location.

2.1.5 Backfill and Fill Material

[ASTM D 2487](#), classification GW, GP, SW, SP with a maximum [ASTM D 4318](#) liquid limit of 35, maximum [ASTM D 4318](#) plasticity index of 12, and a maximum of 25 percent by weight passing [ASTM D 1140](#), No. 200 sieve.

2.1.6 Select Material

Provide materials classified as GW, GP, SW, SP, by [ASTM D 2487](#) where indicated. The liquid limit of such material shall not exceed 35 percent when tested in accordance with [ASTM D 4318](#). The plasticity index shall not be greater than 12 percent when tested in accordance with [ASTM D 4318](#), and not more than 35 percent by weight shall be finer than No. 200 sieve when tested in accordance with [ASTM D 1140](#).

2.1.7 Topsoil

Natural, friable soil representative of productive, well-drained soils in the area, free of subsoil, stumps, rocks larger than [one inch](#) diameter, brush, weeds, toxic substances, and other material detrimental to plant growth. Amend topsoil pH range to obtain a pH of 5.5 to 7.

2.2 UTILITY BEDDING MATERIAL

Except as specified otherwise in the individual piping section, provide bedding for buried piping in accordance with [AWWA C600](#), Type 4, except as specified herein. Backfill to top of pipe shall be compacted to 95 percent of [ASTM D 698](#) maximum density. Plastic piping shall have bedding to spring line of pipe. Provide [ASTM D 2321](#) materials as follows:

- a. Class I: Angular, [0.25 to 1.5 inches](#), graded stone, including a number of fill materials that have regional significance such as coral, slag, cinders, crushed stone, and crushed shells.
- b. Class II: Coarse sands and gravels with maximum particle size of [1.5 inches](#), including various graded sands and gravels containing small percentages of fines, generally granular and noncohesive, either wet or dry. Soil Types GW, GP, SW, and SP are included in this class as specified in [ASTM D 2487](#).

2.2.1 Gravel

Clean, coarsely graded natural gravel, crushed stone or a combination thereof having a classification of GW, GP in accordance with [ASTM D 2487](#) for bedding. Maximum particle size shall not exceed [3 inches](#).

2.3 BORROW

Obtain borrow materials required in excess of those furnished from excavations from sources outside of Government property, except that borrow materials conforming to common fill and fill and backfill material may be obtained from the Government borrow pit. The Government borrow pit is located as indicated. If the Government borrow pit is used, the Contractor shall perform clearing, grubbing, and stripping required for providing access to suitable borrow material. Dispose of materials from clearing and grubbing operations off Government property. Strip top [12 inches](#) of soil material from borrow area and stockpile. After removal of borrow material, regrade borrow pit using stockpiled soil material to contours which will blend in with adjacent topography. Maximum side slopes shall be two horizontal to one vertical. Excavation and backfilling of borrow pit shall ensure proper drainage.

2.4 FILTER FABRIC

Provide a pervious sheet of polyester, nylon, glass or polypropylene, ultraviolet resistant filaments [nonwoven](#), spun bonded, fused, or otherwise manufactured into a nonraveling fabric with uniform thickness and strength. Fabric shall have the following manufacturer certified minimum average roll properties as determined by [ASTM D 4759](#):

	<u>Class A</u>	<u>Class B</u>
a. Grab tensile strength (ASTM D 4632) machine and transversed direction	min. 300	80 lbs.
b. Grab elongation (ASTM D 4632) machine and transverse direction	min. 15	15 percent
c. Puncture resistance (ASTM D 4833)	min. 130	40 lbs.
d. Mullen burst strength (ASTM D 3786)	min. 500	170 psi.

	<u>Class A</u>	<u>Class B</u>
e. Trapezoidal Tear (ASTM D 4533)	min. 100	30 lbs.
f. Permeability (ASTM D 4491)	min. 0.34	0.26
g. Ultraviolet Degradation (ASTM D 4355)	70 percent Strength retained at 150 hours	

2.5 MATERIAL FOR RIP-RAP

Bedding material, Grout, Filter fabric and rock conforming to these requirements for construction indicated.

2.5.1 Bedding Material

Consisting of sand, gravel, or crushed rock, well graded, or poorly graded with a maximum particle size of 2 inches. Material shall be composed of tough, durable particles. Fines passing the No. 200 standard sieve shall have a plasticity index less than six.

2.5.2 Grout

Composed of cement, water, an air-entraining admixture, and sand mixed in proportions of one part portland cement to two parts of sand, sufficient water to produce a workable mixture, and an amount of admixture which will entrain sufficient air to produce durable grout, as determined by the Contracting Officer. Mix grout in a concrete mixer. Mixing time shall be sufficient to produce a mixture having a consistency permitting gravity flow into the interstices of the rip-rap with limited spading and brooming.

2.5.3 Rock

Rock fragments sufficiently durable to ensure permanence in the structure and the environment in which it is to be used. Rock fragments shall be free from cracks, seams, and other defects that would increase the risk of deterioration from natural causes. The size of the fragments shall be such that no individual fragment exceeds a weight of 150 pounds and that no more than 10 percent of the mixture, by weight, consists of fragments weighing 2 pounds or less each. Specific gravity of the rock shall be a minimum of 2.50. The inclusion of more than trace 1 percent quantities of dirt, sand, clay, and rock fines will not be permitted.

2.6 BURIED WARNING AND IDENTIFICATION TAPE

Polyethylene plastic and metallic core or metallic-faced, acid- and alkali-resistant, polyethylene plastic warning tape manufactured specifically for warning and identification of buried utility lines. Provide tape on rolls, 3 inch minimum width, color coded as specified below for the intended utility with warning and identification imprinted in bold black letters continuously over the entire tape length. Warning and identification to read, "CAUTION, BURIED (intended service) LINE BELOW" or similar wording. Color and printing shall be permanent, unaffected by moisture or soil.

Warning Tape Color Codes

Yellow: Electric

Warning Tape Color Codes

Yellow:	Gas, Oil; Dangerous Materials
Orange:	Telephone and Other Communications
Blue:	Water Systems
Green:	Sewer Systems
White:	Steam Systems
Gray:	Compressed Air

2.6.1 Warning Tape for Metallic Piping

Acid and alkali-resistant polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of tape shall be 0.003 inch. Tape shall have a minimum strength of 1500 psi lengthwise, and 1250 psi crosswise, with a maximum 350 percent elongation.

2.6.2 Detectable Warning Tape for Non-Metallic Piping

Polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of the tape shall be 0.004 inch. Tape shall have a minimum strength of 1500 psi lengthwise and 1250 psi crosswise. Tape shall be manufactured with integral wires, foil backing, or other means of enabling detection by a metal detector when tape is buried up to 3 feet deep. Encase metallic element of the tape in a protective jacket or provide with other means of corrosion protection.

2.7 DETECTION WIRE FOR NON-METALLIC PIPING

Detection wire shall be insulated single strand, solid copper with a minimum of 12 AWG.

PART 3 EXECUTION

3.1 PROTECTION

3.1.1 Shoring and Sheeting

Provide shoring bracing, cribbing, trench boxes, underpinning and sheeting. In addition to Section 25 A and B of EM 385-1-1 and other requirements set forth in this contract, include provisions in the shoring and sheeting plan that will accomplish the following:

- a. Prevent undermining of pavements, foundations and slabs.
- b. Prevent slippage or movement in banks or slopes adjacent to the excavation.

3.1.2 Drainage and Dewatering

Provide for the collection and disposal of surface and subsurface water encountered during construction.

3.1.2.1 Drainage

So that construction operations progress successfully, completely drain construction site during periods of construction to keep soil materials sufficiently dry. The Contractor shall establish/construct storm drainage features (ponds/basins) at the earliest stages of site development, and

throughout construction grade the construction area to provide positive surface water runoff away from the construction activity and/or provide temporary ditches, swales, and other drainage features and equipment as required to maintain dry soils, prevent erosion and undermining of foundations. When unsuitable working platforms for equipment operation and unsuitable soil support for subsequent construction features develop, remove unsuitable material and provide new soil material as specified herein. It is the responsibility of the Contractor to assess the soil and ground water conditions presented by the plans and specifications and to employ necessary measures to permit construction to proceed. Excavated slopes and backfill surfaces shall be protected to prevent erosion and sloughing. Excavation shall be performed so that the site, the area immediately surrounding the site, and the area affecting operations at the site shall be continually and effectively drained.

3.1.2.2 Dewatering

Groundwater flowing toward or into excavations shall be controlled to prevent sloughing of excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction. French drains, sumps, ditches or trenches will not be permitted within 3 feet of the foundation of any structure, except with specific written approval, and after specific contractual provisions for restoration of the foundation area have been made. Control measures shall be taken by the time the excavation reaches the water level in order to maintain the integrity of the in situ material. While the excavation is open, the water level shall be maintained continuously, at least two feet below the working level.

3.1.3 Underground Utilities

Location of the existing utilities indicated is approximate. The Contractor shall physically verify the location and elevation of the existing utilities indicated prior to starting construction. The Contractor shall scan the construction site with electromagnetic and sonic equipment and mark the surface of the ground where existing underground utilities are discovered.

3.1.4 Machinery and Equipment

Movement of construction machinery and equipment over pipes during construction shall be at the Contractor's risk. Repair, or remove and provide new pipe for existing or newly installed pipe that has been displaced or damaged.

3.2 SURFACE PREPARATION

3.2.1 Clearing and Grubbing

Unless indicated otherwise, remove trees, stumps, logs, shrubs, brush and vegetation and other items that would interfere with construction operations within the clearing limits. Remove stumps entirely. Grub out matted roots and roots over 2 inches in diameter to at least 18 inches below existing surface.

3.2.2 Stripping

Strip suitable soil from the site where excavation or grading is indicated and stockpile separately from other excavated material. Material

unsuitable for use as topsoil shall be wasted. Locate topsoil so that the material can be used readily for the finished grading. Where sufficient existing topsoil conforming to the material requirements is not available on site, provide borrow materials suitable for use as topsoil. Protect topsoil and keep in segregated piles until needed.

3.2.3 Unsuitable Material

Remove vegetation, debris, decayed vegetable matter, sod, mulch, and rubbish underneath paved areas or concrete slabs.

3.3 EXCAVATION

Excavate to contours, elevation, and dimensions indicated. Reuse excavated materials that meet the specified requirements for the material type required at the intended location. Keep excavations free from water. Excavate soil disturbed or weakened by Contractor's operations, soils softened or made unsuitable for subsequent construction due to exposure to weather. Excavations below indicated depths will not be permitted except to remove unsatisfactory material. Unsatisfactory material encountered below the grades shown shall be removed as directed. Refill with select material and compact to 95 percent of [ASTM D 698](#) maximum density. Unless specified otherwise, refill excavations cut below indicated depth with select material and compact to 95 percent of [ASTM D 698](#) maximum density. Satisfactory material removed below the depths indicated, without specific direction of the Contracting Officer, shall be replaced with satisfactory materials to the indicated excavation grade; except as specified for spread footings. Determination of elevations and measurements of approved overdepth excavation of unsatisfactory material below grades indicated shall be done under the direction of the Contracting Officer.

3.3.1 Pipe Trenches

Excavate to the dimension indicated. Grade bottom of trenches to provide uniform support for each section of pipe after pipe bedding placement. Tamp if necessary to provide a firm pipe bed. Recesses shall be excavated to accommodate bells and joints so that pipe will be uniformly supported for the entire length. Rock, where encountered, shall be excavated to a depth of at least [6 inches](#) below the bottom of the pipe.

3.3.2 Hard Material Excavation

Remove hard material to elevations indicated in a manner that will leave foundation material in an unshattered and solid condition. Roughen level surfaces and cut sloped surfaces into benches for bond with concrete. Protect shale from conditions causing decomposition along joints or cleavage planes and other types of erosion. Removal of hard material beyond lines and grades indicated will not be grounds for a claim for additional payment unless previously authorized by the Contracting Officer. Excavation of the material claimed as rock shall not be performed until the material has been cross sectioned by the Contractor and approved by the Contracting Officer. Common excavation shall consist of all excavation not classified as rock excavation.

3.3.3 Excavated Materials

Satisfactory excavated material required for fill or backfill shall be placed in the proper section of the permanent work required or shall be separately stockpiled if it cannot be readily placed. Satisfactory material

in excess of that required for the permanent work and all unsatisfactory material shall be disposed of as specified in Paragraph "DISPOSITION OF SURPLUS MATERIAL."

3.3.4 Final Grade of Surfaces to Support Concrete

Excavation to final grade shall not be made until just before concrete is to be placed. Only excavation methods that will leave the foundation rock in a solid and unshattered condition shall be used. Approximately level surfaces shall be roughened, and sloped surfaces shall be cut as indicated into rough steps or benches to provide a satisfactory bond. Shales shall be protected from slaking and all surfaces shall be protected from erosion resulting from ponding or flow of water.

3.4 SUBGRADE PREPARATION

Unsatisfactory material in surfaces to receive fill or in excavated areas shall be removed and replaced with satisfactory materials as directed by the Contracting Officer. The surface shall be scarified to a depth of 6 inches before the fill is started. Sloped surfaces steeper than 1 vertical to 4 horizontal shall be plowed, stepped, benched, or broken up so that the fill material will bond with the existing material. When subgrades are less than the specified density, the ground surface shall be broken up to a minimum depth of 6 inches, pulverized, and compacted to the specified density. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12 inches and compacted as specified for the adjacent fill. Material shall not be placed on surfaces that are muddy, frozen, or contain frost. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, or other approved equipment well suited to the soil being compacted. Material shall be moistened or aerated as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used. Minimum subgrade density shall be as specified herein.

3.4.1 Proof Rolling

Proof rolling shall be done on an exposed subgrade free of surface water (wet conditions resulting from rainfall) which would promote degradation of an otherwise acceptable subgrade. After stripping, proof roll the existing subgrade of the building and paved areas with six passes of a dump truck loaded with 6 cubic meters of soil. Operate the truck in a systematic manner to ensure the number of passes over all areas, and at speeds between 2 1/2 to 3 1/2 miles per hour. When proof rolling under buildings, the building subgrade shall be considered to extend 5 feet beyond the building lines, and one-half of the passes made with the roller shall be in a direction perpendicular to the other passes. Notify the Contracting Officer a minimum of 3 days prior to proof rolling. Proof rolling shall be performed in the presence of the Contracting Officer. Rutting or pumping of material shall be undercut as directed by the Contracting Officer.

3.5 FILLING AND BACKFILLING

Fill and backfill to contours, elevations, and dimensions indicated. Compact each lift before placing overlaying lift.

3.5.1 Common Fill Placement

Provide for general site. Use satisfactory materials. Place in 6 inch

lifts. Compact areas not accessible to rollers or compactors with mechanical hand tampers. Aerate material excessively moistened by rain to a satisfactory moisture content. Finish to a smooth surface by blading, rolling with a smooth roller, or both.

3.5.2 Backfill and Fill Material Placement

Provide for paved areas and under concrete slabs, except where select material is provided. Place in 6 inch lifts. Do not place over wet or frozen areas. Place backfill material adjacent to structures as the structural elements are completed and accepted. Backfill against concrete only when approved. Place and compact material to avoid loading upon or against the structure.

3.5.3 Select Material Placement

Provide under porous fill of structures not pile supported. Place in 6 inch lifts. Do not place over wet or frozen areas. Backfill adjacent to structures shall be placed as structural elements are completed and accepted. Backfill against concrete only when approved. Place and compact material to avoid loading upon or against structure.

3.5.4 Backfill and Fill Material Placement Over Pipes and at Walls

Backfilling shall not begin until construction below finish grade has been approved, underground utilities systems have been inspected, tested and approved, forms removed, and the excavation cleaned of trash and debris. Backfill shall be brought to indicated finish grade and shall include backfill for outside grease interceptors and underground fuel tanks. Where pipe is coated or wrapped for protection against corrosion, the backfill material up to an elevation 2 feet above sewer lines and 1 inch above other utility lines shall be free from stones larger than 1 inch in any dimension. Heavy equipment for spreading and compacting backfill shall not be operated closer to foundation or retaining walls than a distance equal to the height of backfill above the top of footing; the area remaining shall be compacted in layers not more than 4 inches in compacted thickness with power-driven hand tampers suitable for the material being compacted. Backfill shall be placed carefully around pipes or tanks to avoid damage to coatings, wrappings, or tanks. Backfill shall not be placed against foundation walls prior to 7 days after completion of the walls. As far as practicable, backfill shall be brought up evenly on each side of the wall and sloped to drain away from the wall.

3.5.5 Trench Backfilling

Backfill as rapidly as construction, testing, and acceptance of work permits. Place and compact backfill under structures and paved areas in 6 inch lifts to top of trench and in 6 inch lifts to one foot over pipe outside structures and paved areas.

3.6 BORROW

Where satisfactory materials are not available in sufficient quantity from required excavations, approved borrow materials shall be obtained as specified herein.

3.7 BURIED WARNING AND IDENTIFICATION TAPE

Provide buried utility lines with utility identification tape. Bury tape

12 inches below finished grade; under pavements and slabs, bury tape 6 inches below top of subgrade.

3.8 BURIED DETECTION WIRE

Bury detection wire directly above non-metallic piping at a distance not to exceed 12 inches above the top of pipe. The wire shall extend continuously and unbroken, from manhole to manhole. The ends of the wire shall terminate inside the manholes at each end of the pipe, with a minimum of 3 feet of wire, coiled, remaining accessible in each manhole. The wire shall remain insulated over its entire length. The wire shall enter manholes between the top of the corbel and the frame, and extend up through the chimney seal between the frame and the chimney seal. For force mains, the wire shall terminate in the valve pit at the pump station end of the pipe.

3.9 COMPACTION

Determine in-place density of existing subgrade; if required density exists, no compaction of existing subgrade will be required. Density requirements specified herein are for cohesionless materials. When cohesive materials are encountered or used, density requirements may be reduced by 5 percent.

3.9.1 General Site

Compact underneath areas designated for vegetation and areas outside the 5 foot line of the paved area or structure to 90 percent of ASTM D 698.

3.9.2 Structures, Spread Footings, and Concrete Slabs

Compact top 12 inches of subgrades to 95 percent of ASTM D 698. Compact common fill, fill and backfill material, select material to 95 percent of ASTM D 698.

3.9.3 Adjacent Area

Compact areas within 5 feet of structures to 90 percent of ASTM D 698.

3.9.4 Paved Areas

Compact top 12 inches of subgrades to 95 percent of ASTM D 698. Compact fill and backfill materials to 95 percent of ASTM D 698.

3.10 PIPELINE CASING UNDER PAVEMENT

Provide new smooth wall steel pipeline casing under new and existing railroad and pavement by the boring and jacking method of installation. Provide each new pipeline casing, where indicated and to the lengths and dimensions shown, complete and suitable for use with the new piped utility as indicated.

3.11 RIP-RAP CONSTRUCTION

Construct rip-rap on filter fabric in accordance with NCDOT, Section 876.

3.11.1 Preparation

Trim and dress indicated areas to conform to cross sections, lines and grades shown within a tolerance of 0.1 foot.

3.11.2 Bedding Placement

Spread filter fabric on prepared subgrade as indicated.

3.11.3 Stone Placement

Place rock for rip-rap on prepared bedding material to produce a well graded mass with the minimum practicable percentage of voids in conformance with lines and grades indicated. Distribute larger rock fragments, with dimensions extending the full depth of the rip-rap throughout the entire mass and eliminate "pockets" of small rock fragments. Rearrange individual pieces by mechanical equipment or by hand as necessary to obtain the distribution of fragment sizes specified above.

3.12 FINISH OPERATIONS

3.12.1 Grading

Finish grades as indicated within **one-tenth of one foot**. Grade areas to drain water away from structures. Maintain areas free of trash and debris. For existing grades that will remain but which were disturbed by Contractor's operations, grade as directed.

3.12.2 Topsoil and Seed

Provide as specified in Section **02 82 30, Re-Establishing Vegetation**.

Scarify existing subgrade. Provide **4 inches** of topsoil for newly graded finish earth surfaces and areas disturbed by the Contractor. Topsoil shall not be placed when the subgrade is frozen, excessively wet, extremely dry, or in a condition otherwise detrimental to seeding, planting, or proper grading. If there is insufficient on-site topsoil meeting specified requirements for topsoil, provide topsoil required in excess of that available.

3.12.3 Protection of Surfaces

Protect newly backfilled, graded, and topsoiled areas from traffic, erosion, and settlements that may occur. Repair or reestablish damaged grades, elevations, or slopes.

3.13 DISPOSITION OF SURPLUS MATERIAL

Remove from Government property surplus or other soil material not required or suitable for filling or backfilling, and brush, refuse, stumps, roots, and timber.

3.14 FIELD QUALITY CONTROL

3.14.1 Sampling

Take the number and size of samples required to perform the following tests.

3.14.2 Testing

Perform one of each of the following tests for each material used. Provide additional tests for each source change.

3.14.2.1 Fill and Backfill Material Testing

Test fill and backfill material in accordance with ASTM C 136 for conformance to ASTM D 2487 gradation limits; ASTM D 1140 for material finer than the No. 200 sieve; ASTM D 4318 for liquid limit and for plastic limit; ASTM D 698 or ASTM D 1557 for moisture density relations, as applicable.

3.14.2.2 Select Material Testing

Test select material in accordance with ASTM C 136 for conformance to ASTM D 2487 gradation limits; ASTM D 1140 for material finer than the No. 200 sieve; ASTM D 698 or ASTM D 1557 for moisture density relations, as applicable.

3.14.2.3 Density Tests

Test density in accordance with ASTM D 1556, or ASTM D 2922 and ASTM D 3017. When ASTM D 2922 and ASTM D 3017 density tests are used, verify density test results by performing an ASTM D 1556 density test at a location already ASTM D 2922 and ASTM D 3017 tested as specified herein. Perform an ASTM D 1556 density test at the start of the job, and for every 10 ASTM D 2922 and ASTM D 3017 density tests thereafter. Test each lift at randomly selected locations every 2000 square feet of existing grade in fills for structures and concrete slabs, and every 2500 square feet for other fill areas and every 2000 square feet of subgrade in cut. Include density test results in daily report.

- a. Bedding and backfill in trenches: One test per 50 linear feet in each lift.

-- End of Section --

SECTION 31 31 16

SOIL TREATMENT FOR SUBTERRANEAN TERMITE CONTROL

08/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

7 USC Section 136

Federal Insecticide, Fungicide, and Rodenticide Act

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Termiticide Application Plan

Termiticide application plan with proposed sequence of treatment work with dates and times. Include the termiticide trade name, EPA registration number, chemical composition, formulation, concentration of original and diluted material, application rate of active ingredients, method of application, area/volume treated, amount applied; and the name and state license number of the state certified applicator.

Termiticides

Manufacturer's label and Material Safety Data Sheet (MSDS) for termiticides proposed for use.

Foundation Exterior

Written verification that other site work will not disturb the treatment.

Utilities and Vents

Written verification that utilities and vents have been located.

Crawl and Plenum Air Spaces

Written verification that crawl spaces and plenum air spaces have been located.

Verification of Measurement

Written verification that the volume of termiticide used meets the application rate.

Application Equipment

A listing of equipment to be used.

Warranty

Copy of Contractor's warranty.

SD-04 Samples

Termiticides

Samples of the pesticides used in this work. The Contracting Officer may draw, at any time and without prior notice, from stocks at the job site; should analysis, performed by the Government, indicate such samples to contain less than the amount of active ingredient specified on the label, work performed with such products shall be repeated, with pesticides conforming to this specification, at no additional cost to the Government.

SD-06 Test Reports

Equipment Calibration and Tank Measurement

Certification of calibration tests conducted on the equipment used in the termiticide application.

Soil Moisture

Soil moisture test result.

Quality Assurance

Pest Management Report and copies of daily records signed by an officer of the Contractor.

SD-07 Certificates

Qualifications

Qualifications and state license number of the termiticide applicator.

1.3 QUALITY ASSURANCE

Comply with 7 USC Section 136 for requirements on Contractor's licensing, certification, and record keeping. Maintain daily records using Pest Management Maintenance Record, DD Form 1532-1 and submit copies of records when requested by the Contracting Officer. These forms may be obtained from the main web site:

<http://www.dtic.mil/whs/directives/infomgt/forms/ddforms1500-1999.htm>

Upon completion of this work, submit Pest Management Report DD Form 1532 identifying target pest, type of operation, brand name and manufacturer of pesticide, formulation, concentration or rate of application used.

1.3.1 Qualifications

For the application of pesticides, use the services of a subcontractor whose principal business is pest control. The subcontractor shall be licensed and certified in the state where the work is to be performed. Termiticide applicators shall also be certified in the U.S. Environmental Protection Agency (EPA) pesticide applicator category which includes structural pest control.

The subcontractor shall:

- a. Have personnel with a state of North Carolina certification as required by Pesticide Law of 1971 as amended.
- b. Check in with insect vectors personnel prior to application of pesticide and herbicides for projects located at Camp Lejeune.
- c. Provide a submittal with the following information to the Contracting Officer:
 - (1) Quantity of pesticide used.
 - (2) Rate of dispersion.
 - (3) Percent of use.
 - (4) Total amount used.

1.3.2 Safety Requirements

Formulate, treat, and dispose of termiticides and their containers in accordance with label directions. Draw water for formulating only from sites designated by the Contracting Officer, and fit the filling hose with a backflow preventer meeting local plumbing codes or standards. The filling operation shall be under the direct and continuous observation of a contractor's representative to prevent overflow. Secure pesticides and related materials under lock and key when unattended. Ensure that proper protective clothing and equipment are worn and used during all phases of termiticide application. Dispose of used pesticide containers off Government property.

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Delivery

Deliver termiticide material to the site in the original unopened containers bearing legible labels indicating the EPA registration number and manufacturer's registered uses. All other materials, to be used on site for the purpose of termite control, shall be delivered in new or otherwise good condition as supplied by the manufacturer or formulator.

1.4.2 Inspection

Inspect termiticides upon arrival at the job site for conformity to type and quality in accordance with paragraph TERMITICIDES. Each label shall bear evidence of registration under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), as amended or under appropriate regulations of the host county. Other materials shall be inspected for conformance with specified requirements. Remove unacceptable materials from the job site.

1.4.3 Storage

Store materials in designated areas and in accordance with manufacturer's labels. Termiticides and related materials shall be kept under lock and key when unattended.

1.4.4 Handling

Observe manufacturer's warnings and precautions. Termiticides shall be handled in accordance with manufacturer's labels, preventing contamination by dirt, water, and organic material. Protect termiticides from sunlight as recommended by the manufacturer.

1.5 SITE CONDITIONS

The following conditions will determine the time of application.

1.5.1 Soil Moisture

Soils to be treated shall be tested immediately before application. Test soil moisture content to a minimum depth of 3 inches. The soil moisture shall be as recommended by the termiticide manufacturer. The termiticide will not be applied when soil moisture exceeds manufacturer's recommendations because termiticides do not adhere to the soil particles in saturated soils.

1.5.2 Runoff and Wind Drift

Do not apply termiticide during or immediately following heavy rains. Applications shall not be performed when conditions may cause runoff or create an environmental hazard. Applications shall not be performed when average wind speed exceeds 10 miles per hour. The termiticide shall not be allowed to enter water systems, aquifers, or endanger humans or animals.

1.5.2.1 Vapor Barriers and Waterproof Membranes

Termiticide shall be applied prior to placement of a vapor barrier or waterproof membrane.

1.5.2.2 Utilities and Vents

Prior to application, HVAC ducts and vents located in treatment area shall be turned off and blocked to protect people and animals from termiticide.

1.5.3 Placement of Concrete

Place concrete covering treated soils as soon as the termiticide has reached maximum penetration into the soil. Time for maximum penetration shall be as recommended by the manufacturer.

1.6 WARRANTY

The Contractor shall provide a 5 -year written warranty against infestations or reinfestations by subterranean termites of the buildings or building additions constructed under this contract. Warranty shall include annual inspections of the buildings or building additions. If live subterranean termite infestation or subterranean termite damage is discovered during the warranty period, and the soil and building conditions have not been altered in the interim, the Contractor shall:

- a. Retreat the soil and perform other treatment as may be necessary for elimination of subterranean termite infestation;
- b. Repair damage caused by termite infestation; and
- c. Reinspect the building approximately 180 days after the retreatment.

PART 2 PRODUCTS

2.1 TERMITICIDES

Provide termiticides currently registered by the EPA or approved for such use by the appropriate agency of the host county. Select non-repellant termiticide for maximum effectiveness and duration after application. The selected termiticide shall be suitable for the soil and climatic conditions at the project site.

PART 3 EXECUTION

3.1 VERIFICATION OF MEASUREMENT

Once termiticide application has been completed, measure tank contents to determine the remaining volume. The total volume measurement of used contents for the application shall equal the established application rate for the project site conditions. Provide written verification of the measurements.

3.2 TECHNICAL REPRESENTATIVE

The certified installation pest management coordinator shall be the technical representative, shall be present at all meetings concerning treatment measures for subterranean termites, and may be present during treatment application. The command Pest Control Coordinator shall be contacted prior to starting work.

3.3 SITE PREPARATION

Work related to final grades, landscape plantings, foundations, or any other alterations to finished construction which might alter the condition of treated soils, shall be coordinated with this specification.

3.3.1 Ground Preparation

Food sources shall be eliminated by removing debris from clearing and grubbing and post construction wood scraps such as ground stakes, form boards, and scrap lumber from the site, before termiticide application begins.

3.3.2 Verification

Before work starts, verify that final grades are as indicated and smooth grading has been completed in accordance with Section 31 23 00.00 20 EXCAVATION AND FILL. Soil particles shall be finely graded with particles no larger than 1 inch and compacted to eliminate soil movement to the greatest degree.

3.3.3 Foundation Exterior

Provide written verification that final grading and landscape planting operations will not disturb treatment of the soil on the exterior sides of foundation walls, grade beams, and similar structures.

3.3.4 Utilities and Vents

Provide written verification that the location and identity of HVAC ducts and vents, water and sewer lines, and plumbing have been accomplished prior to the termiticide application.

3.3.5 Crawl and Plenum Air Spaces

Provide written verification that the location and identity of crawl and plenum air spaces have been accomplished prior to the termiticide application.

3.3.6 Application Plan

Submit a [Termiticide Application Plan](#) for approval before starting the specified treatment.

3.4 TERMITICIDE TREATMENT

3.4.1 Equipment Calibration and Tank Measurement

Immediately prior to commencement of termiticide application, calibration tests shall be conducted on the application equipment to be used and the application tank shall be measured to determine the volume and contents. These tests shall confirm that the [application equipment](#) is operating within the manufacturer's specifications and will meet the specified requirements. Provide written certification of the equipment calibration test results within 1 week of testing.

3.4.2 Mixing and Application

Formulating, mixing, and application shall be performed in the presence of the Contracting Officer or the technical representative. A closed system is recommended as it prevents the termiticide from coming into contact with the applicator or other persons. Water for formulating shall only come from designated locations. Filling hoses shall be fitted with a backflow preventer meeting local plumbing codes or standards. Overflow shall be prevented during the filling operation. Prior to each day of use, the equipment used for applying termiticides shall be inspected for leaks, clogging, wear, or damage. Any repairs are to be performed immediately.

3.4.3 Treatment Method

For areas to be treated, establish complete and unbroken vertical and/or horizontal soil poison barriers between the soil and all portions of the intended structure which may allow termite access to wood and wood related products. Application shall not be made to areas which serve as crawl spaces or for use as a plenum air space. [Drill existing slab and foundation walls if required to provide treatment to meet specified warranty requirements.](#)

3.4.3.1 Surface Application

Use surface application for establishing horizontal barriers. Surface applicants shall be applied as a coarse spray and provide uniform distribution over the soil surface. Termiticide shall penetrate a minimum of 1 inch into the soil, or as recommended by the manufacturer.

3.4.3.2 Rodding and Trenching

Use rodding and trenching for establishing vertical soil barriers. Trenching shall be to the depth of the foundation footing. Width of trench shall be as recommended by the manufacturer, or as indicated. Rodding or other approved method may be implemented for saturating the base of the trench with termiticide. Immediately after termiticide has reached maximum penetration as recommended by the manufacturer, backfilling of the trench shall commence. Backfilling shall be in 6 inch rises or layers. Each rise shall be treated with termiticide.

3.4.4 Sampling

The Contracting Officer may draw from stocks at the job site, at any time and without prior notice, take samples of the termiticides used to determine if the amount of active ingredient specified on the label is being applied.

3.5 CLEAN UP, DISPOSAL, AND PROTECTION

Once application has been completed, proceed with clean up and protection of the site without delay.

3.5.1 Clean Up

The site shall be cleaned of all material associated with the treatment measures, according to label instructions, and as indicated. Excess and waste material shall be removed and disposed off site.

3.5.2 Disposal of Termiticide

Dispose of residual termiticides and containers off Government property, and in accordance with label instructions and EPA criteria.

3.5.3 Protection of Treated Area

Immediately after the application, the area shall be protected from other use by erecting barricades and providing signage as required or directed.

3.6 CONDITIONS FOR SATISFACTORY TREATMENT

3.6.1 Equipment Calibrations and Measurements

Where results from the equipment calibration and tank measurements tests are unsatisfactory, re-treatment will be required.

3.6.2 Testing

Should an analysis, performed by a third party, indicate that the samples of the applied termiticide contain less than the amount of active ingredient specified on the label, and/or if soils are treated to a depth less than specified or approved, re-treatment will be required.

3.6.3 Disturbance of Treated Soils

Soil and fill material disturbed after treatment shall be re-treated before placement of slabs or other covering structures.

3.6.4 Termites Found Within the Warranty Period

If live subterranean termite infestation or termite damage is discovered during the warranty period, re-treat the site.

3.7 RE-TREATMENT

Where re-treatment is required, comply with the requirements specified in paragraph WARRANTY.

-- End of Section --

SECTION 33 11 00

WATER DISTRIBUTION

04/06

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B18.5.2.1M (1981; R 1995) Metric Round Head Short Square Neck Bolts

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA B300 (2004) Hypochlorites

AWWA B301 (2004) Liquid Chlorine

AWWA C104 (1995) Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water

AWWA C105 (2005) Polyethylene Encasement for Ductile-Iron Pipe Systems

AWWA C110 (2003) Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (76 mm through 1219 mm), for Water

AWWA C111 (2000) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings

AWWA C115 (1999) Flanged Ductile-Iron Pipe With Ductile-Iron or Gray-Iron Threaded Flanges

AWWA C151 (2002) Ductile-Iron Pipe, Centrifugally Cast, for Water

AWWA C153 (2000) Ductile-Iron Compact Fittings for Water Service

AWWA C500 (2002; A C500a-95) Metal-Seated Gate Valves for Water Supply Service

AWWA C509 (2001) Resilient-Seated Gate Valves for Water Supply Service

AWWA C600 (2005) Installation of Ductile-Iron Water Mains and Their Appurtenances

AWWA C651 (2005; Errata 2005) Standard for

Disinfecting Water Mains

AWWA C800 (2005) Underground Service Line Valves and Fittings

AWWA M23 (2002) Manual: PVC Pipe - Design and Installation

ASME INTERNATIONAL (ASME)

ASME B16.1 (1998) Cast Iron Pipe Flanges and Flanged Fittings Classes 25, 125, and 250

ASME B16.26 (1988) Cast Copper Alloy Fittings for Flared Copper Tubes

ASME B18.2.2 (1987; R 2005) Standard for Square and Hex Nuts

ASME B18.5.2.2M (1982; R 2005) Metric Round Head Square Neck Bolts

ASTM INTERNATIONAL (ASTM)

ASTM A 307 (2004) Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength

ASTM A 47/A 47M (1999; R 2004) Standard Specification for Steel Sheet, Aluminum-Coated, by the Hot-Dip Process

ASTM A 48/A 48M (2003) Gray Iron Castings

ASTM A 536 (1984e1; R 2004) Standard Specification for Ductile Iron Castings

ASTM A 563 (2004a) Carbon and Alloy Steel Nuts

ASTM B 61 (2002) Steam or Valve Bronze Castings

ASTM B 62 (2002) Composition Bronze or Ounce Metal Castings

ASTM C 94/C 94M (2007) Standard Specification for Ready-Mixed Concrete

ASTM D 1785 (2005) Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120

ASTM D 2241 (2005) Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)

ASTM D 2464 (1999e1) Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80

ASTM D 2466 (2005) Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40

ASTM D 2467 (2005) Poly(Vinyl Chloride) (PVC) Plastic

Pipe Fittings, Schedule 80

ASTM D 2564 (2004) Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems

ASTM D 2774 (2004) Underground Installation of Thermoplastic Pressure Piping

ASTM D 2855 (1996; R 2002) Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings

ASTM F 402 (1993; R 1999) Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-80 (2003) Bronze Gate, Globe, Angle and Check Valves

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 325-1 (1994) Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids

NFPA 49 (3003) Hazardous Chemicals Data

NFPA 704 (2001) Identification of the Hazards of Materials for Emergency Response

UNDERWRITERS LABORATORIES (UL)

UL 262 (2004) Standard for Gate Valves for Fire-Protection Service

UL 789 (2004) Indicator Posts for Fire-Protection Service

UNI-BELL PVC PIPE ASSOCIATION (UBPPA)

UBPPA UNI-B-3 (1992) Recommended Practice for the Installation of Polyvinyl Chloride (PVC) Pressure Pipe (Nominal Diameters 4-36 Inch)

UBPPA UNI-B-8 (2000) Recommended Practice for the Direct Tapping of Polyvinyl Chloride (PVC) Pressure Water Pipe (Nominal Diameters 6-12 Inch)

1.2 DESIGN REQUIREMENTS

1.2.1 Water Distribution Mains

Provide water distribution mains indicated as 4 through 12 inch diameter pipe sizes of ductile-iron pipe. Provide ductile iron pipe for 12 inch diameter or larger pipe sizes. Also provide water main accessories, gate valves as specified and where indicated.

1.2.2 Water Service Lines

Provide water service lines indicated as less than 4 inch lines from water distribution main to building service at a point approximately 5 feet from building. Water service lines shall be polyvinyl chloride (PVC) plastic pipe. Provide water service line appurtenances as specified and where indicated.

1.3 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Piping Materials

Water distribution main piping, fittings, joints, valves, and coupling

Water service line piping, fittings, joints, valves, and coupling

Corporation stops

Submit manufacturer's standard drawings or catalog cuts. Include information concerning gaskets with submittal for joints and couplings.

SD-06 Test Reports

Bacteriological Disinfection

Test results from commercial laboratory verifying disinfection

SD-07 Certificates

Water distribution main piping, fittings, joints, valves, and coupling

Water service line piping, fittings, joints, valves, and coupling

Shop-applied lining and coating

Lining

SD-08 Manufacturer's Instructions

Installation procedures for water piping

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Delivery and Storage

Inspect materials delivered to site for damage. Unload and store with minimum handling. Store materials on site in enclosures or under protective covering. Store plastic piping, jointing materials and rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes, fittings, and valves free of

dirt and debris.

1.4.2 Handling

Handle pipe, fittings, valves, hydrants, and other accessories in a manner to ensure delivery to the trench in sound undamaged condition. Take special care to avoid injury to coatings and linings on pipe and fittings; make repairs if coatings or linings are damaged. Do not place any other material or pipe inside a pipe or fitting after the coating has been applied. Carry, do not drag pipe to the trench. Use of pinch bars and tongs for aligning or turning pipe will be permitted only on the bare ends of the pipe. The interior of pipe and accessories shall be thoroughly cleaned of foreign matter before being lowered into the trench and shall be kept clean during laying operations by plugging or other approved method. Before installation, the pipe shall be inspected for defects. Material found to be defective before or after laying shall be replaced with sound material without additional expense to the Government. Store rubber gaskets that are not to be installed immediately, under cover out of direct sunlight.

1.4.2.1 Miscellaneous Plastic Pipe and Fittings

Handle Polyvinyl Chloride (PVC), pipe and fittings in accordance with the manufacturer's recommendations. Store plastic piping and jointing materials that are not to be installed immediately under cover out of direct sunlight.

Storage facilities shall be classified and marked in accordance with [NFPA 704](#), with classification as indicated in [NFPA 49](#) and [NFPA 325-1](#).

PART 2 PRODUCTS

2.1 WATER DISTRIBUTION MAIN MATERIALS

2.1.1 Piping Materials

2.1.1.1 Ductile-Iron Piping

- a. Pipe and Fittings: Pipe, [AWWA C151](#), Pressure Class 350. Flanged pipe, [AWWA C115](#). Fittings, [AWWA C110](#) or [AWWA C153](#). Fittings shall have pressure rating at least equivalent to that of the pipe. Ends of pipe and fittings shall be suitable for the specified joints. Pipe and fittings shall have cement-mortar lining, [AWWA C104](#), standard thickness.
- b. Joints and Jointing Material:
 - (1) Joints: Joints for pipe and fittings shall be push-on joints or mechanical joints unless otherwise indicated. Provide mechanical joints where indicated. Provide flanged joints where indicated. Provide mechanically coupled type joints using a sleeve-type mechanical coupling. Joints made with sleeve-type mechanical coupling may be used in lieu of push-on joint, subject to the limitations specified in paragraph entitled "Sleeve-Type Mechanical Couplings."
 - (2) Push-On Joints: Shape of pipe ends and fitting ends, gaskets, and lubricant for joint assembly, [AWWA C111](#).

(2) Mechanical Joints: Dimensional and material requirements for pipe ends, glands, bolts and nuts, and gaskets, [AWWA C111](#).

(3) Flanged Joints: Bolts, nuts, and gaskets for flanged connections as recommended in the Appendix to [AWWA C115](#). Flange for setscrewed flanges shall be of ductile iron, [ASTM A 536](#), Grade 65-45-12, and conform to the applicable requirements of [ASME B16.1](#), Class 250. Setscrews for setscrewed flanges shall be 190,000 psi tensile strength, heat treated and zinc-coated steel. Gasket and lubricants for setscrewed flanges, in accordance with applicable requirements for mechanical-joint gaskets specified in [AWWA C111](#). Design of setscrewed gasket shall provide for confinement and compression of gasket when joint to adjoining flange is made.

(6) Sleeve-Type Mechanical Coupled Joints: As specified in paragraph entitled "Sleeve-Type Mechanical Couplings."

2.1.1.2 Valves, Hydrants, and Other Water Main Accessories

2.1.1.2.1 Gate Valves on Buried Piping

[AWWA C500](#), [AWWA C509](#), or [UL 262](#). Unless otherwise specified, valves conforming to: (1) [AWWA C500](#) shall be nonrising stem type with double-disc gates and mechanical-joint ends or push-on joint ends as appropriate for the adjoining pipe, (2) [AWWA C509](#) shall be nonrising stem type with mechanical-joint ends, and (3) [UL 262](#) shall be inside-screw type with operating nut, double-disc or split-wedge type gate, designed for a hydraulic working pressure of 350 psi, and shall have mechanical-joint ends or push-on joint ends as appropriate for the pipe to which it is joined. Materials for [UL 262](#) valves shall conform to the reference standards specified in [AWWA C500](#). Valves shall open by counterclockwise rotation of the valve stem. Stuffing boxes shall have O-ring stem seals. Stuffing boxes shall be bolted and constructed so as to permit easy removal of parts for repair. Where a post indicator is shown, the valve shall have an indicator post flange; indicator post flange for [AWWA C500](#) valve shall conform to the applicable requirements of [UL 262](#).

2.1.1.2.2 Indicator Posts

[UL 789](#). Provide for gate valves where indicated.

2.1.1.2.3 Valve Boxes

Provide a valve box for each gate valve on buried piping, except where indicator post is shown. Valve boxes shall be of cast iron or precast concrete of a size suitable for the valve on which it is to be used and shall be adjustable. Cast-iron boxes shall have a minimum cover and wall thickness of 3/16 inch. Provide a round head. Cast the word "WATER" on the lid. The least diameter of the shaft of the box shall be 5 1/4 inches. Cast-iron box shall have a heavy coat of bituminous paint.

2.1.1.2.4 Tapping Sleeves

Tapping sleeves of the sizes indicated for connection to existing main shall be the cast gray, ductile, or malleable iron, split-sleeve type with flanged or grooved outlet, and with bolts, follower rings and gaskets on each end of the sleeve. Construction shall be suitable for a maximum working pressure of 350 psi. Bolts shall have square heads and hexagonal nuts. Longitudinal gaskets and mechanical joints with gaskets shall be as recommended by the manufacturer of the sleeve. When using grooved

mechanical tee, it shall consist of an upper housing with full locating collar for rigid positioning which engages a machine-cut hole in pipe, encasing an elastomeric gasket which conforms to the pipe outside diameter around the hole and a lower housing with positioning lugs, secured together during assembly by nuts and bolts as specified, pretorqued to 50 foot-pound.

2.1.2.5 Sleeve-Type Mechanical Couplings

Couplings shall be designed to couple plain-end piping by compression of a ring gasket at each end of the adjoining pipe sections. The coupling shall consist of one middle ring flared or beveled at each end to provide a gasket seat; two follower rings; two resilient tapered rubber gaskets; and bolts and nuts to draw the follower rings toward each other to compress the gaskets. The middle ring and the follower rings shall be true circular sections free from irregularities, flat spots, and surface defects; the design shall provide for confinement and compression of the gaskets. For ductile iron pipe, the middle ring shall be of cast-iron or steel; and the follower rings shall be of malleable or ductile iron. Cast iron, [ASTM A 48/A 48M](#), not less than Class 25. Malleable and ductile iron shall conform to [ASTM A 47/A 47M](#) and [ASTM A 536](#), respectively. Steel shall have a strength not less than that of the pipe. Gaskets shall be designed for resistance to set after installation and shall meet the applicable requirements specified for gaskets for mechanical joint in [AWWA C111](#). Bolts shall be track-head type, [ASTM A 307](#), Grade A, with nuts, [ASTM A 563](#), Grade A; or round-head square-neck type bolts, [ANSI B18.5.2.1M](#) and [ASME B18.5.2.2M](#) with hex nuts, [ASME B18.2.2](#). Bolts shall be 5/8 inch in diameter. Bolt holes in follower rings shall be of a shape to hold fast the necks of the bolts used. Mechanically coupled joints using a sleeve-type mechanical coupling shall not be used as an optional method of jointing except where pipeline is adequately anchored to resist tension pull across the joint. Mechanical couplings shall provide a tight flexible joint under all reasonable conditions, such as pipe movements caused by expansion, contraction, slight setting or shifting in the ground, minor variations in trench gradients, and traffic vibrations. Couplings shall be of strength not less than the adjoining pipeline.

2.2 WATER SERVICE LINE MATERIALS

2.2.1 Piping Materials

2.2.1.1 Plastic Piping

Plastic pipe and fittings shall bear the seal of the National Sanitation Foundation (NSF) for potable water service. Plastic pipe and fittings shall be supplied from the same manufacturer.

- a. Polyvinyl Chloride (PVC) Plastic Piping with Screw Joints:
[ASTM D 1785](#), Schedule 40; or [ASTM D 2241](#), with SDR as necessary to provide 150 psi minimum pressure rating. Fittings, [ASTM D 2466](#) or [ASTM D 2467](#). Pipe and fittings shall be of the same PVC plastic material and shall be one of the following pipe/fitting combinations, as marked on the pipe and fitting, respectively: PVC 1120/PVC I; PVC 1220/PVC 12; PVC 2120/PVC II; PVC 2116/PVC II. Solvent cement for jointing, [ASTM D 2564](#). Pipe couplings, when used shall be tested as required by [ASTM D 2464](#).
- b. Polyvinyl Chloride (PVC) Plastic Piping with Elastomeric-Gasket Joints:

Pipe shall conform to dimensional requirements of [ASTM D 1785](#) Schedule 40, with joints meeting the requirements of 150 psi working pressure, 200 psi hydrostatic test pressure, unless otherwise shown or specified.

c. Polyvinyl Chloride (PVC) Plastic Piping with Solvent Cement Joints:

Pipe shall conform to dimensional requirements of [ASTM D 1785](#) or [ASTM D 2241](#) with joints meeting the requirements of 150 psi working pressure and 200 psi hydrostatic test pressure.

2.2.2 Water Service Line Appurtenances

2.2.2.1 Corporation Stops

Ground key type; bronze, [ASTM B 61](#) or [ASTM B 62](#); and suitable for the working pressure of the system. Ends shall be suitable for solder-joint, or flared tube compression type joint. Threaded ends for inlet and outlet of corporation stops, [AWWA C800](#); coupling nut for connection to flared copper tubing, [ASME B16.26](#).

2.2.2.2 Curb or Service Stops

Ground key, round way, inverted key type; made of bronze, [ASTM B 61](#) or [ASTM B 62](#); and suitable for the working pressure of the system. Ends shall be as appropriate for connection to the service piping. Arrow shall be cast into body of the curb or service stop indicating direction of flow.

2.2.2.3 Service Clamps

Service clamps used for repairing damaged cast-iron, steel, PVC or asbestos-cement pipe shall have a pressure rating not less than that of the pipe to be connected and shall be either the single or double flattened strap type. Clamps shall have a galvanized malleable-iron body with cadmium plated straps and nuts. Clamps shall have a rubber gasket cemented to the body.

2.2.2.4 Dielectric Fittings

Dielectric fittings shall be installed between threaded ferrous and nonferrous metallic pipe, fittings and valves, except where corporation stops join mains. Dielectric fittings shall prevent metal-to-metal contact of dissimilar metallic piping elements and shall be suitable for the required working pressure.

2.2.2.5 Check Valves

Check valves shall be designed for a minimum working pressure of 150 psi or as indicated. Valves shall have a clear waterway equal to the full nominal diameter of the valve. Valves shall open to permit flow when inlet pressure is greater than the discharge pressure, and shall close tightly to prevent return flow when discharge pressure exceeds inlet pressure. The size of the valve, working pressure, manufacturer's name, initials, or trademark shall be cast on the body of each valve. Valves 2 inches and larger shall be outside lever and spring type.

- a. Valves 2 inches and smaller shall be all bronze designed for screwed fittings, and shall conform to [MSS SP-80](#), Class 150, Types 3 and 4 as suitable for the application.

2.2.2.6 Gate Valves 3 Inch Size and Larger on Buried Piping

Gate valves 3 inch size and larger on buried piping AWWA C500 or UL 262 and of one manufacturer. Valves, AWWA C500, nonrising stem type with double-disc gates. Valves, UL 262, inside-screw type with operating nut, split wedge or double disc type gate, and designed for a hydraulic working pressure of 175 psi. Materials for UL 262 valves conforming to the reference standards specified in AWWA C500. Valves shall open by counterclockwise rotation of the valve stem. Stuffing boxes shall have O-ring stem seals and shall be bolted and constructed so as to permit easy removal of parts for repair.

2.2.2.7 Gate Valves Smaller than 3 Inch in Size on Buried Piping

Gate valves smaller than 3 inch size on Buried Piping MSS SP-80, Class 150, solid wedge, nonrising stem. Valves shall have flanged or threaded end connections, with a union on one side of the valve. Provide handwheel operators.

2.2.2.8 Gate Valve 3 Inch Size and Larger

Gate valves 3 inch size and larger in valve chambers, valve pits and aboveground locations, AWWA C500 or UL 262 and of one make. Valves conforming to: (1) AWWA C500 shall be outside-screw-and-yoke rising-stem type with flanged ends and double-disc gates, and (2) UL 262 shall be outside-screw-and-yoke type, shall be designed for a hydraulic working pressure of 175 psi, and shall have flanged ends and double-disc or split-wedge type gate. Materials for UL 262 valves shall conform to the reference standards specified in AWWA C500. Provide valves with handwheels that open by a counterclockwise rotation of the valve stem. Stuffing boxes shall be bolted and constructed so as to permit easy removal of parts for repair.

2.2.2.9 Gate Valves Smaller Than 3 Inch Size in Valve Pits

MSS SP-80, Class 150, solid wedge, inside screw, rising stem. Valves shall have flanged or threaded end connections, with a union on one side of the valve and a handwheel operator.

2.2.2.10 Curb Boxes

Provide a curb box for each curb or service stop. Curb boxes shall be of cast iron of a size suitable for the stop on which it is to be used. Provide a round head. Cast the word "WATER" on the lid. Each box shall have a heavy coat of bituminous paint.

2.2.2.11 Valve Boxes

Provide a valve box for each gate valve on buried piping. Valve boxes shall be of cast iron of a size suitable for the valve on which it is to be used and shall be adjustable. Provide a round head. Cast the word "WATER" on the lid. The least diameter of the shaft of the box shall be 5 1/4 inches.

2.2.2.12 Tapping Sleeves

Tapping sleeves of the sizes indicated for connection to existing main shall be the cast gray, ductile, or malleable iron, split-sleeve type with

flanged or grooved outlet, and with bolts, follower rings and gaskets on each end of the sleeve. Construction shall be suitable for a maximum working pressure of 150 psi. Bolts shall have square heads and hexagonal nuts. Longitudinal gaskets and mechanical joints with gaskets shall be as recommended by the manufacturer of the sleeve. When using grooved mechanical tee, it shall consist of an upper housing with full locating collar for rigid positioning which engages a machine-cut hole in pipe, encasing an elastomeric gasket which conforms to the pipe outside diameter around the hole and a lower housing with positioning lugs, secured together during assembly by nuts and bolts as specified, pretorqued to 50 foot-pound.

2.2.2.13 Disinfection

Chlorinating materials shall conform to the following:

Chlorine, Liquid: AWWA B301.

Hypochlorite, Calcium and Sodium: AWWA B300.

2.2.2.14 Backflow Preventer Enclosure

ASSE Standard 1060, Class I Freeze Protection. The enclosure shall have positive drainage of the interior and shall have an access panel for inspection. Provide electrical outlets and service as needed for the heat source. Install the enclosure on a concrete slab as specified. Provide enclosure size suitable to obtain the minimum specified clearances.

PART 3 EXECUTION

3.1 INSTALLATION OF PIPELINES

3.1.1 General Requirements for Installation of Pipelines

These requirements shall apply to all pipeline installation except where specific exception is made in the "Special Requirements..." paragraphs.

3.1.1.1 Location of Water Lines

Terminate the work covered by this section at a point approximately 5 feet. Do not lay water lines in the same trench with gas lines, fuel lines or electric wiring.

a. Water Piping Installation Parallel With Sewer Piping

(1) Normal Conditions: Lay water piping at least 10 feet horizontally from a sewer or sewer manhole whenever possible. Measure the distance edge-to-edge.

(2) Unusual Conditions: When local conditions prevent a horizontal separation of 10 feet, the water piping may be laid closer to a sewer or sewer manhole provided that:

(a) The bottom (invert) of the water piping shall be at least 18 inches above the top (crown) of the sewer piping.

(b) Where this vertical separation cannot be obtained, the sewer piping shall be constructed of AWWA-approved water pipe and pressure tested in place without leakage prior to backfilling.

Approved waste water disposal method shall be utilized.

(c) The sewer manhole shall be of watertight construction and tested in place.

b. Installation of Water Piping Crossing Sewer Piping

(1) Normal Conditions: Water piping crossing above sewer piping shall be laid to provide a separation of at least 18 inches between the bottom of the water piping and the top of the sewer piping.

(2) Unusual Conditions: When local conditions prevent a vertical separation described above, use the following construction:

(a) Sewer piping passing over or under water piping shall be constructed of AWWA-approved ductile iron water piping, pressure tested in place without leakage prior to backfilling.

(b) Water piping passing under sewer piping shall, in addition, be protected by providing a vertical separation of at least 18 inches between the bottom of the sewer piping and the top of the water piping; adequate structural support for the sewer piping to prevent excessive deflection of the joints and the settling on and breaking of the water piping; and that the length, minimum 20 feet, of the water piping be centered at the point of the crossing so that joints shall be equidistant and as far as possible from the sewer piping.

c. Sewer Piping or Sewer Manholes: No water piping shall pass through or come in contact with any part of a sewer manhole.

3.1.1.2 Earthwork

Perform earthwork operations in accordance with Section 31 23 00.00 20, EXCAVATION AND FILL.

3.1.1.3 Pipe Laying and Jointing

Remove fins and burrs from pipe and fittings. Before placing in position, clean pipe, fittings, valves, and accessories, and maintain in a clean condition. Provide proper facilities for lowering sections of pipe into trenches. Do not under any circumstances drop or dump pipe, fittings, valves, or any other water line material into trenches. Cut pipe in a neat workmanlike manner accurately to length established at the site and work into place without springing or forcing. Replace by one of the proper length any pipe or fitting that does not allow sufficient space for proper installation of jointing material. Blocking or wedging between bells and spigots will not be permitted. Lay bell-and-spigot pipe with the bell end pointing in the direction of laying. Grade the pipeline in straight lines; avoid the formation of dips and low points. Support pipe at proper elevation and grade. Secure firm, uniform support. Wood support blocking will not be permitted. Lay pipe so that the full length of each section of pipe and each fitting will rest solidly on the pipe bedding; excavate recesses to accommodate bells, joints, and couplings. Provide anchors and supports where indicated and where necessary for fastening work into place. Make proper provision for expansion and contraction of pipelines. Keep trenches free of water until joints have been properly made. At the end of each work day, close open ends of pipe temporarily with wood blocks

or bulkheads. Do not lay pipe when conditions of trench or weather prevent installation. Depth of cover over top of pipe shall not be less than 2 1/2 feet.

3.1.1.4 Installation of Tracer Wire

Install a continuous length of tracer wire for the full length of each run of nonmetallic pipe. Attach wire to top of pipe in such manner that it will not be displaced during construction operations.

3.1.1.5 Connections to Existing Water Lines

Make connections to existing water lines after approval is obtained and with a minimum interruption of service on the existing line. Make connections to existing lines under pressure in accordance with the recommended procedures of the manufacturer of the pipe being tapped.

3.1.2 Special Requirements for Installation of Water Mains

3.1.2.1 Installation of Ductile-Iron Piping

Unless otherwise specified, install pipe and fittings in accordance with paragraph entitled "General Requirements for Installation of Pipelines" and with the requirements of AWWA C600 for pipe installation, joint assembly, valve-and-fitting installation, and thrust restraint.

- a. Jointing: Make push-on joints with the gaskets and lubricant specified for this type joint; assemble in accordance with the applicable requirements of AWWA C600 for joint assembly. Make mechanical joints with the gaskets, glands, bolts, and nuts specified for this type joint; assemble in accordance with the applicable requirements of AWWA C600 for joint assembly and the recommendations of Appendix A to AWWA C111. Make flanged joints with the gaskets, bolts, and nuts specified for this type joint. Make flanged joints up tight; avoid undue strain on flanges, fittings, valves, and other accessories. Align bolt holes for each flanged joint. Use full size bolts for the bolt holes; use of undersized bolts to make up for misalignment of bolt holes or for any other purpose will not be permitted. Do not allow adjoining flange faces to be out of parallel to such degree that the flanged joint cannot be made watertight without overstraining the flange. When flanged pipe or fitting has dimensions that do not allow the making of a proper flanged joint as specified, replace it by one of proper dimensions. Use setscrewed flanges to make flanged joints where conditions prevent the use of full-length flanged pipe and assemble in accordance with the recommendations of the setscrewed flange manufacturer. Assemble joints made with sleeve-type mechanical couplings in accordance with the recommendations of the coupling manufacturer.
- b. Allowable Deflection: The maximum allowable deflection shall be as given in AWWA C600. If the alignment requires deflection in excess of the above limitations, special bends or a sufficient number of shorter lengths of pipe shall be furnished to provide angular deflections within the limit set forth.
- c. Pipe Anchorage: Provide concrete thrust blocks (reaction backing) for pipe anchorage. Thrust blocks shall be in accordance with the requirements of AWWA C600 for thrust restraint, except that size

and positioning of thrust blocks shall be as indicated. Use concrete, [ASTM C 94/C 94M](#), having a minimum compressive strength of [2,500 psi](#) at 28 days; or use concrete of a mix not leaner than one part cement, 2 1/2 parts sand, and 5 parts gravel, having the same minimum compressive strength.

- d. Exterior Protection: Completely encase buried ductile iron pipelines with polyethylene tube or sheet, using Class A polyethylene film, in accordance with [AWWA C105](#).

3.1.2.2 Installation of Valves and Hydrants

- a. Installation of Valves: Install gate valves, [AWWA C500](#) and [UL 262](#), in accordance with the requirements of [AWWA C600](#) for valve-and-fitting installation and with the recommendations of the Appendix ("Installation, Operation, and Maintenance of Gate Valves") to [AWWA C500](#). Install gate valves, [AWWA C509](#), in accordance with the requirements of [AWWA C600](#) for valve-and-fitting installation and with the recommendations of the Appendix ("Installation, Operation, and Maintenance of Gate Valves") to [AWWA C509](#). Make and assemble joints to gate valves as specified for making and assembling the same type joints between pipe and fittings.

3.1.3 Installation of Water Service Piping

3.1.3.1 Location

Connect water service piping to the building service where the building service has been installed. Where building service has not been installed, terminate water service lines approximately [5 feet](#) from the building line.

3.1.3.2 Service Line Connections to Water Mains

Connect service lines to the main as indicated. Connect service lines to ductile-iron water mains in accordance with [AWWA C600](#) for service taps. Connect service lines to PVC plastic water mains in accordance with [UBPPA UNI-B-8](#) and the recommendations of [AWWA M23](#), Chapter 9, "Service Connections."

3.1.4 Special Requirements for Installation of Water Service Piping

3.1.4.1 Installation of Plastic Piping

Install pipe and fittings in accordance with paragraph entitled "General Requirements for Installation of Pipelines" and with the applicable requirements of [ASTM D 2774](#), unless otherwise specified. Handle solvent cements used to join plastic piping in accordance with [ASTM F 402](#).

- a. Jointing: Make solvent-cemented joints for PVC plastic piping using the solvent cement previously specified for this material; assemble joints in accordance with [ASTM D 2855](#). Make plastic pipe joints to other pipe materials in accordance with the recommendations of the plastic pipe manufacturer.
- b. Plastic Pipe Connections to Appurtenances: Connect plastic pipe service lines to corporation stops and gate valves in accordance with the recommendations of the plastic pipe manufacturer.

3.1.5 Disinfection

Prior to disinfection, obtain Contracting Officer approval of the proposed method for disposal of waste water from disinfection procedures. Disinfect new water piping and existing water piping affected by Contractor's operations in accordance with [AWWA C651](#). Fill piping systems with solution containing minimum of 50 parts per million of available chlorine and allow solution to stand for minimum of 24 hours. Flush solution from the systems with domestic water until maximum residual chlorine content is within the range of 0.2 and 0.5 parts per million, or the residual chlorine content of domestic water supply. Obtain at least two consecutive satisfactory bacteriological samples from new water piping, analyze by a certified laboratory, and submit the results prior to the new water piping being placed into service. Disinfection of systems supplying nonpotable water is not required.

3.2 FIELD QUALITY CONTROL

3.2.1 Field Tests and Inspections

Prior to hydrostatic testing, obtain Contracting Officer approval of the proposed method for disposal of waste water from hydrostatic testing. The Contracting Officer will conduct field inspections and witness field tests specified in this section. The Contractor shall perform field tests, and provide labor, equipment, and incidentals required for testing. The Contractor shall produce evidence, when required, that any item of work has been constructed in accordance with the drawings and specifications. Do not begin testing on any section of a pipeline where concrete thrust blocks have been provided until at least 5 days after placing of the concrete.

3.2.2 Testing Procedure

Test water mains and water service lines in accordance with the applicable specified standard, except for the special testing requirements given in paragraph entitled "Special Testing Requirements." Test ductile-iron water mains and water service lines in accordance with the requirements of [AWWA C600](#) for hydrostatic testing. The amount of leakage on ductile-iron pipelines with mechanical-joints or push-on joints shall not exceed the amounts given in [AWWA C600](#); no leakage will be allowed at joints made by any other method. Test PVC plastic water mains and water service lines made with PVC plastic water main pipe in accordance with the requirements of [UBPPA UNI-B-3](#) for pressure and leakage tests. The amount of leakage on pipelines made of PVC plastic water main pipe shall not exceed the amounts given in [UBPPA UNI-B-3](#), except that at joints made with sleeve-type mechanical couplings, no leakage will be allowed. Test water service lines in accordance with applicable requirements of [AWWA C600](#) for hydrostatic testing. No leakage will be allowed at plastic pipe joints or flanged joints.

3.2.3 Special Testing Requirements

For pressure test, use a hydrostatic pressure [50 psi](#) greater than the maximum working pressure of the system, except that for those portions of the system having pipe size larger than [2 inches](#) in diameter, hydrostatic test pressure shall be not less than [200 psi](#). Hold this pressure for not less than 2 hours. Prior to the pressure test, fill that portion of the pipeline being tested with water for a soaking period of not less than 24 hours. For leakage test, use a hydrostatic pressure not less than the maximum working pressure of the system. Leakage test may be performed at

the same time and at the same test pressure as the pressure test.

3.3 CLEANUP

Upon completion of the installation of water lines, and appurtenances, all debris and surplus materials resulting from the work shall be removed.

-- End of Section --

SECTION 33 30 00

SANITARY SEWERS

04/06

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WATER WORKS ASSOCIATION (AWWA)

- AWWA C104 (1995) Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
- AWWA C110 (2003) Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (76 mm through 1219 mm), for Water
- AWWA C111 (2000) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
- AWWA C153 (2000) Ductile-Iron Compact Fittings for Water Service
- AWWA C600 (2005) Installation of Ductile-Iron Water Mains and Their Appurtenances
- AWWA C605 (2005) Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water
- AWWA C900 (1997) Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Distribution
- AWWA M23 (2002) Manual: PVC Pipe - Design and Installation

ASME INTERNATIONAL (ASME)

- ASME B1.20.1 (1983; R 2006) Pipe Threads, General Purpose (Inch)

ASTM INTERNATIONAL (ASTM)

- ASTM C 150 (2007) Standard Specification for Portland Cement
- ASTM C 270 (2008a) Standard Specification for Mortar for Unit Masonry

ASTM C 94/C 94M	(2007) Standard Specification for Ready-Mixed Concrete
ASTM C 969	(2002) Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines
ASTM D 1784	(2003) Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D 1785	(2005) Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
ASTM D 2241	(2005) Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
ASTM D 2321	(2005) Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
ASTM D 2464	(1999e1) Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D 2466	(2005) Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
ASTM D 2467	(2005) Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D 2680	(2001) Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Composite Sewer Piping
ASTM D 2751	(2005) Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings
ASTM D 3034	(2004a) Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D 3139	(1998; R 2005) Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM D 3212	(2007) Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM F 477	(2008) Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F 949	(2003) Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings

UNI-BELL PVC PIPE ASSOCIATION (UBPPA)

UBPPA UNI-B-6	(1998) Recommended Practice for Low-Pressure Air Testing of Installed
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Sewer Pipe

1.2 SYSTEM DESCRIPTION

1.2.1 Sanitary Sewer Gravity Pipeline

Provide mains and laterals polyvinyl chloride (PVC) plastic pipe. Provide building connections polyvinyl chloride (PVC) plastic pipe. Provide new and modify existing exterior sanitary gravity sewer piping and appurtenances. Provide each system complete and ready for operation. The exterior sanitary gravity sewer system includes equipment, materials, installation, and workmanship as specified herein more than 5 feet outside of building walls.

1.2.2 Sanitary Sewer Pressure Lines

Provide pressure lines of polyvinyl chloride (PVC) plastic pressure pipe.

1.3 GENERAL REQUIREMENTS

The construction required herein shall include appurtenant structures and building sewers to points of connection with the building drains 5 feet outside the building to which the sewer system is to be connected. The Contractor shall replace damaged material and redo unacceptable work at no additional cost to the Government. Backfilling shall be accomplished after inspection by the Contracting Officer. Before, during, and after installation, plastic pipe and fittings shall be protected from any environment that would result in damage or deterioration to the material. The Contractor shall have a copy of the manufacturer's instructions available at the construction site at all times and shall follow these instructions unless directed otherwise by the Contracting Officer. Solvents, solvent compounds, lubricants, elastomeric gaskets, and any similar materials required to install the plastic pipe shall be stored in accordance with the manufacturer's recommendation and shall be discarded if the storage period exceeds the recommended shelf life. Solvents in use shall be discarded when the recommended pot life is exceeded.

1.4 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Pipeline materials

Submit manufacturer's standard drawings or catalog cuts.

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 Delivery and Storage

1.5.1.1 Piping

Inspect materials delivered to site for damage; store with minimum of handling. Store materials on site in enclosures or under protective coverings. Store plastic piping and jointing materials and rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes and fittings free of dirt and debris.

1.5.1.2 Metal Items

Check upon arrival; identify and segregate as to types, functions, and sizes. Store off the ground in a manner affording easy accessibility and not causing excessive rusting or coating with grease or other objectionable materials.

1.5.1.3 Cement, Aggregate, and Reinforcement

As specified in Section 03 30 50 CAST-IN-PLACE CONCRETE.

1.5.2 Handling

Handle pipe, fittings, and other accessories in such manner as to ensure delivery to the trench in sound undamaged condition. Carry, do not drag, pipe to trench.

1.6 EXISTING CONDITIONS

Submit drawings of existing conditions, after a thorough inspection of the area by the Contractor in the presence of the Contracting Officer. Details shall include the environmental conditions of the site and adjacent areas. Submit copies of the records for verification before starting work.

1.7 INSTALLER QUALIFICATIONS

Install specified materials by a licensed underground utility Contractor licensed for such work in the state where the work is to be performed. Installing Contractor's License shall be current and be state certified or state registered.

PART 2 PRODUCTS

2.1 PIPELINE MATERIALS

Pipe shall conform to the respective specifications and other requirements specified below.

2.1.1 PVC Plastic Gravity Sewer Piping

2.1.1.1 PVC Plastic Gravity Pipe and Fittings

ASTM D 3034, SDR 35, or ASTM F 949 with ends suitable for elastomeric gasket joints.

2.1.1.2 PVC Plastic Gravity Joints and Jointing Material

Joints shall conform to ASTM D 3212. Gaskets shall conform to ASTM F 477.

2.1.2 PVC Plastic Pressure Pipe and Associated Fittings

2.1.2.1 PVC Plastic Pressure Pipe and Fittings

- a. Pipe and Fittings Less Than 4 inch Diameter: Pipe, couplings and fittings shall be manufactured of materials conforming to ASTM D 1784, Class 12454B.

(1) Screw-Joint: Pipe shall conform to dimensional requirements

of [ASTM D 1785](#), Schedule 80, with joints meeting requirements of 150 psi working pressure, 200 psi hydrostatic test pressure, unless otherwise shown or specified. Fittings for threaded pipe shall conform to requirements of [ASTM D 2464](#), threaded to conform to the requirements of [ASME B1.20.1](#) for use with Schedule 80 pipe and fittings. Pipe couplings when used, shall be tested as required by [ASTM D 2464](#).

(2) Push-On Joint: [ASTM D 3139](#), with [ASTM F 477](#) gaskets. Fittings for push-on joints shall be iron conforming to [AWWA C110](#) or [AWWA C111](#). Iron fittings and specials shall be cement-mortar lined (standard thickness) in accordance with [AWWA C104](#).

(3) Solvent Cement Joint: Pipe shall conform to dimensional requirements of [ASTM D 1785](#) or [ASTM D 2241](#) with joints meeting the requirements of 150 psi working pressure and 200 psi hydrostatic test pressure. Fittings for solvent cement jointing shall conform to [ASTM D 2466](#) or [ASTM D 2467](#).

- b. Pipe and Fittings 4 inch Diameter to 12 inch: Pipe shall conform to [AWWA C900](#) and shall be plain end or gasket bell end, Pressure Class 150 (DR 18), with cast-iron-pipe-equivalent OD. Fittings shall be gray-iron or ductile-iron conforming to [AWWA C110](#) or [AWWA C153](#) and shall have cement-mortar lining conforming to [AWWA C104](#), standard thickness. Fittings with push-on joint ends shall conform to the same requirements as fittings with mechanical-joint ends, except that bell design shall be modified, as approved, for push-on joint suitable for use with the PVC plastic pressure pipe specified in this paragraph.

2.1.2.2 PVC Plastic Pressure Joints and Jointing Material

Joints for pipe, 4 inch to 12 inch diameter, shall be push-on joints as specified in [ASTM D 3139](#). Joints between pipe and fittings shall be push-on joints as specified in [ASTM D 3139](#) or shall be compression-type joints/mechanical-joints as respectively specified in [ASTM D 3139](#) and [AWWA C111](#). Each joint connection shall be provided with an elastomeric gasket suitable for the bell or coupling with which it is to be used. Gaskets for push-on joints for pipe shall conform to [ASTM F 477](#). Gaskets for push-on joints and compression-type joints/mechanical-joints for joint connections between pipe and fittings shall be as specified in [AWWA C111](#), respectively, for push-on joints and mechanical-joints.

2.2 CONCRETE MATERIALS

2.2.1 Cement Mortar

Cement mortar shall conform to [ASTM C 270](#), Type M with Type II cement.

2.2.2 Portland Cement

Portland cement shall conform to [ASTM C 150](#), Type II for concrete used in concrete pipe, concrete pipe fittings, and manholes and type optional with the Contractor for cement used in concrete cradle, concrete encasement, and thrust blocking.

2.2.3 Portland Cement Concrete

Portland cement concrete shall conform to **ASTM C 94/C 94M**, compressive strength of **4000 psi** at 28 days, except for concrete cradle and encasement or concrete blocks for manholes. Concrete used for cradle and encasement shall have a compressive strength of **2500 psi** minimum at 28 days. Concrete in place shall be protected from freezing and moisture loss for 7 days.

PART 3 EXECUTION

3.1 INSTALLATION OF PIPELINES AND APPURTENANT CONSTRUCTION

3.1.1 General Requirements for Installation of Pipelines

These general requirements apply except where specific exception is made in the following paragraphs entitled "Special Requirements."

3.1.1.1 Location

a. Sanitary piping installation parallel with water line:

(1) Normal conditions: Sanitary piping or manholes shall be laid at least **10 feet** horizontally from a water line whenever possible. The distance shall be measured edge-to-edge.

(2) Unusual conditions: When local conditions prevent a horizontal separation of **10 feet**, the sanitary piping or manhole may be laid closer to a water line provided that:

(a) The top (crown) of the sanitary piping shall be at least **18 inches** below the bottom (invert) of the water main.

(b) Where this vertical separation cannot be obtained, the sanitary piping shall be constructed of AWWA-approved ductile iron water pipe pressure tested in place without leakage prior to backfilling.

(c) The sewer manhole shall be of watertight construction and tested in place.

b. Installation of sanitary piping crossing a water line:

(1) Normal conditions: Lay sanitary sewer piping by crossing under water lines to provide a separation of at least **18 inches** between the top of the sanitary piping and the bottom of the water line whenever possible.

(2) Unusual conditions: When local conditions prevent a vertical separation described above, use the following construction:

(a) Sanitary piping passing over or under water lines shall be constructed of AWWA-approved ductile iron water pipe, pressure tested in place without leakage prior to backfilling.

(b) Sanitary piping passing over water lines shall, in addition, be protected by providing:

1. A vertical separation of at least **18 inches** between the bottom of the sanitary piping and the top of the water line.

2. Adequate structural support for the sanitary piping to prevent excessive deflection of the joints and the settling on and breaking of the water line.

3. That the length, minimum 20 feet, of the sanitary piping be centered at the point of the crossing so that joints shall be equidistant and as far as possible from the water line.

- c. Sanitary sewer manholes: No water piping shall pass through or come in contact with any part of a sanitary sewer manhole.

3.1.1.2 Earthwork

Perform earthwork operations in accordance with Section 31 23 00.00 20, EXCAVATION AND FILL.

3.1.1.3 Pipe Laying and Jointing

Inspect each pipe and fitting before and after installation; replace those found defective and remove from site. Provide proper facilities for lowering sections of pipe into trenches. Lay nonpressure pipe with the bell ends in the upgrade direction. Adjust spigots in bells to give a uniform space all around. Blocking or wedging between bells and spigots will not be permitted. Replace by one of the proper dimensions, pipe or fittings that do not allow sufficient space for installation of joint material. At the end of each work day, close open ends of pipe temporarily with wood blocks or bulkheads. Provide batterboards not more than 25 feet apart in trenches for checking and ensuring that pipe invert elevations are as indicated. Laser beam method may be used in lieu of batterboards for the same purpose. Branch connections shall be made by use of regular fittings or solvent cemented saddles as approved. Saddles for ABS and PVC composite pipe shall conform to Figure 2 of ASTM D 2680; saddles for ABS pipe shall comply with Table 3 of ASTM D 2751; and saddles for PVC pipe shall conform to Table 4 of ASTM D 3034.

3.1.1.4 Connections to Existing Lines

Obtain approval from the Contracting Officer before making connection to existing line. Conduct work so that there is minimum interruption of service on existing line.

3.1.2 Special Requirements

3.1.2.1 Installation of PVC Plastic Piping

Install pipe and fittings in accordance with paragraph entitled "General Requirements for Installation of Pipelines" of this section and with the requirements of ASTM D 2321 for laying and joining pipe and fittings. Make joints with the gaskets specified for joints with this piping and assemble in accordance with the requirements of ASTM D 2321 for assembly of joints. Make joints to other pipe materials in accordance with the recommendations of the plastic pipe manufacturer.

3.1.2.2 Installation of PVC Plastic Pressure Pipe and Fittings

Unless otherwise specified, install pipe and fittings in accordance with paragraph entitled "General Requirements for Installation of Pipelines" of this section; with the requirements of AWWA C605 for laying of pipe,

joining PVC pipe to fittings and accessories, and setting of hydrants, valves, and fittings; and with the recommendations for pipe joint assembly and appurtenance installation in [AWWA M23](#), Chapter 7, "Installation."

a. Pipe Less Than 4 Inch Diameter:

(1) Threaded joints shall be made by wrapping the male threads with joint tape or by applying an approved thread lubricant, then threading the joining members together. The joints shall be tightened with strap wrenches which will not damage the pipe and fittings. The joint shall be tightened no more than 2 threads past hand-tight.

(2) Push-On Joints: The ends of pipe for push-on joints shall be beveled to facilitate assembly. Pipe shall be marked to indicate when the pipe is fully seated. The gasket shall be lubricated to prevent displacement. Care shall be exercised to ensure that the gasket remains in proper position in the bell or coupling while making the joint.

(3) Solvent-weld joints shall comply with the manufacturer's instructions.

b. Pipe 4 Inch Diameter Joints: Make push-on joints with the elastomeric gaskets specified for this type joint, using either elastomeric-gasket bell-end pipe or elastomeric-gasket couplings. For pipe-to-pipe push-on joint connections, use only pipe with push-on joint ends having factory-made bevel; for push-on joint connections to fittings, cut spigot end of pipe off square and re-bevel pipe end to a bevel approximately the same as that on ductile-iron pipe used for the same type of joint. Use an approved lubricant recommended by the pipe manufacturer for push-on joints. Assemble push-on joints for pipe-to-pipe joint connections in accordance with the requirements of [AWWA C605](#) for laying the pipe and the recommendations in [AWWA M23](#), Chapter 7, "Installation," for pipe joint assembly. Assemble push-on joints for connection to fittings in accordance with the requirements of [AWWA C605](#) for joining PVC pipe to fittings and accessories and with the applicable requirements of [AWWA C600](#) for joint assembly. Make compression-type joints/mechanical-joints with the gaskets, glands, bolts, nuts, and internal stiffeners specified for this type joint and assemble in accordance with the requirements of [AWWA C605](#) for joining PVC pipe to fittings and accessories, with the applicable requirements of [AWWA C600](#) for joint assembly, and with the recommendations of Appendix A to [AWWA C111](#). Cut off spigot end of pipe for compression-type joint/mechanical-joint connections and do not re-bevel.

c. Pipe anchorage: Provide concrete thrust blocks (reaction backing) for pipe anchorage. Size and position thrust blocks as indicated. Use concrete conforming to [ASTM C 94/C 94M](#) having a minimum compressive strength of 2,000 psi at 28 days; or use concrete of a mix not leaner than one part cement, 2 1/2 parts sand, and 5 parts gravel, having the same minimum compressive strength.

3.1.3 Concrete Work

Cast-in-place concrete is included in Section [03 30 50](#) CAST-IN-PLACE

CONCRETE.

3.1.4 Miscellaneous Construction and Installation

3.1.4.1 Connecting to Existing Manholes

Pipe connections to existing manholes shall be made so that finish work will conform as nearly as practicable to the applicable requirements specified for new manholes, including all necessary concrete work, cutting, and shaping. The connection shall be centered on the manhole. Holes for the new pipe shall be of sufficient diameter to allow packing cement mortar around the entire periphery of the pipe but no larger than 1.5 times the diameter of the pipe. Cutting the manhole shall be done in a manner that will cause the least damage to the walls.

3.1.4.2 Metal Work

- a. Workmanship and finish: Perform metal work so that workmanship and finish will be equal to the best practice in modern structural shops and foundries. Form iron to shape and size with sharp lines and angles. Do shearing and punching so that clean true lines and surfaces are produced. Make castings sound and free from warp, cold shuts, and blow holes that may impair their strength or appearance. Give exposed surfaces a smooth finish with sharp well-defined lines and arises. Provide necessary rabbets, lugs, and brackets wherever necessary for fitting and support.
- b. Field painting: After installation, clean cast-iron frames, covers, gratings, and steps not buried in concrete to bare metal of mortar, rust, grease, dirt, and other deleterious materials and apply a coat of bituminous paint. Do not paint surfaces subject to abrasion.

3.1.5 Installations of Wye Branches

Cutting into piping for connections shall not be done except in special approved cases. When the connecting pipe cannot be adequately supported on undisturbed earth or tamped backfill, the pipe shall be encased in concrete backfill or supported on a concrete cradle as directed. Concrete required because of conditions resulting from faulty construction methods or negligence by the Contractor shall be installed at no additional cost to the Government. The installation of wye branches in an existing sewer shall be made by a method which does not damage the integrity of the existing sewer. One acceptable method consists of removing one pipe section, breaking off the upper half of the bell of the next lower section and half of the running bell of wye section. After placing the new section, it shall be rotated so that the broken half of the bell will be at the bottom. The two joints shall then be made with joint packing and cement mortar.

3.2 FIELD QUALITY CONTROL

3.2.1 Field Tests and Inspections

The Contracting Officer will conduct field inspections and witness field tests specified in this section. The Contractor shall perform field tests and provide labor, equipment, and incidentals required for testing. Be able to produce evidence, when required, that each item of work has been constructed in accordance with the drawings and specifications.

3.2.2 Tests for Nonpressure Lines

Check each straight run of pipeline for gross deficiencies by holding a light in a manhole; it shall show a practically full circle of light through the pipeline when viewed from the adjoining end of line. When pressure piping is used in a nonpressure line for nonpressure use, test this piping as specified for nonpressure pipe.

3.2.2.1 Leakage Tests

Test lines for leakage by either infiltration tests or exfiltration tests, or by low-pressure air tests. Prior to testing for leakage, backfill trench up to at least lower half of pipe. When necessary to prevent pipeline movement during testing, place additional backfill around pipe sufficient to prevent movement, but leaving joints uncovered to permit inspection. When leakage or pressure drop exceeds the allowable amount specified, make satisfactory correction and retest pipeline section in the same manner. Correct visible leaks regardless of leakage test results.

- a. Infiltration tests and exfiltration tests: Perform these tests for sewer lines made of the specified materials, not only concrete, in accordance with [ASTM C 969](#). Make calculations in accordance with the Appendix to [ASTM C 969](#).
- b. Low-pressure air tests: Perform tests as follows:
 - (1) PVC plastic pipelines: Test in accordance with [UBPPA UNI-B-6](#). Allowable pressure drop shall be as given in [UBPPA UNI-B-6](#). Make calculations in accordance with the Appendix to [UBPPA UNI-B-6](#).

3.2.3 Tests for Pressure Lines

Test pressure lines in accordance with the applicable standard specified in this paragraph, except for test pressures. For hydrostatic pressure test, use a hydrostatic pressure [50 psi](#) in excess of the maximum working pressure of the system, but not less than [100 psi](#), holding the pressure for a period of not less than one hour. For leakage test, use a hydrostatic pressure not less than the maximum working pressure of the system. Leakage test may be performed at the same time and at the same test pressure as the pressure test. Test PVC plastic pressure lines in accordance with the requirements of [AWWA C605](#) for pressure and leakage tests, using the allowable leakage given therein.

-- End of Section --

SECTION 33 32 16.132

PACKAGE GRINDER PUMP STATION

04/06

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- ANSI B16.11 (1996) Forged Steel Fittings, Socket Welded and Threaded
- ANSI B16.3 (1998) Malleable Iron Threaded Fittings Classes 150 and 300

AMERICAN WATER WORKS ASSOCIATION (AWWA)

- AWWA C104 (1995) Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
- AWWA C110 (2003) Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (76 mm through 1219 mm), for Water
- AWWA C111 (2000) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
- AWWA C115 (1999) Flanged Ductile-Iron Pipe With Ductile-Iron or Gray-Iron Threaded Flanges
- AWWA C151 (2002) Ductile-Iron Pipe, Centrifugally Cast, for Water
- AWWA C500 (2002; A C500a-95) Metal-Seated Gate Valves for Water Supply Service
- AWWA C509 (2001) Resilient-Seated Gate Valves for Water Supply Service
- AWWA C600 (2005) Installation of Ductile-Iron Water Mains and Their Appurtenances
- AWWA M23 (2002) Manual: PVC Pipe - Design and Installation

ASME INTERNATIONAL (ASME)

- ASME B1.20.1 (1983; R 2006) Pipe Threads, General Purpose (Inch)

ASME B16.1 (1998) Cast Iron Pipe Flanges and Flanged Fittings Classes 25, 125, and 250

ASTM INTERNATIONAL (ASTM)

ASTM A 123/A 123M (2002) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM A 53/A 53M (2007) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

ASTM A 536 (1984e1; R 2004) Standard Specification for Ductile Iron Castings

ASTM D 1784 (2003) Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds

ASTM D 1785 (2005) Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120

ASTM D 2241 (2005) Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)

ASTM D 2464 (1999e1) Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80

ASTM D 2466 (2005) Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40

ASTM D 2467 (2005) Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80

ASTM D 3139 (1998; R 2005) Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals

ASTM F 477 (2008) Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1 (2007; Errata 2008) Standard for Motors and Generators

1.2 DESCRIPTION OF WORK

The work includes providing submersible sewage grinder pump station and related work. Provide system complete and ready for operations. Grinder pump station system including equipment, materials, installation, and workmanship shall be as specified herein.

1.3 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Pipe and fittings

Check valves

Gate valves

Submersible sewage grinder pumps

Pump motor

Flexible flanged coupling

SD-10 Operation and Maintenance Data

Submersible Sewage Grinder Pumps Data Package 3

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

Include pumps, alarms, and motors. Include all information on all equipment, alarm panel and controls, pumps and pump performance curves, and station layout in data for submersible sewage grinder pump station.

1.4 DELIVERY, STORAGE, AND HANDLING OF MATERIALS

1.4.1 Delivery and Storage

Inspect materials delivered to site for damage. Unload and store with minimum handling. Store materials in enclosures or under protective covering. Store rubber gaskets not to be installed immediately under cover, out of direct sunlight. Do not store materials directly on the ground. Keep interior of pipes and fittings free of dirt and debris.

1.4.2 Handling

Handle pipe, fittings, valves, and other accessories in such manner as to ensure delivery to the trench in sound, undamaged condition. Avoid injury to coatings and linings on pipe and fittings; make satisfactory repairs if coatings or linings are damaged. Carry pipe to the trench; do not drag it.

1.5 EXCAVATION, TRENCHING, AND BACKFILLING

Provide in accordance with Section 31 23 00.00 20 EXCAVATION AND FILL, except as specified herein.

PART 2 PRODUCTS

2.1 PIPE AND FITTINGS

Provide pressure piping, air release valves, and related accessories for force main piping outside the sewage wet well and valve vault in accordance with Section 33 30 00 SANITARY SEWERS.

2.1.1 Ductile-Iron Pipe

AWWA C151, thickness Class 52.

2.1.1.1 Flanged Pipe

AWWA C115, ductile iron.

2.1.1.2 Fittings

AWWA C110, flanged. Provide flanged joint fittings within wet well and valve vault as indicated. Provide mechanical joint fittings outside valve vault enclosure as indicated. Use fittings with pressure rating at least equivalent to that of the pipe.

2.1.1.3 Joints

AWWA C115 for flanged joints. Use bolts, nuts, and gaskets for flanged connections recommended in the Appendix to AWWA C115. Flange for setscrewed flanges shall be of ductile iron, ASTM A 536, Grade 65-45-12, conforming to the applicable requirements of ASME B16.1, Class 250. Setscrews for set screw flanges shall be 190,000 psi tensile strength, heat treated, and zinc-coated steel. Gasket for setscrewed flanges shall conform to the applicable requirements for mechanical-joint gaskets specified in AWWA C111. Use setscrewed gasket designed to provide for confinement and compression of gasket when joint to adjoining flange is made.

2.1.2 PVC Plastic Pressure Pipe and Associated Fittings

2.1.2.1 Pipe and Fittings Less Than 4 inch Diameter

Use pipe, couplings and fittings manufactured of materials conforming to ASTM D 1784, Class 12454-B.

- (1) Screw-Joint: Use pipe conforming to dimensional requirements of ASTM D 1785 Schedule 80, with joints meeting requirements of 150 psi working pressure, 200 psi hydrostatic test pressure, unless otherwise shown or specified. Use threaded pipe fittings conforming to requirements of ASTM D 2464, threaded to conform to the requirements of ASME B1.20.1 for use with Schedule 80 pipe and fittings. Test pipe couplings when used, as required by ASTM D 2464.
- (2) Push-On Joint: ASTM D 3139, with ASTM F 477 gaskets. Fittings for push-on joints: AWWA C110 or AWWA C111. Iron fittings and specials: cement-mortar lined (standard thickness) in accordance with AWWA C104.
- (3) Solvent Cement Joint: Use pipe conforming to dimensional requirements of ASTM D 1785 or ASTM D 2241 with joints meeting the requirements of 150 psi working pressure and 200 psi hydrostatic test pressure. Use fittings for solvent cement jointing conforming to ASTM D 2466 or ASTM D 2467.

2.1.3 Insulating Joints

Provide between pipes of dissimilar metals a rubber gasket or other approved type of insulating joint or dielectric coupling to effectively prevent metal-to-metal contact between adjacent sections of piping.

2.1.4 Accessories

Provide flanges, connecting pieces, transition glands, transition sleeves, and other adapters as required.

2.1.5 Flexible Flanged Coupling

Provide flexible flanged coupling applicable for sewage as indicated. Use flexible flanged coupling designed for a working pressure of 350 psi.

2.2 VALVES AND OTHER PIPING ACCESSORIES

2.2.1 Check Valves Less Than 4 Inch Diameter

Neoprene ball check valve with integral hydraulic sealing flange, designed for a hydraulic working pressure of 175 psi.

2.2.2 Pipe Support

Use pipe support schedule 40 galvanized steel piping conforming to ASTM A 53/A 53M. Provide either ANSI B16.3 or ANSI B16.11 galvanized threaded fittings.

2.2.3 Miscellaneous Metals

Use stainless steel bolts, nuts, washers, anchors, and supports for installation of equipment.

2.2.4 Quick Disconnect System with Hydraulic Sealing Flange

Use quick disconnect system consisting of a steel base plate for supporting the pumps, a hydraulic sealing flange, pump guide rails and the discharge pipe supports. Use two guide rails of galvanized steel in accordance with ASTM A 123/A 123M. Provide a steel lifting chain for raising and lowering the pump in the basin. Build guides onto pump housing to fit the guide post to assure perfect alignment between pump and guide rails.

2.2.5 Wet Well Vent

Galvanized ASTM A 53/A 53M pipe with insect screening.

2.3 SUBMERSIBLE SEWAGE GRINDER PUMPS

Provide explosion proof submersible sewage pumps with grinder units as shown on the drawings. Submersible pump shall be explosion proof for NEC Class 1, Division 1, Group C and D hazardous locations. Provide submersible, centrifugal sewage pumps of the non-clogging type with passageways designed to pass 2 inch diameter spheres without clogging and grinder units capable of grinding all materials found in normal domestic sewage, including plastics, rubber, sanitary napkins, disposable diapers, and wooden articles into a finely ground slurry with particle dimensions no greater than 1/4 inch. Pump capacity and motor characteristics as indicated. Design pump to operate in a submerged or partially submerged condition. Provide an integral sliding guide bracket and two guide bars capable of supporting the entire weight of the pumping unit.

2.3.1 Casing

Provide hard, close-grained cast iron casing which is free from blow holes,

porosity, hard spots, shrinkage defects, cracks, and other injurious defects. Design casings to permit replacement of wearing parts. Design passageways to permit smooth flow of sewage and to be free of sharp turns and projections.

2.3.2 Impeller

Provide non-clogging type cast-iron impeller. Make impeller with smooth surfaces, free flowing with the necessary clearance to permit objects in the sewage to pass. Fit and key, spline, or thread impeller on shaft, and lock in such manner that lateral movement will be prevented and reverse rotation will not cause loosening.

2.3.3 Shaft and Shaft Seals

Provide shaft of stainless steel. Provide mechanical seal of double carbon and ceramic construction with mating surfaces lapped to a flatness tolerance of one light band. Hold rotating ceramics in mating position with stationary carbons by a stainless steel spring. Oil lubricate bearings.

2.3.4 Bearings

Provide heavy duty ball thrust bearing or roller type bearing of adequate size to withstand imposed loads. Oil lubricate bearings.

2.3.5 Pump and Motor

Use pump and motor assembled on a single stainless steel shaft in a heavy duty cast-iron shell. Use free standing pump support legs of cast-iron providing enough clearance for the solids to get into the grinder.

2.4 PUMP MOTOR

Provide explosion proof submersible sewage pumps in wet well NEMA MG 1, 3,450 RPM, 230 volt, single phase, and 60 Hz cycle and for submersible pumps. Motor horsepower shall be not less than pump horsepower at any point on the pump performance curve. Fit motors with lifting "eyes" capable of supporting entire weight of pump and motor.

2.5 PUMP CONTROL SYSTEM

Provide a sealed mercury float switch control system as indicated. Automatically alternate operation from one pump to the other and start second pump in the event first pump cannot handle incoming flow. Provide manual "on-off" switch for each pump. Provide independent adjustable high and low water level switches. Provide floats, supports, and alarm. Metal parts, if used, shall be of bronze or equivalent corrosion resistant material.

2.5.1 Float Assembly Description

Use a direct acting float switch consisting of a normally-open mercury switch enclosed in a float. Use pipe mounted float assembly. Use float molded of rigid high-density polyurethane foam, color-coded and coated with a durable, water and corrosion-resistant jacket of clear urethane. Provide connecting cable and support pole in accordance with manufacturers recommendations. Provide a cast aluminum NEMA Type 4 junction box to connect float assembly. Use box with a gasketed cover with tapped float

fitting and conduit entrance pipe threaded opening. Mount floats at fixed elevations as shown. Use floats designed to tilt and operate their switches causing sequential turn-on turn-off of the pump, when the liquid level being sensed rises or falls past the float.

2.5.2 Alternator

Provide an alternator control switch to operate in connection with each float. Use alternator control switch to alternate the operation of the pumps and operate both pumps if the water level rises above the second high water level. Incorporate time delay function and devices in the alternator controls such that both sewage pumps cannot be started simultaneously for an adjustable period of 10 to 120 seconds after shutdown. Use delay function designed to operate in any condition of start-up in either normal or emergency operational mode.

2.5.3 Sewage Pump Alarm and Control Panel

Enclose alarm panel in NEMA IV enclosure and with a flashing red light with long life bulb in guarded enclosure and 6 inch diameter horn. Horn shall emit 120 DB at 10 feet. Power alarm horn and light from 12V DC power supply with battery backup. Provide a rechargeable battery rated to power both the horn and light for a minimum of two hours upon loss of main power. Provide circuitry to automatically recharge the battery after main power is restored. Full charge of battery shall take no more than 20 hours. Use panel switch with power on light, push to test button for horn and light and push to silence button for horn and light with automatic reset for next alarm. Use alarm designed to activate under the following conditions:

- a. High liquid level as sensed by float switch
- b. Loss of main power
- c. No flow light as sensed by limit switch on the check valve

2.5.4 Electrical Requirements

Furnish motors with their respective pieces of equipment. Motors, controllers, contactors, and disconnects shall be as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Furnish internal wiring for components of packaged equipment as an integral part of the equipment. Provide power wiring and conduit for field installed equipment.

2.5.5 Electric Motor

Use hermetically sealed electric motor. The power cable shall be sealed inside the motor end bell. The cable shall be neoprene covered with a flexible metal cover over it for its full length.

2.6 UNDERGROUND EQUIPMENT ENCLOSURE

2.6.1 Access Hatch Cover

Provide aluminum access hatch cover as indicated. The access hatch shall include lifting mechanism, automatic hold open arm, slam lock with handle, and flush lift handle with red vinyl grip. Use automatic hold open arm that locks in the 90 degree position. Use cover that is 1/4 inch diamond plate with 1/4 inch channel frame and continuous anchor flange. Use access hatch cover capable of withstanding a live load of 300 lbs./sq. ft.

Provide stainless steel cylinder lock with two keys per lock. Key all the locks the same.

2.6.2 Wet Well

Provide fiberglass reinforced polyester resin basin with inside diameter as indicated.

2.6.3 Wet Well Base Material

Provide crushed stone.

PART 3 EXECUTION

3.1 INSTALLATION

Provide pump station in accordance with drawings and requirements of the respective equipment manufacturers. Dampen and isolate equipment vibration.

3.1.1 Installation of PVC Plastic Pressure Pipe and Fittings

Unless otherwise specified, install pipe and fittings in accordance with paragraph entitled "General Requirements for Installation of Pipelines" of this section and with the recommendations for pipe joint assembly and appurtenance installation in [AWWA M23](#), Chapter 7, "Installation."

a. Pipe Less than 4 Inch Diameter:

(1) Make threaded joints by wrapping the male threads with joint tape or by applying an approved thread lubricant, than threading the joining members together. Tighten joints with strap wrenches that will not damage the pipe and fittings. Do not tighten joint more than 2 threads past hand-tight.

(2) Push-On Joints: Bevel ends of pipe for push-on joints to facilitate assembly. Mark pipe to indicate when the pipe is fully seated. Lubricate gasket to prevent displacement. Exercise care to ensure that the gasket remains in proper position in the bell or coupling while making the joint.

(3) Solvent-weld joints shall comply with the manufacturer's instructions.

3.1.2 Valves

Installation of Valves: Install gate valves conforming to [AWWA C500](#) in accordance with [AWWA C600](#) for valve-and-fitting installation and with the recommendations of the Appendix ("Installation, Operation, and Maintenance of Gate Valves") to [AWWA C500](#). Install gate valves conforming to [AWWA C509](#) in accordance with [AWWA C600](#) for valve-and-fitting installation and with the recommendations of the Appendix ("Installation, Operation, and Maintenance of Gate Valves") to [AWWA C509](#). Install check valves in accordance with the applicable requirements of [AWWA C600](#) for valve-and-fitting installation. Make and assemble joints to gate valves and check valves as specified for making and assembling the same type joints between pipe and fittings.

3.1.3 Force Main

Provide in accordance with Section 33 30 00 SANITARY SEWERS.

3.1.4 Equipment Installation

Install equipment in accordance with these specifications and the manufacturer's installation instructions. Grout equipment mounted on concrete foundations before installing piping. Install piping to avoid imposing stress on any equipment. Match flanges accurately before securing bolts.

3.2 FIELD TESTS AND INSPECTIONS

Perform all field tests, and provide all labor, equipment, and incidentals required for testing, except that water and electric power needed for field tests will be furnished as set forth in Division 01. Produce evidence, when required, that any item of work has been constructed in accordance with contract requirements. Allow concrete to cure a minimum of 5 days before testing any section of piping where concrete thrust blocks have been provided.

3.2.1 Testing Procedure

Test piping in accordance with the Section 33 30 00 SANITARY SEWERS. Test in operation all equipment to demonstrate compliance with the contract requirements.

3.2.2 Sewage Grinder Pump Station

Test pumps and controls, in operation, under design conditions to insure proper operation of all equipment. Provide all appliances, materials, water, and equipment for testing, and bear all expenses in connection with the testing. Conduct testing after all equipment is properly installed, electrical services and piping are installed, liquid is flowing, and the pump station is ready for operation. Correct all defects discovered to the satisfaction of the Contracting Officer, and all tests repeated, at the expense of the Contractor, until the equipment is in proper working order.

-- End of Section --

SECTION 33 63 13

EXTERIOR UNDERGROUND STEAM DISTRIBUTION SYSTEM

04/06

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)

AASHTO M 300 (2003; R 2007) Inorganic Zinc-Rich Primer

ASME INTERNATIONAL (ASME)

ASME B16.11 (2005) Forged Fittings, Socket-Welding and Threaded

ASME B16.9 (2007) Standard for Factory-Made Wrought Steel Butt welding Fittings

ASME B31.1 (2007; Addenda 2008) Power Piping

ASTM INTERNATIONAL (ASTM)

ASTM A 106/A 106M (2008) Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service

ASTM A 134 (1996; R 2005) Standard Specification for Pipe, Steel, Electric-Fusion (Arc)-Welded (Sizes NPS 16 and Over)

ASTM A 135/A 135M (2006) Standard Specification for Electric-Resistance-Welded Steel Pipe

ASTM A 139/A 139M (2004) Standard Specification for Electric-Fusion (ARC)-Welded Steel Pipe (NPS 4 and over)

ASTM A 167 (1999; R 2004) Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

ASTM A 234/A 234M (2007) Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service

ASTM A 36/A 36M (2008) Standard Specification for Carbon

Structural Steel

ASTM A 53/A 53M

(2007) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

ASTM D 2487

(2006e1) Soils for Engineering Purposes (Unified Soil Classification System)

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS L-S-125

(Rev B) Screening, Insect, Nonmetallic

1.2 DEFINITIONS

The following definitions are applicable:

1.2.1 Pre-engineered System

A complete underground heat distribution and condensate return system including all required components such as carrier pipes, steam pipe, condensate return pipe, and fittings, anchors, pipe supports, insulation, protective casing for the system supplied. The pre-engineered system shall include all piping and components to a point at least six inches inside the building and valve manhole. The UHDS shall not use any part of the building or valve manhole structure as an anchor point.

1.2.2 Direct-Buried

A system which is buried without the need for a field-fabricated protective enclosure such as a concrete trench or tunnel.

1.2.3 UHDS Types

1.2.3.1 Drainable-Dryable-Testable (DDT) Direct-Buried System

A factory-fabricated system including an air and water-tight outer protective casing, air space and an insulated carrier pipe. Drains and vents are provided at the end plates of the system (in manholes or buildings). The drains are normally plugged but the plugs can be removed to drain water which may leak into the air space if there is a failure in the casing or the carrier pipe. The vents allow water vapor to escape and provide a tell-tale sign of leakage.

1.2.4 UHDS Manufacturer Certification

The UHDS manufacturer is the company responsible for the design and manufacture of the pre-engineered system. The UHDS manufacturer directs the installation of their system and has a representative on the job site. Certification includes that the UHDS manufacturer regularly and currently manufactures direct-buried systems, and that the designs of the system and equipment to be provided for this project conform to specification requirements. This certification shall be an original signed by a principal officer of the UHDS manufacturer and shall be submitted at minimum of 2 weeks prior to start of work.

1.2.5 UHDS Manufacturer's Representative

The UHDS manufacturer's representative shall be a person who regularly

performs the duties specified herein, is certified in writing by the UHDS manufacturer to be technically qualified and experienced in the installation of the system, and shall be authorized by the manufacturer to make and sign the daily reports specified herein. The UHDS manufacturer's representative shall be under the direct employ and supervision of the UHDS manufacturer.

1.2.6 Pipe-Stress and System Expansion Calculations

Pipe-stress and system-expansion calculations for each expansion compensation elbow using a finite element computer generated three-dimensional analysis, not later than 7 days after notice to proceed.

Calculations (including heat loss calculations) shall demonstrate that pipe stresses from temperature changes are within the allowable requirements in ASME B31.1 and the anchors and the guides will withstand the resultant forces. Submitted detailed design layout drawings including the location of all anchors and guides. Layout shall also include all analysis node points. As a minimum, the computer analysis results include node stresses, forces, moments and displacements. Calculations shall be approved, certified, stamped and signed by a registered Professional Engineer in the employ of the UHDS manufacturer.

1.2.7 Manufacturer's Data Sheets

Manufacturer's data sheets on all components of the UHDS and the instrumentation required for thermal performance testing.

Manufacturer's data sheets for all coatings and for carrier pipe insulation, indicate thicknesses not later than 7 days after notice to proceed.

1.2.8 Work Plan

A proposed schedule of activities indicating when various items of work and tests are to be carried out and when the representative of the UHDS manufacturer shall be present at job site. The UHDS manufacturer shall submit a list of what characteristics shall be considered damaged or defective materials that must be replaced.

1.2.9 Quality Assurance Plan

Manufacturer's quality assurance plan for fabrication, delivery, storage, installation and testing of system.

1.2.10 Thermal Performance Testing

A proposed test procedure and proposed samples of test data sheets for each required test, 30 days prior to the proposed test date. The procedure shall contain a complete description of the proposed test with calibration curves or test results furnished by an independent testing laboratory of each instrument, meter, gauge, and thermometer to be used in the tests. The test shall not commence until the procedure has been approved.

1.2.11 Certificate of Compliance

Upon completion of the work, and before final acceptance, a notarized statement signed by a principal officer of both the UHDS manufacturer and the contractor, certifying that the system has been installed

satisfactorily and in accordance with the contract drawings, specifications, UHDS manufacturer's detailed design layout drawings and with the UHDS manufacturer's recommendations.

1.2.12 Testing Firm Qualification

A Certificate of the Testing Firm Qualification from the independent testing firm or firms, not later than 7 days after notice to proceed, certifying that: weld examination methods and procedures, and the interpretation of radiographic films will be performed in accordance with ASME B31.1; the firm intends to utilize the proper film exposure, techniques, and penetrometer to produce density and geometric sharpness in sufficient clarity to determine presence of defects; and that all radiographic films will be reviewed and interpreted, and reading reports signed, by not less than a Certified American Society for Nondestructive Testing Level III Radiographer.

1.2.13 Welds

A Certification of Acceptability of all welds made in the field, upon completion of the project. This certification shall consist of a letter signed by an official of the independent testing firm or firms examining welds, stating that all provisions of this specification have been complied with, and that all welds inspected radiographically have met the acceptability standards specified.

1.2.14 Daily Written Report

A daily written report from the representative of the UHDS manufacturer whenever the representative is required to be on the jobsite. The report shall be checked for accuracy and the original shall be submitted no later than the next working day after the date of the report. One copy shall be forwarded to the UHDS manufacturer's main office. The report shall be signed by the representative. The report shall state whether or not the condition and quality of the materials and methods used and the installation of the system are in accordance with the contract drawings, specifications, and the UHDS manufacturers detailed design layout drawings and requirements. If anything connected with the installation is unsatisfactory, the report shall state what corrective action has been taken or shall contain the UHDS manufacturer's recommendations for corrective action and when the unsatisfactory condition is to be corrected. The daily report will track and report all unsatisfactory conditions and corrective measured being taken. The report shall identify any conditions that could result in an unsatisfactory installation, including such items as open conduit ends left in the trench overnight and improper valve manhole entries and changes required to the UHDS design due to interferences or conflicts, upon realization of interferences or conflicts. On a weekly basis the daily reports shall be reviewed, approved, signed and sealed by the registered Professional Engineer responsible for the system design and shall be submitted to the Contracting Officer.

1.2.15 Heat Distribution System, Data Package 2

The operation and maintenance manual for the heat distribution system shall list routine maintenance procedures, possible breakdowns and repairs, procedures for recording conduit temperatures biannually, and troubleshooting guides. Manual shall include as-built piping layout of the system including final elevations. Submit in accordance with Section

01 78 23 OPERATION AND MAINTENANCE DATA.

1.3 DESCRIPTION

1.3.1 Scope

The work includes the design and fabrication; furnishing; installing, and testing of a direct buried underground insulated steam pipe, , insulated steel condensate return pipe, consisting of piping as indicated, cathodic protection system(where required by this specification), together with all fittings and appurtenances necessary for a complete and operable system. Gland type end seals shall not be permitted. Drainable, dryable, testable (DDT) systems with fiberglass casings shall not be provided.

1.3.2 UHDS Design

The UHDS manufacturer shall be responsible for the complete design of the UHDS, the product to be supplied, fabrication, witnessing installation and testing of the system within the design parameters established by the contract drawings and specifications, and in compliance with the detailed design. The complete design of the UHDS shall be sealed by a Professional Engineer in the employ of the UHDS manufacturer. A Certificate of Satisfactory Operation shall be submitted certifying that at least 3 systems installed by the UHDS manufacturer within the previous 10 years have and are operating satisfactorily for not less than 5 years, not later than 10 days after notice to proceed. The certificate shall indicate the location, type of system, size of system, point of contact (POC) including phone number, for information verification. This certificate of satisfactory operation shall be an original signed by a principal officer of the UHDS manufacturer.

1.3.3 Contract Drawings

The contract drawings accompanying this specification provide information on:

- a. The size of carrier pipes, approximate length, and site location of the system.
- b. The routing and elevation of the piping along the route.
- c. Location and design of manholes.
- d. The obstacles that must be avoided along the path.
- e. Location of piping **anchors** (anchors will be no closer than **3 feet** nor further than **5 feet** from entrance to manholes and buildings) at manholes and/or buildings. The UHDS manufacturer shall incorporate any additional anchors as needed for their system.
- f. Operating pressure and temperature of system.

1.4 SYSTEM REQUIREMENTS

1.4.1 Operating Characteristics

The steam supply system shall have an operating temperature of **358 degrees F** and an operating pressure of **150 psig**. Condensate return system shall have an operating temperature of **245 degrees F** and an operating pressure of

30 psig.

1.4.2 Rated Characteristics

All thermal expansion calculations shall be computed for the supply and return piping using the following design characteristics and installation temperature. The system design conditions for steam, condensate, supply and/or return at a temperature of 358 degrees F and a pressure of 150 psig. For calculation purposes the installation temperature (the ambient temperature at the site) shall be no higher than a temperature of 20 degrees F.

1.4.3 Heat Distribution System design

A complete description of the Heat Distribution System design and assembly of the system, materials of construction and field installation instructions minimum of 2 days prior to the start of field measurements. Also submittal shall include sufficient system details required to show that the specified minimum insulation thickness has been met. A detailed design layout of the system (plan and elevation views) showing size, type, elevations and location of each component to be used in the system, the design and location of anchors, pipe guides, pipe supports, expansion loops, Z-bends, L-bends, end seals, leak plates, joint locations, pipe and insulation thickness and sizes, types, and movements, connection to manhole and building wall penetrations, and including, if applicable, transition point design to aboveground or other type systems. Also, if applicable, type and details of the cathodic protection system to be used. Detailed design layout drawings shall be prepared and approved by a registered Professional Engineer as certified by their stamp.

1.5 STANDARD PRODUCTS

Approval by Contracting Officer is required for products or services of the UHDS manufacturer. The design of the system and equipment provided for this project shall conform to specification requirements, shall be of current production and shall essentially duplicate systems that have been in satisfactory use for at least 5 years, prior to bid opening, at three locations. The systems must have been operated under pressure, temperature and site characteristics that are equal to or more severe than the operating conditions in this specification and must have distributed the same medium. The system shall be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site.

1.6 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Heat Distribution System design

SD-03 Product Data

Pipe

Insulation

Fittings

Anchors

Expansion joints

Coatings

Conduit

Field Connection of Casing Sections

SD-05 Design Data

Pipe-stress and system expansion calculations

Manufacturer's data sheets

SD-07 Certificates

Work plan

Quality assurance

Thermal performance testing

UHDS manufacturer certification

UHDS design

Certificate of compliance

Testing firm qualification

Welds

SD-10 Operation and Maintenance Data

Heat distribution system, Data Package 2;

Submit operation and maintenance data in accordance with Section
01 78 23 OPERATION AND MAINTENANCE DATA.

SD-11 Closeout Submittals

Daily written report

1.7 SITE CLASSIFICATION

Classification of the site conditions for the UHDS was based on ASTM D 2487 and the following criteria: Moderate.

TABLE A
SITE CLASSIFICATION DEFINITION
BASED ON KNOWN UNDERGROUND WATER CONDITIONS

Site Classification	General Conditions for Classification
Severe	<p>The water table is expected to be frequently above the bottom of the system and surface water is expected to accumulate and remain for long periods in the soil surrounding the system.</p> <p>OR</p> <p>The water table is expected to be occasionally above the bottom of the system and surface water is expected to accumulate and remain for long periods in the soil surrounding the system.</p>
Bad	<p>The water table is expected to be occasionally above the bottom of the system and surface water is expected to accumulate and remain for short periods (or not at all) in the soil surrounding the system</p> <p>OR</p> <p>The water table is expected never to be above the bottom of the system but surface water is expected to accumulate and remain for short periods in the soil surrounding the system.</p>
Moderate	<p>The water table is expected never to be above the bottom of the system but surface water is expected to accumulate and remain for short periods (or not at all) in the soil surrounding the system.</p> <p>OR</p> <p>The water table is expected never to be above the bottom of the system but surface water is expected to accumulate and remain for brief or occasional periods in the soil surrounding the system.</p> <p>OR</p> <p>The water table is expected never to be above the bottom of the system and surface water is not expected to accumulate or remain in the soil surrounding the system.</p>

TABLE B
SITE CLASSIFICATION CRITERIA
BASED ON SUBSURFACE SOIL INVESTIGATION

Site Classif- ication	Water Table Level	Soil Types	Terrain	Precipitation Rates or Irrigation Practices in Area
SEVERE	Water table Within 1 foot of bottom of system	Any	Any	Any
	OR			
	Water table Within 5 feet of bottom of system	GC, SC CL, CH OH	Any	Any
BAD	Water table Within 5 feet of bottom of system	GW, GP, SW, SP	Any	Any
	OR			
	No groundwater encountered	GC, SC, SW, CH, OH	Any	Equivalent to 3 in. or more in any one month or 20 in. or more in one year.
MODERATE	No groundwater encountered	GM, SM, ML, OL, MH	Any	Equivalent to 3 in. or more in any one month or 20 in, or more in one year.
	OR			
	No groundwater encountered	GC, SC, CL, CH, OH	Any except low areas	Equivalent to less than 3 in. in any one month or less than 20 in. in one year.
	OR			
	No groundwater encountered	GW, GP, SW, SP	Any	Any
OR				

TABLE B
SITE CLASSIFICATION CRITERIA
BASED ON SUBSURFACE SOIL INVESTIGATION

Site Classif- ication	Water Table Level	Soil Types	Terrain	Precipitation Rates or Irrigation Practices in Area
	No groundwater encountered	GM, SM, ML, SM,	Any	Equivalent to less than 3 in. in any one month or less than 20 in. in one year.

PART 2 PRODUCTS

2.1 FACTORY FABRICATED, DIRECT-BURIED, DRAINABLE, DRYABLE, TESTABLE (DDT) SYSTEMS

2.1.1 DDT Steam and High Temperature Hot Water Carrier Pipes

Requirements shall be in accordance with the "Heat Distribution Piping" paragraph.

2.1.2 DDT Condensate Carrier Pipes

Carrier piping for condensate return systems shall be steel, schedule 80. Pipe requirements shall be in accordance with the "Heat Distribution Piping" paragraph.

Do not locate condensate pipes in conduit casings which contain steam pipes or any other piping.

2.1.3 DDT Carrier Pipe Insulation

Carrier pipe insulation shall conform to minimum thicknesses and type listed in Tables 1 and 2 as required for temperature in carrier pipe specified under the "Rated Conditions" paragraph.

2.1.4 Insulation Banding and Scrim

Stainless steel bands and clips, at least 0.5 inches wide, ASTM A 167 (304 stainless steel), maximum spacing 18 inches shall be used over the scrim to secure the insulation onto the carrier pipe. A minimum of two bands are required for each 4 foot section of insulation. Vinyl-coated fiberglass scrim, FS L-S-125, Type II, Class 2, with 18 x 16 mesh (number of filaments per inch) and made of 0.013 inch diameter vinyl-coated fibrous glass yarn. Bands are used over the scrim to secure the insulation onto the carrier pipe.

2.1.5 Casing

Smooth-wall steel, electric resistance spiral welded, conforming to ASTM A 134, ASTM A 135/A 135M, or ASTM A 139/A 139M and the values tabulated below. Provide eccentric connectors as necessary between casing sections to provide drainage of casing section between manholes and between

manholes and buildings.

Casing Diameter (in.)	Minimum Thickness (in.)
6 - 26	0.250
27 - 36	0.250
37 - 42	0.250
46	0.250

2.1.6 Casing End Plates, Vents, and Drains

End plates shall be made of **ASTM A 36/A 36M** steel, minimum thickness **0.5 inches** for **conduit** pipe sizes above **12 inches** and **0.375 inches** for conduit pipe sizes **12 inches** and less. Provide **1 inch ASTM A 53/A 53M**, Schedule 40, galvanized vent riser pipe on end plate vent opening. Vent pipe shall extend to top of manhole and terminate **12 inches** above grade with a 180 degree bend. Provide **one inch** drain at the bottom and vent at the top. Construct with welded steel half coupling welded to the end plate, and brass plugs. Plug drains, do not plug vents.

2.1.7 Air Space

Provide continuous **one inch** minimum air space between carrier pipe insulation and casing.

2.1.8 Casing Coating

Fusion-bonded epoxy, minimum thickness **0.040 inches**. Rated by coating manufacturer for continuous service for at least 25 years at temperatures of **230 degrees F** and having a coefficient of expansion similar to that of steel. Coating shall be applied in accordance with the coating manufacturer's instructions. Factory-inspect for holidays and make repairs as necessary.

2.1.9 Coating of End Plates and conduit Sections Extending in Manholes

Zinc-rich coating that conforms to **AASHTO M 300**, Type IA except that volatile organic compounds shall not exceed **2.8 pounds per gallon**. The zinc rich coating shall be applied in accordance with the coating manufacturer's requirements including surface preparation. No additional top coat shall be applied.

2.1.10 Carrier Pipe Guides

Maximum spacing **10 feet** on centers, no more than **5 feet** from pipe ends, minimum of three guides per elbow section. Guides shall be designed to allow thermal expansion without damage, provide proper pipe guiding, and to allow horizontal movement in two directions as required at expansion loops and bends. Design of supports shall permit flow of water and air vapor through the support. Pipe insulation shall extend thru the pipe guides and be protected by steel sleeves. Design of guides shall be such that no metal to metal contact exists between the casing and the carrier pipe. Insulation or non-metallic material used to ensure no metal to metal contact shall be designed to not be compressed by the weight of the carrier pipe when full of water.

2.1.11 Anchor Plates

Anchor plate shall be **ASTM A 36/A 36M** steel, welded to carrier pipe and

casing, 0.5 inches minimum thickness and shall include, passages for air flow and water drainage through the annular air space in the system. Exterior surface of the anchor plate shall be coated with the same coating material as the casing.

2.1.12 Field Connection of Casing Sections

Steel section conforming to casing specification, welded to casing sections, coated on all surfaces with UHDS manufacturer's coating field repair compound, and covered with a 0.05 inch minimum thickness polyethylene shrink sleeve designed for a service temperature exceeding 500 degrees F.

2.1.13 Manufacturer's Identification

Provide embossed brass or stainless steel tag hung by brass or stainless steel chain at each end of each conduit or insulated piping in the manholes and buildings. The tag shall identify UHDS manufacturer's name, date of installation, Government contract, and manufacturer's project number.

2.2 PIPE INSULATION FOR DIRECT BURIED HEAT DISTRIBUTION SYSTEMS

Materials containing asbestos are not permitted.

2.2.1 Insulation Thickness

The minimum thickness of insulation for the heat distribution system shall be in accordance with Tables 1 and 2 in which the insulations listed have passed the 96 hour boiling water test.

TABLE 1
MINIMUM PIPE INSULATION THICKNESS (inches)

For Steam (16 to 408 psig) and High Temperature
Hot Water Supply and Return (250 to 450 degrees F).

Nominal Pipe Diameter (inches)	INSULATIONS For Drainable/Dryable Systems		INSULATIONS For other Pre-Engineered Systems		
	Paroc Delta	Epitherm	Kaylo-10 Thermo-12 Super Caltemp	Calcium Silicate	WSL Polyurethane
1.0	2.0	2.5	4.0	N/A	N/A
1.5	2.0	2.5	4.0	N/A	N/A
2.0	2.5	3.5	4.5	N/A	N/A
2.5	2.5	3.5	4.5	N/A	N/A
3.0	3.0	4.0	5.0	1.0	+1.23
4.0	3.0	4.0	5.0	1.0	+1.22
5.0	3.0	4.0	5.0	N/A	N/A
6.0	3.5	4.5	5.5	1.5	+1.34
8.0	3.5	4.5	5.5	2.0	+1.21
10.0	4.0	5.0	6.0	2.5	+1.31
12.0	4.0	5.0	6.0	2.0	+1.29
14.0	4.0	5.0	6.0	N/A	N/A
16.0	4.0	5.0	6.0	N/A	N/A
18.0	4.0	5.0	6.0	N/A	N/A

TABLE 2
 MINIMUM PIPE INSULATION THICKNESS (inches)
 CONDENSATE RETURN
 HIGH TEMPERATURE HOT WATER RETURN SYSTEM

Nominal Pipe Diameter (inches)	Kaylo-10 Thermo-12			
	Paroc	Epitherm	Super Caltemp	Polyurethane
1.0	1.5	2.0	3.0	N/A
1.5	1.5	2.0	3.0	N/A
2.0	1.5	2.0	3.0	0.77
2.5	1.5	2.0	3.0	N/A
3.0	2.0	2.5	3.5	1.05
4.0	2.0	2.5	3.5	1.05
5.0	2.0	2.5	3.5	N/A
6.0	2.5	3.0	4.5	1.32
8.0	2.5	3.0	4.5	N/A
10.0	3.0	4.0	5.0	N/A
12.0	3.0	4.0	5.0	N/A
14.0	3.0	4.0	5.0	N/A
16.0	3.0	4.0	5.0	N/A
18.0	3.0	4.0	5.0	N/A

2.3 HEAT DISTRIBUTION PIPING

2.3.1 Steam Pipe

Pipe material shall be steel; seamless, [ASTM A 53/A 53M](#), Grade B or [ASTM A 106/A 106M](#), Grade B; or electric resistance welded [ASTM A 53/A 53M](#), Grade B; Schedule 40. Standard weight permitted for pipe sizes 12 inches and above. [ASTM A 53/A 53M](#), Type F furnace butt welded pipe is not allowed. No joints shall be allowed in the factory fabricated straight section of the carrier pipe. Factory fabricated piping sections as part of an expansion loop or bend shall have all welded joints 100 percent radiographed inspected in accordance with [ASME B31.1](#). Radiographs shall be reviewed and interpreted by a Certified American Society for Nondestructive Testing (ASNT) Level III radiographer, employed by the testing firm, who shall sign the reading report.

2.3.1.1 Condensate Pipe

Steel; seamless, [ASTM A 53/A 53M](#), Grade B or [ASTM A 106/A 106M](#), Grade B, schedule 80; electric resistance welded [ASTM A 53/A 53M](#), Grade B; Schedule 80. [ASTM A 53/A 53M](#), Type F furnace butt welded pipe is not allowed. No joints shall be allowed in the factory fabricated straight section of the carrier pipe. Factory fabricated piping sections as part of an expansion loop or bend shall have all welded joints 100 percent radiographed inspected in accordance with [ASME B31.1](#). Radiographs shall be reviewed and interpreted by an ASNT Certified Level II radiographer, employed by the testing firm, who shall sign the reading report.

2.3.1.2 Joints

Joints shall be butt-weld except socket-weld joints are permitted for pipe sizes 2 inches and smaller. Dye penetrant inspection may be used in place of 100 percent radiographic inspection for pipe sizes 2 inches and below.

Indicate location and elevation of all field joints on detailed design layout drawings. Split-ring welding rings may be used.

2.3.2 Fittings

All welds in factory fittings shall be 100 percent radiographic inspected. All radiographs shall be reviewed and interpreted by a Certified ASNT Level III radiographer, employed by the testing firm, who shall sign the reading report. The Contracting Officer reserves the right to review all inspection records, and if any welds inspected are found unacceptable in accordance with ASME B31.1, the fitting shall be removed, replaced, and radiographically reexamined at no cost to the government.

2.3.2.1 Butt-Welded

Steel, ASTM A 234/A 234M, Grade B, ASME B16.9, same schedule as adjoining pipe. All elbows shall be long radius unless otherwise indicated. Tees shall be full size or reducing as required, having interior surfaces smoothly contoured. Split-ring welding rings may be used.

2.3.2.2 Socket-Welded

Forged steel, ASME B16.11, 2000 pound class will be used for pipe sizes 2 inch and below. Dye penetrant inspection may be used in place of 100 percent radiographic inspection of welded fittings for pipe sizes 2 inch and below.

2.4 EXPANSION JOINTS, LOOPS AND BENDS

Stresses shall be less than the maximum allowable stress from the Power Piping Code (ASME B31.1). Submit detailed design layout drawings and stress and anchor force calculations for all loops and bends. Show locations of all anchors, guides and supports. Base the calculations on rated characteristics (pressures and temperatures), specified herein, for both the supply and return lines.

PART 3 EXECUTION

3.1 GENERAL

3.1.1 UHDS Design

The UHDS manufacturer is responsible for the complete design of the UHDS, the product to be supplied, fabrication, witnessing installation and testing of the system within the design parameters established by the contract drawings and specifications and in compliance with the detailed design. The complete design of the UHDS shall be prepared, signed, and sealed by a Professional Engineer in the employ of the UHDS manufacturer.

3.1.2 Installation, Inspection, and Testing

The pre-engineered system shall be installed, inspected, and tested in accordance with the contract drawings and specifications, the UHDS manufacturer's standard procedures, detailed design layout drawings and any directions given by the UHDS manufacturer's representative. All work described in paragraph "UHDS Manufacturer's Representative's Responsibilities" shall be performed in the presence of the UHDS manufacturer's representative.

3.1.3 Interruption of Existing Service

The contractor shall arrange, phase and perform work and provide temporary facilities, materials, equipment, and connections to utilities, to assure adequate heat distribution service for existing installations at all times. Only such absolutely necessary interruptions as may be required for making connections shall be permitted, and only at such times when approval is obtained from the Contracting Officer. Interruptions to heat distribution service shall be only with prior approval, and be the minimum possible duration as approved by the Contracting Officer.

3.1.4 Connecting to Existing Work

Connect new work to existing work in a neat and workmanlike manner. Connection shall be made only in manholes. Where an existing structure must be cut or existing utilities interfere, such obstruction shall be bypassed, removed, replaced or relocated, restored and repaired. Any changes required to the UHDS design as a result of interferences or conflicts must be approved by the UHDS designer and the Contracting Officer. Work disturbed or damaged shall be replaced to its prior condition, as required by Section 01 11 00 SUMMARY OF WORK.

3.1.5 Coordination

Coordinate the location of all items of equipment and work of all trades. Maintain operability and maintainability of the equipment and systems. Any relocation of equipment or systems to comply with the requirement of operability and maintainability shall be performed by the contractor at his cost.

3.1.6 Grading

Unless otherwise shown on the contract drawings or the detailed design layout drawings, steam/condensate and high temperature hot water supply/return lines shall be graded uniformly downward not less than 5.0 inches in 100 feet to the lower point of entry between manholes and/or building entries.

3.1.7 Variations

Any variations from the approved detailed design layout drawings must be submitted to the Contracting Officer for approval. Variations must be signed and sealed by the UHDS manufacturers' professional engineer responsible for the complete design of the UHDS.

3.1.8 Storage and Handling

Equipment and material placed on the job shall remain in the custody of the Contractor until final acceptance whether or not the Contractor has been reimbursed for the equipment and material by the Government.

The Contractor is solely responsible for the protection of the equipment and material against damage from any source. Protect all materials against entry of water and mud by installing watertight protection on open ends at all times. Sections of the casing or carrier piping found to have been subjected to full or partial submergence in water (which would allow the insulation to become wet) shall be immediately replaced. Protect materials at all times while stored or during installation from damage from UV light. Materials awaiting installation shall be completely covered to

protect from UV degradation.

Place all damaged items in new operating condition or replace damaged items as determined and directed by the Contracting Officer, at no additional cost to the Government.

3.2 DEMOLITION

Perform work in accordance with requirements for phasing. Completely remove all pipe, valves, fittings, insulation, and all hangers including the connection to the structure and any fastenings. Seal all openings in manhole or building walls after removal of piping. All material and equipment removed shall become the property of the Contractor and shall be removed from Government property within one week and shall not be stored in operating areas. All flame cutting shall be performed with adequate fire protection facilities available as required by safety codes and Contracting Officer.

3.2.1 Asbestos Removal

Conform to Section 02 82 16 REMOVAL AND DISPOSAL OF ASBESTOS MATERIALS.

3.3 PIPE, PIPING JOINTS AND FITTINGS

3.3.1 Welded Joints

Clean pipe and fittings inside and outside before and after assembly. Remove all dirt, scale, and other foreign matter from inside the piping by use of a pipe swab or pipe pig before connecting pipe sections, valves, equipment or fittings. Use eccentric connectors as necessary between casing sections to provide drainage of casing section between manholes and between manholes and buildings.

3.3.2 Fittings

All changes in direction shall be made with factory-built reinforced fittings. Field-fabricated fittings and miters are not permitted.

3.4 WELDING

The Contractor is entirely responsible for the quality of the welding and shall:

- a. Conduct tests of the welding procedures used by his organization, determine the suitability of the procedures used, determine that the welds made shall meet the required tests, and also determine that the welding operators have the ability to make sound welds under standard conditions.
- b. Comply with ASME B31.1.
- c. Perform all welding operations required for construction and installation of the heat distribution system.

3.4.1 Qualification of Welders

Rules of procedure for qualification of all welders and general requirements for fusion welding shall conform with the applicable portions of ASME B31.1 and also as outlined below.

3.4.2 Examining Welders

The contractor shall examine each welder to determine the ability of the welder to meet the qualifications required. Test welders for piping for all positions, including welds with the axis horizontal (not rolled) and with the axis vertical. Each welder shall:

- a. Weld only in positions in which he/she has qualified.
- b. Identify welds with the specific code marking signifying name and number assigned.

3.4.3 Examination Results

Provide the Contracting Officer with a list of names and corresponding code markings. Retest welders which fail to meet the prescribed welding qualifications. Disqualify welders who fail the second test, for work on the project.

3.4.4 Beveling

Field bevels and shop bevels shall be done by mechanical means or by flame cutting. Where beveling is done by flame cutting, surfaces shall be thoroughly cleaned of scale and oxidation just prior to welding. Conform to specified standards.

3.4.5 Alignment

Utilize split welding rings for field joints on all carrier pipes above **two inches** to assure proper alignment, complete weld penetration, and prevention of weld spatter reaching the interior of the pipe. Make field joints **two inches** and smaller with welding sockets.

3.4.6 Erection

Piping shall not be split, bent, flattened, or otherwise damaged either before, during, or after installation. Where the pipe temperature falls to **32 degrees F** or lower, the pipe shall be heated to approximately **100 degrees F** for a distance of **one foot** on each side of the weld before welding, and the weld shall be finished before the pipe cools to **32 degrees F**.

3.4.7 Defective Welds

Replace and reinspect defective welds in accordance with **ASME B31.1**. Repairing defective welds by adding weld material over the defect or by peening shall not be permitted. Welders responsible for defective welds must be requalified.

3.4.8 Electrodes

Electrodes shall be stored in a dry heated area, and be kept free of moisture and dampness during fabrication operations. Discard electrodes that have lost part of their coating.

3.4.9 Radiographic Testing

An approved independent testing firm regularly engaged in radiographic

testing shall perform radiographic examination of 100 percent of the field welds in the carrier piping of direct-buried systems in accordance with ASME B31.1. Furnish a set of films showing each weld inspected, a reading report evaluating the quality of each weld, and a location plan showing the physical location where each weld is to be found in the completed project, prior to installing casing field joints, backfilling and hydrostatic testing. All radiographs shall be reviewed and interpreted by a Certified American Society for Nondestructive Testing Level III radiographer, employed by the testing firm, who shall sign the reading report. The Contracting Officer reserves the right to review all inspection records, and if any welds inspected are found unacceptable they shall be removed, rewelded, and radiographically reexamined at no cost to the Government.

3.5 HEAT DISTRIBUTION SYSTEM INSTALLATION

The UHDS manufacturer's representative shall oversee the delivery, storage, and witness the installation and testing of the system. All work shall be in strict accordance with the requirements specified herein and with the printed instructions of the manufacturer. These specifications shall take precedence over the printed instructions, if conflicts arise. Printed instructions shall be submitted to the Contracting Officer prior to system installation.

3.5.1 Verification of Final Elevations

Prior to covering the top of the casing with backfill material, but after all temporary supports have been removed and initial backfilling of the conduit system has been accomplished, the Contractor shall measure and record the elevation of the top of the casing in the trench. Elevations shall be taken at every completed field joint, 1/3 points along each pipe section and top of elbows. This measurement shall be checked against the contract drawings. These measurements shall confirm that the conduit system has been installed to the elevations shown on the contract drawings. Slope shall be uniform to within 0.1 percent. These measurements shall be recorded by the Contractor, included in the UHDS manufacturer's representative daily report, and given to the Contracting Officer prior to covering the casing with backfill material.

3.5.2 Excavation, Trenching, and Backfilling

Perform all excavation, trenching, and backfilling as required by the UHDS manufacturer's design. Pipe shall lay on a 12 inch minimum sand bed and backfilled with sand on all sides to a minimum of 6 inches as measured from outside of casing. Foundation for system must be firm and stable. Foundation and backfill must be free from rocks or substances which could damage the system coating. Concrete anchor and thrust blocks must be installed in undisturbed earth. Backfilling must not commence until system has been satisfactorily pressure tested (both hydrostatic test of carrier and, for DDT systems, pneumatic test of casing. Minimum depth of burial to the top of the casing is 24 inches. Maximum depth of burial to the top of the casing is 10 feet.

3.5.3 UHDS Manufacturer's Representative Responsibilities

This shall be a person who regularly performs the duties listed below, is certified in writing by the UHDS manufacturer to be technically qualified and experienced in the installation of the system, and shall be authorized by the manufacturer to make and sign the daily reports specified herein. The UHDS Manufacturer's representative shall be present at the job site and

witness when the following types of work are being performed:

- a. Inspection and unloading.
- b. Inspection of trench prior to commencing installation of system.
- c. Inspection of concrete anchors and thrust blocks.
- d. Hydrostatic testing of carrier piping.
- e. Field joint closure work.
- f. Pneumatic testing of DDT system casing.
- g. Holiday test of conduit coating.
- h. Repair of any coating.
- i. Installation of cathodic protection system.
- j. Initial backfill up to 10 inches above the top of the casing.
- k. Verification of final elevations. Elevation readings shall be witnessed and recorded.
- l. Testing of cathodic protection system.
- m. Operational tests

The UHDS manufacturer's representative is to notify the contractor immediately of any problems. If necessary, the UHDS manufacturer's representative will notify the Contracting Officer of problems requiring immediate action, otherwise the daily reports will note any problems encountered and indicate the corrective actions taken.

3.5.4 UHDS Manufacturer Representative's Reports

The UHDS manufacturer representative shall prepare and sign a written daily report. Present the original daily report to the Contracting Officer no later than one working day after it is prepared, and forward one copy to the manufacturer's main office. The report shall state whether or not the condition and quality of the materials used and the delivery, storage, installation and testing of the system are in accordance with the plans, specifications, and manufacturer's printed instructions and is satisfactory in all respects. When any work connected with the installation is unsatisfactory, the report shall state what corrective action has been taken or shall contain the UHDS manufacturer's recommendations for corrective action. The report shall identify any conditions that could result in an unsatisfactory installation, including such items as open conduit ends left in the trench overnight and improper manhole entries. The daily reports are to be reviewed, signed and sealed, on a weekly basis, by the registered engineer responsible for the system design. Signed and sealed copies of the daily reports shall be submitted with the payment request. Requests for payment shall be denied if the weekly review is not accomplished.

Upon completion of the work and before final acceptance, deliver to the Contracting Officer a notarized Certificate of Compliance signed by a principal officer of both the manufacturing and the contracting firm,

stating that the installation is satisfactory and in accordance with plans, specifications, and manufacturer's instructions.

The UHDS manufacturer will retain a copy of all daily reports and the Certificate of Compliance for 5 years after final acceptance of the system by the government.

3.5.5 Protection

Protect casing coating from damage during unloading, storage, rigging and installation. Protect casing and carrier pipe ends from water intrusion during unloading, storage, rigging and installation. Protect piping and all accessories from damage due to exposure to UV light.

3.5.6 Defective Material

The UHDS Manufacturer's Representative shall take prompt action to remove from the site all damaged or defective material, subject to rejection in accordance with the quality assurance provisions included in the manufacturer's submittals and printed instructions, and shall order prompt replacement of such material.

3.6 TESTS

Demonstrate leak-tightness of all piping systems by performing pressure tests (hydrostatic, pneumatic) and operational tests. Pressure test heat distribution system in conformance with requirements stated in this specification and in printed instructions for the system supplied. Tests shall include carrier piping and casing. The carrier pipe shall be hydrostatically tested. Casings of DDT systems shall be pneumatically tested.

3.6.1 Holiday Testing of Direct-Buried System Steel Casings

Test entire exterior surface of the casing including the bottom exterior surface of the casing for faults in coating after installation in trench prior to backfilling. Use test method and voltage recommended by coating manufacturer. Repair any holidays found and retest. System shall not be backfilled until all holidays are eliminated.

3.6.2 Pneumatic, Hydrostatic and Operational Tests

Before conducting heat distribution system tests, flush lines with high pressure water until discharge shows no foreign matter and are deemed clean to the satisfaction of the Contracting Officer.

3.6.2.1 Pneumatic Test

The casing of DDT systems shall be pneumatically tested after welding and before field coating using air as the test medium. The test pressure shall be 15 psig. Persons not working on the test operations shall be kept out of the testing area while testing is proceeding. The test shall be made on the system as a whole or on sections that can be isolated. Joints in sections shall be tested prior to backfilling when trenches must be backfilled before the completion of other pipeline sections. The test shall continue for 24 hours from the time of the initial readings to the final readings of pressure and temperature. The initial test readings of the instrument shall not be made for at least 1 hour after the casing has been subjected to the full test pressure, and neither the initial nor final

readings shall be made at times of rapid changes in atmospheric conditions. There shall be no indication of reduction of pressure during the test after corrections have been made for changes in atmospheric conditions in conformity with the relationship $T(1)P(2)=T(2)P(1)$, in which T and P denote absolute temperature and pressure, respectively, and the numbers denote initial (1) and final (2) readings. Pressure shall be measured with a mercury manometer, inclined manometer (slope gauge), or an equivalent device so calibrated as to be read in increments of not greater than 0.1 psi. During the test, the entire system shall be completely isolated from all compressors and other sources of air pressure. Each joint shall be tested while under test pressure by means of soap and water or an equivalent nonflammable solution prior to backfilling or concealing any work. The testing instruments shall be approved by the Contracting Officer. All labor, materials and equipment for conducting the tests shall be furnished by the Contractor and shall be subject to inspection at all times during the tests. The Contractor shall maintain proper safety precautions for air pressure testing at all times during the tests.

3.6.2.2 Operational Test

Prior to acceptance of the installation, Contractor shall subject system to operating tests simulating actual operating conditions to demonstrate satisfactory functional and operating efficiency. These operating tests shall cover a period of not less than six hours for each portion of system tested. Conduct tests at times as the Contracting Officer may direct.

- a. The contractor shall provide calibrated instruments, equipment, facilities and labor, at no additional cost to the Government.
- b. When failures occur, repair problems then repeat test.

3.6.3 Deficiencies

Deficiencies discovered shall be corrected at the Contractor's expense, to the satisfaction of the Contracting Officer. Major deficiencies or failure to correct deficiencies, to the satisfaction of the Contracting Officer, may be considered cause for rejecting the entire installation.

3.7 BURIED UTILITY WARNING AND IDENTIFICATION

3.7.1 Plastic Marking Tape

Polyethylene plastic tape manufactured specifically for warning and identifying buried utility lines shall be supplied and installed. Tape shall be buried above the pipe during the trench backfilling operation and shall be buried approximately 12 inches below grade. Tape shall be 0.004 inch thick polyethylene. Tape shall be acid and alkali-resistant and shall have a minimum strength of 1750 psi lengthwise and 1500 psi crosswise with an elongation factor of 350 percent. The tape shall be manufactured with integral wires, foil backing or other means to enable detection by a metal detector when the tape is buried up to 3 feet deep. The metallic core of the tape shall be encased in a protective jacket or provided with other means to protect it from corrosion. The tape shall be of a type specifically manufactured for marking and locating metallic underground utilities. Tape shall be 6 inches wide and printed with a caution and identification of the piping system over the entire tape length. Tape shall be yellow with bold black letters. Tape color and lettering shall be unaffected by moisture and other substances contained in the backfill material.

3.7.2 Markers for Underground Piping

Markers for underground piping shall be located along the distribution and service lines. Markers shall be placed as indicated approximately 2 feet to the right of the distribution system when facing in direction of flow in the supply line. The marker shall be concrete 6 inch square or round section 2 feet long. The top edge of the marker shall have a minimum 1/2 inch chamfer all around. The letters STEAM shall be impressed or cast on the top, and on one side of the markers to indicate the type of system that is being identified. Each letter shall be formed with a V-shaped groove and shall have a width of stroke at least 1/4 inch at the top and depth of 1/4 inch. The top of the marker shall protrude not more than 1 inch(es) above finished grade.

-- End of Section --

SECTION 33 71 02

UNDERGROUND TRANSMISSION AND DISTRIBUTION

01/07

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

- ASTM B 1 (2001) Hard-Drawn Copper Wire
- ASTM B 8 (2004) Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
- ASTM C 260 (2001) Air-Entraining Admixtures for Concrete

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

- IEEE Std 48 (1996) High-Voltage Alternating-Current Cable Terminations

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

- NEMA RN 1 (1989) Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit
- NEMA TC 2 (2003) Standard for Electrical Polyvinyl Chloride (PVC) Tubing and Conduit
- NEMA TC 3 (1999) PVC Fittings for Use with Rigid PVC Conduit and Tubing
- NEMA TC 6 (1990) PVC and ABS Plastic Utilities Duct for Underground Installation
- NEMA TC 9 (1990) Fittings for ABS and PVC Plastic Utilities Duct for Underground Installation

INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)

- NETA ATS (1999) Electrical Power Distribution Equipment and Systems

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

- NFPA 70 (2007; AMD 1 2008) National Electrical Code - 2008 Edition

- NFPA 70B (1998) Electrical Equipment Maintenance
- UNDERWRITERS LABORATORIES (UL)
- UL 6 (2007) Standard for Electrical Rigid Metal Conduit-Steel
- UL 83 (20086) Standard for Thermoplastic-Insulated Wires and Cables
- UL 467 (2007) Standard for Grounding and Bonding Equipment
- UL 486A-486B (2003; Rev thru Aug 2006) Standard for Wire Connectors
- UL 510 (2005; Rev thru Aug 2005) Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape
- UL 514B (2004; Rev thru Aug 2007) Standard for Conduit, Tubing and Cable Fittings
- UL 651 (2005; Rev thru May 2007) Standard for Schedule 40 and 80 Rigid PVC Conduit and Fittings
- UL 854 (1996; Bul. 1997 R 1998) Service-Entrance Cables
- UL 1242 (2006; Rev thru Jul 2007) Standard for Electrical Intermediate Metal Conduit -- Steel

1.2 RELATED REQUIREMENTS

Section 26 00 00, "Basic Electrical Materials and Methods" applies to this section with additions and modifications specified herein.

1.2.1 Underground Service

Terminate underground service into building at a point 5 feet outside the building and projections thereof, except that service conductors shall be continuous to the interior terminating point indicated. Connections of the service to the service switch, panelboard, or load center is included in Section 26 20 00, "Interior Distribution System." Protect ends of underground conduit with threaded metal caps or plastic plugs as applicable until connections are made.

1.3 DEFINITIONS

- a. In the text of this section, the words conduit and duct are used interchangeably and have the same meaning.

1.4 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Medium voltage cable terminations

600 volt wires and cables

SD-06 Test Reports

Acceptance checks and tests

Identify each cable for 600-volt, and medium voltage cable tests. When testing grounding electrodes and systems, identify each electrode and system for each test, as well as the resistance and soil conditions at the time the measurement were made.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 Conduit

2.1.1.1 Rigid Metal Conduit

UL 6, galvanized steel, threaded type.

2.1.1.2 Rigid Metal Conduit, PVC Coated

UL 6, galvanized steel, threaded type, coated with a polyvinyl chloride (PVC) sheath bonded to the galvanized exterior surface, nominal 40 mils thick, conforming to NEMA RN 1, Type A40, except that hardness shall be nominal 85 Shore A durometer, dielectric strength shall be minimum 400 volts per mil at 60 Hz, tensile strength shall be minimum 3500 psi, and aging shall be minimum 1000 hours in an Atlas Weatherometer.

2.1.1.3 Intermediate Metal Conduit

UL 1242, galvanized steel, threaded type.

2.1.1.4 Intermediate Metal conduit, PVC Coated

UL 1242, galvanized steel, threaded type, coated with a polyvinyl chloride (PVC) sheath bonded to the galvanized exterior surface, nominal 40 mils thick, conforming to NEMA RN 1, Type A40, except that hardness shall be nominal 85 Shore A durometer, dielectric strength shall be minimum 400 volts per mil at 60 Hz, tensile strength shall be minimum 3500 psi, and aging shall be minimum 1000 hours in an Atlas Weatherometer.

2.1.1.5 Plastic Conduit for Direct Burial

NEMA TC 2, EPC-40-PVC.

2.1.1.6 Plastic Utilities Duct for Concrete Encasement

NEMA TC 6, Type EB.

2.1.2 Fittings

2.1.2.1 Metal Fittings

UL 514B, threaded type.

2.1.2.2 PVC Conduit Fittings

NEMA TC 3 UL 651.

2.1.2.3 PVC Duct Fittings

NEMA TC 9.

2.1.3 Conductors Rated 600 Volts and Less

Conductor and conduit sizes indicated are for copper conductors unless otherwise noted. Insulated conductors shall have the date of manufacture and other identification imprinted on the outer surface of each cable at regular intervals throughout the cable length. Wires and cables manufactured more than 12 months prior to date of delivery to the site shall not be used.

2.1.3.1 600 Volt Wires and Cables

Service entrance and direct buried conductors shall conform to UL 854, Type USE. Conductors in conduit other than service entrance shall conform to UL 83, Type THWN. Conductor size and number of conductors in each cable shall be as indicated. Conductors shall be color coded. Conductor identification shall be provided within each enclosure where a tap, splice, or termination is made. Conductor identification shall be by color-coded insulated conductors, plastic-coated self-sticking printed markers, colored nylon cable ties and plates, or heat shrink type sleeves. Control circuit terminations shall be properly identified. Conductors No. 10 AWG and smaller shall be solid copper. Conductors No. 8 AWG and larger shall be stranded copper. All conductors shall be copper. Conductors No. 6 AWG and smaller shall be copper.

a. Colors for coding conductors shall be:

208-VOLT SYSTEM

Neutral - White
Phase A - Black
Phase B - Red
Phase C - Blue
Grounding conductor - Green

2.1.4 600 Volt Wire Connector and Terminals

Shall provide a uniform compression over the entire contact surface. Solderless terminal lugs shall be used on stranded conductors.

a. For use with copper conductors: UL 486A-486B.

2.1.5 Medium Voltage Cable Terminations

IEEE Std 48 Class 1. Provide terminations including stress control terminator, ground clamp, connectors, and lugs. Terminator shall be the

product of one manufacturer, suitable for the type and materials of the cable terminated. Furnish components in the form of a "UL listed" kit, including complete instructions which shall be followed for assembly and installation. Provide terminator as specified herein for terminating single conductor, solid insulated, nonmetallic jacketed type cables for service voltage up to 35 KV indoor and outdoor. Do not use separate parts of copper or copper alloy in contact with aluminum alloy parts in the construction or installation of the terminator.

2.1.5.1 Termination; Separable Insulated Connector Type

Provide as specified in Section 26 12 19.10, "three-Phase Pad-Mounted Transformers".

2.1.6 Tape

2.1.6.1 Insulating Tape

UL 510, plastic insulating tape, capable of performing in a continuous temperature environment of 80 degrees C.

2.1.6.2 Buried Warning and Identification Tape

Provide detectable aluminum foil plastic-backed tape or detectable magnetic plastic tape manufactured specifically for warning and identification of buried cable and conduit. Tape shall be detectable by an electronic detection instrument. Provide tape in rolls, 2 inches minimum width, color coded for the utility involved with warning and identification imprinted in bold black letters continuously and repeatedly over entire tape length. Warning and identification shall be CAUTION BURIED ELECTRIC, TELEPHONE CABLE BELOW or similar. Use permanent code and letter coloring unaffected by moisture and other substances contained in trench backfill material.

2.1.7 Pull Rope

Shall be plastic having a minimum tensile strength of 200 pounds.

2.1.8 Grounding and Bonding Equipment

UL 467. Ground rods shall be copper clad steel with diameter adequate to permit driving to full length of the rod, but not less than 3/4 inch in diameter and 10 feet long unless otherwise indicated.

PART 3 EXECUTION

3.1 INSTALLATION

NFPA 70.

3.1.1 Contractor Damage

The Contractor shall promptly repair any indicated utility lines or systems damaged by Contractor operations. Damage to lines or systems not indicated, which are caused by Contractor operations, shall be treated as "Changes" under the terms of the General Provisions of the contract. If the Contractor is advised in writing of the location of a nonindicated line or system, such notice shall provide that portion of the line or system with "indicated" status in determining liability for damages. In any event, the Contractor shall immediately notify the Contracting Officer of any such

damage.

3.1.2 Concrete

Shall be composed of fine aggregate, coarse aggregate, portland cement, and water so proportioned and mixed as to produce a plastic, workable mixture. Fine aggregate shall be of hard, dense, durable, clean, and uncoated sand. The coarse aggregate shall be reasonably well graded from 3/16 to one inch. The fine and coarse aggregates shall be free from injurious amounts of dirt, vegetable matter, soft fragments or other deleterious substances. Water shall be fresh, clean, and free from salts, alkali, organic matter, and other impurities. Concrete shall have a compressive strength of 3000 psi at the age of 28 days. Slump shall not exceed 3 inches. Retempering of concrete will not be permitted. Exposed, unformed concrete surfaces shall be given a smooth, wood float finish. Concrete shall be cured for a period of not less than 7 days, and concrete made with high early strength portland cement shall be repaired by patching honeycombed or otherwise defective areas with cement mortar as directed by the Contracting Officer. Air entrain concrete exposed to weather using and air-entraining admixture conforming to ASTM C 260. Air content shall be between 4 and 6 percent.

3.1.3 Underground Conduit/Duct Without Concrete Encasement

Type of conduit shall be EPC-40-PVC, .

3.1.3.1 Conduit Installation

Top of the conduit shall be not less than 24 inches below grade, and shall have a minimum slope of 3 inches in each 100 feet away from buildings and toward manholes and other necessary drainage points. Run conduit in straight lines except where a change of direction is necessary. As each conduit run is completed, for conduit sizes 3 inches and larger, draw a flexible testing mandrel approximately 12 inches long with a diameter less than the inside diameter of the conduit through the conduit. After which, draw a stiff bristle brush through until conduit is clear of particles of earth, sand and gravel; then immediately install conduit plugs. For conduit sizes less than 3 inches, draw a stiff bristle brush through until conduit is clear of particles of earth, sand and gravel; then immediately install conduit plugs. Provide not less than 3 inches clearance from the conduit to each side of the trench. A minimum clearance of 2 1/2 inches shall be provided between adjacent conduits. Grade bottom of trench smooth; where rock, soft spots, or sharp-edged materials are encountered, excavate the bottom for an additional 3 inches, fill and tamp level with original bottom with sand or earth free from particles, that would be retained on a 1/4 inch sieve. Provide color, type and depth of warning tape as specified in paragraph "BURIED WARNING AND IDENTIFICATION TAPE".

3.1.3.2 Encasement Under Roads and Structures

Under roads, paved areas, and railroad tracks, install conduits in concrete encasement of rectangular cross-section providing a minimum of 3 inch concrete cover around ducts. Concrete encasement shall extend at least 5 feet beyond the edges of paved areas and roads, and 12 feet beyond the rails on each side of railroad tracks. Conduits to be installed under existing paved areas which are not to be disturbed, and under roads and railroad tracks, shall be zinc-coated, rigid steel, jacked into place.

3.1.3.3 Multiple Conduits

Separate multiple conduits by a minimum distance of **2 1/2 inches**, except that light and power conduits shall be separated from control, signal, and telephone conduits by a minimum distance of **3 inches**. Stagger the joints of the conduits by rows and layers to strengthen the conduit assembly. Provide plastic duct spacers that interlock vertically and horizontally. Spacer assembly shall consist of base spacers, intermediate spacers, and top spacers to provide a completely enclosed and locked-in conduit assembly. Install spacers per manufacturer's instructions, but provide a minimum of two spacer assemblies per **10 feet** of conduit assembly.

3.1.4 Underground Duct with Concrete Encasement

Construct underground duct lines of individual conduits encased in concrete. Except where rigid galvanized steel conduit is indicated or specified, the conduit shall be PVC Type EB-35. Do not mix different kinds of conduit in any one duct bank. Ducts shall not be smaller than **4 inches** in diameter unless otherwise indicated. Concrete encasement surrounding the bank shall be rectangular in cross-section and shall provide at least **3 inches** of concrete cover for ducts. Separate conduits by a minimum concrete thickness of **2 inches**, except separate light and power conduits from control, signal, and telephone conduits by a minimum concrete thickness of **3 inches**. Provide color, type and depth of warning tape as specified in paragraph "BURIED WARNING AND IDENTIFICATION TAPE".

3.1.4.1 Depth of Encasement

Top of the concrete encasement shall not be less than **18 inches** below grade except that under roads and pavement concrete be a minimum of **24 inches** below grade.

3.1.4.2 Slope of Encasement

Duct banks shall have a continuous slope downward toward underground structures and away from buildings with a minimum pitch of **3 inches in 100 feet**. Except at conduit risers, accomplish changes in direction of runs exceeding a total of **10 degrees**, either vertical or horizontal, by long sweep bends having a minimum radius of curvature of **25 feet**; sweep bends may be made up of one or more curved or straight sections or combinations thereof. Manufactured bends shall have a minimum radius of **18 inches** for use with conduits of less than **3 inches** in diameter and a minimum radius of **36 inches** for ducts of **3 inches** in diameter and larger. Excavate trenches along straight lines from structure to structure before ducts are laid or structure constructed so the elevation can be adjusted, if necessary, to avoid unseen obstruction.

3.1.4.3 Conduits

Terminate conduits in end-bells where duct lines enter underground structures. Stagger conduit joints by rows and layers to strengthen the duct bank. Provide plastic duct spacers that interlock vertically and horizontally. Spacer assembly shall consist of base spacers, intermediate spacers, and top spacers to provide a completely enclosed and locked-in duct bank. Install spacers per manufacture's instructions, but provide a minimum of two spacer assemblies per **10 feet** of duct bank. Before pouring concrete, anchor duct bank assemblies to prevent the assemblies from floating during concrete pouring. Anchoring shall be done by driving reinforcing rods adjacent to every other duct spacer assembly and attaching

the rod to the spacer assembly.

3.1.4.4 Test Mandrel

As each section of a duct line is completed from structure to structure, draw a flexible testing mandrel approximately 12 inches long with a diameter less than the diameter of the conduit through each conduit. After which, draw a stiff bristle brush through the conduit, until conduit is clear of particles of earth, sand, and gravel; then immediately install end plugs.

3.1.4.5 Conduit Plugs and Pull Rope

New conduit indicated as being unused or empty shall be provided with plugs on each end. Plugs shall contain a weephole or screen to allow water drainage. Provide a plastic pull rope having 3 feet of slack at each end of unused or empty conduits.

3.1.4.6 Connections to Existing Concrete Pads

For duct bank connections to concrete pads, break an opening in the pad out to the dimensions required and preserve steel in pad. Cut the steel and extend into the duct bank envelope. Chip out the opening in the pad to form a key for the duct bank envelope.

3.1.4.7 Partially Completed Duct Banks

During construction wherever a construction joint is necessary in a duct bank, prevent debris such as mud, and, and dirt from entering ducts by providing suitable conduit plugs. Fit concrete envelope of a partially completed duct bank with reinforcing steel extending a minimum of 2 feet back into the envelope and a minimum of 2 feet beyond the end of the envelope. Provide one No. 4 bar in each corner, 3 inches from the edge of the envelope. Secure corner bars with two No. 3 ties, spaced approximately one foot apart. Restrain reinforcing assembly from moving during concrete pouring.

3.1.5 Underground Conduit for Service Feeders Into Buildings

Shall be PVC, Type EPC-40 from the service equipment to a point 5 feet beyond the building and projections thereof. Protect the ends of the conduit by threaded metal caps or bushings; coat the threads with graphite grease or other coating. Clean and plug conduit until conductors are installed. Encase the underground portion of the conduit in a concrete envelope and bury as specified for underground duct with concrete encasement.

3.1.6 Conduit Protection at Concrete Penetrations

Galvanized conduits which penetrate concrete (slabs, pavement, and walls) in wet locations shall be PVC coated and shall extend from at least 2 inches within the concrete to the first coupling or fitting outside the concrete (minimum of 6 inches from penetration).

3.1.7 Buried Warning and Identification Tape

Bury tape with the printed side up at a depth of 12 inches below the top surface of earth or the top surface of the subgrade under pavements.

3.1.8 Cable Pulling

Test existing duct lines with a mandrel and thoroughly swab out to remove foreign material before pulling cables. Pull cables down grade with the feed-in point at the manhole or buildings of the highest elevation. Use flexible cable feeds to convey cables through manhole opening and into duct runs. Do not exceed the specified cable bending radii when installing cable under any conditions, including turnups into switches, transformers, switchgear, switchboards, and other enclosures.

3.1.8.1 Cable Lubricants

Use lubricants that are specifically recommended by the cable manufacturer for assisting in pulling jacketed cables.

3.1.8.2 Cable Pulling Tensions

Tensions shall not exceed the maximum pulling tension recommended by the cable manufacturer.

3.1.8.3 Conductors Installed in Parallel

Conductors shall be grouped such that each conduit of a parallel run contains 1 Phase A conductor, 1 Phase B conductor, 1 Phase C conductor, and 1 neutral conductor.

3.1.9 600 Volt Cable Splicing and Terminating

Provide splices and terminations to protect 600 volts insulated power and lighting cables from accidental contact, deterioration of coverings and moisture. Make terminations and splices with materials and methods as indicated or specified herein and as designated by the written instructions of the manufacturer. Do not allow the cables to be moved until after the splicing material has completely set.

3.1.10 Medium Voltage Cable Terminations

Provide terminating devices and materials to protect medium voltage cable terminations from accidental contact, deterioration of coverings, and moisture. Make terminations by using materials and methods specified herein and as designated by the written instruction of the cable manufacturer and termination kit manufacturer. Termination for high-voltage cables shall be rated, and be capable of withstanding test voltages, in accordance with [IEEE Std 48](#). Terminations of single- and multiconductor cables shall include the securing and sealing of the sheath and insulation of the cable conductors, stress relief and grounding of cable shields of shielded cable, and grounding of neutral conductors, metallic sheaths, and armor. Adequately support cables and cable terminations to avoid any excessive strain on the termination and the conductor connection.

3.1.11 Grounding Systems

Noncurrent-carrying metallic parts associated with electrical equipment shall have a maximum resistance to solid earth ground not exceeding the following values:

Pad-mounted transformers without protective fences: 5 ohms

Grounded secondary distribution system neutral and

noncurrent-carrying metal parts associated with distribution systems and grounds not otherwise covered: 5 ohms

When work in addition to that indicated or specified is directed in order to obtain the specified ground resistance, the provisions of the contract covering "Changes" shall apply.

3.1.11.1 Grounding Electrodes

Provide cone pointed driven ground rods driven full depth plus 6 inches, installed to provide an earth ground of the appropriate value for the particular equipment being grounded.

3.1.11.2 Grounding Connections

Make grounding connections which are buried or otherwise normally inaccessible, by exothermic weld or compression connector.

- a. Make exothermic welds strictly in accordance with the weld manufacturer's written recommendations. Welds which are "puffed up" or which show convex surfaces indicating improper cleaning are not acceptable. Mechanical connectors are not required at exothermic welds.
- b. Make compression connections using a hydraulic compression tool to provide the correct circumferential pressure. Tools and dies shall be as recommended by the manufacturer. An embossing die code or other standard method shall provide visible indication that a connector has been adequately compressed on the ground wire.

3.1.11.3 Grounding Conductors

Grounding conductors shall be stranded-bare copper conforming to ASTM B 8, Class B, for sizes No. 6 AWG and larger, and shall be solid-bare copper conforming to ASTM B 1 for sizes No. 8 and smaller. Cable sheaths, cable shields, conduit, and equipment shall be grounded with No. 6 AWG, except 34.5 kV cable sheaths and cable shields shall be grounded with No. 4/0 AWG.

3.1.11.4 Ground Rod Connections

Connect ground rods only to insulated copper ground conductor and weld the connection. Insulate entire area of the rod in the vicinity of the weld in accordance with UL 467 and the connecting wire and seal against moisture penetration.

3.1.12 Reconditioning of Surfaces

3.1.12.1 Unpaved Surfaces

Restore to their original elevation and condition unpaved surfaces disturbed during installation of duct or direct burial cable. Preserve sod and topsoil removed during excavation and reinstall after backfilling is completed. Replace sod that is damaged by sod of quality equal to that removed. When the surface is disturbed in a newly seeded area, re-seed the restored surface with the same quantity and formula of seed as that used in the original seeding.

3.2 FIELD QUALITY CONTROL

As an exception to requirements that may be stated elsewhere in the contract, notify the Contracting Officer 5 working days prior to each tests. Furnish labor, equipment and incidentals required for testing, except that the Government will provide electric power required for the tests. Correct defects in the work provided by the Contractor and repeat tests until the work is in compliance with contract requirements.

3.2.1 Performance of Acceptance Checks and Tests

Perform in accordance with the manufacturer's recommendations, NFPA 70B, NETA ATS, and referenced ANSI standards. Include the following visual and mechanical inspections and electrical tests, performed in accordance with NETA ATS.

3.2.1.1 600 Volt Cable Tests

Perform tests after wiring is completed, connected, and ready for operation, but prior to placing system in service and before any branch circuit breaker is closed.

a. Visual and Mechanical Inspection

(1) Inspect cables for physical damage and proper connection in accordance with contract plans and specifications.

(2) Test cable mechanical connections to manufacturer's recommended values using a calibrated torque wrench. In the absence of manufacturer's data use NETA recommended values.

(3) Check cable color coding for compliance with contract specifications.

b. Electrical Tests

(1) Perform insulation-resistance test on each conductor with respect to ground and adjacent conductor; applied potential shall be 1000 volts DC for 1 minute; minimum insulation-resistance values shall not be less than 2 megohms.

(2) Perform continuity test to insure proper cable connection.

3.2.1.2 Medium Voltage Cables

Perform tests after installation of cable, splices, and terminators and before terminating to equipment.

a. Visual and Mechanical Inspection

(1) Inspect exposed cable sections for physical damage.

(2) Verify that cable is supplied and connected in accordance with contract plans and specifications.

(3) Inspect for proper shield grounding, cable support, and cable termination.

(4) Verify that cable bends are not less than ICEA or

manufacturer's minimum allowable bending radius.

- (5) Inspect for proper fireproofing.
- (6) Visually inspect jacket and insulation condition.
- (7) Inspect for proper phase identification and arrangement.

b. Electrical Tests

(1) Perform a shield continuity test on each power cable by ohmmeter method. Record ohmic value, resistance values in excess of 10 ohms per 1000 feet of cable must be investigated and justified.

(2) Perform a DC high-potential test on all cables. Adhere to precautions and limits as specified in the applicable NEMA/ICEA Standard for the specific cable. Test procedure shall be as follows, and the results for each cable test shall be recorded as specified herein. Field acceptance test voltage for 15 kV cable shall be 65 kV DC.

(a) Current-sensing circuits in test equipment shall measure only the leakage current associated with the cable under test and shall not include internal leakage of the test equipment.

(b) Record wet- and dry-bulb temperatures or relative humidity and temperature.

(c) Test each section of cable individually.

(d) Individually test each conductor with all other conductors grounded; Ground all shields.

(e) Terminations shall be properly corona-suppressed by guard ring, field reduction sphere, or other suitable methods as necessary.

(f) Ensure that the maximum test voltage does not exceed the limits for terminators specified in IEEE standard 48 or manufacturer's specifications.

(g) Apply the DC high-potential test in at least five equal increments until maximum test voltage is reached. No increment shall exceed the voltage rating of the cable. Record DC leakage current at each step after a constant stabilization time consistent with system charging current.

(h) Raise the conductor to the specified maximum test voltage and hold for fifteen (15) minutes. Record readings of leakage current at 30 seconds and one minute and at one-minute intervals thereafter. Provide a graphic plot of readings with leakage current (X axis) versus voltage (Y axis) at each increment.

(i) Reduce the conductor test potential to zero and measure residual voltage at discrete intervals.

(j) Apply grounds for a time period adequate to drain all insulation stored charge.

(k) When new cables are spliced into existing cables, the DC high-potential test shall be performed on the new cable prior to splicing. After test results are approved for new cable and the splice is completed, an insulation-resistance test and a shield-continuity test shall be performed on the length of new and existing cable including the splice. After a satisfactory insulation-resistance test, a DC high-potential test shall be performed on the completed cable system utilizing a test voltage 75 percent of new cable tested value.

3.2.1.3 Ground Rods

Perform ground resistance tests for ground rods before any wire is connected. Take measurements in normally dry weather, not less than 48 hours after rainfall. Ground resistance shall also be measured for each piece of equipment and medium voltage cable splice to the ground electrode. Use a portable ground testing megger in accordance with manufacturer's instructions to test each ground or group of grounds. The instrument shall be equipped with a meter reading directly in ohms or fractions thereof to indicate the ground value of the ground electrode under test.

-- End of Section --

SECTION 33 82 00

TELECOMMUNICATIONS OUTSIDE PLANT (OSP)

01/07

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

- ASTM B 1 (2001) Hard-Drawn Copper Wire
- ASTM B 8 (2004) Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
- ASTM D 1557 (2002e1) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu.m.))
- ASTM D 709 (2001; R 2007) Laminated Thermosetting Materials

ELECTRONIC INDUSTRIES ALLIANCE (EIA)

- EIA TIA/EIA-455-107A (1999) Component Reflectance or Link/System Return Loss using a Loss Test Set
- EIA TIA/EIA-455-204 (2000) FOTP-204 Measurement of Bandwidth on Multimode Fiber
- EIA TIA/EIA-455-46A (1990) FOTP-46 Spectral Attenuation Measurement for Long-Length, Graded-Index Optical Fibers
- EIA TIA/EIA-455-59A (2000) FOTP-59 Measurement of Fiber Point Discontinuities Using an OTDR
- EIA TIA/EIA-455-61A (2000) FOTP-61 Measurement of Fiber or Cable Attenuation Using an OTDR
- EIA TIA/EIA-455-B (1998) Test Procedures for Fiber Optic Fibers, Cables, Transducers, Sensors, Connecting and Terminating Devices, and other Fiber Optic Components (ANSI)
- EIA TIA/EIA-472D000-A (1993) Fiber Optic Communications Cable for Outside Plant Use

EIA TIA/EIA-492CAAA	(1998; R 2002) Class IVA Dispersion-Unshifted Single-Mode Optical Fibers
EIA TIA/EIA-526-14A	(1998) OFSTP-14A Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant (ANSI/TIA/EIA-526-14A)
EIA TIA/EIA-526-7	(1998) OFSTP-7 Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant (ANSI/TIA/EIA-526-7)
EIA TIA/EIA-568-B.1	(2001; Addendum 2001) Commercial Building Telecommunications Cabling Standard - Part 1: General Requirements (ANSI/TIA/EIA-568-B.1)
EIA TIA/EIA-568-B.2	(2001) Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted Pair Cabling Components (ANSI/TIA/EIA-568-B.2)
EIA TIA/EIA-568-B.3	(2000; Addendum 2002) Optical Fiber Cabling Components Standard (ANSI/TIA/EIA-568-B.3)
EIA TIA/EIA-569-A	(1998; Addenda 2000, 2001) Commercial Building Standards for Telecommunications Pathways and Spaces (ANSI/TIA/EIA-569-A)
EIA TIA/EIA-590-A	(1997) Standard for Physical Location and Protection of Below Ground Fiber Optic Cable Plant
EIA TIA/EIA-598-B	(2001) Optical Fiber Cable Color Coding
EIA TIA/EIA-606-A	(2002) Administration Standard for the Telecommunications Infrastructure (ANSI/TIA/EIA-606)
EIA TIA/EIA-758	(1999; Addendum 1999) Customer-Owned Outside Plant Telecommunications Cabling Standard (ANSI/TIA/EIA-758)
TIA J-STD-607-A	(2002) Commercial Building Grounding (Earthen) and Bonding Requirements for Telecommunications

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C2	(2007; Errata 2007; INT 2008) National Electrical Safety Code
IEEE Std 100	(2000) The Authoritative Dictionary of IEEE Standards Terms

INSULATED CABLE ENGINEERS ASSOCIATION (ICEA)

ICEA S-87-640	(1999) Fiber Optic Outside Plant
---------------	----------------------------------

Communications Cable

ICEA S-98-688 (1997) Broadband Twisted Pair,
Telecommunications Cable Aircore,
Polyolefin Insulated Copper Conductors

ICEA S-99-689 (1997) Broadband Twisted Pair
Telecommunications Cable Filled,
Polyolefin Insulated Copper Conductors

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA C62.61 (1993) Gas Tube Surge Arresters on Wire
Line Telephone Circuits

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2007; AMD 1 2008) National Electrical
Code - 2008 Edition

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC SP 6 (7) Commercial Blast Cleaning

U.S. DEPARTMENT OF AGRICULTURE (USDA)

RUS 1755.200 Standard for Splicing Copper and Fiber
Optic Cables

RUS 1755.390 Specification for Filled Telephone Cables

RUS 1755.910 Specification for Outside Plant Housing
and Serving Area Interface Systems.

RUS Bul 1751F-630 (2002) Underground Plant Design

RUS Bul 1751F-640 (1995) Design of Buried Plant, Physical
Considerations

RUS Bul 1751F-643 (1996) Design of Aerial Plant

RUS Bul 1751F-815 (1979) Electrical Protection of Outside
Plant

RUS Bul 1753F-201 (1997) Acceptance Tests of
Telecommunications Plant (PC-4)

RUS Bul 1753F-401 (1995) Splicing Copper and Fiber Optic
Cables (PC-2)

RUS Bul 345-50 (1979) Trunk Carrier Systems (PE-60)

RUS Bul 345-65 (1985) Shield Bonding Connectors (PE-65)

RUS Bul 345-72 (1985) Filled Splice Closures (PE-74)

RUS Bul 345-83 (1979; Rev Oct 1982) Gas Tube Surge
Arrestors (PE-80)

UNDERWRITERS LABORATORIES (UL)

- UL 497 (2001) Protectors for Paired Conductor Communication Circuits
- UL 83 (20086) Standard for Thermoplastic-Insulated Wires and Cables

1.2 RELATED REQUIREMENTS

Section 27 10 00, "Building Telecommunications Cabling System"; Section 33 71 02, "Underground Transmission and Distribution" apply to this section with additions and modifications specified herein.

1.3 DEFINITIONS

Unless otherwise specified or indicated, electrical and electronics terms used in this specification shall be as defined in EIA TIA/EIA-568-B.1, EIA TIA/EIA-568-B.2, EIA TIA/EIA-568-B.3, EIA TIA/EIA-569-A, EIA TIA/EIA-606-A, and IEEE Std 100 and herein.

1.3.1 Campus Distributor (CD)

A distributor from which the campus backbone cabling emanates. International expression for main cross-connect - (MC).

1.3.2 Entrance Facility (EF)

An entrance to the building for both private and public network service cables (including antennae) including the entrance point at the building wall and continuing to the entrance room or space.

1.3.3 Entrance Room (ER)

A centralized space for telecommunications equipment that serves the occupants of a building. Equipment housed therein is considered distinct from a telecommunications room because of the nature of its complexity.

1.3.4 Building Distributor (BD)

A distributor in which the building backbone cables terminate and at which connections to the campus backbone cables may be made. International expression for intermediate cross-connect - (IC).

1.3.5 Pathway

A physical infrastructure utilized for the placement and routing of telecommunications cable.

1.4 SYSTEM DESCRIPTION

The telecommunications outside plant consists of cable, conduit, manholes, poles, etc. required to provide signal paths from the closest point of presence to the new facility, including free standing frames or backboards, interconnecting hardware, terminating cables, lightning and surge protection modules at the entrance facility. The work consists of providing, testing and making operational cabling, interconnecting hardware and lightning and surge protection necessary to form a complete outside plant telecommunications system for continuous use. The telecommunications

contractor must coordinate with Base Telephone concerning layout and configuration of the EF telecommunications and OSP. The telecommunications contractor may be required to coordinate work effort for access to the EF telecommunications and OSP with Base Telephone.

1.5 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 "Submittal Procedures":

- a. Submittals shall include the manufacturer's name, trade name, place of manufacture, and catalog model or number. Submittals shall also include applicable federal, military, industry, and technical society publication references. Should manufacturer's data require supplemental information for clarification, the supplemental information shall be submitted as specified in paragraph "Regulatory Requirements" and as required for certificates in Section 01 33 00 "Submittal Procedures".
- b. Commercial off-the-shelf manuals shall be provided for operation, installation, configuration, and maintenance of products provided as a part of the telecommunications outside plant (OSP). Submit operations and maintenance data in accordance with Section 01 78 23, "Operation and Maintenance Data" and as specified herein not later than 2months prior to the date of beneficial occupancy. In addition to requirements of Data package 5, include the requirements of paragraphs "Telecommunications Outside Plant Shop Drawings" and "Telecommunications Entrance Facility Drawings".

SD-02 Shop Drawings

Telecommunications Outside Plant

Telecommunications Entrance Facility Drawings

SD-03 Product Data

Wire and cable

Cable splices, and connectors

Closures

Building protector assemblies

Protector modules

Cross-connect terminal cabinets

Spare Parts

SD-06 Test Reports

Pre-installation tests

Acceptance tests

Outside Plant Test Plan

SD-07 Certificates

Telecommunications Contractor Qualifications

Key Personnel Qualifications

Minimum Manufacturer's Qualifications

SD-08 Manufacturer's Instructions

Building protector assembly installation

Cable tensions

Fiber Optic Splices

Submit instructions prior to installation.

SD-09 Manufacturer's Field Reports

Factory Reel Test Data

SD-10 Operation and Maintenance Data

Telecommunications outside plant (OSP), Data Package 5

SD-11 Closeout Submittals

Record Documentation

In addition to other requirements, provide in accordance with paragraph "Record Documentation".

1.6 QUALITY ASSURANCE

1.6.1 Shop Drawings

Include wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure a coordinated installation. Wiring diagrams shall identify circuit terminals and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment. Drawings shall indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices. Submittals shall include the nameplate data, size, and capacity. Submittals shall also include applicable federal, military, industry, and technical society publication references.

1.6.1.1 Telecommunications Outside Plant Shop Drawings

Provide Outside Plant Design in accordance with EIA TIA/EIA-758, RUS Bul 1751F-630 for aerial system design, RUS Bul 1751F-643 for underground duct system design and for direct buried system design. Provide T0 shop drawings that show the physical and logical connections from the perspective of an entire campus, such as actual building locations, exterior pathways and campus backbone cabling on plan view drawings, major system nodes, and related connections on the logical system drawings in accordance with EIA TIA/EIA-606-A. Drawings shall include wiring and schematic diagrams for fiber optic and copper cabling and

splices, copper conductor gauge and pair count, fiber pair count and type, pathway duct and innerduct arrangement, associated construction materials, and any details required to demonstrate that cable system has been coordinated and will properly support the switching and transmission system identified in specification and drawings. Provide Registered Communications Distribution Designer (RCDD) approved drawings of the telecommunications outside plant. Update existing telecommunication Outside Plant T0 drawings to include information modified, deleted or added as a result of this installation in accordance with [EIA TIA/EIA-606-A](#). The [telecommunications outside plant \(OSP\)](#) shop drawings shall be included in the operation and maintenance manuals.

1.6.1.2 Telecommunications Entrance Facility Drawings

Provide T3 drawings for EF Telecommunications in accordance with [EIA TIA/EIA-606-A](#) that include telecommunications entrance facility plan views, pathway layout (cable tray, racks, ladder-racks, etc.), mechanical/electrical layout, and cabinet, rack, backboard, and wall elevations. Drawings shall show layout of applicable equipment including building protector assembly, incoming cable connector blocks, patch panels and equipment spaces, and cabinet/racks. Drawings shall include a complete list of equipment and material, equipment rack details, proposed layout and anchorage of equipment and appurtenances, and equipment relationship to other parts of the work including clearance for maintenance and operation. Drawings may also be an enlargement of a congested area of T1 or T2 drawings. Provide T3 drawings for EF Telecommunications as specified in the paragraph "Telecommunication Space Drawings" of Section 27 10 00, "Building Telecommunications Cabling Systems". The telecommunications entrance facility shop drawings shall be included in the operation and maintenance manuals.

1.6.2 Telecommunications Qualifications

Work under this section shall be performed by and the equipment shall be provided by the approved telecommunications contractor and key personnel. Qualifications shall be provided for: the telecommunications system contractor, the telecommunications system installer, the supervisor (if different from the installer), and the cable splicing and terminating personnel. A minimum of 30 days prior to installation, submit documentation of the experience of the telecommunications contractor and of the key personnel.

1.6.2.1 Telecommunications Contractor Qualifications

The telecommunications contractor shall be a firm which is regularly and professionally engaged in the business of the applications, installation, and testing of the specified telecommunications systems and equipment. The telecommunications contractor shall demonstrate experience in providing successful telecommunications systems that include outside plant and broadband cabling within the past 3 years. Submit documentation for a minimum of three and a maximum of five successful telecommunication system installations for the telecommunications contractor. Each of the key personnel shall demonstrate experience in providing successful telecommunications systems in accordance with [EIA TIA/EIA-758](#) within the past 3 years.

1.6.2.2 Key Personnel Qualifications

Provide key personnel who are regularly and professionally engaged in the

business of the application, installation and testing of the specified telecommunications systems and equipment. There may be one key person or more key persons proposed for this solicitation depending upon how many of the key roles each has successfully provided. Each of the key personnel shall demonstrate experience in providing successful telecommunications systems within the past 3 years.

Cable splicing and terminating personnel assigned to the installation of this system or any of its components shall have training in the proper techniques and have a minimum of 3 years experience in splicing and terminating the specified cables. Modular splices shall be performed by factory certified personnel or under direct supervision of factory trained personnel for products used.

Supervisors and installers assigned to the installation of this system or any of its components shall have factory or factory approved certification from each equipment manufacturer indicating that they are qualified to install and test the provided products.

Submit documentation for a minimum of three and a maximum of five successful telecommunication system installations for each of the key personnel. Documentation for each key person shall include at least two successful system installations provided that are equivalent in system size and in construction complexity to the telecommunications system proposed for this solicitation. Include specific experience in installing and testing telecommunications outside plant systems, including broadband cabling, and provide the names and locations of at least two project installations successfully completed using optical fiber and copper telecommunications cabling systems. All of the existing telecommunications system installations offered by the key persons as successful experience shall have been in successful full-time service for at least 18 months prior to the issuance date for this solicitation. Provide the name and role of the key person, the title, location, and completed installation date of the referenced project, the referenced project owner point of contact information including name, organization, title, and telephone number, and generally, the referenced project description including system size and construction complexity.

Indicate that all key persons are currently employed by the telecommunications contractor, or have a commitment to the telecommunications contractor to work on this project. All key persons shall be employed by the telecommunications contractor at the date of issuance of this solicitation, or if not, have a commitment to the telecommunications contractor to work on this project by the date that the bid was due to the Contracting Officer.

Note that only the key personnel approved by the Contracting Officer in the successful proposal shall do work on this solicitation's telecommunications system. Key personnel shall function in the same roles in this contract, as they functioned in the offered successful experience. Any substitution for the telecommunications contractor's key personnel requires approval from the Contracting Officer.

1.6.2.3 Minimum Manufacturer Qualifications

Cabling, equipment and hardware manufacturers shall have a minimum of 3 years experience in the manufacturing, assembly, and factory testing of components which comply with, [EIA TIA/EIA-568-B.1](#), [EIA TIA/EIA-568-B.2](#) and [EIA TIA/EIA-568-B.3](#). In addition, cabling manufacturers shall have a

minimum of 3 years experience in the manufacturing and factory testing of cabling which comply with ICEA S-87-640, ICEA S-98-688, and ICEA S-99-689.

1.6.3 Outside Plant Test Plan

Prepare and provide a complete and detailed test plan for field tests of the outside plant including a complete list of test equipment for the copper conductor and optical fiber cables, components, and accessories for approval by the Contracting Officer. Include a cut-over plan with procedures and schedules for relocation of facility station numbers without interrupting service to any active location. Submit the plan at least 30 days prior to tests for Contracting Officer approval. Provide outside plant testing and performance measurement criteria in accordance with EIA TIA/EIA-568-B.1 and RUS Bul 1753F-201. Include procedures for certification, validation, and testing that includes fiber optic link performance criteria.

1.6.4 Standard Products

Provide materials and equipment that are standard products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship and shall be the manufacturer's latest standard design that has been in satisfactory commercial or industrial use for at least 2 years prior to bid opening. The 2 year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturer's catalogs, or brochures during the 2 year period. Products supplied shall be specifically designed and manufactured for use with outside plant telecommunications systems. Where two or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in this section.

1.6.4.1 Alternative Qualifications

Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturer's factory or laboratory tests, is provided.

1.6.4.2 Material and Equipment Manufacturing Date

Products manufactured more than 3 years prior to date of delivery to site shall not be used, unless specified otherwise.

1.6.5 Regulatory Requirements

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Contracting Officer. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.

1.6.5.1 Independent Testing Organization Certificate

In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing, and approved by the Contracting Officer. The certificate shall state that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard.

1.7 DELIVERY, STORAGE, AND HANDLING

Ship cable on reels in 5000 foot lengths for 25, 50, or 100 pair configuration and 1250 feet length for larger cables. Radius of the reel drum shall not be smaller than the minimum bend radius of the cable. Wind cable on the reel so that unwinding can be done without kinking the cable. Two meters of cable at both ends of the cable shall be accessible for testing. Attach permanent label on each reel showing length, cable identification number, cable size, cable type, and date of manufacture. Provide water resistant label and the indelible writing on the labels. Apply end seals to each end of the cables to prevent moisture from entering the cable. Reels with cable shall be suitable for outside storage conditions when temperature ranges from minus 40 degrees C to plus 65 degrees C, with relative humidity from 0 to 100 percent. Equipment, other than cable, delivered and placed in storage shall be stored with protection from weather, humidity and temperature variation, dirt and dust, or other contaminants in accordance with manufacturer's requirements.

1.8 MAINTENANCE

1.8.1 Record Documentation

Provide the activity responsible for telecommunications system maintenance and administration a single complete and accurate set of record documentation for the entire telecommunications system with respect to this project.

Provide record documentation as specified in Section 27 10 00, "Building Telecommunications Cabling Systems".

Provide T5 drawings including documentation on cables and termination hardware in accordance with EIA TIA/EIA-606-A. T5 drawings shall include schedules to show information for cut-over and cable plant management, patch panel layouts, cross-connect information and connecting terminal layout as a minimum. T5 drawings shall be provided in both hard copy format and on electronic media using Windows based computer cable management software. A licensed copy of the cable management software including documentation shall be provided. Update existing record documentation to reflect campus distribution T0 drawings and T3 drawing schedule information modified, deleted or added as a result of this installation. Provide the following T5 drawing documentation as a minimum:

- a. Cables - A record of installed cable shall be provided in accordance with EIA TIA/EIA-606-A. The cable records shall include only the required data fields on the hard copy and the required data fields for each cable and complete end-to-end circuit report for each complete circuit from the assigned outlet to the entry facility in accordance with EIA TIA/EIA-606-A. Include manufacture date of cable with submittal.
- b. Termination Hardware - Provide a record of installed patch panels,

cross-connect points, campus distributor and terminating block arrangements and type in accordance with EIA TIA/EIA-606-A. Documentation shall include the required data fields in accordance with EIA TIA/EIA-606-A.

1.8.2 Spare Parts

In addition to the requirements of Section 01 78 23, "Operation and Maintenance Data", provide a complete list of parts and supplies, with current unit prices and source of supply, and a list of spare parts recommended for stocking. Spare parts shall be provided no later than the start of field testing.

1.9 WARRANTY

The equipment items shall be supported by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

Products supplied shall be specifically designed and manufactured for use with outside plant telecommunications systems.

2.2 TELECOMMUNICATIONS ENTRANCE FACILITY

2.2.1 Building Protector Assemblies

Building protector assembly shall be self-contained and have interconnecting hardware for connection to exterior cabling at full capacity. Provide manufacturers instructions for building protector assembly installation. Provide copper cable interconnecting hardware as specified in Section 27 10 00, "Building Telecommunications Cabling System".

2.2.2 Protector Modules

Provide in accordance with UL 497 3-electrode gas tube or solid state type 5 pin rated for the application. Provide gas tube protection modules in accordance with RUS Bul 345-83 and shall be heavy duty, 400 volt where A is the maximum single impulse discharge current, B is the impulse life and C is the AC discharge current in accordance with NEMA C62.61. The gas modules shall shunt high voltage to ground, fail short, and be equipped with an external spark gap and heat coils in accordance with UL 497. Provide the number of surge protection modules equal to the number of pairs of exterior cable of the building protector assembly.

2.2.3 Fiber Optic Terminations

Provide fiber optic cable terminations as specified in Section 27 10 00, "Building Telecommunications Cabling System".

2.2.4 Pathways

For underground applications, provide a minimum of two (2) four inch ducts, one of which contains four (4) one (1) inch inner ducts, 3" concrete encased, 24 inches below grade minimum from the Telecommunications Entrance

Facility to the maintenance hole that will be providing service to the building. The ducts will be plugged at both ends.

For direct buried applications, provide a minimum of two (2) four inch ducts from Telecommunications Entrance Facility to five feet outside the bldg, 24 inches below grade. The ducts will be plugged at both ends and clearly marked on outside end.

Handholes and maintenance holes shall be traffic rated. Hand hole size min 4'x4'x4'. Maintenance hole size min 6'x7'x8'.

2.3 CLOSURES

2.3.1 Copper Conductor Closures

2.3.1.1 Aerial Cable Closures

Provide cable closure assembly consisting of a frame with clamps, a lift-off polyethylene cover, cable nozzles, and drop wire rings. Closure shall be suitable for use on Figure 8 cables. Closures shall be free breathing and suitable for housing either straight-through or branch type splices of non-pressurized communications cables and shall be sized as indicated. The closure shall be constructed with ultraviolet resistant PVC.

NOTE: The installation of aerial cabling aboard Marine Corps Base, Camp Lejeune and Marine Corps Air Station, New River is not authorized.

2.3.1.2 Underground Cable Closures

- a. Aboveground. Provide aboveground closures constructed of not less than 14 gauge steel and acceptable pole or stake mounting in accordance with RUS 1755.910. Closures shall be sized and contain a marker as indicated. Covers shall be secured to prevent unauthorized entry.
- b. Direct burial. Provide buried closure suitable for enclosing a straight, butt, and branch splice in a container into which can be poured an encapsulating compound. Closure shall have adequate strength to protect the splice and maintain cable shield electrical continuity in the buried environment. Encapsulating compound shall be re-enterable and shall not alter the chemical stability of the closure. Provide filled splice cases in accordance with RUS Bul 345-72.
- c. In vault or manhole. Provide underground closure suitable to house a straight, butt, and branch splice in a protective housing into which can be poured an encapsulating compound. Closure shall be of suitable thermoplastic, thermoset, or stainless steel material supplying structural strength necessary to pass the mechanical and electrical requirements in a vault or manhole environment. Encapsulating compound shall be re-enterable and shall not alter the chemical stability of the closure. Provide filled splice cases in accordance with RUS Bul 345-72.

2.3.2 Fiber Optic Closures

2.3.2.1 Aerial

Provide aerial closure that is free breathing and suitable for housing

splice organizer of non-pressurized cables. Closure shall be constructed from heavy PVC with ultraviolet resistance.

NOTE: The installation of aerial cabling aboard Marine Corps Base, Camp Lejeune and Marine Corps Air Station, New River is not authorized.

2.3.2.2 Direct Burial

Provide buried closure suitable to house splice organizer in protective housing into which can be poured an encapsulating compound. Closure shall have adequate strength to protect the splice and maintain cable shield electrical continuity, when metallic, in buried environment. Encapsulating compound shall be re-enterable and shall not alter chemical stability of the closure.

2.3.2.3 Vaults or Manholes

Provide underground closure suitable to house splice organizer in a protective housing into which can be poured an encapsulating compound. Closure shall be of thermoplastic, thermoset, or stainless steel material supplying structural strength necessary to pass the mechanical and electrical requirements in a vault or manhole environment. Encapsulating compound shall be re-enterable and shall not alter the chemical stability of the closure.

2.4 PAD MOUNTED CROSS-CONNECT TERMINAL CABINETS

Provide in accordance with [RUS 1755.910](#) and the following:

- a. Constructed of 14 gauge steel.
- b. Equipped with a double set of hinged doors with closed-cell foam weather-stripping. Doors shall be locked and contain a marker as indicated.
- c. Equipped with spool spindle bracket, mounting frames, binding post log, jumper instruction label and load coil mounting provisions.
- d. Complete with cross connect modules to terminate number of pairs as indicated.
- e. Sized as indicated.

2.5 CABLE SPLICES, AND CONNECTORS

2.5.1 Copper Cable Splices

Provide multi-pair, in-line fold back or single pair, in-line splices of a moisture resistant, three-wire insulation displacement connector held rigidly in place to assure maximum continuity in accordance with [RUS Bul 1753F-401](#). Cables greater than 25 pairs shall be spliced using multi-pair splicing connectors, which accommodate 25 pairs of conductors at a time. Provide correct connector size to accommodate the cable gauge of the supplied cable.

2.5.2 Copper Cable Splice Connector

Provide splice connectors with a polycarbonate body and cap and a tin-plated brass contact element. Connector shall accommodate 19 to 26 AWG

solid wire with a maximum insulation diameter of 1.65 mm (0.065 inch). Fill connector with sealant grease to make a moisture resistant connection, in accordance with [RUS Bul 1753F-401](#).

2.5.3 Fiber Optic Cable Splices

Provide fiber optic cable splices and splicing materials for fusion methods at locations shown on the construction drawings. The splice insertion loss shall be 0.3 dB maximum when measured in accordance with [EIA TIA/EIA-455-59A](#) using an Optical Time Domain Reflectometer (OTDR). Splices shall be designed for a return loss of 40.0 db max for single mode fiber when tested in accordance with [EIA TIA/EIA-455-107A](#). Physically protect each fiber optic splice by a splice kit specially designed for the splice.

2.5.4 Fiber Optic Splice Organizer

Provide splice organizer suitable for housing fiber optic splices in a neat and orderly fashion. Splice organizer shall allow for a minimum of 1 m (3 feet) of fiber for each fiber within the cable to be neatly stored without kinks or twists. Splice organizer shall accommodate individual strain relief for each splice and allow for future maintenance or modification, without damage to the cable or splices. Provide splice organizer hardware, such as splice trays, protective glass shelves, and shield bond connectors in a splice organizer kit.

2.5.5 Shield Connectors

Provide connectors with a stable, low-impedance electrical connection between the cable shield and the bonding conductor in accordance with [RUS Bul 345-65](#).

2.6 CONDUIT

Provide conduit as specified in Section [33 71 02](#), "Underground Transmission and Distribution."

2.7 PLASTIC INSULATING TAPE

UL 510.

2.8 WIRE AND CABLE

2.8.1 Copper Conductor Cable

Solid copper conductors, covered with an extruded solid insulating compound. Insulated conductors shall be twisted into pairs which are then stranded or oscillated to form a cylindrical core. For special high frequency applications, the cable core shall be separated into compartments. Cable shall be completed by the application of a suitable core wrapping material, a corrugated copper or plastic coated aluminum shield, and an overall extruded jacket. Telecommunications contractor shall verify distances between splice points prior to ordering cable in specific cut lengths. Gauge of conductor shall determine the range of numbers of pairs specified; 19 gauge (6 to 400 pairs), 22 gauge (6 to 1200 pairs), 24 gauge (6 to 2100 pairs), and 26 gauge (6 to 3000 pairs). Copper conductors shall conform to the following: All copper conductor cable from 6 to 1800 pair shall be PE-39 type.

2.8.1.1 Underground

Provide filled cable meeting the requirements of ICEA S-99-689 and RUS 1755.390. Provide enough cable slack suitable for splicing operations, but in no case less than 10 feet.

2.8.1.2 Aerial

Provide filled cable meeting the requirements of ICEA S-99-689, ICEA S-98-688, and RUS 1755.390 except that it shall be suitable for aerial installation and shall be Figure 8 distribution wire with 26,700 N (6,000 pound) Class A galvanized steel or 26,700 N (6,000 pound) aluminum-clad steel strand.

NOTE: The installation of aerial cabling aboard Marine Corps Base, Camp Lejeune and Marine Corps Air Station, New River is not authorized.

2.8.1.3 Screen

Provide screen-compartmental core cable filled cable meeting the requirements of ICEA S-99-689 and RUS 1755.390.

2.8.2 Fiber Optic Cable

Provide single-mode, 8/125-um, 0.10 aperture 1310 nm fiber optic cable in accordance with EIA TIA/EIA-492CAAA, EIA TIA/EIA-472D000-A, and ICEA S-87-640 including any special requirements made necessary by a specialized design. Provide 12 optical fibers as indicated. Fiber optic cable shall be specifically designed for outside use with loose buffer construction. Provide fiber optic color code in accordance with EIA TIA/EIA-598-B

2.8.2.1 Strength Members

Provide central/non-central, and non-metallic/metallic strength members with sufficient tensile strength for installation and residual rated loads to meet the applicable performance requirements in accordance with ICEA S-87-640. The strength member is included to serve as a cable core foundation to reduce strain on the fibers, and shall not serve as a pulling strength member.

2.8.2.2 Shielding or Other Metallic Covering

Provide bare aluminum or coated aluminum, single tape covering or shield in accordance with ICEA S-87-640.

2.8.2.3 Performance Requirements

Provide fiber optic cable with optical and mechanical performance requirements in accordance with ICEA S-87-640.

2.8.3 Grounding and Bonding Conductors

Provide grounding and bonding conductors in accordance with RUS 1755.200, TIA J-STD-607-A, IEEE C2, and NFPA 70. Solid bare copper wire meeting the requirements of ASTM B 1 for sizes number 8 AWG and smaller and stranded bare copper wire meeting the requirements of ASTM B 8, for sizes number 6 AWG and larger. Insulated conductors shall have 600-volt, Type TW insulation meeting the requirements of UL 83.

2.9 T-SPAN LINE TREATMENT REPEATERS

Provide as indicated. Repeaters shall be pedestal mounted with non-pressurized housings, sized as indicated and shall meet the requirements of [RUS Bul 345-50](#).

2.10 CABLE TAGS IN MANHOLES, HANDHOLES, AND VAULTS

Provide tags for each telecommunications cable or wire located in manholes, handholes, and vaults. Cable tags shall be stainless steel or polyethylene and labeled in accordance with [EIA TIA/EIA-606-A](#). Handwritten labeling is unacceptable.

2.10.1 Stainless Steel

Provide stainless steel, cable tags 41.25 mm (1 5/8 inches) in diameter 1.58 mm (1/16 inch) thick minimum, and circular in shape. Tags shall be die stamped with numbers, letters, and symbols not less than 6.35 mm (0.25 inch) high and approximately 0.38 mm (0.015 inch) deep in normal block style.

2.10.2 Polyethylene Cable Tags

Provide tags of polyethylene that have an average tensile strength of 22.4 MPa (3250 pounds per square inch); and that are two millimeter (0.08 inch) thick minimum, non-corrosive non-conductive; resistive to acids, alkalis, organic solvents, and salt water; and distortion resistant to 77 degrees C (170 degrees F). Provide 1.3 mm (0.05 inch) minimum thick black polyethylene tag holder. Provide a one-piece nylon, self-locking tie at each end of the cable tag. Ties shall have a minimum loop tensile strength of 778.75 N (175 pounds). The cable tags shall have black block letters, numbers, and symbols 25 mm (one inch) high on a yellow background. Letters, numbers, and symbols shall not fall off or change positions regardless of cable tag orientation.

2.11 BURIED WARNING AND IDENTIFICATION TAPE

Provide fiber optic media marking and protection in accordance with [EIA TIA/EIA-590-A](#). Provide color, type and depth of tape as specified in paragraph "Buried Warning and Identification Tape" in Section [33 71 02](#), "Underground Transmission and Distribution".

2.12 GROUNDING BRAID

Provide grounding braid that provides low electrical impedance connections for dependable shield bonding in accordance with [RUS 1755.200](#). Braid shall be made from flat tin-plated copper.

2.13 MANUFACTURER'S NAMEPLATE

Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

2.14 FIELD FABRICATED NAMEPLATES

Provide laminated plastic nameplates in accordance with [ASTM D 709](#) for each

patch panel, protector assembly, rack, cabinet and other equipment or as indicated on the drawings. Each nameplate inscription shall identify the function and, when applicable, the position. Nameplates shall be melamine plastic, 3 mm (0.125 inch) thick, white with black center core. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core. Minimum size of nameplates shall be 25 by 65 mm (one by 2.5 inches). Lettering shall be a minimum of 6.35 mm (0.25 inch) high, and of normal block style.

2.15 TESTS, INSPECTIONS, AND VERIFICATIONS

2.15.1 Factory Reel Test Data

Test 100 percent OTDR test of FO media at the factory in accordance with EIA TIA/EIA-568-B.1 and EIA TIA/EIA-568-B.3. Use EIA TIA/EIA-526-7 for single mode optic fiber and EIA TIA/EIA-526-14A Method B for multi mode optic fiber measurements. Calibrate OTDR to show anomalies of 0.2 dB minimum. Enhanced performance filled OSP copper cables, referred to as Broadband Outside Plant (BBOSP), shall meet the requirements of ICEA S-99-689. Enhanced performance air core OSP copper cables shall meet the requirements of ICEA S-98-688. Submit test reports, including manufacture date for each cable reel and receive approval before delivery of cable to the project site.

PART 3 EXECUTION

3.1 INSTALLATION

Install all system components and appurtenances in accordance with manufacturer's instructions IEEE C2, NFPA 70, and as indicated. Provide all necessary interconnections, services, and adjustments required for a complete and operable telecommunications system.

3.1.1 Contractor Damage

Promptly repair indicated utility lines or systems damaged during site preparation and construction. Damages to lines or systems not indicated, which are caused by Contractor operations, shall be treated as "Changes" under the terms of the Contract Clauses. When Contractor is advised in writing of the location of a non-indicated line or system, such notice shall provide that portion of the line or system with "indicated" status in determining liability for damages. In every event, immediately notify the Contracting Officer of damage.

3.1.2 Cable Inspection and Repair

Handle cable and wire provided in the construction of this project with care. Inspect cable reels for cuts, nicks or other damage. Damaged cable shall be replaced or repaired to the satisfaction of the Contracting Officer. Reel wraps shall remain intact on the reel until the cable is ready for placement.

3.1.3 Direct Burial System

Installation shall be in accordance with RUS Bul 1751F-640. Under railroad tracks, paved areas, and roadways install cable in conduit encased in concrete. Slope ducts to drain. Excavate trenches by hand or mechanical trenching equipment. Provide a minimum cable cover of 610 mm (24 inches) below finished grade. Trenches shall be not less than 155 mm (6 inches)

wide and in straight lines between cable markers. Do not use cable plows. Bends in trenches shall have a radius of not less than 915 mm (36 inches). Where two or more cables are laid parallel in the same trench, space laterally at least 78 mm (3 inches) apart. When rock is encountered, remove it to a depth of at least 78 mm (3 inches) below the cable and fill the space with sand or clean earth, free from particles larger than 6 mm (1/4 inch). Do not unreel and pull cables into the trench from one end. Cable may be unreel on grade and lifted into position. Provide color, type and depth of warning tape as specified in paragraph "Buried Warning and Identification Tape" in Section 33 71 02, "Underground Transmission and Distribution".

3.1.3.1 Cable Placement

- a. Prior to design and installation of any copper or optical fiber cable systems, cable routes and pathways must be approved by the Base Telephone Officer.
- b. Separate cables crossing other cables or metal piping from the other cables or pipe by not less than 78 mm (3 inches) of well tamped earth. Do not install circuits for communications under or above traffic signal loops.
- c. Cables shall be in one piece without splices between connections except where the distance exceeds the lengths in which the cable is furnished.
- d. Avoid bends in cables of small radii and twists that might cause damage. Do not bend cable and wire in a radius less than 10 times the outside diameter of the cable or wire.
- e. Leave a horizontal slack of approximately 915 mm (3 feet) in the ground on each end of cable runs, on each side of connection boxes, and at points where connections are brought aboveground. Where cable is brought above ground, leave additional slack to make necessary connections.

3.1.3.2 Identification Markers

Provide a marker at each change of direction of the cable, over the ends of ducts or conduits which are installed under paved areas and roadways and over each splice. Identification markers shall be of concrete, approximately 508 mm (20 inches) square by 155 mm (6 inches) thick.

3.1.3.3 Backfill for Rocky Soil

When placing cable in a trench in rocky soil, the cable shall be cushioned by a fill of sand or selected soil at least 53 mm (2 inches) thick on the floor of the trench before placing the cable or wire. The backfill for at least 103 mm (4 inches) above the wire or cable shall be free from stones, rocks, or other hard or sharp materials which might damage the cable or wire. If the buried cable is placed less than 610 mm (24 inches) in depth, a protective cover of concrete shall be used.

3.1.4 Cable Protection

Provide direct burial cable protection in accordance with NFPA 70 and as specified in Section 33 71 02, "Underground Transmission and Distribution". Galvanized conduits which penetrate concrete (slabs, pavement, and walls)

shall be PVC coated and shall extend from the first coupling or fitting outside either side of the concrete minimum of 155 mm per 305 mm (6 inches per 12 inches) burial depth beyond the edge of the surface where cable protection is required; all conduits shall be sealed on each end. Where additional protection is required, cable may be placed in galvanized iron pipe (GIP) sized on a maximum fill of 40% of cross-sectional area, or in concrete encased 103 mm (4 inches) PVC pipe. Conduit may be installed by jacking or trenching. Trenches shall be backfilled with earth and mechanically tamped at 155 mm (6 inches) lift so that the earth is restored to the same density, grade and vegetation as adjacent undisturbed material.

3.1.4.1 Cable End Caps

Cable ends shall be sealed at all times with coated heat shrinkable end caps. Cable ends shall be sealed when the cable is delivered to the job site, while the cable is stored and during installation of the cable. The caps shall remain in place until the cable is spliced or terminated. Sealing compounds and tape are not acceptable substitutes for heat shrinkable end caps. Cable which is not sealed in the specified manner at all times will be rejected.

3.1.5 Underground Duct

Provide underground duct and connections to existing manholes, handholes, as specified in Section 33 71 02, "Underground Transmission and Distribution" with any additional requirements as specified herein.

3.1.6 Reconditioning of Surfaces

Provide reconditioning of surfaces as specified in Section 33 71 02, "Underground Transmission and Distribution".

3.1.7 Penetrations

Caulk and seal cable access penetrations in walls, ceilings and other parts of the building. Seal openings around electrical penetrations through fire resistance-rated wall, partitions, floors, or ceilings.

3.1.8 Cable Pulling

Test duct lines with a mandrel and swab out to remove foreign material before the pulling of cables. Avoid damage to cables in setting up pulling apparatus or in placing tools or hardware. Do not step on cables when entering or leaving the manhole. Do not place cables in ducts other than those shown without prior written approval of the Contracting Officer or Base Telephone Officer. Roll cable reels in the direction indicated by the arrows painted on the reel flanges. Set up cable reels on the same side of the manhole as the conduit section in which the cable is to be placed. Level the reel and bring into proper alignment with the conduit section so that the cable pays off from the top of the reel in a long smooth bend into the duct without twisting. Under no circumstances shall the cable be paid off from the bottom of a reel. Check the equipment set up prior to beginning the cable pulling to avoid an interruption once pulling has started. Use a cable feeder guide of suitable dimensions between cable reel and face of duct to protect cable and guide cable into the duct as it is paid off the reel. As cable is paid off the reel, lubricate and inspect cable for sheath defects. When defects are noticed, stop pulling operations and notify the Contracting Officer to determine required corrective action. Cable pulling shall also be stopped when reel binds or does not pay off

freely. Rectify cause of binding before resuming pulling operations. Provide cable lubricants recommended by the cable manufacturer. Avoid bends in cables of small radii and twists that might cause damage. Do not bend cable and wire in a radius less than 10 times the outside diameter of the cable or wire.

3.1.8.1 Cable Tensions

Obtain from the cable manufacturer and provide to the Contracting Officer, the maximum allowable pulling tension. This tension shall not be exceeded.

3.1.8.2 Pulling Eyes

Equip cables 32 mm (1.25 inches) in diameter and larger with cable manufacturer's factory installed pulling-in eyes. Provide cables with diameter smaller than 32 mm (1.25 inches) with heat shrinkable type end caps or seals on cable ends when using cable pulling grips. Rings to prevent grip from slipping shall not be beaten into the cable sheath. Use a swivel of 19 mm (3/4 inch) links between pulling-in eyes or grips and pulling strand.

3.1.8.3 Installation of Cables in Manholes, Handholes, and Vaults

Do not install cables utilizing the shortest route, but route along those walls providing the longest route and the maximum spare cable lengths. Form cables to closely parallel walls, not to interfere with duct entrances, and support cables on brackets and cable insulators at a maximum of 1220 mm (4 feet). Install cable or cables in corresponding ducts entering and exiting the manholes. In existing manholes, handholes, and vaults where new ducts are to be terminated, or where new cables are to be installed, modify the existing installation of cables, cable supports, and grounding as required with cables arranged and supported as specified for new cables. Identify each cable with corrosion-resistant embossed metal tags.

3.1.9 Aerial Cable Installation

Where physical obstructions make it necessary to pull distribution wire along the line from a stationary reel, use cable stringing blocks to support wire during placing and tensioning operations. Do not place ladders, cable coils, and other equipment on or against the distribution wire. Wire shall be sagged in accordance with the data shown. Protect cable installed outside of building less than 2.5 meters (8 feet) above finished grade against physical damage.

NOTE: The installation of aerial cabling aboard Marine Corps Base, Camp Lejeune and Marine Corps Air Station, New River is not authorized.

3.1.9.1 Figure 8 Distribution Wire

Perform spiraling of the wire within 24 hours of the tensioning operation. Perform spiraling operations at alternate poles with the approximate length of the spiral being 4575 mm (15 feet). Do not remove insulation from support members except at bonding and grounding points and at points where ends of support members are terminated in splicing and dead-end devices. Ground the support wire at poles to the pole ground.

3.1.9.2 Suspension Strand

Place suspension strand as indicated. Tension in accordance with the data indicated. When tensioning strand, loosen cable suspension clamps enough to

allow free movement of the strand. Place suspension strand on the road side of the pole line. In tangent construction, point the lip of the suspension strand clamp toward the pole. At angles in the line, point the suspension strand clamp lip away from the load. In level construction place the suspension strand clamp in such a manner that it will hold the strand below the through-bolt. At points where there is an up-pull on the strand, place clamp so that it will support strand above the through-bolt. Make suspension strand electrically continuous throughout its entire length, bond to other bare cables suspension strands and connect to pole ground at each pole.

3.1.9.3 Aerial Cable

Keep cable ends sealed at all times using cable end caps. Take cable from reel only as it is placed. During placing operations, do not bend cables in a radius less than 10 times the outside diameter of cable. Place temporary supports sufficiently close together and properly tension the cable where necessary to prevent excessive bending. In those instances where spiraling of cabling is involved, accomplish mounting of enclosures for purposes of loading, splicing, and distribution after the spiraling operation has been completed.

NOTE: The installation of aerial cabling aboard Marine Corps Base, Camp Lejeune and Marine Corps Air Station, New River is not authorized.

3.1.10 Cable Splicing

3.1.10.1 Copper Conductor Splices

Perform splicing in accordance with requirements of [RUS Bul 1753F-401](#) except that direct buried splices and twisted and soldered splices are not allowed. Exception does not apply for pairs assigned for carrier application.

3.1.10.2 Fiber Optic Splices

Fiber optic splicing shall be in accordance with manufacturer's recommendation and shall exhibit an insertion loss not greater than 0.3 dB for fusion splices.

3.1.11 Surge Protection

All cables and conductors, except fiber optic cable, which serve as communication lines through off-premise lines, shall have surge protection installed at each end which meets the requirements of [RUS Bul 1751F-815](#).

3.1.12 Grounding

Provide grounding and bonding in accordance with [RUS 1755.200](#), [TIA J-STD-607-A](#), [IEEE C2](#), and [NFPA 70](#). Ground exposed non-current carrying metallic parts of telephone equipment, cable sheaths, cable splices, and terminals.

3.1.12.1 Telecommunications Main Ground Bar (TMGB)

The TMGB is the hub of the basic telecommunications grounding system providing a common point of connection for ground from outside cable, CD, and equipment. Establish a TMGB for connection point for cable stub shields to connector blocks and CD protector assemblies as specified in Section

26 20 00 "Interior Distribution System". The TMGB will at a minimum be 4 inches by 10 inches by 1/4 inch.

3.1.12.2 Incoming Cable Shields

Shields shall not be bonded across the splice to the cable stubs. Ground shields of incoming cables in the EF Telecommunications to the TMGB.

3.1.12.3 Campus Distributor Grounding

- a. Protection assemblies: Mount CD protector assemblies directly on the telecommunications backboard. Connect assemblies mounted on each vertical frame with number 6 AWG copper conductor to provide a low resistance path to TMGB.
- b. TMGB connection: Connect TMGB to TGB with copper conductor with a total resistance of less than 0.01 ohms.

3.1.13 Cut-Over

All necessary transfers and cut-overs shall be accomplished by the telecommunications contractor.

3.2 LABELING

3.2.1 Labels

Provide labeling for new cabling and termination hardware located within the facility in accordance with EIA TIA/EIA-606-A. Handwritten labeling is unacceptable. Stenciled lettering for cable and termination hardware shall be provided using either thermal ink transfer process or laser printer.

3.2.2 Cable Tag Installation

Install cable tags for each telecommunications cable or wire located in manholes, handholes, and vaults including each splice. Tag only new wire and cable provided by this contract. Tag new wire and cable provided under this contract and existing wire and cable which are indicated to have splices and terminations provided by this contract. The labeling of telecommunications cable tag identifiers shall be in accordance with EIA TIA/EIA-606-A. Tag legend shall be as indicated. Do not provide handwritten letters. Install cable tags so that they are clearly visible without disturbing any cabling or wiring in the manholes, handholes, and vaults.

3.2.3 Termination Hardware

Label patch panels, distribution panels, connector blocks and protection modules using color coded labels with identifiers in accordance with EIA TIA/EIA-606-A.

3.3 FIELD APPLIED PAINTING

Provide ferrous metallic enclosure finishes in accordance with the following procedures. Ensure that surfaces are dry and clean when the coating is applied. Coat joints and crevices. Prior to assembly, paint surfaces which will be concealed or inaccessible after assembly. Apply primer and finish coat in accordance with the manufacturer's recommendations.

3.3.1 Cleaning

Clean surfaces in accordance with [SSPC SP 6](#).

3.3.2 Priming

Prime with a two component polyamide epoxy primer which has a bisphenol-A base, a minimum of 60 percent solids by volume, and an ability to build up a minimum dry film thickness on a vertical surface of 0.127 mm (5.0 mils). Apply in two coats to a total dry film thickness of 0.127 to 0.2 mm (5 to 8 mils).

3.3.3 Finish Coat

Finish with a two component urethane consisting of saturated polyester polyol resin mixed with aliphatic isocyanate which has a minimum of 50 percent solids by volume. Apply to a minimum dry film thickness of 0.05 to 0.076 mm (2 to 3 mils). Color shall be the manufacturer's standard.

3.4 FIELD FABRICATED NAMEPLATE MOUNTING

Provide number, location, and letter designation of nameplates as indicated. Fasten nameplates to the device with a minimum of two sheet-metal screws or two rivets.

3.5 FIELD QUALITY CONTROL

Provide the Contracting Officer 10 working days notice prior to each test. Provide labor, equipment, and incidentals required for testing. Correct defective material and workmanship disclosed as the results of the tests. Furnish a signed copy of the test results to the Contracting Officer within 3 working days after the tests for each segment of construction are completed. Perform testing as construction progresses and do not wait until all construction is complete before starting field tests.

3.5.1 [Pre-Installation Tests](#)

Perform the following tests on cable at the job site before it is removed from the cable reel. For cables with factory installed pulling eyes, these tests shall be performed at the factory and certified test results shall accompany the cable.

3.5.1.1 Cable Capacitance

Perform capacitance tests on at least 10 percent of the pairs within a cable to determine if cable capacitance is within the limits specified.

3.5.1.2 Loop Resistance

Perform DC-loop resistance on at least 10 percent of the pairs within a cable to determine if DC-loop resistance is within the manufacturer's calculated resistance.

3.5.1.3 Pre-Installation Test Results

Provide results of pre-installation tests to the Contracting Officer at least 5 working days before installation is to start. Results shall indicate reel number of the cable, manufacturer, size of cable, pairs

tested, and recorded readings. When pre-installation tests indicate that cable does not meet specifications, remove cable from the job site.

3.5.2 Acceptance Tests

Perform acceptance testing in accordance with [RUS Bul 1753F-201](#) and as further specified in this section. Provide personnel, equipment, instrumentation, and supplies necessary to perform required testing. Notification of any planned testing shall be given to the Contracting Officer at least 14 days prior to any test unless specified otherwise. Testing shall not proceed until after the Contractor has received written Contracting Officer's approval of the test plans as specified. Test plans shall define the tests required to ensure that the system meets technical, operational, and performance specifications. The test plans shall define milestones for the tests, equipment, personnel, facilities, and supplies required. The test plans shall identify the capabilities and functions to be tested. Provide test reports in booklet form showing all field tests performed, upon completion and testing of the installed system. Measurements shall be tabulated on a pair by pair or strand by strand basis.

3.5.2.1 Copper Conductor Cable

Perform the following acceptance tests in accordance with [EIA TIA/EIA-758](#):

- a. Wire map (pin to pin continuity)
- b. Continuity to remote end
- c. Crossed pairs
- d. Reversed pairs
- e. Split pairs
- f. Shorts between two or more conductors
- g. Grounded pairs.

3.5.2.2 Fiber Optic Cable

Test fiber optic cable in accordance with [EIA TIA/EIA-455-B](#) and as further specified in this section. Two optical tests shall be performed on all optical fibers: Optical Time Domain Reflectometry (OTDR) Test, and Attenuation Test. In addition, a Bandwidth Test shall be performed on all multimode optical fibers. These tests shall be performed on the completed end-to-end spans which include the near-end pre-connectorized single fiber cable assembly, outside plant as specified, and the far-end pre-connectorized single fiber cable assembly.

- a. OTDR Test: The OTDR test shall be used to determine the adequacy of the cable installations by showing any irregularities, such as discontinuities, micro-bendings or improper splices for the cable span under test. Hard copy fiber signature records shall be obtained from the OTDR for each fiber in each span and shall be included in the test results. The OTDR test shall be measured in both directions. A reference length of fiber, 1000 feet minimum, used as the delay line shall be placed before the new end connector and after the far end patch panel connectors for inspection of connector signature. Conduct OTDR test and provide

calculation or interpretation of results in accordance with EIA TIA/EIA-526-7 for single-mode fiber and EIA TIA/EIA-526-14A for multimode fiber. Splice losses shall not exceed 0.3 db.

- b. Attenuation Test: End-to-end attenuation measurements shall be made on all fibers, in both directions, using a 850 and 1300 for 62.5 multi-mode fiber and 1310 and 1550 for single mode nanometer light source at one end and the optical power meter on the other end to verify that the cable system attenuation requirements are met in accordance with EIA TIA/EIA-455-46A for multimode and EIA TIA/EIA-526-7 for single-mode fiber optic cables. The measurement method shall be in accordance with EIA TIA/EIA-455-61A. Attenuation losses shall not exceed 0.5 db/km at 1310 nm and 1550 nm for single-mode fiber. Attenuation losses shall not exceed 5.0 db/km at 850 nm and 1.5 db/km at 1300 nm for multimode fiber.
- c. Bandwidth Test: The end-to-end bandwidth of all multimode fiber span links shall be measured by the frequency domain method. The bandwidth shall be measured in both directions on all fibers. The bandwidth measurements shall be in accordance with EIA TIA/EIA-455-204.

3.5.3 Soil Density Tests

- a. Determine soil-density relationships for compaction of backfill material in accordance with ASTM D 1557, Method D.

-- End of Section --

ASBESTOS AND LEAD PAINT INSPECTION

MAJOR INTERIOR MODIFICATIONS

Building 205

MBF PROJECT NUMBER 0630 & 0904

MARINE CORPS CAMP LEJEUNE

NORTH CAROLINA

PREPARED FOR

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N. C. ASBESTOS PROJECT DESIGNER NO. 40039
UNC-CH TRAINED LEAD IN PAINT INSPECTOR

INTRODUCTION

An asbestos and lead paint inspection of Building 205 at the USMCB – Camp Lejeune, North Carolina was completed on January 23, 2007

The work area of concern is, but not limited to, the renovation of the building interior by replacement of the, all mechanical and electrical systems, floors, the ceilings and all interior and exterior finishes.

The building is a two story masonry and brick structure, on an elevated concrete slab floor , brick veneer and interior wood and plaster or sheet rock walls .

This inspection was to identify asbestos containing building materials; to identify lead containing paint and to assess the condition of the materials, prior to repair and / or alteration of the building.

OBSERVATIONS

Roof

The roof is a steel frame “A” roof covered with standard three tab shingles.

Walls

The exterior walls are plaster , brick and block walls. Some of the interior walls are wood frame plaster or sheet rock walls..

Windows and Doors

The windows and doors are metal frame and the doors are metal. No fire retardant doors were detected.

Ceilings

The ceilings are plaster.

Floors

The floors are concrete covered with ceramic tile, 12x12 floor tile and or carpet on the top layer.

Attic

The attic is the underside of the “A” roof

Pipes

The insulated pipes have paper wrapped fiber glass insulation with plastic joints or is a cloth wrapped foam rubber insulation The paper wrapped fiber glass pipe insulation has mastic on the ends and joints. There are cloth wrapped white powder insulated pipes in the pipe chases and in the ceiling of the bath rooms and the center hall on the first floor.

PAINT

The interior and exterior paints are semi gloss industrial type paints intended for heavy wear.

The interior of the building area is painted a cream with blue trim and doors the exterior doors and windows are painted with a white color.

SUSPECT ASBESTOS

The suspect Asbestos Containing Materials found in the building, for the purpose of this report, consist of four types of materials: Miscellaneous Non-Friable Material, Surfacing material and Thermal System Friable. Material.

MISCELLANEOUS NON FRIABLE MATERIALS (MIS-NF)

The Miscellaneous Non-Friable Materials (MIS-NF) are classified as a non-friable material; because of their density and/or asphalt content. However; some of these materials can become Friable if they are cut, sawed, broken or abraded in a way that would release fibers in to the air.

Four Miscellaneous Non-Friable Materials were found in the building: floor tile and floor tile mastic, wall and ceiling plaster.

SURFACING FRIABLE MATERIALS (SUR-F)

These materials (SUR-F) are considered very friable, because they are easily broken, crumbled, pulverized, and reduced to powder by hand pressure. These materials are usually sprayed on finish coats over other materials and are applied to provide a texture appearance to the finish of a wall or ceiling.

One Surfacing Friable material was found in the work area: the ceiling finish material.

THERMAL SYSTEM INSULATION – FRIABLE (TSI-F)

Thermal system insulation (TSI) is insulation applied to pipes, tanks and etc. to prevent freezing or loss of steam heat. The insulation is applied to pipes and wrapped with a cloth or other material as a covering to contain the insulation and to prevent damage to the insulation. The insulation is usually very friable, therefore any disturbance to the wrapping, creates a release of material into the air.

One thermal system insulation material was found in the building: pipe insulation and air duct insulation. The TSI appeared to be paper or cloth wrapped fiber glass with plastic elbows and appeared to all be “asbestos free”; however the pipe insulation has a mastic sealer on the ends of the insulation that is a suspect asbestos containing material. The air ducts are covered with a aluminum fiber glass wrapped insulation. There are some cloth wrapped and paper wrapped white powder pipes in the steam pit The original steam pipe insulation appears to be cloth wrapped white powder through out the building. The steam and water pipes are in the steam pit and are circulated upward into the building to provide heat to radiators and water to the restrooms. Some of the pipes in the steam pit were marked “asbestos free”. The original pipes in the wall chase has cloth wrapped white powder insulation and the original pipes to th restrooms has paper wrapped fiber glass insulation.

SUMMARY

The building was inspected for identification of suspect asbestos containing materials and lead containing paint, that would be affected by the proposed renovation of the building. Those materials identified were analyzed for the presence of asbestos and/or lead.

LEAD

Paint containing more than 0.5 % lead is considered a regulated paint in accordance with present North Carolina, EPA and HUD guide lines.

There are four paints detected that contained more than 0.5 % lead,

Paint containing more than 0.06 % lead is considered a regulated paint in accordance with Atlantic Div. NAVFACENGCOM and Navy Spec. # 13282 and 13283 may apply.

The following paints have the lowest levels of lead – Less Than 0.06 % and are considered lead free.

SAMPLE ID. NUMBER	COND. P/G/E.	PAINT DESCRIPTION	SAMPLE LOCATION	% LEAD CONTENT
12L 205	P	WHITE	HVAC DUCT AT CEILING IN CENTER ROOM EAST WING ON 1 ST FLOOR	<0.008
16L 205	G	CREAM	WEST WALL IN S.E. WING ON 2 ND FLOOR	<0.008
10L 205	G	CREAM	WEST WALL IN CENTER OFFICE WEST WING ON 1 ST FLOOR	<0.009
17L 205	G	BLACK	BASEBOARD AT NORTH END S.E. WING ON 2 ND FLOOR	<0.009
26L 205	G	CREAM OVER BROWN	RADIATOR IN EAST SIDE SECTION BATHROOM AT WEST END ON 2 ND FLOOR	<0.009
1L 205	G	DARK BLUE OVER GREEN	EXTERIOR EXIT DOOR AT REAR IN CENTER WING ON 1 ST FLOOR	<0.010
3L 205	G	CREAM	EAST WALL IN CENTER WING ON 1 ST FLOOR	0.010
8L 205	G	RED OVER GREEN	STAIR TRIM AT WEST END ON 1 ST FLOOR	<0.010
13L 205	G	BLACK	BASEBOARD NEAR STAIRS EAST END ON 1 ST FLOOR	<0.010
14L 205	G	RED	STAIR RAIL AT EAST END ON 1 ST FLOOR	<0.010
22L 205	G	CREAM	WEST WALL IN CENTER ROOM WEST WING ON 2 ND FLOOR	<0.010
24L 205	G	RED OVER BLACK	DOOR TRIM TO CENTER ROOM WEST WING ON 2 ND FLOOR	<0.010

he following paints have the lowest levels of lead – Less Than 0.06 % and are considered lead free.

SAMPLE ID. NUMBER	COND. P/G/E.	PAINT DESCRIPTION	SAMPLE LOCATION	% LEAD CONTENT
4L 205	G	BLACK	BASE BOARD ON EAST SIDE IN CENTER WING ON 1 ST FLOOR	<0.011
15L 205	P	BLACK OVER RED	STEP TO STAIRS AT EAST END ON 1 ST FLOOR	0.012
18L 205	G	BLACK	WINDOW SILL ON EAST SIDE S.E. WING ON 2 ND FLOOR	<0.012
25L 205	G	CREAM	DOOR TO CENTER ROOM WEST WING ON 2 ND FLOOR	<0.012
11L 205	G	BLACK OVER CREAM	WINDOW SILL ON WEST WALL IN CENTER OFFICE WEST WING ON 1 ST FLOOR	<0.013
19L 205	G	CREAM	EAST WALL IN S.E. WING ON 2 ND FLOOR	<0.014
2L 205	G	WHITE	DUCT AT CEILING IN CENTER WING ON 1 ST FLOOR	<0.017
6L 205	G	WHITE	PORCH POLE ON N.W. END	<0.022
21L 205	G	CREAM OVER GREEN	HVAC DUCT AT CEILING IN WEST END BATHROOM ON 2 ND FLOOR	0.047

The following paints have the highest unregulated levels of lead – 0.06 % to 0.5%

SAMPLE ID. NUMBER	COND. P/G/E.	PAINT DESCRIPTION	SAMPLE LOCATION	% LEAD CONTENT
5L 205	G	BLACK	RADIATOR IN WEST END BATHROOM ON 1 ST FLOOR	0.057
27L 205	G	CREAM OVER GREEN	BATHROOM STALL ON EAST SIDE IN BATHROOM AT WEST END ON 2 ND FLOOR	0.069

The following paints have the highest levels of lead – 0.5% or greater

SAMPLE ID. NUMBER	COND. P/G/E.	PAINT DESCRIPTION	SAMPLE LOCATION	% LEAD CONTENT
7L 205	G	SAFETY YELLOW	PORCH TRIM ON N.W. END	0.13
23L 205	G	BLACK	WINDOW SILL ON WEST WALL CENTER ROOM WEST WING ON 2 ND FLOOR	0.13
20L 205	G	BLACK	RADIATOR IN WEST END BATHROOM ON 2 ND FLOOR	0.21
9L 205	G	WHITE	CEILING NEAR STAIRS AT WEST END ON FIRST FLOOR	4.5

All paints appeared to be in good to excellent condition.

Guidance on Lead-Based Paint Issues

An inspection and lead paint chip analysis is required of all painted surfaces which will be disturbed. When paint containing lead and/or lead-based paint has been identified in the work area, LANTDIV NAVFACENGCOSINST 10360.1 directs that appropriate guide specifications be included in the projects documents if paint in the work area is found to contain lead concentrations in excess of 0.06%.

LANTDIV recommends use of **Guide Specification 13282, Removal and Disposal of Material Containing Lead**, for projects where cutting, grinding, sanding, or welding of painted surfaces or removal of paint is required but **lead-based paint hazard abatement is not the purpose of the work**; and use of **Guide Specification 13283, Removal of Lead-Containing Paint**, only if **lead-based paint hazard abatement is the purpose of the work**.

Paint chips and painted materials must be properly disposed. All loose chips or flakes of paint must be removed from materials slated for disposal. Chips or flakes of paints that may contain detectable quantities of lead must be collected and examined for hazardous waste characteristics (TCLIP analysis) prior to disposal. Painted materials cannot be disposed of as inert debris. A TCLIP analysis of more than 5 ppm lead is considered a hazardous waste material.

Disposal

Paint chips and painted materials must be properly disposed. All loose chips or flakes of paint must be removed from materials slated for disposal. Chips or flakes of paints that may contain detectable quantities of lead must be collected and examined for hazardous waste characteristics prior to disposal. Painted materials cannot be disposed of as inert debris. The Resource Conservation and Recovery Act has a 5 ppm limit on lead. The proper test for solid waste disposal of lead paint is testing for metals as a Toxicity Characteristic Leaching Procedure (TCLP) and should include levels of cadmium and chromium. The limit for cadmium is 1 ppm and the limit for chromium is 5 ppm.

OSHA

OSHA Action Level is 30 ug / m³ as an 8 – hour time weighted average (TWA) by personnel air sampling.

Rev. 8/1/01

Asbestos containing materials WERE DETECTED

SAMPLE NUMBER	HOMOGENEOUS AREA	MATERIAL DESCRIPTION	QUANTITY	SAMPLE LOCATION	ASBESTOS CONTENT
20-205	MIS-NF1 FT-1	CREAM W/TAN STREAKS FLOOR TILE	12X12	S.E. WING ON 2 ND FLOOR	2% CRYSTOTILE
28-205	MIS-NF1 FT-1	CREAM W/TAN STREAKS FLOOR TILE	12X12	CENTER HALL AT WEST WING ON 2 ND FLOOR	2% CRYSTOTILE
3-205	MIS-NF2	BLACK F.T. MASTIC		REAR CENTER WING ON 1 ST FLOOR	4% CRYSTOTILE
21-205	MIS-NF2	BLACK F.T. MASTIC		S.E. WING ON 2 ND FLOOR	4% CRYSTOTILE
29-205	MIS-NF2	BLACK F. T. MASTIC		CENTER HALL AT WEST WING ON 2 ND FLOOR	4% CRYSTOTILE

ASBESTOS


The vertical and horizontal plumbing chases in the walls and in the ceilings of the first floor may contain asbestos insulation with chrysotile and amosite asbestos insulation. Access to these areas was not available with out destructive inspection.

No insulated pipes were observed in the attic, because of the blown in fiber glass insulation, however this type of building typically contains asbestos insulated pipes, cloth wrapped with white powder insulation in the attic space. It should be assumed that this type of material may be present.

The 12x12 floor tile and the floor tile mastic, throughout the building , on the first and second floor contains up to 4% chrysotile asbestos.

NO other Asbestos containing materials were detected by this inspection.

SEE ATTACHED SAMPLE LIST, SAMPLE LOCATION DIAGRAMS AND LAB ANALYSIS REPORTS.

____Mack Churchill _____  **____5/28/2009____**
Signature Date

LAB CHAIN OF CUSTODY BULK SAMPLE DATA AND ANALYSIS RESULTS FORM

PAINT CHIP AAS

1. Client:: Maune Belangia Falkenberry Ref: Bill Faukenberry
 2. Client's Address: 317-C Pollock Street New Bern 28560
 3. Sample Collected By: Mack Churchill - N.C. Inspector Cert. No. 10831
 SITE : CLMCB CAMP LEJEUNE, N.C. VARIOUS PROJECTS
 Shipped To: HOWARD VARNER - Environmental Hazards Services – ELPAT # 08648 – AIHA # 8648 - UPS - 7469 Whitepine Road - Richmond Virginia 23237
4. Analysis Requested: X LEAD _____
 5. No. of Samples: 27 6. Sample Collection Date: 1/16/07
 7. Date Results Needed: _____ 72 Hour _____
 BUILDING: 205

SAMPLE ID. NUMBER	COND. P/G/E.	PAINT DESCRIPTION	SAMPLE LOCATION	% LEAD CONTENT
1L 205	G	DARK BLUE OVE GREEN	EXTERIOR EXIT DOOR AT REAR IN CENTER WING ON 1 ST FLOOR	<0.010
2L 205	G	WHITE	DUCT AT CEILING IN CENTER WING ON 1 ST FLOOR	<0.017
3L 205	G	CREAM	EAST WALL IN CENTER WING ON 1 ST FLOOR	0.010
4L 205	G	BLACK	BASE BOARD ON EAST SIDE IN CENTER WING ON 1 ST FLOOR	<0.011
5L 205	G	BLACK	RADIATOR IN WEST END BATHROOM ON 1 ST FLOOR	0.057
6L 205	G	WHITE	PORCH POLE ON N.W. END	<0.022
7L 205	G	SAFETY YELLOW	PORCH TRIM ON N.W. END	0.13
8L 205	G	RED OVER GREEN	STAIR TRIM AT WEST END ON 1 ST FLOOR	<0.010
9L 205	G	WHITE	CEILING NEAR STAIRS AT WEST END ON FIRST FLOOR	4.5
10L 205	G	CREAM	WEST WALL IN CENTER OFFICE WEST WING ON 1 ST FLOOR	<0.009
11L 205	G	BLACK OVER CREAM	WINDOW SILL ON WEST WALL IN CENTER OFFICE WEST WING ON 1 ST FLOOR	<0.013
12L 205	P	WHITE	HVAC DUCT AT CEILING IN CENTER ROOM EAST WING ON 1 ST FLOOR	<0.008
13L 205	G	BLACK	BASEBOARD NEAR STAIRS EAST END ON 1 ST FLOOR	<0.010
14L 205	G	RED	STAIR RAIL AT EAST END ON 1 ST FLOOR	<0.010
15L 205	P	BLACK OVER RED	STEP TO STAIRS AT EAST END ON 1 ST FLOOR	0.012
16L 205	G	CREAM	WEST WALL IN S.E. WING ON 2 ND FLOOR	<0.008
17L 205	G	BLACK	BASEBOARD AT NORTH END S.E. WING ON 2 ND FLOOR	<0.009
18L 205	G	BLACK	WINDOW SILL ON EAST SIDE S.E. WING ON 2 ND FLOOR	<0.012
19L 205	G	CREAM	EAST WALL IN S.E. WING ON 2 ND FLOOR	<0.014
20L 205	G	BLACK	RADIATOR IN WEST END BATHROOM ON 2 ND FLOOR	0.21
21L 205	G	CREAM OVER GREEN	HVAC DUCT AT CEILING IN WEST END BATHROOM ON 2 ND FLOOR	0.047
22L 205	G	CREAM	WEST WALL IN CENTER ROOM WEST WING ON 2 ND FLOOR	<0.010
23L 205	G	BLACK	WINDOW SILL ON WEST WALL CENTER ROOM WEST WING ON 2 ND FLOOR	0.13
24L 205	G	RED OVER BLACK	DOOR TRIM TO CENTER ROOM WEST WING ON 2 ND FLOOR	<0.010
25L 205	G	CREAM	DOOR TO CENTER ROOM WEST WING ON 2 ND FLOOR	<0.012
26L 205	G	CREAM OVER BROWN	RADIATOR IN EAST SIDE SECTION BATHROOM AT WEST END ON 2 ND FLOOR	<0.009
27L 205	G	CREAM OVER GREEN	BATHROOM STALL ON EAST SIDE IN BATHROOM AT WEST END ON 2 ND FLOOR	0.069

Samples Received at Lab and Accepted By: HOWARD VARNER Lab Results Reviewed By: Mack Churchill  Date: 5/28/2009

LAB CHAIN OF CUSTODY BULK SAMPLE DATA AND ANALYSIS RESULTS FORM

1. Client: Maune Belanga Faulkenberry ARCHITECTS Ref: Bill Faulkenberry

4. Analysis Requested: _____ Asbestos PLM

2. Client's Address: 317-C Pollock Street New Bern, NC 28560

5. No. of Samples: 32 6. Sample Collection Date: 1/16/07

3. Sample Collected By: Mack Churchill - N. C. Inspector Cert. No. 10831

7. Date Results Needed: _____ 72 Hour _____

SITE: CLMCB CAMP LEJUENE , N.C. VARIOUS PROJECTS

BUILDING: 205

Shipped To: HOWARD VARNER - Environmental Hazards Services - NY ELAP #11714., NVLAP # 101882-0 - AIHA # 8648 - UPS - 7469 Whitepine Road - Richmond Virginia 23237

1-205	SUR-F1	SPRAYED ON CEILING MATERIAL		REAR CENTER WING ON 1 ST FLOOR	NONE
2-205	MIS-NF1 FT-1	CREAM W/TAN STREAKS FLOOR TILE	12X12	REAR CENTER WING ON 1 ST FLOOR	NONE
3-205	MIS-NF2	BLACK F.T. MASTIC		REAR CENTER WING ON 1 ST FLOOR	4% CRYSTOTILE
4-205	MIS-NF6	PLASTER MATERIAL (TOP)		EAST WALL CENTER WING	NONE
5-205	MIS-NF6	PLASTER (2 ND LAYER)		EAST WALL CENTER WING	NONE
6-205	TSI-NF1	PAPER WRAP F. G. MASTIC	5''	PIPE NEAR CEILING ON WEST SIDE IN REAR CENTER WING ON 1 ST FLOOR	NONE
7-205	TSI-NF10	PAPER WRAP F.G. INSULATION DEBRIS		EAST SIDE PLUMBING WALL CENTER HALL TO REAR WING ON 1 ST FLOOR	NONE
8-205	MIS-NF1 FT-1	CREAM W/TAN STREAKS FLOOR TILE	12C12	CENTER MAIN HALL NEAR REAR WING ON 1 ST FLOOR	NONE
9-205	MIS-NF2	TAN F.T. MASTIC		CENTER MAIN HALL NEAR REAR WING ON 1 ST FLOOR	NONE
10-205	MIS-NF6	PLASTER MATERIAL		UPPER WALL IN WEST END BATHROOM	NONE
11-205	TSI-F1	PAPER WRAP WHITE POWDER	3''	PLUMBING WALL IN WEST SIDE SECTION IN WEST END BATHROOM ON 1 ST FLOOR	NONE
12-205	MIS-NF6	PLASTER MATERIAL (TOP)		WEST WALL IN CENTER RM WEST WING ON 1 ST FLOOR	NONE
13-205	MIS-NF6	PLASTER MATERIAL (2 ND LAYER)		WEST WALL IN CENTER RM WEST WING ON 1 ST FLOOR	NONE
14-205	SUR-F1	SPRAYED ON CEILING MATERIAL		CENTER ROOM WEST WING ON 1 ST FLOOR	NONE

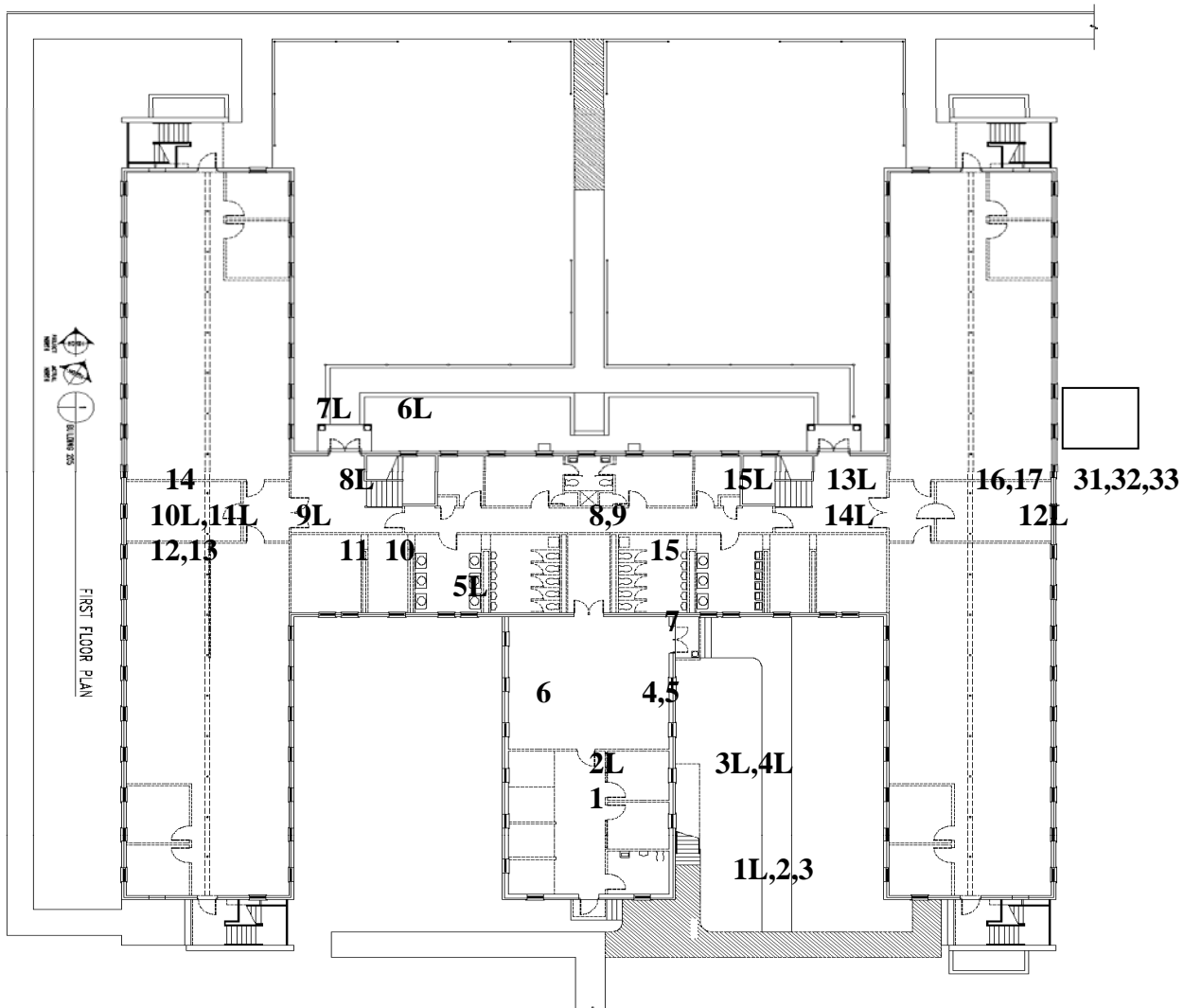
Samples Received at Lab and Accepted By: HOWARD VARNER Lab Results Reviewed By: Mack Churchill  Date: 5/28/2009

SAMPLE NUMBER	HOMOGENEOUS AREA	MATERIAL DESCRIPTION	QUANTITY	SAMPLE LOCATION	ASBESTOS CONTENT
15-205	SUR-F1	SPRAYED ON CEILING MATERIAL		ROOM ON SOUTH SIDE EAST END HALL ON 1 ST FLOOR	NONE
16-205	MIS-NF1 FT-2	CREAM W/TAN DESIGN FLOOR TILE	12X12	CENTER ROOM EAST WING ON 1 ST FLOOR	NONE
17-205	MIS-NF2	TAN F.T. MASTIC		CENTER ROOM EAST WING ON 1 ST FLOOR	NONE
18-205	SUR-F1	SPRAYED ON CEILING MATERIAL		S.E. WING ON 2 ND FLOOR	NONE
19-205	MIS-NF7	PLASTER MATERIAL		S.E. WING ON 2 ND FLOOR	NONE
20-205	MIS-NF1 FT-1	CREAM W/TAN STREAKS FLOOR TILE	12X12	S.E. WING ON 2 ND FLOOR	2% CRYSTOTILE
21-205	MIS-NF2	BLACK F.T. MASTIC		S.E. WING ON 2 ND FLOOR	4% CRYSTOTILE
22-205	MIS-NF6	PLASTER (TOP)		EAST WALL S.E. WING ON 2 ND FLOOR	NONE
23-205	MIS-NF6	PLASTER (2 ND LAYER)		EAST WALL S.E. WING ON 2 ND FLOOR	NONE
24-205	MIS-NF9	SHEET ROCK MUD		WEST SIDE PLUMBING WALL IN CENTER HALL TO REAR CENTER WING ON 2 ND FLOOR	NONE
25-205	TSI-F1	PAPER WRAP WHITE POWDER		WEST SIDE PLUMBING WALL IN WEST END BATHROOM ON 2 ND FLOOR	NONE
26-205	TSI-F1	PAPER WRAP WHITE POWDER		EAST SIDE PLUMBING WALL IN WEST END BATHROOM ON 2 ND FLOOR	NONE
27-205	SUR-F1	SPRAYED ON CEILING MATERIAL		CENTER ROOM WEST WING ON 2 ND FLOOR	NONE
28-205	MIS-NF1 FT-1	CREAM W/TAN STREAKS FLOOR TILE	12X12	CENTER HALL AT WEST WING ON 2 ND FLOOR	2% CRYSTOTILE
29-205	MIS-NF2	BLACK F. T. MASTIC		CENTER HALL AT WEST WING ON 2 ND FLOOR	4% CRYSTOTILE
30-205	TSI-NF10	PAPER WRAP F. G. INSULATION	6''	WEST WALL AT TANK IN STEAM PIT	NONE
31-205	TSI-F1	PAPER WRAP WHITE POWDER	6''	NORTH WALL IN STEAM PIT	NONE
32-205	TSI-F2	CLOTH WRAP WHITE POWDER		TANK IN STEAM PIT	NONE

MACK CHURCHILL AND ASSOC.
1120 E. FORT MACON ROAD
ATLANTIC BEACH, N. C. 252-247-3484

January 23, 2007
INSPECTION REPORT
Building 205

BUILDING 205 FIRST FLOOR



BUILDING 205 SECOND FLOOR

22L
23L

27 24L
25L

28,29

21L 26
25 20L 24

27L,26L

20,21

18,19 18L ,19L

16L

22,23

17L

ENVIRONMENTAL HAZARDS SERVICES, L.L.C.

7469 WHITE PINE ROAD - RICHMOND, VA 23237
804-275-4788 FAX 804-275-4907

LEAD IN PAINT ANALYSIS SUMMARY

CLIENT: Mack Churchill & Associates
1120 E. Fort Macon Rd.
Atlantic Beach, NC 28512

DATE OF SAMPLING: 16 Jan 2007
DATE OF RECEIPT: 18 Jan 2007
DATE OF ANALYSIS: 18 Jan 2007
DATE OF REPORT: 19 Jan 2007

CLIENT NUMBER: 34-3914 A
EHS PROJECT #: 2007-01-1832
PROJECT: 205

EHS SAMPLE#	CLIENT SAMPLE#	SAMPLE WEIGHT (g)	CONCENTRATION (% BY WEIGHT)
01	1 L-205	0.201	<0.010
02	2 L-205	0.118	<0.017
03	3 L-205	0.203	0.010
04	4 L-205	0.199	<0.011
05	5 L-205	0.087	0.057
06	6 L-205	0.093	<0.022
07	7 L-205	0.246	0.13
08	8 L-205	0.216	<0.010
09	9 L-205	0.223	4.5
10	10 L-205	0.227	<0.009
11	11 L-205	0.162	<0.013
12	12 L-205	0.253	<0.008
13	13 L-205	0.200	<0.010
14	14 L-205	0.207	<0.010
15	15 L-205	0.170	0.012
16	16 L-205	0.272	<0.008
17	17 L-205	0.241	<0.009
18	18 L-205	0.174	<0.012
19	19 L-205	0.148	<0.014

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ENVIRONMENTAL HAZARDS SERVICES, L.L.C.

CLIENT NUMBER: 34-3914 A
 EHS PROJECT #: 2007-01-1832
 PROJECT: 205

EHS SAMPLE#	CLIENT SAMPLE#	SAMPLE WEIGHT (g)	CONCENTRATION (% BY WEIGHT)
20	20 L-205	0.068	0.21
21	21 L-205	0.175	0.047
22	22 L-205	0.201	<0.010
23	23 L-205	0.076	0.13
24	24 L-205	0.210	<0.010
25	25 L-205	0.177	<0.012
26	26 L-205	0.248	<0.009
27	27 L-205	0.093	0.069

QUALITY CONTROL DATA

BATCH#:	011807P-2
INCLUSIVE EHS SAMPLE NUMBERS:	01-20
Continuing Calibration Verification 10 (10.0ppm Pb)	102% Recovery
Continuing Calibration Verification 5 (5.00ppm Pb)	107% Recovery
Laboratory Control Standard	102% Recovery
Matrix Spike	95.6% Recovery
Duplicate Relative Percent Difference	5.71 RPD
Reporting Limit	20ug
Method Detection Limit	2.9ug

BATCH#:	011807P-3
INCLUSIVE EHS SAMPLE NUMBERS:	21-27
Continuing Calibration Verification 10 (10.0ppm Pb)	99.8% Recovery
Continuing Calibration Verification 5 (5.00ppm Pb)	107% Recovery
Laboratory Control Standard	95.4% Recovery
Matrix Spike	98.0% Recovery
Duplicate Relative Percent Difference	2.76 RPD
Reporting Limit	20ug
Method Detection Limit	2.9ug

PREPARATION METHOD: EPA 600/R-93/200
ANALYSIS METHOD: EPA SW846 7420

ANALYST: Darlene Schiltz

Reviewed By Authorized Signatory:

Irma Faszewski
 Michael A. Mueller, MPH, Laboratory Director
 Howard Varner, General Manager
 Irma Faszewski, Quality Assurance Coordinator
 David Xu, MS, Senior Chemist

ENVIRONMENTAL HAZARDS SERVICES, L.L.C.

CLIENT NUMBER: 34-3914 A
EHS PROJECT #: 2007-01-1832
PROJECT: 205

This method has been validated for sample weights of 0.020g or greater. When samples with a weight of less than that are analyzed those results fall outside of the scope of accreditations.

Sample results denoted with a "less than" (<) sign contain less than 20ug total lead, based on a 40ml sample volume.

The condition of the samples analyzed was acceptable upon receipt per laboratory protocol unless otherwise noted on this report. Results represent the analysis of samples submitted by the client. Sample location, description, area, volume etc., was provided by the client. This report shall not be reproduced, except in full, without the written consent of Environmental Hazards Services, L.L.C. California Certification #2319 NY ELAP #11714

LEGEND	g = gram	ug = microgram	ppm = parts per million
	ml = milliliter	Pb = lead	

painpb08.AAFS220A.dot/07MAR2006/REV2/MR

-- PAGE 03 of 03 -- END OF REPORT --

ENVIRONMENTAL HAZARDS SERVICES, L.L.C.

7469 WHITE PINE ROAD - RICHMOND, VA 23237
 804-275-4788 FAX 804-275-4907

BULK ASBESTOS SAMPLE ANALYSIS SUMMARY

CLIENT: Mack Churchill & Associates
 1120 E. Fort Macon Rd.
 Atlantic Beach, NC 28512

DATE OF RECEIPT: 18 Jan 2007
DATE OF ANALYSIS: 22 Jan 2007
DATE OF REPORT: 23 Jan 2007

CLIENT NUMBER: 34-3914 A
EHS PROJECT #: 2007-01-1831
PROJECT: 205

EHS SAMPLE #	CLIENT SAMPLE #/ LABORATORY GROSS DESCRIPTION	% ASBESTOS	OTHER MATERIALS
01	1-205/ White Texture-Like	NAD	100% Non-Fibrous
02	2-205/ Cream/Tan Gran.	NAD	100% Non-Fibrous
03	3-205/ Black Adhes.	4% Chrysotile 4% Total Asbestos	96% Non-Fibrous
04	4-205/ Off-White Paint-Like; White Cementitious	NAD	100% Non-Fibrous
05	5-205/ Gray Cementitious	NAD	100% Non-Fibrous
06	6-205/ White Adhesive-Like; Yellow Fib.	NAD	2% Cellulose 48% Fibrous Glass 50% Non-Fibrous
07	7-205/ Off-White Fib.; Silver Foil-Like	NAD	62% Cellulose 23% Synthetic 15% Non-Fibrous
08	8-205/ Cream/Tan Gran.	NAD	100% Non-Fibrous
09	9-205/ Tan Adhes.	NAD	100% Non-Fibrous
10	10-205/ Gray Cementitious; Black/Green Paint-Like	NAD	100% Non-Fibrous
11	11-205/ Gray Fib.	NAD	40% Fibrous Glass 60% Non-Fibrous

ENVIRONMENTAL HAZARDS SERVICES, L.L.C.

CLIENT NUMBER: 34-3914 A
 EHS PROJECT #: 2007-01-1831
 PROJECT: 205

EHS SAMPLE #	CLIENT SAMPLE #/ LABORATORY GROSS DESCRIPTION	% ASBESTOS	OTHER MATERIALS
12	12-205/ White/Green Paint-Like; White Cementitious	NAD	100% Non-Fibrous
13	13-205/ Gray Cementitious	NAD	100% Non-Fibrous
14	14-205/ White Texture-Like	NAD	100% Non-Fibrous
15	15-205/ White Texture-Like	NAD	100% Non-Fibrous
16	16-205/ Cream/Tan Gran.	NAD	100% Non-Fibrous
17	17-205/ Yellow Adhes.	NAD	100% Non-Fibrous
18	18-205/ White/Beige Texture-Like	NAD	100% Non-Fibrous
19	19-205/ White/Beige Texture	NAD	100% Non-Fibrous
20	20-205/ Cream/Tan Gran.	2% Chrysotile 2% Total Asbestos	98% Non-Fibrous
21	21-205/ Black Adhes.	4% Chrysotile 4% Total Asbestos	96% Non-Fibrous
22	22-205/ Off-White Paint-Like; Beige Cementitious	NAD	100% Non-Fibrous
23	23-205/ Gray Cementitious	NAD	2% Cellulose 98% Non-Fibrous
24	24-205/ Beige Gran.; Brown Fib.; Off-White Chalky	NAD	20% Cellulose 10% Synthetic 70% Non-Fibrous
25	25-205/ Gray Fib.	NAD	40% Fibrous Glass 60% Non-Fibrous
26	26-205/ Gray Fib.	NAD	40% Fibrous Glass 60% Non-Fibrous

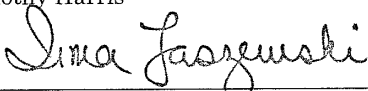
ENVIRONMENTAL HAZARDS SERVICES, L.L.C.

CLIENT NUMBER: 34-3914 A
EHS PROJECT #: 2007-01-1831
PROJECT: 205

EHS SAMPLE #	CLIENT SAMPLE #/ LABORATORY GROSS DESCRIPTION	% ASBESTOS	OTHER MATERIALS
27	27-205/ White Texture-Like	NAD	100% Non-Fibrous
28	28-205/ Cream/Tan Gran.	2% Chrysotile 2% Total Asbestos	98% Non-Fibrous
29	29-205/ Black Adhes.	4% Chrysotile 4% Total Asbestos	96% Non-Fibrous
30	30-205/ Yellow Fib.	NAD	96% Fibrous Glass 4% Non-Fibrous
31	31-205/ Beige Chalky; Beige Fib.	NAD	60% Fibrous Glass 40% Non-Fibrous
32	32-205/ Green Foam-Like	NAD	25% Synthetic 75% Non-Fibrous

QC SAMPLE: M11992-1
QC BLANK: SRM 1866 Fiberglass
REPORTING LIMIT: 1% Asbestos
METHOD: Polarized Light Microscopy, EPA Method 600/R-93/116 *
ANALYST: Timothy Harris

Reviewed By Authorized Signatory:


Michael A. Mueller, MPH, Laboratory Director
Howard Varner, General Manager
Irma Faszewski, Quality Assurance Coordinator

ENVIRONMENTAL HAZARDS SERVICES, L.L.C.

CLIENT NUMBER: 34-3914 A
EHS PROJECT #: 2007-01-1831
PROJECT: 205

The condition of the samples analyzed was acceptable upon receipt per laboratory protocol unless otherwise noted on this report. Results represent the analysis of samples submitted by the client. Sample location, description, area, volume, etc., was provided by the client. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written consent of Environmental Hazards Services, L.L.C. California Certification #2319 NY ELAP #11714. All information concerning sampling location, date, and time can be found on Chain-of-Custody. Environmental Hazards Services, L.L.C. does not perform any sample collection.

Environmental Hazards Services, L.L.C. recommends reanalysis by point count (for more accurate quantification) or Transmission Electron Microscopy (TEM), for enhanced detection capabilities) for materials regulated by the EPA NESHAP (National Emission Standards for Hazardous Air Pollutants) and found to contain less than ten percent (<10%) asbestos by polarized light microscopy (PLM). Both services are available for an additional fee.

* All California samples analyzed by Polarized Light Microscopy, EPA Method 600/M4-82-020, Dec. 1982.

LEGEND NAD = no asbestos detected
 SCF = suspected ceramic fibers

p1m1.dot/07MAR2006/REV2/pd

-- PAGE 04 of 04 -- END OF REPORT --

