CONTRACT N40085-17-B-0080

NAVFAC SPECIFICATION
NO. 05-17-0080

INTERIOR/EXTERIOR REPAIRS GROUND SUPPORT EQUIPMENT SHOP AS4135

AT THE

MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

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A/E Contract: N40085-15-D-0859

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05170080

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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 full renovation, including new finishes, HVAC, electrical, plumbing, fire protection systems and incidental related work.

1.1.2 Location

The work shall be located at the at the Marine Corps Air Station, New River, Jacksonville, NC 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 aras 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 Existing Buildings

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

Relocate movable furniture as required to perform the work, protect the furniture, and replace the furniture in its original locations upon completion of the work. Leave attached equipment in place, and protect it against damage, or temporarily disconnect, relocate, protect, and reinstall at the completion of the work.

The Government will remove and relocate other Government property in the areas of the building 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, and compressed air, 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.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 01 20 00

PRICE AND PAYMENT PROCEDURES

04/12

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)

EP-1110-1-8	(2009) 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 05 92, "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 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.

1.6.2 Payment for Onsite and Offsite Materials

Progress payments may be made to the contractor for materials delivered on the site, for materials stored off construction sites, or materials that are in transit to the construction sites under the following conditions:

a. FAR 52.232-5(b) Payments Under Fixed Price Construction Contracts.

b. Materials delivered on the site but not installed, including completed preparatory work, and off- site materials to be considered for progress payment shall be major high cost, long lead, special order, or specialty items, not susceptible to deterioration or physical damage in storage or in transit to the construction site. Examples of materials acceptable for payment considerations include, but are not limited to, structural steel, non-magnetic steel, non-magnetic aggregate, equipment, machinery, large pipe and fittings, precast/ prestressed concrete products, plastic lumber (e.g. fender piles/ curbs), and high-voltage electrical cable. Materials no acceptable for payment include consumable materials such as nails, fasteners, conduits, gypsum board, glass, insulation, and wall coverings.

c. Materials to be considered for progress payment prior to installation shall be specifically and separately identified in the Contractor's estimates of work submitted for the Contracting Officer's approval in accordance with Earned Value Report requirement of this contract. Requests for progress payment considerations for such items shall be supported by documents establishing their value and that the title requirements of the clause at FAR 52.232-5 have been met.

d. Materials are adequately insured and protected from theft and exposure.

e. Provide a written consent from the surety company with each payment request for offsite materials.

f. Materials to be considered for progress payments prior to installation shall be stored in the Continental United States.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 01 30 00

ADMINISTRATIVE REQUIREMENTS

02/13

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. Pass and Identification Office, Bldg AS-187 for badge (910-449-7695) and vehicle pass (910-449-5513).

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 Contactor 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 (910-451-1158) or to MCAS, Building AS-187 (910-449-5513) for vehicle decal:

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 Space Temperature Control, HVAC TAB, and Apparatus Inspection

All contract requirements of Section 23 09 23.13, Direct Digital Control System," Section 23 73 33, "HVAC Testing/Adjusting/Balancing," and Section 23 05 92, "Testing" shall be accomplished directly by a first tier subcontractor. No work required by SectionS 23 09 23.13, 23 73 33, and 23 05 92 shall be accomplished by a second tier subcontractor.

1.4.9.2 Telecommunication and High Voltage Work

When telecommunications and high voltage work is required, all work associated with telecommunications and high voltage shall be accomplished by a first tier subcontractor. The contractor must possess a valid North Carolina Public Utility - Electrical, contractor's license and be insured to do such work in the State of North Carolina.

1.4.9.3 Paving Associated with Utility Cuts

All pavement repairs associated with utility cuts shall be completed within 14 days of completing work within paved area.

1.5 DISCLOSURE OF INFORMATION

Contactor shall comply as follows:

(a) The Contractor shall not release to anyone outside the Contractor's organization any unclassified information, regardless of medium (e.g., film, tape, document), pertaining to any part of this contract or any program related to this contact, unless -

(1) The Contracting Officer has given prior written approval; or

(2) The information is otherwise in th public domain before the date of release.

(b) Requests for approval shall identify the specific information to be released, the medium to be used, and the purpose for the release. The Contractor shall submit its request to the Contracting Officer at least 45 days before the proposed date for release.

(c) The Contractor agrees to include a similar requirement in each subcontract under this contract. Subcontractors shall submit requests for authorization to release through the prime contractor to the Contracting Officer.

1.6 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).

1.7 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.

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 --

SECTION 01 32 16

CONSTRUCTION PROGRESS DOCUMENTATION

04/12

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 P6 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 05 92, "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 125 activities. The schedule shall identify as a minimum:

a. Construction time for all major systems and components;

b. Manpower requirements for each activity;

c. Major submittals and submittal processing time; and

d. Major equipment lead time.

1.4.1 CPM Submittals and Procedures

The Contractor shall use the critical path method (CPM) to schedule and control project activities. Project schedules shall be prepared and maintained using Primavera P6, Primavera SureTrak or current mandated scheduling program. Save files in Concentric P6 or current mandated scheduling program file format, compatible with the Governments version of the scheduling program. 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

05/13

PART 1 GENERAL

1.1 SUMMARY

1.1.1 Government-Furnished Information

Submittal register will be delivered to the contractor in hard copy format. Register 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.

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 North Carolina IPT Approval - Telecommunications Submittals

Submit the following for IPT approval:

a. Section 27 10 00 BUILDING TELECOMMUNICATIONS CABLING SYSTEM: All submittals. Provide an information copy of all submittals to Base Telephone through the Contracting Officer. Base Telephone will coordinate their review and approval through the Marines Corps North Carolina IPT.

b. TELECOMMUNICATIONS OUTSIDE PLAN (OSP): All submittals. Provide an information copy of all submittals to Base Telephone through the Contracting Officer. Base Telephone will coordinate their review and approval through the Marines Corps North Carolina IPT.

1.2.4 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

1.2.5 Approving Authority

Person authorized to approve submittal.

1.2.6 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

Complete Submittal Package 2 CD/DVD's

1.4 USE OF SUBMITTAL REGISTER

Prepare and maintain submittal register, as the work progresses. Use the hard copy submittal register furnished by the Government or other approved 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 a hard copy. 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:

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.

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.

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.

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 N40085-17-B-0080, 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 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 Complete Submittal Package

Contractor shall make electronic copies of all submittals, including the approved transmittal sheets, and provide two (2) CD/DVD's containing all submittals for the project.

The CD/DVD's shall be marked "Complete Submittal Package - Contract #_____."

1.6.2 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.

1.6.3 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.

1.6.4 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.

1.6.5 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.

1.6.6 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.

1.6.7 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:

Architect-Engineer Firm

Attn: Steve Fender
Talley & Smith Architecture, Inc.
P.O. Box 518, Shelby, NC 28151
409 E. Marion St., Shelby, NC 28150

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:

ROICC/OICC
Jacksonville, North Carolina Area
1005 Michael Road
Camp Lejeune, NC 28542-2521

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 --

SECTION 01 35 29

SAFETY AND OCCUPATIONAL HEALTH REQUIREMENTS

10/15

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 SAFETY ENGINEERS (ASSE/SAFE)

ASSE/SAFE Z359.1	(2007) Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components

ASME INTERNATIONAL (ASME)

ASME B30.22	(2010) Articulating Boom Cranes
ASME B30.3	(2009) Tower Cranes
ASME B30.5	(2007) Mobile and Locomotive Cranes
ASME B30.8	(2010) Floating Cranes and Floating Derricks

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 10	(2010) Standard for Portable Fire Extinguishers
NFPA 241	(2009) Standard for Safeguarding Construction,Alteration, and Demolition Operations
NFPA 51B	(2009; TIA 09-1) Standard for Fire Prevention During Welding, Cutting, and Other Hot Work
NFPA 70	(2011) National Electrical Code
NFPA 70E	(2009; Errata 09-1) Standard for Electrical Safety in the Workplace

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2008; Errata 1-2010; Changes 1-3 2010; Changes 4-6 2011; Change 7 2012) 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 cabable 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 through 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 certifictae, 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.

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

1.7.1.1 **Site Safety and Health Officer (SSHO)**

The SSHO must meet the requirements of EM 385-1-1 section 1 and ensure that the requirements of 29 CFR 1926.16 are met for the project. Provide a Safety oversight team that includes a minimum of one (1) person at each project site to function as the Site Safety and Health Officer (SSHO). The SSHO or an equally-qualified Designated Representative/alternate shall be at the work site at all times to implement and administer the Contractor's safety program and government-accepted Accident Prevention Plan. The SSHO's training, experience, and qualifications shall be as required by EM 385-1-1 paragraph 01.A.17, entitled SITE SAFETY AND HEALTH OFFICER (SSHO), and all associated sub-paragraphs.

A Competent Person shall be provided for all of the hazards identified in the Contractor's Safety and Health Program in accordance with the accepted Accident Prevention Plan, and shall be on-site at all times when the work that presents the hazards associated with their professional expertise is being performed. Provide the credentials of the Competent Person(s) to the the Contracting Officer's Representative for acceptance.
Office.

1.7.1.2 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.

1.7.1.3 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 spe cifying necessary controls and protective actions to ensure worker health.

1.7.1.4 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 capacitates 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, SSHO 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 movile crane's hoists) at any radius of lift; lifts involving more thatn 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 day6s 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. Teh 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 requiremetns 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 this section.

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 operatins 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 t othe prime contractor for submittal to the Contracting Offficer.

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 th 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 ASSE/SAFE 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-isocynates, 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.**

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 ASSE/SAFE 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 ASSE/SAFE Z359.1. Exiting horizontal lifeline achorages 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 by a qualified person**, installed, certified and used under the supervision of a **competent 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 contracator 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) 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. 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

All underground utilities in the work area must be positively identified by a third party, independent, private utility locating company 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, including utility depth, 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 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 100 feet if parallel within 5 feet of the excavation.

3.7.3 Utilities Within and Under Concrete, Bituminous Asphalt and Other Impervious Surfaces

Utilities located within concrete slabs or pier decks, bridges, parking areas, and the like, are extremely difficult to identify. Whenever contract work involves chipping, saw cutting, or core drilling through concrete, bituminous asphalt or other impervious surfaces, the existing

utility location must be coordinated with station utility departments in addition to location and depth verification by a third party, independent, private locating company. The third party, independent, private locating company shall locate utility depth by use of Ground Penetrating Radar (GPR), X-ray, bore scope, or ultrasound prior to the start of demolition and construction. Outages to isolate utility systems must be used in circumstances where utilities are unable to be positively identified. The use of historical drawings does not alleviate the contractor from meeting this requirement.

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/Hazsrd 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 electrial distribution system. Organization shall be independent of th aupplier, manufacturer, and installer of ht equipment. The organization shall be a first tier subcontractor. This work shall not be performed by a second tier subcontractor.

a. Submit name and qualificaitons of organization. Organization shall have been regularaly 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 nad 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 personel 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 --

SECTION 01 42 00

SOURCES FOR REFERENCE PUBLICATIONS
08/10

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 B564 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.

AMERICAN CONCRETE INSTITUTE 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

ACOUSTICAL SOCIETY OF AMERICA (ASA)
2 Huntington Quadrangle, Suite 1NO1
Melville, NY 11747-4502
Ph: 516-576-2360
Fax: 516-576-2377
E-mail: asa@aip.org
Internet: http://asa.aip.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

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: fdietz@ahrinet.org
Internet: http://www.ahrinet.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 60173-5774
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@aashto.org
Internet: http://www.aashto.org

AMERICAN BEARING MANUFACTURERS ASSOCIATION (ABMA)
2025 M Street, NW, Suite 800
Washington, DC 20036
Ph: 202-367-1155
Fax: 202-367-2155
E-mail: info@americanbearings.org
Internet: http://www.abma-dc.org

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)
1330 Kemper Meadow Drive
Cincinnati, OH 45240
Ph: 513-742-2020 or 513-742-6163
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
E-mail: awcpubs@afandpa.org
Internet: http://www.awc.org/

AMERICAN HARDBOARD ASSOCIATION (AHA)
1210 West Northwest Highway
Palatine, IL 60067
Ph: 847-934-8800

Fax: 847-934-8803
E-mail: aha@hardboard.org
Internet: http://www.hardboard.org

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)
One East Wacker Drive, Suite 700
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
Centennial, 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: 202-463-6577
E-mail: webmaster@steel.org
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/

AMERICAN RAILWAY ENGINEERING AND MAINTENANCE-OF-WAY ASSOCIATION (AREMA)
10003 Derekwood Lane, Suite 210
Lanham, MD 20706
Ph: 301-459-3200
Fax: 301-459-8077
Internet: http://www.arema.org

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)
1801 Alexander Bell Drive
Reston, VA 20191-4400
Ph: 703-295-6300 - 800-548-2723
Fax: 703-295-6333
E-mail: member@asce.org

Internet: http://www.asce.org

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
E-mail: smorrison@awwa.org
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 or customerservice@awspubs.com
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 St.
Tacoma, WA 98466-5333
Ph: 253-565-6600
Fax: 253-565-7265
E-mail: help@apawood.org
Internet: http://www.apawood.org

ARCHITECTURAL WOODWORK INSTITUTE (AWI)
46179 Westlake Drive, Suite 120
Potomac Falls, VA 20165
Ph: 571-323-3636
Fax: 571-323-3630
E-mail: info@awinet.org
Internet: http://www.awinet.org

ARCNET TRADE ASSOCIATION (ATA)
E-M-mail: info@arcnet.com
Internet: http://www.arcnet.com/index.htm</URL

ASME INTERNATIONAL (ASME)
Three Park Avenue, M/S 10E
New York, NY 10016-5990
Ph: 800-854-7179 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.aabchq.com

ASTM INTERNATIONAL (ASTM)
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken, PA 19428-2959
Ph: 610-832-9585
Fax: 610-832-9555
E-mail: service@astm.org
Internet: http://www.astm.org

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)
355 Lexington Avenue
15th Floor
New York, NY 10017
Ph: 212-297-2122
Fax: 212-370-9047
E-mail: assocmgmt@aol.com
Internet: http://www.buildershardware.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

COMPRESSED AIR AND GAS INSTITUTE (CAGI)
1300 Sumner Avenue
Cleveland OH 44115-2851
Ph: 216-241-7333
Fax: 216-241-0105
E-mail: cagi@cagi.org
Internet: http://www.cagi.org/

CONSUMER ELECTRONICS ASSOCIATION (CEA)
1919 South Eads St.
Arlington, VA 22202
Ph: 866-858-1555 or 703-907-7600
Fax: 703-907-7675
E-mail: cea@CE.org
Internet: http://www.CE.org

CONSUMER PRODUCT SAFETY COMMISSION (CPSC)
4330 East-West Highway
Bethesda, MD 20814-4408
Ph: 301-504-7923
Fax: 301-504-0124 or 301-504-0025
E-mail: info@cpsc.gov
Internet: http://www.cpsc.gov

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

DISTRICT OF COLUMBIA MUNICIPAL REGULATIONS (DCMR)
1350 Pennsylvania Avenue, NW, Room 419
Washington DC 20004
Ph: 202-727-6306 8:30 a.m. to 5:00 p.m.
Fax: 202-727-3582
E-mail: secretary@dc.gov
Internet: http://os.dc.gov/info/odai/odai.shtm

ELECTRONIC COMPONENTS ASSOCIATION (ECA)
2500 Wilson Blvd.
Suite 310
Arlington, VA 22201
Ph: 703-907-8024
E-mail: emikoski@ecaus.org
Internet: http://www.ecaus.org

FM GLOBAL (FM)
270 Central Avenue
P.O. Box 7500
Johnston, RI 02919
Ph: 401-275-3000 ext. 1945
Fax: 401-275-3029
E-mail: servicedesk.myrisk@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 866-545-6340
Fax: 213-740-8399
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Internet: http://www.usc.edu/dept/fccchr

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2945 SW Wanamaker Drive, Suite A
Topeka, KS 66614
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Internet: http://www.glasswebsite.com

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Washington, DC 20036-5525
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Internet: http://www.greenseal.org

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Fax: 703-435-2537
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Internet: http://www.hpva.org

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)
445 Hoes Lane or 2001 L Street, NW. Suite 700
Piscataway, NJ 08855-1331 or Washington, DC 20036-4910 USA
Ph: 732-981-0060 or 800-701-4333
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Internet: http://www.ieee.org

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Internet: www.iccsafe.org

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Fax: 41-22-919-0300
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Internet: http://www.iec.ch

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E-mail: central@iso.ch
Internet: http://www.iso.org

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

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

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Glen Ellyn, IL 60137
Ph: 630-942-6591
Fax: 630-790-3095
E-mail: wlewis7@cox.net(Vernon Lewis,technical consultant)
Internet: http://www.naamm.org

NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION (NECA)
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Internet: http://www.nicet.org

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10255 West Higgins Road, Suite 600
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Internet: http://www.nelma.org

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Fax: 734-769-0109
E-mail: info@nsf.org
Internet: http://www.nsf.org

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Ph: 630-858-6540
Fax: 630-790-3095
Internet: http://www.ppfahome.org

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E-Mail: pdi@PDIonline.org
Internet: http://www.pdionline.org

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Fax: 415-382-8531
E-Mail: info@calredwood.org
Internet: http://www.redwoodinspection.com/

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Fax: 510-452-8001
Internet: http://www.scs1.com

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Fax: 703-803-3732
E-mail: info@smacna.org
Internet: http://www.smacna.org

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Fax: 724-776-0790
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Internet: http://www.sae.org

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Internet: http://www.spib.org

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E-mail: support@sos.state.md.us
Internet: www.dsd.state.md.us/comar/

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
Internet:

STATE OF VIRGINIA ADMINISTRATIVE CODE (VAC)
Virginia Code Commission
General Assembly Building, 2nd Floor

910 Capitol Street
Richmond, Virginia 23219
Ph: 804-786-3591
Fax: 804-692-0625
E-mail: tlong@dls.virginia.gov (Tina Long)
Internet: http://leg1.state.va.us/000/srr.htm

STEEL DOOR INSTITUTE (SDI/DOOR)
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Ph: 440-899-0010
Fax: 440-892-1404
E-mail: info@steeldoor.org
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

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2500 Wilson Blvd,. Suite 300
Arlington, VA 22201
Ph: 703-907-7700
Fax: 703-907-7727
Internet: http://www.tiaonline.org

TILE COUNCIL OF NORTH AMERICA (TCNA)
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Internet: http://www.tileusa.com

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Internet: http://www.tpinst.org

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700 Robbins Avenue
Philadelphia, PA 19111-5094
Ph: 215-697-6396 - for account/password issues
Internet: http://assist.daps.dla.mil/online/start/; account registration required
Obtain Unified Facilities Criteria (UFC) from:
Whole Building Design Guide (WBDG)
National Institute of Building Sciences (NIBS)
1090 Vermont Avenue NW, Suite 700

Washington, CD 20005
Ph: 202-289-7800
Fax: 202-289-1092
Internet: http://www.wbdg.org/references/docs_refs.php

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)
Ariel Rios Building
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Washington, DC 20004
Ph: 202-272-0167
for Fax and E-mail see below
Internet: http://www.epa.gov
--- Some EPA documents are available only from:
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Ph: 503-639-0651
Fax: 503-684-8928
E-mail: info@wclib.org
Internet: http://www.wclib.org

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Internet: http://www.wwpa.org

WINDOW AND DOOR MANUFACTURERS ASSOCIATION (WDMA)
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Internet: http://www.wdma.com

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Ph: 530-661-9591 or 800-550-7889
Fax: 530-661-9586
E-mail: info@wmmpa.com
Internet: http://www.wmmpa.com

PART 2 PRODUCTS

Not used

PART 3 EXECUTION

Not used

-- 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	(2010c) Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
ASTM D 3666	(2009a) Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials
ASTM D 3740	(2010) Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
ASTM E 329	(2009) Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction
ASTM E 543	(2009) Standard Practice for Agencies Performing Non-Destructive 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 work ing 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 per formed;

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 meet ing, 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, super intendent, 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 sponsered 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.

1.5.2.1 Electrical and Telecommunications Systems GXC Specialists

Text

Qualification/Experience in Area of Responsibility	Area of Responsibility	Frequency

Electrical Inspector Crew supervision for 10 years minimum Master Electrician licensed in North Carolina	Electrical Systems, all Division 26 Sections and Division 33 Electrical Sections	Full time during installation and testing of all systems
Telecommunications Systems Installation Specialist 10 years minimum experience in telecommunications systems installation	Telecommunications Systems, all Division 27 and 28 Sections, and Divison 33 Outside Plan (OSP) work	Full time during systems installation and testing

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 meet ing. 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 documen tation 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 quali fied 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 78 00, "Closeout Procedures", 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.

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

05/13

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	(2007) Standard for Reduced-Pressure Principle Backflow Prevention Assembly

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

FCCCHR List	(continuously updated) List of Approved Backflow Prevention Assemblies
FCCCHR Manual	(1988e9) Manual of Cross-Connection Control

1.2 SUBMITTALS

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

SD-01 Preconstruction Submittals

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 List, 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 indicted 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.

d. It is mandatory that the contractor also contact the North Carolina One-Call Center to coordinate the location of underground natural gas infrastructure. North Carolina 811, Inc. can be reached at 811 on a touch-tone phone in the state of North Carolina or toll-free at 1.800.632.4949 if calling from out of state. Work requests may also be submitted online at www.nc811.org.

1.4.4.1 The Locations of Underground Utilities

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 form 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. Contract 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 fenced project site is available for storage.

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 Maintenance of Temporary Facilities

Suitably paint and maintain the temporary facilities. Failure to do so will be sufficient reason to require their removal.

1.8.2 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 of 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, bronze or brass 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 List and shall be accompanied by a Certificate of Full Approval from FCCCHR List.

- or -

Not used.

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 Manual. Test and tag each reduced pressure backflow preventer upon initial installation (prior to continued water use) and monthly 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

09/14

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	(2007; Rev F) Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment
MIL-STD-462	(Rev D; Notice 4) Electromagnetic Interference Characteristics

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

29 CFR 1910	Occupational Safety and Health Standards
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 262	Standards Applicable to Generators of Hazardous Waste
40 CFR 263	Standards Applicable to Transporters of Hazardous Waste
40 CFR 300	National Oil and Hazardous Substances Pollution Contingency Plan
49 CFR 171	General Information, Regulations, and Definitions
49 CFR 172	Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements

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 recyclables and 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 non-recyclable paper and cardboard, crockery, and bones.

Recyclables includes: clean paper, cardboard, glass, plastics (No. 1 & 2), metal, and cans.

Non-recyclable paper and cardboard are defined as material that has become wet or contaminated with food or other residue that render it un-acceptable for recycling.

Treated wood/lumber is defined as wood that has been stained or treated to prevent rot, or composite wood products such as OSB, pressboard furniture, etc.

Untreated wood is defined as lumber, trees, stumps, limbs, tops, and shrubs.

1.3.5 Debris

Combustible and noncombustible wastes such as ashes and waste materials resulting from construction or maintenance and repair work, (excluding organic matter) leaves, pine straw, grass and shrub clippings.

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-01 Preconstruction Submittals

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."

1.8 CAMP LEJEUNE SANITARY LANDFILL INFORMATION

1. Contractors may ONLY use the Camp Lejeune Sanitary Landfill for the disposal of asbestos containing materials, building products with tightly adhered lead containing paint, non-contaminated clean dirt and clean gravel. The hours of operation are 0730-1530.

2. Delivery of acceptable materials (identified above) shall be by

appointment only. Appointments made by phone at 910-451-5011 or 910-451-2946. ALL other contractor generated material shall be weighed through the Base Landfill scales before being removed from the Base. Contractors utilizing the base scales will require Contracting Officer assisted pre-registration with the Landfill Manager.

3. The Contracting Officer will register the contract via E-mail, with the Base Landfill. All haul vehicles will maintain a secure vehicle placard as a condition to utilize the scale. E-mail the contract information to the Landfill Clerk, including the name on the Prime Contractor, contract number, job name/description, completion date and whether or not any of the above materials will be delivered to the Landfill.

4. As of May 01 2014 the above supersedes any other statements/specifications pertaining to the delivery of materials to the Base Landfill.

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. Conform to the national and state permitting requirements of the Clean Water Act.

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-16165for 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 EROSION AND SEDIMENT CONTROL MEASURES

3.5.1 Burnoff

Burnoff of the ground cover is not permitted.

3.6 CONTROL AND DISPOSAL OF SOLID WASTES

Pick up and separate 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.

3.6.1 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 deposting in Government owned receptable, located at Building 962.

3.6.2 Disposal of Rubbish and Debris

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

Metals shall be taken to the DRMO disposal area at Lot 203, as specified.

3.6.3 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

3.7 CONTROL AND DISPOSAL OF HAZARDOUS WASTE

3.7.1 Hazardous Waste Generation

Handle generated hazardous waste in accordance with 40 CFR 262.

3.7.2 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.

3.7.3 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.

3.7.4 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.

3.7.5 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.

3.7.6 Ozone Depleting Substances (ODS)

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

3.8 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.

3.8.1 Abrasive Blasting

3.8.1.1 Blasting Operations

The use of silica sand is prohibited in abrasive blasting.

Provide tarpaulin drop cloths and windscreens to enclose abrasive blasting operations to confine and collect dust, abrasive agent, paint chips, and other debris. Perform work involving removal of hazardous material in accordance with 29 CFR 1910.

3.8.1.2 Disposal Requirements

Collect dust, abrasive, paint, and other debris resulting from abrasive blasting operations and store in 55 gallon drums with watertight lids. Take a representative sample of this material, and test for EP toxicity with respect to lead, chromium, and cadmium content. The sampling and testing shall be performed in accordance with 40 CFR 261.

3.9 SOIL

No dirt from construction sites shall leave Marine Corps Base Camp Lejeune or Marine Corps Air Station property (with the exception of environmental remedial activities). Any excess soil that cannot be reused on its originating site shall be transported to one of the following locations:

Areas managed by G-3/5 for re-use on training areas for various maintenance activities:

1. 3.1 acre storage east of OP-4 on Sneads Ferry Road (figure 1)

2. 3.5 acre storage within TLZ Condor off Verona Loop Road (figure 2)

Prior to delivering soil to these stockpile locations, the following must be conducted:

1. Coordinate with G-3/5 (Mr. Dave Lynch or Mr. Bill VanPelt, MCIEAST-MCB CAMLEJ, 910-451-5772/8799) to determine capacity available (i.e., how much soil can be stored)

2. All soils will be clear of organic material such as roots and timber.

3. Contact POCs listed above 7-10 days in advance to coordinate delivery of material at the storage locations

NOTE: Soil contaminated with debris or chemicals cannot be

disposed at the stockpile locations. If contaminated soils are suspected or confirmed through presence of UXO, odors or visual staining, affected soils must be properly tested, manifested and disposed of in accordance with RCRA regulations. Contact Base EMD (ER Program Manager) for more information."

3.10 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: _____

MATERIAL	UNIT	QUANTITY (CRM)	TOTAL QUANTITY
A. Insulation			
1. Loose fill	Ft3		
2. Blanket or batt	Ft2		
3. Board	Ft2		
4. Spray-in-place	m3		
5. Other			
B. Cement and Concrete	yd3		
C. Paper and Paper Products			
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

MATERIAL	DEFINITION
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

MATERIAL	DEFINITION
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 --

SECTION 01 78 00

CLOSEOUT PROCEDURES

05/13

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

Record of materials

Maximo requirements

Complete Submittal Package 2 CD/DVD's

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 as specified in Section 01 78 30, DIGITAL DATA DELIVERABLES (GIS).

1.2.1 As-Built Drawings

"FAC 5252.236-9310, Record Drawings." As-built drawings will be submitted in redline mark-up format.

1.2.2 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
_____	_____	_____	_____	_____

1.3 MAXIMO REQUIREMENTS

Submit maximo requirements as specified in Section 23 03 00.00 20 and 26 00 00.

1.4 EQUIPMENT/PRODUCT WARRANTIES

1.4.1 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 therefor, 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.

1.4.2 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

1.5 MECHANICAL TESTING AND BALANCING

All contract requirements of 23 09 23.13, "Direct Digital Control Systems," shall be fully completed, including all testing, prior to contract completion date. In addition, all contract requirements of Section 23 05 92, "HVAC Testing/Adjusting/Balancing," shall be fully completed, including testing and inspection, prior to contract completion date, except as noted otherwise in Section 23 05 92. The time required to complete all work and testing as prescribed by Sections 23 09 23.13, 23 05 92, and 23 03 00.00 20 is included in the allotted calendar days for completion.

1.6 COMPLETE SUBMITTAL PACKAGE

Contractor shall make electronic copies of all submittals, including the approved transmittal sheets, and provide two (2) CD/DVD's containing all submittals for the project.

The CD/DVD's shall be marked "Complete Submittal Package - Contract #_____."

1.7 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
08/15

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 E1971	(2005; R 2011) Standard Guide for Stewardship for the Cleaning of Commercial and Institutional Buildings

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-10 Operation and Maintenance Data

O&M Database

Training Plan

Training Outline

Training Content

SD-11 Closeout Submittals

Training Video Recording

Validation of Training Completion

1.3 OPERATION AND MAINTENANCE DATA

Submit Operation and Maintenance (O&M) Data for the provided equipment, product, or system, defining the importance of system interactions, troubleshooting, and long-term preventive operation and maintenance. Compile, prepare, and aggregate O&M data to include 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.

1.3.1 Package Quality

Documents must be fully legible. Operation and Maintenance data must be consistent with the manufacturer's standard brochures, schematics, printed instructions, general operating procedures, and safety precautions.

1.3.2 Package Content

Provide data package content in accordance with paragraph 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.

1.3.3 Changes to Submittals

Provide manufacturer-originated changes or revisions to submitted data if a component of an item is so affected subsequent to acceptance of the O&M Data. Submit changes, additions, or revisions required by the Contracting Officer for final acceptance of submitted data within 30 calendar days of the notification of this change requirement.

1.4 O&M DATABASE

Develop an editable, electronic spreadsheet based on the equipment in the Operation and Maintenance Manuals that contains the information required to start a preventive maintenance program. As a minimum, provide list of system equipment, location installed, warranty expiration date, manufacturer, model, and serial number.

1.5 OPERATION AND MAINTENANCE MANUAL FILE FORMAT

Assemble data packages into electronic Operation and Maintenance Manuals. Assemble each manual into a composite electronically indexed file using the most current version of Adobe Acrobat or similar software capable of producing PDF file format. Provide compact disks (CD) or data digital versatile disk (DVD) as appropriate, so that each one contains operation, maintenance and record files, project record documents, and training videos. Include a complete electronically linked operation and maintenance directory.

1.5.1 Organization

Bookmark Product and Drawing Information documents using the current version of CSI Masterformat numbering system, and arrange submittals using the specification sections as a structure. Use CSI Masterformat and UFGS numbers along with descriptive bookmarked titles that explain the content of the information that is being bookmarked.

1.5.2 CD or DVD Label and Disk Holder or Case

Provide the following information on the disk label and disk holder or case:

a. Building Number

b. Project Title

c. Activity and Location

d. Construction Contract Number

e. Prepared For: (Contracting Agency)

f. Prepared By: (Name, title, phone number and email address)

g. Include the disk content on the disk label

h. Date

i. Virus scanning program used

1.6 TYPES OF INFORMATION REQUIRED IN O&M DATA PACKAGES

The following are a detailed description of the data package items listed in paragraph SCHEDULE OF OPERATION AND MAINTENANCE DATA PACKAGES.

1.6.1 Operating Instructions

Provide specific instructions, procedures, and illustrations for the following phases of operation for the installed model and features of each system:

1.6.1.1 Safety Precautions and Hazards

List personnel hazards and equipment or product safety precautions for operating conditions. List all residual hazards identified in the Activity Hazard Analysis provided under Section 01 35 29 SAFETY AND OCCUPATIONAL HEALTH REQUIREMENTS. Provide recommended safeguards for each identified hazard.

1.6.1.2 Operator Prestart

Provide procedures required to install, set up, and prepare each system for use.

1.6.1.3 Startup, Shutdown, and Post-Shutdown Procedures

Provide narrative description for Startup, Shutdown and Post-shutdown operating procedures including the control sequence for each procedure.

1.6.1.4 Normal Operations

Provide Control Diagrams with data to explain operation and control of systems and specific equipment. Provide narrative description of Normal Operating Procedures.

1.6.1.5 Emergency Operations

Provide 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. Provide Emergency Shutdown Instructions for fire, explosion, spills, or other foreseeable contingencies. Provide guidance and procedures for emergency operation of utility systems including required valve positions, valve locations and zones or portions of systems controlled.

1.6.1.6 Operator Service Requirements

Provide instructions for services to be performed by the operator such as lubrication, adjustment, inspection, and recording gauge readings.

1.6.1.7 Environmental Conditions

Provide 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.

1.6.1.8 Operating Log

Provide forms, sample logs, and instructions for maintaining necessary operating records.

1.6.1.9 Additional Requirements for HVAC Control Systems

Provide Data Package 5 and the following for control systems:

a. Narrative description on how to perform and apply 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 checkout tests and calibrations performed by the Contractor (not Cx tests).

d. Full points list. Provide a listing of rooms 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 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. Marking of system sensors and thermostats on the as-built floor plan and mechanical drawings with their control system designations.

1.6.2 Preventive Maintenance

Provide the following information for preventive and scheduled maintenance to minimize repairs for the installed model and features of each system.

Include potential environmental and indoor air quality impacts of recommended maintenance procedures and materials.

1.6.2.1 Lubrication Data

Include the following preventive maintenance lubrication data, in addition to instructions for lubrication required under paragraph 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.

1.6.2.2 Preventive Maintenance Plan, Schedule, and Procedures

Provide manufacturer's schedule for routine preventive maintenance, inspections, condition monitoring (predictive tests) and adjustments required to ensure proper and economical operation and to minimize repairs. Provide instructions stating when the systems should be retested. 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.

a. Define the anticipated time required to perform each of each test (work-hours), test apparatus, number of personnel identified by responsibility, and a testing validation procedure permitting the record operation capability requirements within the schedule. Provide a remarks column for the testing validation procedure referencing operating limits of time, pressure, temperature, volume, voltage, current, acceleration, velocity, alignment, calibration, adjustments, cleaning, or special system notes. Delineate procedures for preventive maintenance, inspection, adjustment, lubrication and cleaning necessary to minimize repairs.

b. Repair requirements must inform operators how to check out, troubleshoot, repair, and replace components of the system. Include electrical and mechanical schematics and diagrams and diagnostic techniques necessary to enable operation and troubleshooting of the system after acceptance.

1.6.2.3 Cleaning Recommendations

Provide environmentally preferable cleaning recommendations in accordance with ASTM E1971.

1.6.3 Repair

Provide 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.

1.6.3.1 Troubleshooting Guides and Diagnostic Techniques

Provide 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.

1.6.3.2 Wiring Diagrams and Control Diagrams

Provide 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.

1.6.3.3 Repair Procedures

Provide instructions and a list of tools required to repair or restore the product or equipment to proper condition or operating standards.

1.6.3.4 Removal and Replacement Instructions

Provide step-by-step procedures and a list of required tools and supplies for removal, replacement, disassembly, and assembly of components, assemblies, subassemblies, accessories, and attachments. Provide tolerances, dimensions, settings and adjustments required. Use a combination of text and illustrations.

1.6.3.5 Spare Parts and Supply Lists

Provide lists of spare parts and supplies required for 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.

1.6.3.6 Repair Work-Hours

Provide manufacturer's projection of repair work-hours including requirements by type of craft. Identify, and tabulate separately, repair that requires the equipment manufacturer to complete or to participate.

1.6.4 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:

1.6.4.1 Product Submittal Data

Provide a copy of SD-03 Product Data submittals documented with the required approval.

1.6.4.2 Manufacturer's Instructions

Provide a copy of SD-08 Manufacturer's Instructions submittals documented with the required approval.

1.6.4.3 O&M Submittal Data

Provide a copy of SD-10 Operation and Maintenance Data submittals documented with the required approval.

1.6.4.4 Parts Identification

Provide identification and coverage for the 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 must show the index, reference, or key number that will cross-reference the illustrated part to the listed part. Group the parts shown in the listings 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.

1.6.4.5 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 componentsof the system. Provide copies of warranties required by Section 01 78 00 CLOSEOUT SUBMITTALS.

1.6.4.6 Extended Warranty Information

List all warranties for products, equipment, components, and sub-components whose duration exceeds one year. For each warranty listed, indicate the applicable specification section, duration, start date, end date, and the point of contact for warranty fulfillment. Also, list or reference the specific operation and maintenance procedures that must be performed to keep the warranty valid. Provide copies of warranties required by Section 01 78 00 CLOSEOUT SUBMITTALS.

1.6.4.7 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.

1.6.4.8 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. Provide final set points.

1.6.4.9 Testing and Performance Data

Include completed prefunctional checklists, functional performance test forms, and monitoring reports. Include recommended schedule for retesting and blank test forms. Provide final set points.

1.6.4.10 Field Test Reports

Provide a copy of Field Test Reports (SD-06) submittals documented with the required approval.

1.6.4.11 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.

1.7 SCHEDULE OF OPERATION AND MAINTENANCE DATA PACKAGES

Provide the O&M data packages specified in individual technical sections. The information required in each type of data package follows:

1.7.1 Data Package 1

a. Safety precautions and hazards

b. Cleaning recommendations

c. Maintenance and repair procedures

d. Warranty information

e. Extended warranty information

f. Contractor information

g. Spare parts and supply list

1.7.2 Data Package 2

a. Safety precautions and hazards

b. Normal operations

c. Environmental conditions

d. Lubrication data

e. Preventive maintenance plan, schedule, and procedures

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. Extended warranty information

m. Contractor information

1.7.3 Data Package 3

a. Safety precautions and hazards

b. Operator prestart

c. Startup, shutdown, and post-shutdown procedures

d. Normal operations

e. Emergency operations

f. Environmental conditions

g. Operating log

h. Lubrication data

i. Preventive maintenance plan, schedule, and procedures

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. Product submittal data

q. O&M submittal data

r. Parts identification

s. Warranty information

t. Extended warranty information

u. Testing equipment and special tool information

v. Testing and performance data

w. Contractor information

x. Field test reports

1.7.4 Data Package 4

a. Safety precautions and hazards

b. Operator prestart

c. Startup, shutdown, and post-shutdown procedures

d. Normal operations

e. Emergency operations

f. Operator service requirements

g. Environmental conditions

h. Operating log

i. Lubrication data

j. Preventive maintenance plan, schedule, and procedures

k. Cleaning recommendations

l. Troubleshooting guides and diagnostic techniques

m. Wiring diagrams and control diagrams

n. Repair procedures

o. Removal and replacement instructions

p. Spare parts and supply list

q. Repair work-hours

r. Product submittal data

s. O&M submittal data

t. Parts identification

u. Warranty information

v. Extended warranty information

w. Personnel training requirements

x. Testing equipment and special tool information

y. Testing and performance data

z. Contractor information

aa. Field test reports

1.7.5 Data Package 5

a. Safety precautions and hazards

b. Operator prestart

c. Start-up, shutdown, and post-shutdown procedures

d. Normal operations

e. Environmental conditions

f. Preventive maintenance plan, schedule, and procedures

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. Extended warranty information

s. Testing and performance data

t. Contractor information

u. Field test reports

v. Additional requirements for HVAC control systems

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 TRAINING

Prior to acceptance of the facility by the Contracting Officer for Beneficial Occupancy, provide comprehensive training for the systems and equipment specified in the technical specifications. The training must be targeted for the Facilities Management Specialist, building maintenance personnel, and applicable building occupants. Instructors must be well-versed in the particular systems that they are presenting. Address aspects of the Operation and Maintenance Manual submitted in accordance with Section 01 78 00 CLOSEOUT SUBMITTALS.. Training must include classroom or field lectures based on the system operating requirements. The location of classroom training requires approval by the Contracting Officer.

3.1.1 Training Plan

Submit a written training plan to the Contracting Officer for approval at least 60 calendar days prior to the scheduled training. Training plan must be approved by the Quality Control Manager (QC) prior to forwarding to the Contracting Officer. Also, coordinate the training schedule with the Contracting Officer and QC. Include within the plan the following elements:

a. Equipment included in training

b. Intended audience

c. Location of training

d. Dates of training

e. Objectives

f. Outline of the information to be presented and subjects covered including description

g. Start and finish times and duration of training on each subject

h. Methods (e.g. classroom lecture, video, site walk-through, actual operational demonstrations, written handouts)

i. Instructor names and instructor qualifications for each subject

j. List of texts and other materials to be furnished by the Contractor that are required to support training

k. Description of proposed software to be used for video recording of training sessions.

3.1.2 Training Content

The core of this training must be based on manufacturer's recommendations and the operation and maintenance information. The QC is responsible for overseeing and approving the content and adequacy of the training. Spend 95 percent of the instruction time during the presentation on the OPERATION AND MAINTENANCE DATA. Include the following for each system training presentation:

a. Start-up, normal operation, shutdown, unoccupied operation, seasonal changeover, manual operation, controls set-up and programming, troubleshooting, and alarms.

b. Relevant health and safety issues.

c. Discussion of how the feature or system is environmentally responsive. Advise adjustments and optimizing methods for energy conservation.

d. Design intent.

e. Use of O&M Manual Files.

f. Review of control drawings and schematics.

g. Interactions with other systems.

h. Special maintenance and replacement sources.

i. Tenant interaction issues.

3.1.3 Training Outline

Provide the Operation and Maintenance Manual Files (Bookmarked PDF) and a written course outline listing the major and minor topics to be discussed by the instructor on each day of the course to each trainee in the course. Provide the course outline 14 calendar days prior to the training.

3.1.4 Training Video Recording

Record classroom training session(s) on video. Provide to the Contracting Officer two copies of the training session(s) in DVD video recording format. Capture within the recording, in video and audio, the instructors' training presentations including question and answer periods with the attendees. The recording camera(s) must be attended by a person during the recording sessions to assure proper size of exhibits and projections during the recording are visible and readable when viewed as training.

3.1.5 Unresolved Questions from Attendees

If, at the end of the training course, there are questions from attendees that remain unresolved, the instructor must send the answers, in writing, to the Contracting Officer for transmittal to the attendees, and the training video must be modified to include the appropriate clarifications.

3.1.6 Validation of Training Completion

Ensure that each attendee at each training session signs a class roster daily to confirm Government participation in the training. At the completion of training, submit a signed validation letter that includes a sample record of training for reporting what systems were included in the training, who provided the training, when and where the training was performed, and copies of the signed class rosters. Provide two copies of the validation to the Contracting Officer, and one copy to the Operation and Maintenance Manual Preparer for inclusion into the Manual's documentation.

3.1.7 Quality Control Coordination

Coordinate this training with the QC in accordance with Section 01 45 10 QUALITY CONTROL.

-- End of Section --

SECTION 01 78 30.00 22

GIS DATA DELIVERABLES

11/18

PART 1 GENERAL

1.1 OBJECTIVE

The primary objective of this section is to provide detailed specifications for collection and delivery of geospatial data commonly referred to as Geographic Information System (GIS) data. Additionally, this section shall provide guidance to ensure that all GIS data delivered is compatible and will add value to the Marine Corps Base (MCB) Camp Lejeune Installation Geospatial Information and Services (IGI&S) GEOdatabase.

Failure to comply with the specifications outlined in this document will result in non-acceptance of data deliverables.

1.1.1 Point of Contact for MCB Camp Lejeune

The Points of Contact (POC) for assistance in preparation of GIS deliverables are:

Resident Officer In Charge Of Construction
Construction Manager (CM)
1005 Michael Drive
Camp Lejeune, NC 28547-2521
(910) 451-2581

Public Works Division
GIS Data Manager
1005 Michael Road
Camp Lejeune, NC 28547-2521
(910) 451-5507 ext 3264

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES 01 33 00.05 20 CONSTRUCTION SUBMITTAL PROCEDURES:

SD-11 Closeout Submittals

GIS Data Deliverables; G

1.3 GOVERNMENT GEOSPATIAL DATA AND SCHEMA

1. The IGI&S repository model schema is based on the Spatial Data Standards for Facilities, Infrastructure and Environment (SDSFIE) GEOFidelis Data Model with recurring business driven modifications and or adaptations.

   a. Data will be created and delivered by developing an ARCGIS Personal GEODatabase using ArcGIS 10.1 or higher if a higher version is being utilized by the Government at the time the deliverable is being developed.

   b. Request the existing GIS Data, Schema and Domain Properties by means of a Data Request Package (DRP). Receipt of request will include Geospatial Database table structure, schema, Domain configuration, Attribute text format, i.e., case size as well as

Meta Data information.

c. The DRP should be submitted prior to the start of data collection efforts and again every 6 months for the duration of the contract. Ensure that all GIS data has been created and delivered utilizing the most up to date IGI&S GEODatabase schema.

d. Verify the ArcGIS and schema version, via the CM or PM, at the commencement of this contract. All GIS DATA DELIVERABLES will be created in accordance with the current version and these specifications.

2. Submit a request for a Geospatial DRP to the CM or the Project Manager.

a. Request to be completely filled out and include all the information as instructed on the data request form.

b. Request only GIS data and or schema for feature classes that are relevant to the contract and within the boundary of project area.

c. Attach Scope of Work, which is defined by this GIS DATA DELIVERABLES section for each project request.

d. Return the DRP to the CM or Project Manager for sponsorship and submittal to the Installation Geospatial Information & Services (IGI&S) Office.

e. Incomplete forms may delay receipt of the requested GIS data and Schema.

1.3.1 Global Positioning System (GPS) and Spatial Reference Properties

GPS data shall be completed in accordance with the GPS Data Collection and Documentation Standards, Version 4 (or higher version if available at the time of this project) as prepared by Geographic Information Coordinating Council (GICC) Statewide Mapping Advisory Committee (SMAC) and adopted by the North Carolina Geographic Information Coordinating Council.

1. Prior to GPS efforts, ALL underground utilities are to be located utilizing a utility locating service in order to verify and obtain accurate feature locations.

2. Only bench marks included in the North Carolina Geodetic Survey Base Station Network are to be used for GPS data collection.

3. Mission planning is essential. Utilize the best Position Dilution of Precision (PDOP) values for data accuracy.

4. Utility data, as identified in paragraph "ATTRIBUTE DATA COLLECTION AND GPS REQUIREMENTS FOR SPECIFIC FEATURES" will be collected utilizing Survey Grade GPS data collection methods.

5. Infrastructure data, as identified in paragraph "ATTRIBUTE DATA COLLECTION AND GPS REQUIREMENTS FOR SPECIFIC FEATURES" will be collected utilizing Sub-Foot or better GPS data collection methods.

a. Spatial accuracy requirements for Survey and Sub-Foot grade data collection are as follows:

i. Sub-Foot requirements:

1) All points shall be within + 12 inches

2) 95 percent accuracy rate for all points.

ii. Survey Grade requirements:

1) All points shall be within + 1 centimeter

2) 98 percent accuracy rate for all points

6. Make every effort to capture feature locations without using offsets. All Offsets will be noted in the Final Report for each feature.

7. Excessive offsets included in the Final Data, which will be referenced in the Final Report, will be reviewed for quality control.

a. Resubmittal of data will be required if PDOP planning was not observed per this specification.

The following GEODatabase Coordinate Systems and Spatial Reference Properties should be utilized for Camp Lejeune:

1. Transverse Mercator (UTM) Zone 18N

a. GRS 1980 spheroid

b. North American Datum 1983 (NAD83) horizontal datum

c. North American Vertical Datum 1988 (NAVD88) vertical datum.

2. Domain precision of 1000 which will result in a database accuracy of 1/1000 m

1.3.2 Demolished and Abandoned in Place (AIP) Features

Reference all Demolished and or AIP features in the data delivered. Should the current feature data class attributes and or domains not reference AIP or demolished features, the Contractor will be responsible for appropriately delivering these features by creating an associated "Demolished" or AIP feature class for all point and polyline data, i.e., CLJN.CL.WastewaterUtilitySegment and CLJN.CL.WateUtilNode_wHydrant, etc.

1. Utilize a blank schema for the associated feature class.

2. Rename associated feature class and add DEMO or AIP as a prefix, i.e., DEMO.CLJN.CL.WastewaterUtilitySegment, AIP.CLJN.CL.WastewaterUtilitySegment.

3. All demolished and or AIP features should provide existing spatial and non-spatial data which may be copied from existing data.

4. Update attributes appropriately to include the following:

a. Contract Number.

b. Drawing Number.

c. isDemolished.

d. dateDemolished or dateAIP.

e. Status.

1.3.3 Creating a New Feature Class

Should a new feature class be required that is not readily available in the current GIS schema provided by the Government. Contact the CM or Project Manager for guidence and schema format.

1.3.4 GIS Topology Rules

All data must be created using GIS topology rules for polygons, points and lines, such as, but not limited to the following examples:

1. Polygons, Polylines and points rules; please reference illustrating topology rules in ArcGIS at www.esri.com.

2. Polygons must not have slivers.

3. All utility or infrastructure system data, which is, but is not limited to, transportation system and electrical, water, steam distribution, and wastewater collection, etc., will be created using GIS spatial connectivity rules which specify that vertex, edge and endpoints be snapped to features within the system.

4. Features will be snapped to the appropriate item.

5. Data will be created to represent the real world, for example, water, sewer, and transportations systems, etc. will be drawn and or created in the direction of flow.

6. Utility and transportation systems will be created from source to sink, etc.

7. Abandoned In Place (AIP) utility lines will be located and updated in the current feature data set and identified as AIP in the attribute tableor provide in a feature data set as specified in paragraph "Demolished and Abandoned in Place (AIP) Features" with CM approval.

1.3.5 Creation of Geographic Data Documentation (METADATA)

For each digital file delivered containing geographic information, provide documentation consistent with the Federal Geographic Data Committee (FGDC) Content Standards for Digital Geospatial Metadata (CSDGM).

Metadata generation tools included in the ArcGIS suite of software (or equivalent technology) will be used in the production of the required metadata in XML format. Regardless of the tools used for metadata creation, must ensure that the metadata is delivered in XML format and can be easily imported into the IGI&S GEODatabase.

(NOTE: The metadata should be formatted from the Government perspective, not the Contractor project perspective. Therefore such items as Point of Contact (POC) should be the POC currently associated with the data and NOT the Contractor's Project Manager. Use language and format consistent with existing metadata.)

1.3.6 GIS Submittals Guidelines

All GIS Submittals will be submitted to the CM or PM and then analyzed by Government GIS personnel prior to final approval. Failure to comply with the specifications outlined in this document will result in non-acceptance of data deliverables.

1. Prior to any database development, provide the Government with a technical approach document, in PDF format, for review and approval. The Technical Approach document will describe in detail the Contractor's technical approach to designing and developing the database.

2. All attributes will be populated in accordance with the "ATTRIBUTE DATA COLLECTION AND GPS REQUIREMENTS FOR SPECIFIC FEATURES" and will be obtained via contract specifications, plans and record drawings.

3. Reasearch may be required to be conducted to collect data and make copies of reports and studies as necessary to verify existing and/or record drawing data. Record drawing data and closed contracts can be located in the Technical Records Section in the Public Works Department which is located at 1005 Michael Street, MCB Camp Lejeune.

4. Raw GPS data and collection data files will be included with every phase of delivery.

5. Actual spatial and non-spatial conditions in the field always supersede drawings. Locate and field verify all features to ensure attribute data and location is correctly recorded.

6. Submit a preliminary review of data at 25 percent contract completion to ensure specifications compliance.

7. Deliver digital geographic maps, GPS collection files and related data. All working text and documents and personal geodatabase will be included for review in the draft and final delivery of data.

    a. All maps of GIS DATA DELIVERABLES will be ANSI C size and include a project title, contract number, scale, legend, standard symbology, attributes, i.e., building numbers, road names, segment diameters, etc. Also provide a PDF copy of all maps.

8. When required, provide a technical consultant to meet on site.

9. Do not deliver blank unused schema or feature class data with no attributes. Deliver only data pertinent to the contract that adds value to the GEODatabase per this section.

10. When projects are constructed in phases, deliver GIS Data at the end of each phase for all Phased Projects and Construction projects.

11. It is the Contractor's responsibility to perform quality assurance for all data and related materials required in the section prior to submitting product to the Government.

12. The data will be analyzed for discrepancies in subject content, correct format in accordance with this statement of work, and compatibility with the existing GIS system as well as all other specifications in

this section.

1.3.7 Formats, Versions and Guidelines

All data deliverables will be in the following formats and/or versions.

1. GIS data will be provided in an ArcGIS 10.1 or higher if a higher version is being used by the Government at the time of this project. Verify the ArcGIS version, via the CM or PM at the commencement of this contract.

2. Microsoft Windows 7 operating system, unless otherwise approved by the Government.

3. All reports and maps will be delivered as a hard copy and in a searchable Adobe Portable Document Format (PDF).

4. All text, spreadsheet, database files, reports, and maps will be delivered on Digital Versatile Disc read - only memory (DVD-ROM).

5. Verify required version(s) of software and schema, via the CM or PM.

6. Map submittals will accompany each geospatial deliverable.

    a. Include ANSI C map for each project/area.

    b. Data should be labeled and attributed per specification.

    c. All maps should include the date, a legend, scale, contract title, and number.

    d. Each map should be exported on a .pdf and delivered electronically with the project.

1.3.8 Final Report Requirements with additional Guidelines

Follow the following:

1. Specific procedures and list of equipment, software and versions that were utilized for the GPS data collection and creation of geospatial data.

2. Submit all GPS data files.

3. Provide the date(s) the IGI&S schema and geospatial data was received.

4. Provide details on any offsets to include justification as to why offsets were utilized and on which features and or points offsets were used.

5. Describe all modifications to the geodatabase to include the name of all new features classes, i.e., new, demolished or AIP.

6. Provide the source that was utilized for required attributes.

    a. Include an ANSI C size copy of all design drawings that were referenced in the attribute data. This information should be included in all phases of delivery to include draft and final reviews.

b. Provide the overall utility site plan drawing(s)with each submittal.

c. Provide a separate map for communication which includes infrastructure in PDF format.

7. Specify Deliverable "Draft #" or "Final Submittal" when data is submitted to the CM or PM for review.

8. Provide the name and contact information for the GIS Technical Point of Contact who can answer questions regarding the data deliverable.

9. GIS DATA DELIVERABLES must be provided in a format that does not require translation or pre/post processing prior to being loaded into the IGI&S GEODatabase.

10. Provide any miscellaneous information that is deemed significant.

11. Provide the current version of the GIS DATA DELIVERABLES specification utilized for this contract submittal.

1.3.9 Ownership

All digital files, final hardcopy products, GPS raw data, source data acquired for this project, and related materials, including that furnished by the Government, will become the property of the Government and will not be issued, posted, distributed, or published by the Contractor. All documentation will be delivered in the final delivery.

Note: No endorsement of software or hardware is implied.

1.4 ATTRIBUTE DATA COLLECTION AND GPS REQUIREMENTS FOR SPECIFIC FEATURES

GPS and collect attribute data as specified for each feature listed with (GPS) accuracy as described in paragraph "Global Positioning System (GPS) and Spatial Reference Properties". Attribute fields may be associated with Domains, which are utilized to constrain the values allowed in a particular field, attribute table or feature class. Domains must be utilized when populating the feature where required.

1.4.1 **CLJN.CL.Common**

GPS and collect attribute data as specified for each feature listed with GPS accuracy as described in paragraph "Global Positioning System (GPS) and Spatial Reference Properties." Attribute fields may be associated with Domains, which are utilized to constrain the values allowed in a particular field, attribute table, or feature class. Domains must be utilized when populating the feature where required.

GPS and collect the following attributes:

CLJN.CL.Sign
A structure that conveys directional, warning, or other information.

a) numberOfSigns
b) assemblyOffset
c) SignText
d) SignType - Directional, Standard Identifier, Safety

Warnings, Regulatory, etc.
e) SymbolCode - Utilize manual for Uniform Traffic Control Devices Code as issued by the Federal Highway Administration
f) GisFeatureCollectionMethod - Survey Grade GPS, Digitized, etc.
g) Contract Number
h) SdsFeatureDescription
i) signAssemblyType - Pedestal Pole, Wood 4x4, etc.

1.4.2 CLJN.CL.EMERGENCY_SERVICES

GPS and collect attribute data as specified for each feature listed with GPS accuracy as described in paragraph "Global Positioning System (GPS) and Spatial Reference Properties". Attribute fields may be associated with Domains, which are utilized to constrain the values allowed in a particular field, attribute table, or feature class. Domains must be utilized when populating the feature where required.

CLJN.CL.RoadCenterline
The center of the road area

a) roadClass - Major Roads/Local Roads/etc.
b) trackOrLaneCount
c) speedLimit
d) isPaved - YES / NO
e) oneWayDirection
f) fullStreetName
g) mediaID - GIS Collection Method - CAD, Survey Grade GPS, etc.
h) contractNumber
i) isTankTrail - YES / NO
j) isLighted - Yes / No
k) routeMinTravelledWayWidth
l) routeMinTravelledWayWidthUOM
m) routeTotalUsableWidth
n) routeTotalUsableWidthUOM
o) supportedByBridgeSpan - Yes / No

1.4.3 CLJN.CL.REAL.PROPERTY

GPS and collect attribute data as specified for each feature listed with GPS accuracy as described in paragraph "Global Positioning System (GPS) and Spatial Reference Properties." Attribute fields may be associated with Domains, which are utilized to constrain the values allowed in a particular field, attribute table or feature class. Domains must be utilized when populating the feature where required.

GPS and collect the following attributes:

CLJN.CL.AccessControl
A structure manned or unmanned intended to control access to an area

a) controlType - gate, barricade, tire shedder, etc.
b) contractNumber
c) mediaID - GIS Collection Method - CAD, Survey Grade GPS, etc.
d) isRangeAccess - YES / NO

e) gateType -
f) Facility Number
g) sdsFeatureDescription - Location

CLJN.CL.AlternativeEnergyPoint
Locations used for the production of alternative energy sources, such as wind turbines, photovoltaic, etc.

a) alternativeEnergyType - Photovoltaic, Natural Gas, etc.
b) contractNumber
c) designDrawingNumber
d) gisFeatureCollectionMethod - CAD, Survey Grade GPS, etc.
e) isPortable - YES / NO
f) wattage
g) operationalStatus - inservice, abandoned, etc.
h) panelType
i) sdsFeatureName
j) sdsFeatureDescription
k) wattage - Total per unit
l) hasInverter - YES / NO
m) isPartOfElectricalNetwork - YES / NO
n) photovoltaicPanelInstallation

CLJN.CL.AlternativeEnergyArea
Locations used for the production of alternative energy sources

a) operationalStatus - inservice, abandoned, etc.
b) isPortable - YES / NO
c) panelType
d) wattage - total for area
e) gisFeatureCollectionMethod - CAD, Survey Grade GPS, etc.
f) contractNumber
g) sdsFeatureName - Facility Number
h) hasInverter - YES / NO
i) isPartOfElectricalNetwork - YES / NO

CLJN.CL.BoatRamp
A partially submerged hard surfaced structure on a shoreline for launching or retrieving vessels or vehicles

a) boatRampIDPK - Facility Number
b) dateConstructed
c) gisFeatureCollectionMethod - CAD, Survey Grade GPS, etc.
d) contractNumber
e) sdsFeatureName
f) sdsFeatureDescription - Location
g) numberofLaunchLanes

CLJN.CL.Bridge
A structure used by vehicles that allows passage over or under an obstacle such as a river, chasm, mountain, road or railroad

a) isFixed - YES / NO
b) TransportationSystemType - Pedestrian, Road, Railway, etc.
c) FacilityNumber

d) verticalConstructionMaterial - Brick, Concrete, etc.
e) mediaID - GIS Collection Method - CAD, Survey Grade GPS, etc.
f) contractNumber
g) sdsFeatureDescription - Road Name if applicable
h) OperationalStatus - closed, operational, etc.

CLJN.CL.Building
A roofed, floored and walled structure that is completely enclosed

a) facilityNumber
b) builtDate
c) mediaID - GIS Collection Method - CAD, Survey Grade GPS, etc.
d) contractNumber
e) sdsFeatureDescription - General Description of Building's Purpose
f) floorCount
g) material - Exterior material such as Brick, Concrete, etc.
h) operationalStatus - inService, abandoned, etc.

CLJN.CL.BuildingFloorPlan
A linear representation of floor plans for buildings, provided in one feature per floor

a) buildingFloorLevel
b) buildingIDFK - Structure Number
c) gisFeatureCollectionMethod - CAD, Survey Grade GPS, etc.
d) contractNumber
e) sdsFeatureDescription Renovation Date

CLJN.CL.Disposal_RealProperty
Real property demolished structures

a) sdsFeatureDescription
b) sdsFeatureName
c) facilityNumber
d) contractNumber
e) disposalDate

CLJN.CL.DocksAndWharfs
A manmade water-land interface structure often for access to boats or ships

a) PurposeType - Fishing, Mooring, etc.
b) mediaID - GIS Collection Method - CAD, Survey Grade GPS, etc.
c) contractNumber
d) Facility Number - Structure Number
e) sdsFeatureDescription - Pier, boat ramp, dock, etc.
f) natureOfConstruction - concrete, earthen, steel

CLJN.CL.Fence
A freestanding structure designed to restrict or prevent movement across a boundary

a) facilityIDFK - Structure Number
b) fenceType - metal, wood, etc.
c) fenceUse - agriculture, boundary, etc.
d) mediaID - GIS Collection Method - CAD, Survey Grade GPS, etc.
e) contractNumber
f) sdsFeatureName - Fence or Gate
g) sdsFeatureDescription

CLJN.CL.Marina
Any facility or area for the exchange of people or materials from land to water such as a port, harbor, marina, launch area or small craft facility

a) marinaIDPK - Structure Number
b) marinaType
c) gisFeatureCollectionMethod - CAD, Survey Grade GPS, etc.
d) contractNumber
e) sdsFeatureName
f) createdDate - Construction Date
g) categoryOfCraftFacility - boat launch or landed, etc.

CLJN.CL.NavigationalAid
A visual or electronic device, on the ground or airborne, which provides point-to-point guidance information or position data to aircraft in flight

a) navigationalAidIDPK - Structure Number
b) navaidType - TACAN, Radar station, Beacon, etc.
c) gisFeatureCollectionMethod - CAD, Survey Grade GPS, etc.
d) contractNumber
e) sdsFeatureName - Type of navigational aid

CLJN.CL.PavementSectionAirfield
A pavement section is a portion of a pavement branch that differs in some aspect from other sections such that further segmentation is required to uniquely identify that section)

a) pavementSectionType - apron, roadway, etc.
b) isLighted - YES / NO
c) operationalStatus - inService, abandoned, etc.
d) mediaID - GIS Collection Method - CAD, Survey Grade GPS, etc.
e) builtDate
f) contractNumber
g) runwayClassification - class A, class B, rotatory, etc.
h) sdsFeatureName
i) sdsFeatureDescription - MCBCL, MCASNR, Geiger, Stone Bay, etc.

CLJN.CL.PavementSectionParkingArea
A vehicle parking area is an area used for parking vehicles not including residential streets and driveways.

a) mediaID - GIS Collection Method - CAD, Survey Grade GPS, etc.
b) operationalStatus - inService, abandoned, etc.
c) pavementSectionType - parking, slab, driveway, etc.

d) sdsFeatureDescription - Dumpster, Driveway, Transformer, Parking, etc.
e) sdsFeatureName - Pad, Slab, Parking, etc.
f) facilityNumber
g) builtDate
h) contractNumber
i) isLighted

CLJN.CL.PavementSectionRoadway
The surface area that comprise a road area, upon which vehicles drive and park.

a) mediaID - GIS Collection Method - CAD, Survey Grade GPS, etc.
b) operationalStatus - inService, abandoned, etc.
c) pavementSectionType - curb, roadway, etc.
d) facCode - Surfaced or Unsurfaced
e) divided - Yes / No
f) featureCode
g) oneWay - Yes / No
h) routeSurfaceComposition - concrete, asphalt, etc.
i) builtDate
j) contractNumber
k) isLighted - Yes / No
l) isTankTrail - Yes / No

CLJN.CL.PavementSectionSidewalk
The paved pedestrian walkway prepared to facilitate travel on foot. It may or may not be adjacent to a street/road.

a) mediaID - GIS Collection Method - CAD, Survey Grade GPS, etc.
b) operationalStatus - inService, abandoned, etc.
c) pavementSectionType - Sidewalks
d) sdsFeatureDescription - Named Area
e) routeSurfaceComposition - Concrete, Asphalt, etc.
f) builtDate
g) contractNumber
h) installationCode - M67001
i) isLighted - Yes / No

CLJN.CL.RailTrack
A track is the main designation for describing a physical linear portion of the network

a) contractNumber
b) facilityNumber
c) mediaID - GIS Collection Method - CAD, Survey Grade GPS, etc.
d) NetworkSubtype - railroadTrack, craneTrack
e) operationalStatus - inservice, abandoned, etc.
f) sdsFeatureName - Start & finish Points
g) sdsFeatureDescription - Provide Street Name Cross cover

CLJN.CL.RecreationArea
An area defined for recreational purposes

a) facilityNumber
b) mediaID - GIS Collection Method - CAD, Survey Grade GPS, etc.
c) contractNumber
d) sdsFeatureName - Type of recreation field
e) sdsFeatureDescription - Type of recreation feature
f) areaType - biking, boating, picnic, Hunting, etc.

CLJN.CL.RecreationTrail
A location providing physical activities which are mentally relaxing, such as running/walking, biking, or hiking

a) recreationTrailIDPK - Facility or Structure Number
b) trailType - Multi-use, horse riding, etc.
c) isPaved - YES / NO
d) dateConstructed
e) gisFeatureCollectionMethod - CAD, Survey Grade GPS, etc.
f) contractNumber
g) sdsFeatureName - Trail Name
h) sdsFeatureDescription - Area, Location or parallel street

CLJN.CL.StructureArea
A facility classified as other than a building or linear asset

a) facilityNumber - Structure Number
b) builtDate
c) mediaID - GIS Collection Method - CAD, Survey Grade GPS, etc.
d) contractNumber
e) sdsFeatureName - Name of structure according to contract
f) sdsFeatureDescription - Description of item
g) heightAboveSurfaceLevel
h) heightAboveSurfaceLevelUOM - foot, inch, meter, etc.

CLJN.CL.StructurePoint
Example: Flag poles; Point of Information Signs (POI) etc

a) facilityNumber - Structure Number
b) builtDate
c) mediaID - GIS Collection Method - CAD, Survey Grade GPS, etc.
d) contractNumber
e) sdsFeatureName - POI, Sign, Flagpole, bleacher, etc.
f) sdsFeatureDescription - Specific type of feature

CLJN.CL.Tower
A vertical projection, higher than its diameter, generally used for observation, storage, or electronic transmission

a) towerUseType - communication, observation, etc.
b) heightMax
c) heightUOM - foot, inch, meter, etc.
d) contractNumber
e) towerType - Observation Tower, Guard Tower, etc.
f) facilityNumber - Structure number

g) sdsFeatureDescription
h) mediaID - GIS Collection Method - CAD, Survey Grade GPS, etc.
i) towerMaterial - wood, concrete, steel, etc.

CLJN.CL.TrafficControlLight
A feature used to represent traffic lights

a) contractNumber
b) gisFeatureCollectionMethod - CAD, Survey Grade GPS, etc.
c) sdsFeatureName - Traffic Control Light, Traffic Signal control box, etc.
d) sdsFeatureDescription - Location such as streets that intersect

CLJN.CL.Wall
A linear feature used for separation of facilities, ornamental decoration, or structural reinforcement (retaining wall

a) wallType - brick, timber, stone, concrete, etc.
b) wallHeight
c) wallHeightUOM - foot, inch, meter, etc.
d) dateConstructed
e) gisFeatureCollectionMethod - CAD, Survey Grade GPS, etc.
f) contractNumber
g) sdsFeatureName
h) sdsFeatureDescription - Dumpster enclosure, Utility Enclosure, Blast Protection, etc.

1.4.4 CLJN.CL.REAL_PROPERTY_RESTRICTED

GPS and collect attribute data as specified for each feature listed with GPS accuracy as described in paragraph "Global Positioning System (GPS) and Spatial Reference Properties." Attribute fields may be associated with Domains, which are utilized to constrain the values allowed in a particular field, attribute table or feature class. Domains must be utilized when populating the feature where required.

GPS and collect the following attributes:

CLJN.CL.Well
A shaft dug or drilled into the Earth for the purpose of extracting fluids from the subsurface, collecting environmental samples, injecting fluids into the subsurface or extracting contamination or other impurities from the subsurface

a) facilityNumber - Structure Number
b) wellPurpose - extraction, injection, etc.
c) wellResource - WATER
d) operationalStatus - inservice, abandoned, etc.
e) mediaID - GIS Collection Method - CAD, Survey Grade GPS, etc.
f) contractNumber
g) sdsFeatureName - potable or nonpotable
h) sdsFeatureDescription - operational status source
i) ProjectID - Name of Plant this well services

j) wellType - artesian, drilled, etc.
k) operationalStatus - inservice, abandoned, removed, etc

1.4.5 CLJN.CL.COMMUNICATIONS_RESTRICTED

GPS and collect attribute data as specified for each feature listed with GPS accuracy as described in paragraph "Global Positioning System GPS and Spatial Reference Properties." Attribute fields may be associated with Domains, which are utilized to constrain the values allowed in a particular field, attribute table or feature class. Domains must be utilized when populating the feature where required.

GPS and collect the following attributes:

CLJN.CL.CommCartographicFeatureArea
Graphic features that aid in visually associating CommAnnotation features to the appropriate communication infrastructure feature.

a) gisFeatureCollectionMethod - CAD, Survey Grade GPS, etc.
b) sdsFeatureName
c) sdsFeatureDescription
d) commProjectName - Contract Number
e) operationalStatus - In service, Removed, Abandon in Place, etc.

CLJN.CL.CommCartographicFeatureLine
Graphic features that aid in visually associating CommAnnotation features to the appropriate communication infrastructure feature.

a) gisFeatureCollectionMethod - CAD, Survey Grade GPS, etc.
b) sdsFeatureName
c) sdsFeatureDescription
d) commProjectName - Contract Number
e) operationalStatus - In service, Removed, Abandon in Place, etc.

CLJN.CL.CommCartographicFeaturePoint
Graphic features that aid in visually associating CommAnnotation features to the appropriate communication infrastructure feature.

a) gisFeatureCollectionMethod - CAD, Survey Grade GPS, etc.
b) sdsFeatureName
c) sdsFeatureDescription
d) commProjectName - Contract Number
e) operationalStatus - In service, Removed, Abandon in Place, etc.

CLJN.CL.CommUtilityNode
A subdivision of a communications network, particularly an asset that participates in the transmission of a signal but that is not a cable.

a) commUtilityNodeIDPK - Structure Number
b) commNodeType - connection or two or more sheaths, Devise Used to detect & measure various environmental conditions, Devise converts electrical signal in to sound, etc.

c) operatingSpectrum
d) transmissionPower
e) powerUOM
f) operationalStatus - In service, Removed, Abandon in Place, etc.
g) commProjectName - Contract Number
h) gisFeatureCollectionMethod - CAD, Survey Grade GPS, etc.
i) sdsFeatureName - MNS - Big Voice, MNS - Little Voice, MSN - Control Station, etc.
j) sdsFeatureDescription - MNS - Big Voice, Field Antenna, Antenna Communication, etc.

CLJN.CL.CommUtilitySegment
A subdivision of a communications network, particularly a cable for the transmission of a signal.

a) cableMaterial - Fiber Optical, PB, CU, Steel, ABS, etc.
b) cableSheathing - PE, XLPE, Cross Ply, etc.
c) availableFibers -
d) usedFibers
e) numberOfMultiModeFibers
f) numberOfPairs
g) numberOfSingleModeFibers
h) installationTypeCode - Underground, above ground, etc.
i) operationalStatus - In service, Removed, Abandon in Place, etc.
j) cableInstaller -
k) cableRoute -
l) cableCount -
m) numberOfStrands -
n) wireGauge -
o) commProjectName - Contract Number
p) gisFeatureCollectionMethod - CAD, Survey Grade GPS, etc.
q) sdsFeatureName - Non-direct Buried Lines, Direct Buried Lines, etc.
r) sdsFeatureDescription - communications line, etc.

CLJN.CL.UtilityFeature_cDuctBank
One or more ducts routed in parallel between two nodes.

a) networkType - A network used for the transmission of a signal.
b) networkSubType - The communication network subtype.
c) utilityFeatureType - One or more ducts routed in parallel between two nodes. (L), etc.
d) diameter
e) diameterUOM - Inches, Feet, meters, etc.
f) ductDepth
g) ductDepthUOM - Inches, Feet, meters, etc.
h) interDuctDiameter
i) interDuctDiameterUOM - Inches, Feet, meters, etc.
j) isEncased - Yes or No
k) numberOfDucts
l) numberOfInserts
m) operationalStatus - In service, Removed, Abandon in Place, etc.
n) commProjectName - Contract Number

o) gisFeatureCollectionMethod - CAD, Survey Grade GPS, etc.

CLJN.CL.UtilityFeature_cManhole
An enclosed structure (manhole, or handhole)

a) utilityFeatureIDPK - MH Number - See project Manager
b) networkType - Network used for transmission of signal,
c) networkSubType - Communication network subtype
d) utilityFeatureType - Manhole, hand hole, etc.
e) cManholeType - T, R2A, L, j4, JC9C, etc.
f) cManholeMaterial - steel, plastic, aluminum, fiberglass, etc.
g) isHandhole - Yes or No
h) widthValue
i) widthUOM - Inches, Feet, meters, etc.
j) lengthValue
k) lengthUOM - Inches, Feet, meters, etc.
l) heightValue
m) heightUOM - Inches, Feet, meters, etc.
n) diameter
o) diameterUOM - Inches, Feet, meters, etc.
p) cManholeDepth
q) cManholeDepthUOM - Inches, Feet, meters, etc.
r) operationalStatus - In service, Removed, Abandon in Place, etc.
s) commProjectName - Contract Number
t) gisFeatureCollectionMethod - CAD, Survey Grade GPS, etc.

CLJN.CL.UtilityFeature_cPedestal
An above-ground enclosed structure that provides access to buried plant and a place to house splices, terminals, etc.

a) networkType - A network used for the transmission of a signal.
b) networkSubType - The communication network subtype.
c) utilityFeatureType - above-ground enclosed structure that provides access to buried plant and a place to house splices, terminal, etc.
d) pedestalType - rectangular box type, etc.
e) operationalStatus - In service, Removed, Abandon in Place, etc.
f) commProjectName - Add Contract Number
g) gisFeatureCollectionMethod - CAD, Survey Grade GPS, etc.
h) sdsFeatureDescription

CLJN.CL.UtilityFeature_cVault
An enclosed structure in a facility used for cable entrance.

a) utilityFeatureType
b) networkType - A network used for the transmission of a signal.
c) networkSubType - The communication network subtype.
d) heightValue
e) heightUOM - Inches, Feet, meters, etc.
f) widthValue
g) widthUOM - Inches, Feet, meters, etc.
h) vaultDepth

i) vaultDepthUOM - Inches, Feet, meters, etc.
j) diameter
k) diameterUOM - Inches, Feet, meters, etc.
l) operationalStatus - In service, Removed, Abandon in Place, etc.
m) commProjectName - Contract Number
n) gisFeatureCollectionMethod - CAD, Survey Grade GPS, etc.
o) sdsFeatureDescription

1.4.6 **CLJN.CL.UTILITIES_ELECTRICAL**

GPS and collect attribute data as specified for each feature listed with GPS accuracy as described in paragraph "Global Positioning System (GPS) and Spatial Reference Properties." Attribute fields may be associated with Domains, which are utilized to constrain the values allowed in a particular field, attribute table or feature class. Domains must be utilized when populating the feature where required.

GPS and collect the following attributes:

CLJN.CL.ElecUtilNode_eExteriorLight
Exterior lighting is supplied by local distribution systems and is generally the only service for which the electric utility installs, operates and maintains utilization equipment

a) electricalUtilityNodeIDPK
b) exteriorLightType - streetLight, parkingLotLight, etc.
c) electricalNodeType - eExteriorLight
d) operationalStatus - inservice, abandoned, etc.
e) bulbType LED, INCA, etc.
f) circuitID - This available from CM or PM
g) hasSensor - YES / NO
h) mediaID - GIS Collection Method - CAD, Survey Grade GPS, etc.
i) contractNumber
j) dateInService
k) sdsFeatureName
l) Voltage
m) Wattage

CLJN.CL.ElecUtilNode_eGenerator
Generator is a power source for providing electricity. Generators may be primary or standby power sources

a) FacilityNumber - structure number
b) electricalNodeType - eGenerator
c) operationalStatus - inservice, abandoned, etc.
d) voltage
e) kvaRate
f) circuitID - List is available from CM or PM
g) mediaID - GIS Collection Method - CAD, Survey Grade GPS, etc.
h) contractNumber
i) dateInService
j) sdsFeatureName - Manufacturer
k) generatorType - Primary, backup, emergency, etc.

CLJN.CL.ElecUtilNode_eMeterPoint
A electrical meter point represents the location of the metering device

a) electricalNodeType - Description
b) operationalStatus - inservice, abandoned, etc.
c) circuitID - List is available from CM or PM
d) mediaID - GIS Collection Method - CAD, Survey Grade GPS, etc.
e) contractNumber
f) dateInService
g) sdsFeatureName
h) sdsFeatureDescription -
i) mountingType
j) utilityOwner
k) voltage - 208Y-120V, 480Y-277V, etc.

CLJN.CL.ElecUtilNode_eSwitch
Electrical Switches are installed at strategic locations throughout distribution feeder circuits

a) electricalNodeType
b) switchPosition - closed, open, etc.
c) operationalStatus - inservice, abandoned, etc.
d) electricalSwitchType - switches
e) circuitID - List is available from CM or PM
f) numberOfPhases single, three, two
g) switchPosition - Open, closed, etc.
h) voltage - 208Y-120V, 480Y-277V, etc.
i) mediaID - GIS Collection Method - CAD, Survey Grade GPS, etc.
j) contractNumber

CLJN.CL.ElecUtilNode_eTransformer
The Transformer feature class captures information about distribution and power transformers

a) electricalNodeType - Transformer
b) transformerType - stepdown, step up, etc.
c) mountingType - pool or pad
d) numberOfPhases - 1, 2, 3, etc.
e) primaryVoltage - 208Y-120V, 480Y-277V, etc.
f) secondaryVoltage - 208Y-120V, 480Y-277V, etc.
g) totalKVA
h) circuitID - List is available from CM or PM
i) mediaID - GIS Collection Method - CAD, Survey Grade GPS, etc.
j) contractNumber
k) sdsFeatureName - Manufacturer
l) operationalStatus - inservice, abandoned, etc.

CLJN.CL.ElecUtilNode_eVoltageRegulator
Voltage regulators vary the ac supply or source voltage to the customer to maintain the voltage within desired limits

a) electricalNodeType - VoltageRegulator
b) operationalStatus - inservice, abandoned, etc.
c) primaryVoltage - 208Y-120V, 480Y-277V, etc.
d) secondaryVoltage - 208Y-120V, 480Y-277V, etc.
e) numberOfPhases - 1, 2, 3,

f) circuitID - This available from CM or PM
g) mediaID - GIS Collection Method - CAD, Survey Grade GPS, etc.
h) contractNumber

CLJN.CL.UtilFeat_eSupportStructure
A structure that supports electric devices

a) utilityFeatureType - Utility, Guy, Poles, etc.
b) networkType - electrical
c) heightValue -
d) heightUOM - foot, inch, meter, etc.
e) utilityOwner
f) operationalStatus - inservice, abandoned, etc.
g) cableCircuitName - List is available from CM or PM
h) gisFeatureCollectionMethod - CAD, Survey Grade GPS, etc.
i) contractNumber
j) sdsFeatureName - Utility Pole, etc
k) sdsFeatureDescription - Number of circuits attached to pole

CLJN.CL.UtilFeat_eUndergroundStructure
Underground Structure is a simple junction feature that includes vaults and manholes that house and protect electrical equipment

a) utilityFeatureIDPK - Structure Number
b) utilityFeatureType - Underground, surface structure, etc
c) networkType - electrical
d) operationalStatus - inservice, abandoned, etc.
e) electricalJunctionType - Manhole, Junction Box, Handhole, etc.
f) numberOfCables -
g) rimElevation -
h) rimElevationUOM - foot, inch, meter, etc.
i) cableCircuitName - List is available from CM or PM
j) gisFeatureCollectionMethod - CAD, Survey Grade GPS, etc.
k) contractNumber

CLJN.CL.ElecUtilSegment
A subdivision of an electrical distribution network, particularly a line for the transmission of electricity

a) electricalSegmentType - OH Primary, UG Primary, OH Secondary, UG Secondary, etc.
b) cableMaterial - AL, copper, etc.
c) location - aboveground, underground, etc.
e) voltage - 208Y-120V, 480Y-277V, etc.
f) utilityOwner -
g) operationalStatus - inservice, abandoned, etc.
h) insulationMaterial - polyCross, none, etc.
i) conductorSize -
j) neutralSize -
k) numberOfConduct -
l) numberOfNeutral -
m) numberOfPhases - 1, 2, 3, etc.
n) circuitID - List is available from CM or PM
o) mediaID - GIS Collection Method - CAD, Survey Grade GPS, etc.
p) contractNumber -

q) dateInService -
r) sdsFeatureName - Electrical Distribution, exterior lighting, etc.
s) sdsFeatureDescription - Armless mount, cross arm, etc.

CLJN.CL.UtilFeat_eElecFacilitySite
Polygon feature class to define boundaries of electrical facility stations

a) utilityFeatureType - Electrical Facility station
b) operationalStatus - inservice, abandoned, etc.
c) numberOfCircuits
d) numberOfSpareBays
e) numberOfTransformers
f) voltageIn - 208Y-120V, 480Y-277V, etc.
g) utilityOwner
h) gisFeatureCollectionMethod - - CAD, Survey Grade GPS, etc.
i) contractNumber
j) equipmentInstallationDate
k) sdsFeatureDescription - Location of substation
l) facilityIDFK - structure number

1.4.7 CLJN.CL.UTILITIES_POL

GPS and collect attribute data as specified for each feature listed with GPS accuracy as described in paragraph "Global Positioning System GPS and Spatial Reference Properties." Attribute fields may be associated with Domains, which are utilized to constrain the values allowed in a particular field, attribute table or feature class. Domains must be utilized when populating the feature where required.

GPS and collect the following attributes:

CLJN.CL.POLUtilNode_oDispenser
A fuel dispenser is a machine at a fueling station that is used to pump fuel into vehicles or AGE equipment

a) polNodeType - Fuel dispenser
b) networkSubType - automotive_diesel, jpts, etc.
c) operationalStatus - inservice, abandoned, etc.
d) mediaID - GIS Collection Method - CAD, Survey Grade GPS, etc.
e) contractNumber
f) dateInService
g) sdsFeatureName - Fuel Dispenser
h) sdsFeatureDescription - Type of fuel, unleaded, ethanol, diesel, etc.

CLJN.CL.UtilFeat_oPumpingFacility
A structure, typically a building, containing pumps, filters, and controls as part of a larger fuel handling system

a) utilityFeatureIDPK
b) utilityFeatureType - off-loading pumping facility
c) networkSubType automotive_diesel, jpts, etc.
d) operationalStatus - inservice, abandoned, etc.
e) gisFeatureCollectionMethod - - CAD, Survey Grade GPS, etc.
f) contractNumber

g) equipmentInstallationDate
h) sdsFeatureDescription -

1.4.8 CLJN.CL.UTILITIES_STORMWATER

GPS and collect attribute data as specified for each feature listed with GPS accuracy as described in paragraph "Global Positioning System GPS and Spatial Reference Properties." Attribute fields may be associated with Domains, which are utilized to constrain the values allowed in a particular field, attribute table or feature class. Domains must be utilized when populating the feature where required.

GPS and collect the following attributes:

CLJN.CL.Impoundment_Stormwater
An accumulation of storm water that is impounded by a dam or weir

a) permitID - Permit Number
b) impoundmentType - minimumPool, topOfFloodControl, etc.
c) waterSurfaceElevation
d) waterSurfaceElevationUOM - foot, inch, meter, etc.
e) dateConstructed
f) gisFeatureCollectionMethod - CAD, Survey Grade GPS, etc.
g) contractNumber
h) operationalStatus - inservice, abandoned, etc.
i) stormwaterTreatmentType - Infiltration Basin, Constructed Wetlands, etc.
j) utilityOwner

CLJN.CL.StormwaterUtilityNode_swInlet
The location at which stormwater is collected/received into the stormwater network

a) stormwaterUtilityNodeIDPK - Structure ID
b) stormwaterNodeType - swInlet description
c) networkSubType - stormWater
d) stormwaterInletType - Inlet, Headwall, etc.
e) gisFeatureCollectionMethod - CAD, Survey Grade GPS, etc.
f) contractNumber
g) equipmentInstallationDate
h) sdsFeatureDescription -
i) operationalStatus inservice, abandoned, etc.

CLJN.CL.StormwaterUtilitySegment
A subdivision of a stormwater network, particularly a pipeline or drainage ditch for the transport of stormwater, between the source, holding facilities, and/or treatment facilities

a) diameter
b) diameterUOM - inch
c) pipeMaterial - cement, plastic, etc.
d) isLined - YES / NO
e) downstreamInvertElevation
f) upstreamInvertElevation
g) gisFeatureCollectionMethod - - CAD, Survey Grade GPS, etc.
h) contractNumber

i) equipmentInstallationDate
j) sdsFeatureName - Stormwater pipe, Open Ditch, etc.
k) sdsFeatureDescription
l) operationalStatus - inservice, abandoned, etc.
m) stormwaterPipeStyle
n) stormwaterSegmentType - open ditch, closed under other feature type, etc.

CLJN.CL.StorUtilNode_swManhole
A storm water manhole is an underground concrete structure with a top opening used for collecting and routing storm water runoff through underground pipes

a) stormwaterNodeType
b) stormwaterUtilityNodeIDPK - Structure Number
c) numberOfPipes
d) operationalStatus - inservice, abandoned, etc.
e) stormwaterBasinIDFK - Basin id
f) gisFeatureCollectionMethod - CAD, Survey Grade GPS, etc.
g) contractNumber
h) equipmentInstallationDate
i) sdsFeatureName
j) sdsFeatureDescription

1.4.9 CLJN.CL.UTILITIES_THERMAL

GPS and collect attribute data as specified for each feature listed with GPS accuracy as described in paragraph "Global Positioning System GPS and Spatial Reference Properties." Attribute fields may be associated with Domains, which are utilized to constrain the values allowed in a particular field, attribute table or feature class. Domains must be utilized when populating the feature where required.

GPS and collect the following attributes:

CLJN.CL.GeothermalWell
A geothermal well is part of a central heating and/or cooling system that pumps heat to or from the ground

a) geothermalWellIDPK - Well ID
b) pipeMaterial - AL, stainless_steel, etc.
c) geothermalWellCasingMaterial
d) thermalInsulationMaterial - MINERAL_FIBER, ARMAFLEX, etc.
e) geothermalWellDepth
f) geothermalWellDepthUOM - foot, inch, meter, etc.
g) downholePipeDiameter
h) downholePipeDiameterUOM - foot, inch, meter, etc.
i) hasBentoniteSeal - YES / NO
j) hasPump - YES / NO
k) operationalStatus - inservice, abandoned, etc.
l) gisFeatureCollectionMethod - CAD, Survey Grade GPS, etc.
m) contractNumber
n) designDrawingNumber
o) equipmentInstallationDate
p) sdsFeatureDescription - Associated Building Number
q) geothermalPipeType
r) xLocation

s) xLocationUOM - foot, inch, meter, etc.
t) yLocation
u) yLocationUOM - foot, inch, meter, etc.

CLJN.CL.TherUtilNode
The Thermal Fitting Type bend, cap, tee, etc. subclass represents the joint between two lines

a) thermalUtilityNodeIDPK
b) thermalNodeType - tFittingType bend, cap, tee, etc.
c) diameter
d) diameterUOM - foot, inch, meter, etc.
e) operationalStatus - inservice, abandoned, etc.
f) fittingType - bend, cap, tee, etc.
g) mediaID - GIS Collection Method - CAD, Survey Grade GPS, etc.
h) contractNumber
i) dateInService
j) sdsFeatureName
k) sdsFeatureDescription
l) depth
m) depthUOM - foot, inch, meter, etc.
n) facilityNumber
o) fittingType - bend, cap, tee, etc.
p) projectID
q) utilityOwner

CLJN.CL.TherUtilSegment
A subdivision of a thermal distribution network, particularly a pipeline for the transmission of chilled water, refrigerant, hot water, or steam

a) thermalSegmentType - tMainLine, tServiceLine
b) networkSubType
c) operationalStatus - inservice, abandoned, etc.
d) material - AL, stainless_steel, etc.
e) pipeLocation - aboveground, underground, etc.
f) diameter
g) diameterUOM - foot, inch, meter, etc.
h) mediaID - GIS Collection Method - CAD, Survey Grade GPS, etc.
i) contractNumber
j) dateInService
k) sdsFeatureName
l) sdsFeatureDescription
m) cathodicProtection - YES / NO
n) depth
o) depthUOM - foot, inch, meter, etc.
p) facilityNumber
q) pipeType - circular, box, etc.
r) projectID
s) utilityOwner

CLJN.CL.TherUtilNode_tProdStruc
Thermal production structures are facilities which produce steam, high-temperature water, low-temperature water, dual-temperature water or chilled water

a) thermalNodeType - facility which produce steam, etc.
b) Capacity
c) CapacityUOM - foot, inch, meter, etc.
d) operationalStatus - inservice, abandoned, etc.
e) mediaID - GIS Collection Method - CAD, Survey Grade GPS, etc.
f) contractNumber
g) dateInService
h) sdsFeatureName
i) sdsFeatureDescription
j) facilityNumber
k) utilityOwner

CLJN.CL.TherUtilNode_tSystemValve
A thermal system valve is a device installed in a pipeline to isolate flow

a) thermalNodeType
b) systemValveType - gate, ball, etc.
c) diameter
d) diameterUOM - foot, inch, meter, etc.
e) operationalStatus - inservice, abandoned, etc.
f) mediaID - GIS Collection Method - CAD, Survey Grade GPS, etc.
g) contractNumber
h) dateInService
i) depth
j) depthUOM - foot, inch, meter, etc.
k) utilityOwner
l) valveMaterial - AL, stainless_steel, etc.

CLJN.CL.UtilFeat_tUGEnclosureAccess
A point feature class for locating the access point to a thermal manhole junction

a) utilityFeatureType - SCADA, UGEnclosureAccess point, etc.
b) networkSubType - steamSupply, steamReturn, etc.
c) networktype -
d) operationalStatus - inservice, abandoned, etc.
e) gisFeatureCollectionMethod - CAD, Survey Grade GPS, etc.
f) contractNumber
g) diameter
h) diameterUOM - inch, feet, meter, etc.
i) sdsFeatureName - steam pit, etc.

1.4.10 CLJN.CL.UTILITIES_WASTEWATER

GPS and collect attribute data as specified for each feature listed with GPS accuracy as described in paragraph "Global Positioning System GPS and Spatial Reference Properties." Attribute fields may be associated with Domains, which are utilized to constrain the values allowed in a particular field, attribute table or feature class. Domains must be utilized when populating the feature where required.

GPS and collect the following attributes:

CLJN.CL.UtilFeat_sPretreatmentDevice
A wastewater pretreatment device is a piece of equipment that removes

contaminants before they enter the waste system, etc.

a) utilityFeatureIDPK - Structure Number
b) utilityFeatureType - Pretreatment Device see existing data
c) operationalStatus - inservice, abandoned, etc.
d) pretreatmentDeviceType - OWS, Trap, etc.
e) gisFeatureCollectionMethod - CAD, Survey Grade GPS, etc.
f) contractNumber
g) equipmentInstallationDate
h) sdsFeatureDescription - detailed description

CLJN.CL.UtilityFeature_sPumpStation
This is a collection of waste water Pump Station is a facility, which indications total capacity for the station

a) utilityFeatureIDPK - Structure Number
b) utilityFeaturetype - Pump station, etc.
c) networkType - wastewater network subtype….
d) numberOfPumps -
e) totalDesignCapacity -
f) designCapacityUOM -
g) totalRatedFlow
h) ratedFlowUOM - GPM, CF_SEC, etc.
i) operationalStatus - inservice, abandoned, etc.
j) gisFeatureCollectionMethod - CAD, Survey Grade GPS, etc.
k) contractNumber
l) equipmentInstallationDate
m) sdsFeatureName
n) sdsFeatureDescription

CLJN.CL.UtilityFeature_sSCADASensor
The SCADA sensor is a feature that is used to remotely measure the status of network components

a) utilityFeatureIDPK - Structure Number
b) utilityFeatureType - SCADA
c) networkType - wastewater
d) operationalStatus - inservice, abandoned, etc.
e) gisFeatureCollectionMethod - CAD, Survey Grade GPS, etc.
f) contractNumber
g) equipmentInstallationDate
h) sdsFeatureName
i) sdsFeatureDescription - Antenna Radio to Location

CLJN.CL.UtilityFeature_sSepticTank
A wastewater septic tank is a small-scale anaerobic digester and leach field designed to treat wastewater from an individual facility, and is not connected to the wastewater collection system

a) utilityFeatureIDPK - Structure Number
b) utilityFeatureType - septic tank
c) storageTankProduct - domestic wastewater
d) volume
e) volumeUOM - usGallon, cubicMeter, etc.
f) isRegulated - YES / NO
g) operationalStatus - inservice, abandoned, etc.

h) gisFeatureCollectionMethod - CAD, Survey Grade GPS, etc.
i) contractNumber
j) equipmentInstallationDate
k) sdsFeatureName - Septic Tank
l) sdsFeatureDescription - Location area name

CLJN.CL.WastUtilNode_sCleanOut
A clean out is an access point in a lateral used for maintenance purposes

a) wastewaterNodeType - Cleanout
b) material - PVC, etc.
c) diameter
d) diameterUOM - inch, meter, etc.
e) operationalStatus - inservice, abandoned, etc.
f) mediaID - GIS Collection Method - - CAD, Survey Grade GPS, etc.
g) contractNumber
h) utilityOwner

CLJN.CL.WastUtilNode_sFitting
The wastewater fitting that represents the join between two lines

a) fittingType - Bend, Cap, Tee, etc.
b) sdsFeatureDescription - Ben, Cap, Tee, Wye, etc.
c) diameter
d) diameterUOM - foot, inch, meter, etc.
e) operationalStatus - inservice, abandoned, etc.
f) material - PVC, precast, stainless steel, etc.
g) mediaID - GIS Collection Method - - CAD, Survey Grade GPS, etc.
h) contractNumber
i) fittingType - bend, cap, tee, etc.
j) utilityOwner

CLJN.CL.WastUtilNode_sManhole
The wastewater manhole represents an access point between two or more lines

a) wastewaterNodeType - sManhole
b) operationalStatus - inservice, abandoned, etc.
c) numberOfPipes
d) pipeMaterial - precast brick, etc.
e) diameter
f) diameterUOM - inch, etc.
g) rimElevation
h) rimElevationUOM - foot, inch, meter, etc.
i) mediaID - GIS Collection Method - - CAD, Survey Grade GPS, etc.
j) contractNumber
k) dateInService
l) sdsFeatureName - Manhole, Valve box, etc.
m) manholeMaterial - precast brick, etc.
n) utilityOwner

CLJN.CL.WastUtilNode_sPump
A wastewater pump is a piece of equipment that adds energy to a fluid being conveyed through a pipe or other closed conduit

a) facilityNumber
b) numberOfPumps
c) operationalStatus - inservice, abandoned, etc.
d) wastewaterNodeType - sPump
e) ratedFlow
f) ratedFlowUOM - GPM, CF_SEC, etc.
g) pumpHorsepower
h) contractNumber
i) dateInService
j) mediaID - GIS Collection Method - - CAD, Survey Grade GPS, etc.
k) sdsFeatureName - Wastwater Pump, Lift Station, etc.
l) utilityOwner

CLJN.CL.WastUtilNode_sSystemValve
A system valve is a facility that is fitted to a pipeline or orifice in which the closure member is either rotated or moved transversely or longitudinally in the waterway so as to control or stop the flow

a) wastewaterNodeType - sSystemValve
b) valveMaterial - stainless_steel, etc.
c) diameter
d) diameterUOM - inch, meter, etc.
e) operationalStatus - inservice, abandoned, etc.
f) valveType - gate, butterfly, check, etc.
g) mediaID - GIS Collection Method - CAD, Survey Grade GPS, etc.
h) contractNumber
i) dateInService
j) utilityOwner

CLJN.CL.WastUtilNode_sTreatmentPlant
A facility designed to treat wastewater using physical, chemical and/or biological processes prior to discharge into receiving waters

a) wastewaterNodeType - facility designed to treat wastewater
b) Capacity
c) CapacityUOM - gallons, meter, etc.
d) ContractNumber
e) operationalStatus - inservice, abandoned, etc.
f) facilityNumber - Structure Number
g) mediaID - GIS Collection Method - - CAD, Survey Grade GPS, etc.
h) dateInService
i) sdsFeatureName

CLJN.CL.WastUtilSegment
Wastewater Line - A pipeline for the transport of sewage or industrial waste between the source, holding facilities, and/or treatment facilities

a) wastewaterSegmentType - Gravity, Force Main, Service etc.

b) utilityOwner - CLJN / ONWASA
c) operationalStatus - inservice, abandoned, etc.
d) pipeMaterial - PVC, VC, etc.
e) isLined - YES / NO
f) diameter
g) diameterUOM -foot, inch, meter, etc.
h) mediaID - GIS Collection Method - - CAD, Survey Grade GPS, etc.
i) contractNumber
j) dateInService
k) sdsFeatureName -
l) invertElevationDownstream
m) invertElevationUpstream
n) invertElevationUOM - foot, inch, meter, etc.
o) slope

1.4.11 **CLJN.CL.UTILITIES_WATER**

GPS and collect attribute data as specified for each feature listed with GPS accuracy as described in paragraph "Global Positioning System (GPS) and Spatial Reference Properties." Attribute fields may be associated with Domains, which are utilized to constrain the values allowed in a particular field, attribute table or feature class. Domains must be utilized when populating the feature where required.

GPS and collect the following attributes:

CLJN.CL.UtilFeat_wUGEnclosureAccess
A point feature class for locating the access point to a water manhole junction

a) utilityFeatureIDPK - Manhole Number
b) numberOfPipes
c) groundElevation
d) elevationUOM - inch, foot, meter, etc.
e) operationalStatus - inservice, abandoned, etc.
f) gisFeatureCollectionMethod - CAD, Survey Grade GPS, etc.
g) contractNumber
h) equipmentInstallationDate
i) sdsFeatureName - Manhole
j) utilityFeatureType - wUGEnclosureAccess
k) waterServiceAreaIDFK - Holcomb, Hadnot Pt, Onslow Beach, etc.

CLJN.CL.WaterUtilNode_wFittingType bend, cap, tee, etc.
The water fitting class represents the joint between two lines in the water network

a) waterNodeType - fitting class represents transition between two lines
b) diameter -
c) diameterUOM - inch, meter, etc.
d) operationalStatus -inservice, abandoned, etc.
e) fittingType - reducer, bend, cap, tee, etc.
f) mediaID - GIS Collection Method - CAD, Survey Grade GPS, etc.
g) contractNumber
h) dateInServicen

CLJN.CL.WaterUtiNode_wHydrant
A water distribution point that enables fire fighters to attach fire hoses

a) waterNodeType - wHydrant
b) networkSubType - fireProtectionwater
c) operationalStatus - inservice, abandoned, etc.
d) connectionType - fireconnect, firehydrant
e) facilityNumber - Structure number if connection is to structure
f) mediaID - GIS Collection Method - CAD, Survey Grade GPS, etc.
g) contractNumber
h) dateInService

CLJN.CL.WaterUtilNode_wMeterPoint
A water meter point represents the location of the metering device

a) waterNodeType - meterPoint
b) operationalStatus - inservice, abandoned, etc.
c) projectID - area name
d) mediaID - GIS Collection Method - CAD, Survey Grade GPS, etc.
e) contractNumber
f) diameter
g) diameterUOM - foot, inch, meter, etc.
h) dateInService

CLJN.CL.WateUtilNode_wReliefValve
A valve used to relieve pressure

a) operationalStatus
b) sdsFeatureDescription
c) sdsFeatureName - Air Release Valve
d) contractNumber
e) dateInService
f) diameter
g) diameterUOM
h) mediaID - GIS Collection Method - CAD, Survey Grade GPS, etc.
i) projectID
j) utilityOwner

CLJN.CL.WaterUtilNode_wSystemValve
A valve used to regulate pressure, isolate, throttle flow, prevent backflow

a) waterNodeType - wSystemValve
b) diameter
c) diameterUOM - foot, inch, meter, etc.
d) operationalStatus - inservice, abandoned, etc.
e) valveType - gate, ball, etc.
f) projectID - MCASNR, MCBCLJN, Geiger, etc
g) mediaID - GIS Collection Method -- CAD, Survey Grade GPS, etc.
h) contractNumber
i) dateInService
j) valveType - Gate Valve, Post Indicator Valve, etc.

CLJN.CL.WaterUtilSegment
A subdivision of a water distribution network, particularly a distribution pipeline

a) networkSubType - potable water, raw water, Service, Fire etc.
b) material - PVC, Ductile Iron, Cement, etc,
c) diameter
d) diameterUOM - inch
e) utilityOwner - MBCCLJN, Onwasa, etc.
f) operationalStatus -inservice, abandoned, etc.
g) projectID
h) mediaID - GIS Collection Method /- CAD, Survey Grade GPS, etc.
i) contractNumber
j) dateInService
k) sdsFeatureName - Main, Service, Fire, AIP, Raw, etc.
l) invertElevationDownstream
m) invertElevationUpstream

CLJN.CL.WateUtilNode_wProdStructure
Water production structures are facilities which produce raw or treated water

a) waterNodeType - produce treated water, etc.
b) facilityNumber - Structure Number
c) capacity
d) capacityUOM - gallons per day, etc
e) operationalStatus - inservice, abandoned, etc.
f) mediaID - GIS Collection Method - CAD, Survey Grade GPS, etc.
g) contractNumber
h) dateInService
i) sdsFeatureName - Water Treatment Plant, Location
j) sdsFeatureDescription - Describe Plant purpose

CLJN.CL.WateUtilNode_wStorageStructure
Water storage structures are facilities that store large volumes of water - Water Tank)

a) facilityNumber - structure number
b) waterNodeType - water Storage Structure
c) storageTankProduct - treatedWater, rawWater, etc.
d) volume
e) volumeUOM - gallons, etc.
f) tankType - Elevated, Under Ground, Above Ground, etc.
g) operationalStatus - inservice, abandoned, etc.
h) width
i) widthUOM - foot, etc.
j) groundElevation
k) invertElevation
l) overflowElevation
m) surfaceElevation
n) elevationUOM - foot, etc.
o) projectID - Named Area of Location, Hadnot Point, etc.
p) mediaID - GIS Collection Method - CAD, Survey Grade GPS, etc.
q) contractNumber

r) dateInService
s) storageTypeProduct - Raw water or Potable Water

1.4.12 Non-Compliance

Failure to follow the specification outlined in this document will result in non-acceptance of data deliverable.

Note: Geospatial data delivery does not replace record drawing requirements.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

-- End of Section --

SECTION 02 41 00

DEMOLITION
05/10

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 145	(1991; R 2012) Standard Specification for Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)

ASSE/SAFE A10.6	(2006) Safety Requirements for Demolition Operations

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2014) Safety and Health Requirements Manual

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

40 CFR 61	National Emission Standards for Hazardous Air Pollutants

1.2 PROJECT DESCRIPTION

1.2.1 Demolition/Deconstruction Plan

Prepare a Demolition Plan and submit proposed demolition and removal procedures for approval before work is started. 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, and a detailed description of methods and equipment to be used for each operation and of the sequence of operations. Coordinate with Waste Management Plan. 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.

1.2.2 General Requirements

Do not begin demolition or deconstruction until authorization is received from the Contracting Officer. Remove rubbish and debris from the project site; do not allow accumulations inside or outside the buildings . The work includes demolition of 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 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, deconstruction, or demolition work performed under this contract. Do not overload structural elements and pavements to remain. 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.

1.3.1 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 dust, dirt, and debris from work areas daily.

1.3.2 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.

1.3.3 Trees

Protect trees within the project site which might be damaged during demolition or deconstruction, 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.

1.3.4 Utility Service

Maintain existing utilities indicated to stay in service and protect against damage during demolition and deconstruction operations.

1.3.5 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.

1.4 BURNING

The use of burning at the project site for the disposal of refuse and debris will not be permitted.

1.5 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Demolition Plan;
Existing Conditions

SD-07 Certificates

Notification;

SD-11 Closeout Submittals

1.6 QUALITY ASSURANCE

Submit timely notification of demolition an drenovation projects to Federal, State, regional, and local authorities in accordance with 40 CFR 61, Subpart M. Notify the 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. 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 ASSE/SAFE A10.6. Comply with the Environmental Protection Agency requirements specified. Use of explosives will be permitted, but if you do need to use explosives let me know because I want to see it.

1.6.1 Dust and Debris Control

Prevent the spread of dust and debris to occupied portions of the building 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. **Clean, vacuum and dust the work area daily.**

1.7 PROTECTION

1.7.1 Protection of Personnel

Before, during and after the demolition work 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.

1.8 RELOCATIONS

Perform the removal and reinstallation of relocated items as indicated with workmen skilled in the trades involved. Repair or replace items to be relocated which are damaged by the Contractor with new undamaged items as approved by the Contracting Officer.

1.9 EXISTING CONDITIONS

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. Submit survey results.

PART 2 PRODUCTS

2.1 FILL MATERIAL

a. Comply with excavating, backfilling, and compacting procedures for soils used as backfill material to fill basements, voids, depressions or excavations resulting from demolition or deconstruction of structures.

b. Fill material shall conform to the definition of satisfactory soil material as defined in AASHTO M 145, Soil Classification Groups A-1, A-2-4, A-2-5 and A-3. In addition, fill material shall be free from roots and other organic matter, trash, debris, frozen materials, and stones larger than 2 inches in any dimension. Provide 6" of topsoil an reseed as specified.

PART 3 EXECUTION

EXISTING FACILITIES TO BE REMOVED

Utilities and Related Equipment

3.1 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.

3.2 Masonry

Sawcut and remove masonry so as to prevent damage to surfaces to remain, and to facilitate the installation of new work. Where new masonry adjoins existing, the new work shall abut or tie into the existing construction as indicated. Provide square, straight edges and corners where existing masonry adjoins new work and other locations. New coursing and joints shall match existing building where work occurs.

3.3 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. Recycling is not required if the tiles contain or may have been exposed to asbestos material.

3.4 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, 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.

b. Where existing partitions have been removed leaving damaged or missing resilient tile flooring, patch to match the existing floor tile.

3.5 DISPOSITION OF MATERIAL

3.5.1 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 deconstruction, and materials and equipment to be removed, is vested in the Contractor upon approval by the Contracting Officer of the Contractor's demolition, deconstruction, and removal procedures, and authorization by the Contracting Officer to begin demolition and deconstruction. 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.

3.6 CLEANUP

Remove debris and rubbish from basement and similar excavations. Remove and transport the debris in a manner that prevents spillage on streets or

adjacent areas. Apply local regulations regarding hauling and disposal.

3.7 DISPOSAL OF REMOVED MATERIALS

3.7.1 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.

3.7.2 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.

-- 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.

DISTRICT OF COLUMBIA MUNICIPAL REGULATIONS (DCMR)

20 DCMR	(1997) Environment - Chapters 40 to 70, Subtitle E: Hazardous Waste, Chapters 40 - 70

STATE OF MARYLAND CODE OF MARYLAND REGULATIONS (COMAR)

COMAR 26.13	(1988) Chapters .01- .13, Disposal of Controlled Hazardous Substances

STATE OF VIRGINIA ADMINISTRATIVE CODE (VAC)

9 VAC 20-60	Title 9, Agency 20, Chapter 60: Hazardous Waste Management Regulations
9 VAC 20-80	Title 9, Agency 20, Chapter 80: Solid Waste Management Regulations

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	Standards Applicable to Generators of Hazardous Waste
40 CFR 263	Standards Applicable to Transporters of Hazardous Waste
40 CFR 264	Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 265	Interim Status Standards for 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 and COMAR 26.13 9 VAC 20-60 and 9 VAC 20-80 20 DCMR. Perform mercury-containing lamps storage and transport in accordance with 40 CFR 261, 40 CFR 264, 40 CFR 265, 40 CFR 273 and COMAR 26.13 9 VAC 20-60 and 9 VAC 20-80.

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 COMAR 26.13 and of the Contractor removal work plan and disposal plan for PCB and for associated mercury-containing lamps.

1.5 SUBMITTALS

Submit the following 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 posses 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 operated by the Defense Reutilization and marketing Officer (DRMO). If the primary site is filled to capacity, contact the Contracting Officer. The transport distance to any storage site will not exceed the distance between the project site and the DRMO storage site.

3.5.3.1 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 04

CONCRETE FOR MINOR STRUCTURES
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 CONCRETE INSTITUTE INTERNATIONAL (ACI)

ACI 308R	(2001) Guide to Curing Concrete
ACI 318/318R	(2005) Building Code Requirements for Structural Concrete and Commentary

ASTM INTERNATIONAL (ASTM)

ASTM A 185	(2002) Steel Welded Wire Reinforcement, Plain, for Concrete
ASTM A 615/A 615M	(2005a) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM C 143/C 143M	(2005) Slump of Hydraulic Cement Concrete
ASTM C 150	(2007) Standard Specification for Portland Cement
ASTM C 171	(2003) Sheet Materials for Curing Concrete
ASTM C 172	(2004) Sampling Freshly Mixed Concrete
ASTM C 231	(2009a) Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 260	(2001) Air-Entraining Admixtures for Concrete
ASTM C 309	(2003) Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C 31/C 31M	(2003a) Making and Curing Concrete Test Specimens in the Field
ASTM C 33	(2003) Concrete Aggregates
ASTM C 39/C 39M	(2004a) Compressive Strength of Cylindrical Concrete Specimens
ASTM C 494/C 494M	(2005) Chemical Admixtures for Concrete

ASTM C 94/C 94M	(2007) Standard Specification for Ready-Mixed Concrete
ASTM D 1752	(2004a; R 2008) Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion
ASTM D 75	(2003) Sampling Aggregates
ASTM D 98	(1998) Calcium Chloride

U.S. ARMY CORPS OF ENGINEERS (USACE)

COE CRD-C 400	(1963) Requirements for Water for Use in Mixing or Curing Concrete

1.2 SUBMITTALS

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

SD-03 Product Data

Air-Entraining Admixture
Water-Reducing or Retarding Admixture
Curing Materials
Reinforcing Steel
Expansion Joint Filler Strips, Premolded

Manufacturer's literature is available from suppliers which demonstrates compliance with applicable specifications for the above materials.

SD-06 Test Reports

Aggregates

Aggregates will be accepted on the basis of certificates of compliance and test reports that show the material(s) meets the quality and grading requirements of the specifications under which it is furnished.

Concrete Mixture Proportions

Ten days prior to placement of concrete, the contractor shall submit the mixture proportions that will produce concrete of the quality required. Applicable test reports shall be submitted to verify that the concrete mixture proportions selected will produce concrete of the quality specified.

SD-07 Certificates

Cementitious Materials

Certificates of compliance attesting that the concrete materials meet the requirements of the specifications shall be submitted in accordance with the Special Clause "CERTIFICATES OF COMPLIANCE". Cementitious material will be accepted on the basis of a manufacturer's certificate of compliance, accompanied by mill test

reports that the material(s) meet the requirements of the specification under which it is furnished.

Aggregates

Aggregates will be accepted on the basis of certificates of compliance and tests reports that show the material(s) meet the quality and grading requirements of the specifications under which it is furnished.

1.3 DESIGN AND PERFORMANCE REQUIREMENTS

The Government will maintain the option to sample and test aggregates and concrete to determine compliance with the specifications. The Contractor shall provide facilities and labor as may be necessary to assist the Government in procurement of representative test samples. Samples of aggregates will be obtained at the point of batching in accordance with ASTM D 75. Concrete will be sampled in accordance with ASTM C 172. Slump and air content will be determined in accordance with ASTM C 143/C 143M and ASTM C 231, respectively, when cylinders are molded. Compression test specimens will be made, cured, and transported in accordance with ASTM C 31/C 31M. Compression test specimens will be tested in accordance with ASTM C 39/C 39M. Samples for strength tests will be taken not less than once each shift in which concrete is produced. A minimum of three specimens will be made from each sample; two will be tested at 28 days (90 days if pozzolan is used) for acceptance, and one will be tested at 7 days for information.

1.3.1 Strength

Acceptance test results will be the average strengths of two specimens tested at 28 days (90 days if pozzolan is used). The strength of the concrete will be considered satisfactory so long as the average of three consecutive acceptance test results equal or exceed the specified compressive strength, f'c, and no individual acceptance test result falls below f'c by more than 500 psi.

1.3.2 Concrete Mixture Proportions

Concrete mixture proportions shall be the responsibility of the Contractor. Mixture proportions shall include the dry weights of cementitious material(s); the nominal maximum size of the coarse aggregate; the specific gravities, absorptions, and saturated surface-dry weights of fine and coarse aggregates; the quantities, types, and names of admixtures; and quantity of water per cubic yard of concrete. All materials included in the mixture proportions shall be of the same type and from the same source as will be used on the project. Specified compressive strength f'c shall be 4,000 psi at 28 days (90 days if pozzolan is used). The maximum nominal size coarse aggregate shall be 3/4 inch, in accordance with ACI 318/318R. The air content shall be between 4.5 and 7.5 percent. The slump shall be between 2 and 5 inches. The maximum water cement ratio shall be 0.50.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Cementitious Materials

Cementitious materials shall conform to the appropriate specifications listed:

2.1.1.1 Portland Cement

ASTM C 150, Type II.

2.1.2 Aggregates

Fine and coarse aggregates shall meet the quality and grading requirements of ASTM C 33 Class Designations 4M or better.

2.1.3 Admixtures

Admixtures to be used, when required or approved, shall comply with the appropriate specification listed. Chemical admixtures that have been in storage at the project site for longer than 6 months or that have been subjected to freezing shall be retested at the expense of the contractor at the request of the Contracting Officer and shall be rejected if test results are not satisfactory.

2.1.3.1 Air-Entraining Admixture

Air-entraining admixture shall meet the requirements of ASTM C 260.

2.1.3.2 Accelerating Admixture

Calcium chloride shall meet the requirements of ASTM D 98. Other accelerators shall meet the requirements of ASTM C 494/C 494M, Type C or E.

2.1.3.3 Water-Reducing or Retarding Admixture

Water-reducing or retarding admixture shall meet the requirements of ASTM C 494/C 494M, Type A, B, or D.

2.1.4 Water

Water for mixing and curing shall be fresh, clean, potable, and free from injurious amounts of oil, acid, salt, or alkali, except that unpotable water may be used if it meets the requirements of COE CRD-C 400.

2.1.5 Reinforcing Steel

Reinforcing steel bar shall conform to the requirements of ASTM A 615/A 615M, Grade 60. Welded steel wire fabric shall conform to the requirements of ASTM A 185. Details of reinforcement not shown shall be in accordance with ACI 318/318R, Chapters 7 and 12.

2.1.6 Expansion Joint Filler Strips, Premolded

Expansion joint filler strips, premolded shall be sponge rubber conforming to ASTM D 1752, Type I.

2.1.7 Formwork

The design and engineering of the formwork as well as its construction, shall be the responsibility of the Contractor.

2.1.8 Form Coatings

Forms for exposed surfaces shall be coated with a nonstaining form oil, which shall be applied shortly before concrete is placed.

2.1.9 Curing Materials

Curing materials shall conform to the following requirements.

2.1.9.1 Impervious Sheet Materials

Impervious sheet materials, ASTM C 171, type optional, except polyethylene film, if used, shall be white opaque.

2.1.9.2 Membrane-Forming Curing Compound

ASTM C 309, Type 1-D or 2, Class A.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 General

Construction joints shall be prepared to expose coarse aggregate, and the surface shall be clean, damp, and free of laitance. Ramps and walkways, as necessary, shall be constructed to allow safe and expeditious access for concrete and workmen. Snow, ice, standing or flowing water, loose particles, debris, and foreign matter shall have been removed. Earth foundations shall be satisfactorily compacted. Spare vibrators shall be available. The entire preparation shall be accepted by the Government prior to placing.

3.1.2 Embedded Items

Reinforcement shall be secured in place; joints, anchors, and other embedded items shall have been positioned. Internal ties shall be arranged so that when the forms are removed the metal part of the tie will be not less than 2 inches from concrete surfaces permanently exposed to view or exposed to water on the finished structures. Embedded items shall be free of oil and other foreign matters such as loose coatings or rust, paint, and scale. The embedding of wood in concrete will be permitted only when specifically authorized or directed. All equipment needed to place, consolidate, protect, and cure the concrete shall be at the placement site and in good operating condition.

3.1.3 Formwork Installation

Forms shall be properly aligned, adequately supported, and mortar-tight. The form surfaces shall be smooth and free from irregularities, dents, sags, or holes when used for permanently exposed faces. All exposed joints and edges shall be chamfered, unless otherwise indicated.

3.1.4 Production of Concrete

3.1.4.1 Ready-Mixed Concrete

Ready-mixed concrete shall conform to ASTM C 94/C 94M except as otherwise specified.

3.2 CONVEYING AND PLACING CONCRETE

Conveying and placing concrete shall conform to the following requirements.

3.2.1 General

Concrete placement shall not be permitted when weather conditions prevent proper placement and consolidation without approval. When concrete is mixed and/or transported by a truck mixer, the concrete shall be delivered to the site of the work and discharge shall be completed within 1-1/2 hours or 45 minutes when the placing temperature is 85 degrees F or greater unless a retarding admixture is used. Concrete shall be conveyed from the mixer to the forms as rapidly as practicable by methods which prevent segregation or loss of ingredients. Concrete shall be in place and consolidated within 15 minutes after discharge from the mixer. Concrete shall be deposited as close as possible to its final position in the forms and be so regulated that it may be effectively consolidated in horizontal layers 18 inches or less in thickness with a minimum of lateral movement. The placement shall be carried on at such a rate that the formation of cold joints will be prevented.

3.2.2 Consolidation

Each layer of concrete shall be consolidated by rodding, spading, or internal vibrating equipment. Internal vibration shall be systematically accomplished by inserting the vibrator through the fresh concrete in the layer below at a uniform spacing over the entire area of placement. The distance between insertions shall be approximately 1.5 times the radius of action of the vibrator and overlay the adjacent, just-vibrated area by a few inches. The vibrator shall penetrate rapidly to the bottom of the layer and at least 6 inches into the layer below, if such a layer exists. It shall be held stationary until the concrete is consolidated and then withdrawn slowly at the rate of about 3 inches per second.

3.2.3 Cold-Weather Requirements

No concrete placement shall be made when the ambient temperature is below 35 degrees F or if the ambient temperature is below 40 degrees F and falling. Suitable covering and other means as approved shall be provided for maintaining the concrete at a temperature of at least 50 degrees F for not less than 72 hours after placing and at a temperature above freezing for the remainder of the curing period. Salt, chemicals, or other foreign materials shall not be mixed with the concrete to prevent freezing. Any concrete damaged by freezing shall be removed and replaced at the expense of the contractor.

3.2.4 Hot-Weather Requirements

When the rate of evaporation of surface moisture, as determined by use of Figure 1 of ACI 308R, is expected to exceed 0.2 psf per hour, provisions for windbreaks, shading, fog spraying, or covering with a light-colored material shall be made in advance of placement, and such protective

measures shall be taken as quickly as finishing operations will allow.

3.3 FORM REMOVAL

Forms shall not be removed before the expiration of 24 hours after concrete placement except where otherwise specifically authorized. Supporting forms and shoring shall not be removed until the concrete has cured for at least 5 days. When conditions on the work are such as to justify the requirement, forms will be required to remain in place for longer periods.

3.4 FINISHING

3.4.1 General

No finishing or repair will be done when either the concrete or the ambient temperature is below 50 degrees F.

3.4.2 Finishing Formed Surfaces

All fins and loose materials shall be removed, and surface defects including tie holes shall be filled. All honeycomb areas and other defects shall be repaired. All unsound concrete shall be removed from areas to be repaired. Surface defects greater than 1/2 inch in diameter and holes left by removal of tie rods in all surfaces not to receive additional concrete shall be reamed or chipped and filled with dry-pack mortar. The prepared area shall be brush-coated with an approved epoxy resin or latex bonding compound or with a neat cement grout after dampening and filled with mortar or concrete. The cement used in mortar or concrete for repairs to all surfaces permanently exposed to view shall be a blend of portland cement and white cement so that the final color when cured will be the same as adjacent concrete.

3.4.3 Finishing Unformed Surfaces

All unformed surfaces that are not to be covered by additional concrete or backfill shall be float finished to elevations shown, unless otherwise specified. Surfaces to receive additional concrete or backfill shall be brought to the elevations shown and left as a true and regular surface. Exterior surfaces shall be sloped for drainage unless otherwise shown. Joints shall be carefully made with a jointing tool. Unformed surfaces shall be finished to a tolerance of 3/8 inch for a float finish as determined by a 10 foot straightedge placed on surfaces shown on the plans to be level or having a constant slope. Finishing shall not be performed while there is excess moisture or bleeding water on the surface. No water or cement shall be added to the surface during finishing.

3.4.3.1 Broom Finish

A broom finish shall be applied. The concrete shall be screeded and floated to required finish plane with no coarse aggregate visible. After surface moisture disappears, the surface shall be broomed or brushed with a broom or fiber bristle brush in a direction transverse to that of the main traffic or as directed.

3.4.3.2 Expansion and Contraction Joints

Expansion and contraction joints shall be made in accordance with the details shown or as otherwise specified. Provide 1/2 inch thick

transverse expansion joints where new work abuts an existing concrete. Expansion joints shall be provided at a maximum spacing of 50 feet on center in sidewalks, unless otherwise indicated. Contraction joints shall be provided at a maximum spacing of 5 linear feet in sidewalks , unless otherwise indicated. Contraction joints shall be cut at a minimum of 1 inch deep with a jointing tool after the surface has been finished.

3.5 CURING AND PROTECTION

Beginning immediately after placement and continuing for at least 7 days, all concrete shall be cured and protected from premature drying, extremes in temperature, rapid temperature change, freezing, mechanical damage, and exposure to rain or flowing water. All materials and equipment needed for adequate curing and protection shall be available and at the site of the placement prior to the start of concrete placement. Preservation of moisture for concrete surfaces not in contact with forms shall be accomplished by one of the following methods:

a. Continuous sprinkling or ponding.

b. Application of absorptive mats or fabrics kept continuously wet.

c. Application of sand kept continuously wet.

d. Application of impervious sheet material conforming to ASTM C 171.

e. Application of membrane-forming curing compound conforming to ASTM C 309, Type 1-D, on surfaces permanently exposed to view and Type 2 on other surfaces shall be accomplished in accordance with manufacturer's instructions.

The preservation of moisture for concrete surfaces placed against wooden forms shall be accomplished by keeping the forms continuously wet for 7 days. If forms are removed prior to end of the required curing period, other curing methods shall be used for the balance of the curing period. During the period of protection removal, the temperature of the air in contact with the concrete shall not be allowed to drop more than 25 degrees F within a 24 hour period.

3.6 TESTS AND INSPECTIONS

3.6.1 General

The individuals who sample and test concrete as required in this specification shall have demonstrated a knowledge and ability to perform the necessary test procedures equivalent to the ACI minimum guidelines for certification of Concrete Field Testing Technicians, Grade I.

3.6.2 Inspection Details and Frequency of Testing

3.6.2.1 Preparations for Placing

Foundation or construction joints, forms, and embedded items shall be inspected in sufficient time prior to each concrete placement by the Contractor to certify that it is ready to receive concrete.

3.6.2.2 Air Content

Air content shall be checked at least twice during each shift that

concrete is placed. Samples shall be obtained in accordance with ASTM C 172 and tested in accordance with ASTM C 231.

3.6.2.3 Slump

Slump shall be checked once for each truck load of concrete delivered to the job site. Samples shall be obtained in accordance with ASTM C 172 and tested in accordance with ASTM C 143/C 143M.

3.6.2.4 Compressive Strength

Provide one sample set for each 10 cubic yards of concrete placed; however, provide one sample for each abutment wall as a minimum in accordance with ASTM C 39/C 39M.

3.6.3 Action Required

3.6.3.1 Placing

The placing foreman shall not permit placing to begin until he has verified that an adequate number of acceptable vibrators, which are in working order and have competent operators, are available. Placing shall not be continued if any pile is inadequately consolidated.

3.6.3.2 Air Content

Whenever a test result is outside the specification limits, the concrete shall not be delivered to the forms and an adjustment shall be made to the dosage of the air-entrainment admixture.

3.6.3.3 Slump

Whenever a test result is outside the specification limits, the concrete shall not be delivered to the forms and an adjustment should be made in the batch weights of water and fine aggregate. The adjustments are to be made so that the water-cement ratio does not exceed that specified in the submitted concrete mixture proportion.

3.6.4 Reports

The results of all tests and inspections conducted at the project site shall be reported informally at the end of each shift and in writing weekly and shall be delivered within 3 days after the end of each weekly reporting period. See Section 01 45 10 QUALITY CONTROL.

-- End of Section --

SECTION 05 40 00

COLD-FORMED METAL FRAMING
10/03

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	(1996) 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	(2003) Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 370	(2003a) Mechanical Testing of Steel Products
ASTM A 653/A 653M	(2003) 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	(2002) 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-02 Shop Drawings

Framing Components;

a. Cross sections, plans, and/or elevations showing component types and locations for each framing application; including shop coatings and material thicknesses for each framing component.

b. Connection details showing fastener type, quantity, location, and other information to assure proper installation.

c. Drawings depicting panel configuration, dimensions, components, locations, and construction sequence if the Contractor elects to install prefabricated/prefinished frames.

SD-03 Product Data

Steel studs,joists, tracks, bracing, bridging and accessories

SD-07 Certificates

Load-bearing and 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 AND NON-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.

1.5 MAXIMUM DEFLECTION

a. Exterior Studs:

Deflection Criteria	Exterior Finish
L/240 or L/360	Synthetic Plaster, Metal Panels
L/360	Cement Plaster, Wood Veneer
L/600	Brick Veneer, Stone Panels

Wall deflections shall be computed on the basis that studs withstand all lateral forces independent of any composite action from sheathing materials. Studs abutting windows or louvers shall also be designed not to exceed 1/4 inch maximum deflection.

b. Floor Joists:

L/360 - Live load only
L/240 - Total load

c. Roof Rafters:

L/240 - Live load only

1.6 QUALITY ASSURANCE

1.6.1 Drawing Requirements

Submit framing components to show sizes, thicknesses, layout, material designations, methods of installation, and accessories.

1.7 MINIMUM GAGE STANDARDS

Unless specifically noted otherwise in project drawings, light gage metal framing shall be 20 gage or heavier. The standard for 20 gage thickness shall be 0.0329" minimum. "Drywall" and lighter gage framing is not permitted, regardless of whether the application is load-bearing or non-load-bearing.

Unless specifically stated otherwise, minimum gage standard applies to all cold-formed metal framing, including but not limited to steel studs, joists, tracks, bracing, bridging, framing, furring, resilient channels, "Z" furring, and hat channels.

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, G60.

2.1.2 Studs and Joists of 18 Gage (0.0478 Inch) and Lighter

Studs and Joists of 18 Gage (0.0478 Inch) and Lighter, Track, and Accessories (All Gages): Galvanized steel, ASTM A 653/A 653M, SS, Grade 50 33,000 psi G60. Steel stud deflection shall be limited to L/600 for exterior wall brick veneer construction.

The lightest acceptable gage on project is 20 Gage for studs and joists, and 18 gage for runners and tracks. Drywall framing studs are not permitted.

2.2 RESILIENT CHANNELS, Z FURRING, AND HAT CHANNELS

2.2.1 Sizes, Gages, Section Modulus, and Other Structural Properties

Size shall be as indicated. Provide 20 gage minimum unless indicated otherwise.

2.3 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.

2.4 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.

2.5 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. 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.

3.1.3 Anchors

Anchors shall be of the type, size, and location shown on the drawings or as recommended by manufacturer. Power driven anchors can be used to attach tracks to structural steel and concrete floors and foundations. Power driven anchors will not be used to anchor shear walls.

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. Solid, continous bracing shall be installed behind vertical and horizontal joints in gypsum board or other sheathing type wall finishes. In curtain wall construction, provide for vertical movement where studs connect to the structural frame. 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:

LOAD	HEIGHT	BRACING
Wind load only	Up to 10 feet	One row at mid-height
	Over 10 feet	Rows 5'-0" o.c. maximum
Axial load	Up to 10 feet	Two rows at 1/3 points
	Over 10 feet	Rows 3'-4" o.c. maximum

3.2.3 Joists and Trusses

Locate each joist or truss directly above a stud. Provide doubled joists under parallel partitions wherever partition length exceeds 1/2 of joist span. Joists shall have at least 2.50 inches of bearing on steel, 4 inches on masonry, and shall be reinforced over bearings where required to prevent web crippling. Splice joists over bearings only. Lap and weld splices as indicated. Provide manufacturer's standard bridging which shall not be less than the following:

CLEAR SPAN	BRIDGING
Up to 14 feet	One row near center
14 to 20 feet	Two rows at 1/3 points
20 to 26 feet	Three rows at 1/4 points
26 to 32 feet	Four rows at 1/5 points

Temporary bracing shall be provided and remain in place until work is permanently stabilized.

3.2.4 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 06 10 00

ROUGH CARPENTRY
05/11

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	(2005) National Design Specification (NDS) for Wood Construction

AMERICAN HARDBOARD ASSOCIATION (AHA)

AHA A135.4	(1995; R 2004) Basic Hardboard

AMERICAN INSTITUTE OF TIMBER CONSTRUCTION (AITC)

AITC 111	(2005) Recommended Practice for Protection of Structural Glued Laminated Timber During Transit, Storage and Erection
AITC TCM	(2004; Errata 2008) Timber Construction Manual, 5th Edition
ANSI/AITC A190.1	(2007) American National Standard, Structural Glued Laminated Timber

AMERICAN LUMBER STANDARDS COMMITTEE (ALSC)

ALSC PS 20	(2010) American Softwood Lumber Standard

AMERICAN RAILWAY ENGINEERING AND MAINTENANCE-OF-WAY ASSOCIATION (AREMA)

AREMA Eng Man	(2010) Manual for Railway Engineering

AMERICAN WOOD PROTECTION ASSOCIATION (AWPA)

AWPA BOOK	(2009) AWPA Book of Standards
AWPA M2	(2007) Standard for Inspection of Treated Wood Products
AWPA M6	(2007) Brands Used on Forest Products
AWPA P5	(2009) Standard for Waterborne Preservatives

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 EWS R540C	(1995; R 1996) Builder Tips Proper Storage and Handling of Glulam Beams
APA EWS T300E	(2005) Technical Note: Glulam Connection Details
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	(2010) Square and Hex Bolts and Screws (Inch Series)
ASME B18.2.2	(2010) 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 A307	(2010) Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
ASTM A653/A653M	(2010) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM C 1136	(2010) Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation
ASTM D 3498	(2011) Adhesives for Field-Gluing Plywood to Lumber Framing for Floor Systems
ASTM E 96/E 96M	(2010) Standard Test Methods for Water Vapor Transmission of Materials
ASTM F 1667	(2011) Driven Fasteners: Nails, Spikes,

and Staples

ASTM F 547 (2006) Nails for Use with Wood and Wood-Base Materials

FM GLOBAL (FM)

FM 4435 (2004) Roof Perimeter Flashing

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC (2009; Errata First Printing) International Building Code

NATIONAL HARDWOOD LUMBER ASSOCIATION (NHLA)

NHLA Rules (2007) Rules for the Measurement & Inspection of Hardwood & Cypress

NORTHEASTERN LUMBER MANUFACTURERS ASSOCIATION (NELMA)

NELMA Grading Rules (2006) Standard Grading Rules for Northeastern Lumber

REDWOOD INSPECTION SERVICE (RIS) OF THE CALIFORNIA REDWOOD ASSOCIATION (CRA)

RIS Grade Use (1998) Redwood Lumber Grades and Uses

SOUTHERN CYPRESS MANUFACTURERS ASSOCIATION (SCMA)

SCMA Spec (1986; Supple. No. 1, Aug 1993) Standard Specifications for Grades of Southern Cypress

SOUTHERN PINE INSPECTION BUREAU (SPIB)

SPIB 1003 (2002) Standard Grading Rules for Southern Pine Lumber

TRUSS PLATE INSTITUTE (TPI)

TPI 1 (2002) National Design Standard for Metal Plate Connected Wood Truss Construction; Commentary and Appendices

TPI HIB (1991) Commentary and Recommendations for Handling, Installing and Bracing Metal Plate Connected Wood Trusses

U.S. DEPARTMENT OF COMMERCE (DOC)

DOC/NIST PS56 (1973) Structural Glued Laminated Timber

DOC/NIST PS58 (1973) Basic Hardboard (ANSI A135.4)

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-1923 (Rev A; Notice 2) Shield, Expansion (Lag,

	Machine and Externally Threaded Wedge Bolt Anchors)
CID A-A-1924	(Rev A; Notice 2) Shield, Expansion (Self Drilling Tubular Expansion Shell Bolt Anchors
CID A-A-1925	(Rev A; Notice 2) Shield Expansion (Nail Anchors)
FS UU-B-790	(Rev A; Am 1; Notice 1) Building Paper, Vegetable Fiber: (Kraft, Waterproofed, Water Repellent and Fire Resistant)

WEST COAST LUMBER INSPECTION BUREAU (WCLIB)

WCLIB 17	(2000) Standard Grading Rules

WESTERN WOOD PRODUCTS ASSOCIATION (WWPA)

WWPA G-5	(1998) Western Lumber Grading Rules

1.2 SUBMITTALS

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

SD-02 Shop Drawings

Structural glued laminated members;

Fabricated structural members;

Modifications of structural members;

Drawings of structural laminated members, fabricated wood trusses, engineered wood joists and rafters, and other fabricated structural members indicating materials, shop fabrication, and field erection details; including methods of fastening.

Nailers and Nailing Strips;

Drawings of field erection details, including materials and methods of fastening nailers in conformance with Factory Mutual wind uplift rated systems specified in other Sections of these specifications.

SD-03 Product Data

Underlayment;

Engineered wood products;
Structural-use;

SD-05 Design Data

Modifications of structural members;

Design analysis and calculations showing design criteria used to

accomplish the applicable analysis.

SD-06 Test Reports

Preservative-treated lumber and plywood

SD-07 Certificates

Certificates of grade

Manufacturer's certificates (approved by an American Lumber Standards approved agency) attesting that lumber and material not normally grade marked meet the specified requirements. Certificate of Inspection for grade marked material by an American Lumber Standards Committee (ALSC) recognized inspection agency prior to shipment.

Preservative treatment

SD-10 Operation and Maintenance Data

SD-11 Closeout Submittals

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. Laminated timber shall be handled and stored in accordance with AITC 111 or APA EWS R540C. 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. Hammer marking will be permitted on timbers when all surfaces will be exposed to view.

1.4.2 Structural Glued Laminated Timber

Mark each member with the mark of a recognized association or independent inspection agency that maintains continuing control over the quality of structural glued laminated timber products. The marking shall indicate compliance with ANSI/AITC A190.1 and shall include all identification information required by ANSI/AITC A190.1. Structurally end-jointed lumber shall also be certified and grade marked in accordance with

ANSI/AITC A190.1.

1.4.3 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.

1.4.4 Structural-Use

Mark each panel with the mark of a recognized association or independent inspection agency that maintains continuing control over the quality of the panel. The mark shall indicate end use, span rating, and exposure durability classification.

Oriented Strand Board (OSB) is prohibited.

1.4.5 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.

1.4.6 Hardboard, Gypsum Board, and Fiberboard

Mark each sheet or bundle to identify the standard under which the material is produced and the producer.

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 board, 19 percent maximum

b. Timbers 5 inches and thicker, 25 percent maximum

c. Roof planking, 15 percent maximum

d. 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 BOOK Use Category System Standards U1 and 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.

a. 0.25 pcf intended for above ground use.

b. 0.40 pcf intended for ground contact and fresh water use. 0.60 pcf intended for Ammoniacal Copper Quaternary Compound (ACQ)-treated foundations. 0.80 to 1.00 pcf intended for ACQ-treated pilings. 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. 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. The following items shall be preservative treated:

   1. Wood framing, woodwork, and plywood up to and including the subflooring at the first-floor level of structures having crawl spaces when the bottoms of such items are 24 inches or less from the earth underneath.

   2. Wood members that are in contact with water.

   3. Exterior wood steps, platforms, and railings; and all wood framing of open, roofed structures.

   4. Wood sills, soles, plates, furring, and sleepers that are less than 24 inches from the ground, furring and nailers that are set into or in contact with concrete or masonry.

   5. Nailers, edge strips, crickets, curbs, and cants for roof decks.

1.8 QUALITY ASSURANCE

1.8.1 Drawing Requirements

For fabricated structural members, trusses, qlu-lam members, indicate materials, details of construction, methods of fastening, and erection details. Include reference to design criteria used and manufacturers design calculations. Submit drawings for all proposed modifications of structural members. Do not proceed with modifications until the submittal has been approved.

1.8.2 Data Required

Submit calculations and drawings for all proposed modifications of

structural members. Do not proceed with modifications until the submittal has been approved.

1.8.3 Certificates of Grade

Submit certificates attesting that products meet the grade requirements specified in lieu of grade markings where appearance is important and grade marks will deface material.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Engineered Wood Products

Products shall contain no added urea-formaldehyde if exposed to interior spaces.

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 1,200,000E. Use for joists, rafters, headers, trusses, beams (except collar beams), columns, posts, stair stringers, girders, and all other members indicated to be stress rated. Design of members and fastenings shall conform to AITC TCM. Other stress graded or dimensioned items such as blocking, carriages, and studs shall be standard or No. 2 grade except that studs may be Stud grade.

2.2.2 Framing Lumber

Framing lumber such as studs, plates, caps, collar beams, cant strips, bucks, sleepers, nailing strips, and nailers and board lumber such as subflooring and wall and roof sheathing shall be one of the species listed in the table below. Minimum grade of species shall be as listed. Finger-jointed lumber may be used in the same applications as solid lumber of an equivalent species and grade, provided the finger-jointed lumber meets all the requirements of the certification and the quality control programs of the rules writing agency having jurisdiction and all applicable requirements of DOC/NIST PS56.

Table of Grades for Framing and Board Lumber

Grading Rules	Species	Framing	Board Lumber
WWPA G-5 standard grading rules	Aspen Douglas Fir-Larch Douglas Fir South Engelmann Spruce -Lodgepole Pine Engelmann Spruce Hem-Fir Idaho White Pine Lodgepole Pine Mountain Hemlock Mountain Hemlock	All Species: Standard Light Framing or No. 3 Structural Light Framing (Stud Grade for 2x4 nominal size, 10 feet and shorter)	All Species: No. 3 Common

Table of Grades for Framing and Board Lumber

Grading Rules	Species	Framing	Board Lumber
	-Hem-Fir Ponderosa Pine -Sugar Pine Ponderosa Pine -Lodgepole Pine Subalpine Fir White Woods Western Woods Western Cedars Western Hemlock		
WCLIB 17 standard grading rules	Douglas Fir-Larch Hem-Fir Mountain Hemlock Sitka Spruce Western Cedars Western Hemlock	All Species: Standard Light Framing or No. 3 Structural Light Framing (Stud Grade for 2x4 nominal size, 10 feet and shorter)	All Species: Standard
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
SCMA Spec standard specifications	Cypress	No. 2 Common	No. 2 Common
NELMA Grading Rules standard grading rules	Balsam Fir Eastern Hemlock -Tamarack Eastern Spruce Eastern White Pine Northern Pine Northern Pine Cedar	All Species: Standard Light Framing or No. 3 Structural Light Framing (Stud Grade for 2x4 nominal size, 10 feet and shorter)	All Species: No. 3 Common except Standard for Eastern White and Northern Pine
RIS Grade Use standard specifications	Redwood	All Species: Standard Light Framing or No. 3 Structural Light Framing (Stud Grade for 2x4 nominal size, 10 feet and shorter)	Construction Heart
NHLA Rules rules for the measurement and inspection	Cypress	No. 2 Dimension	No. 2 Common

Table of Grades for Framing and Board Lumber

Grading Rules of hardwood and cypress lumber	Species	Framing	Board Lumber

2.2.3 Structural Glued Laminated Timber

ANSI/AITC A190.1, allowable working stress values for loads of normal duration in pounds per square inch (psi) as necessary to support floor loads as stated:

Fabricated with wet-use adhesives. Beams shall use glue-laminated lumber. Posts and studs shall use laminated-strand lumber. Joists shall use laminated-veneer lumber or dimensional lumber as indicated in drawings. Members shall be Industrial Appearance Grade, sealed with a penetrating sealer, and wrapped as standard with the manufacturer and approved. Members shall be complete with hardware for joining laminated members and for their connection to other construction.

2.3 PLYWOOD AND STRUCTURAL-USE PANELS

APA PS 1, APA PS 2, APA E445S, and APA F405L respectively.

2.3.1 Subflooring

2.3.1.1 Plywood

C-D Grade, Exposure 1 durability classification, Span rating as necessary for application where indicated.

2.3.1.2 Structural-Use Panels

Sheathing grade with durability equivalent to Exposure 1, Span Rating of as required for application where indicated.

2.3.2 Combination Subfloor-Underlayment

2.3.2.1 Plywood

Underlayment Grade, Exposure 1. Minimum thickness shall be whichever is thicker, that as listed below or as indicated in project drawings.

Support Spacing	Underlayment Minimum Thickness
16 inches	1/2 inch for Group 1 species 19/32 inch for Group 2 and 3 species 23/32 inch for Group 4 species
24 inches	23/32 inch for Group 1 species 7/8 inch for Group 2 and 3 species one inch for Group 4 species

2.3.2.2 Structural-Use Panel

Combination subfloor-underlayment grade with durability equivalent to

Exterior plywood, Span Rating of 16 or greater.

2.3.3 Structural-Use Panels

Sheathing grade with durability equivalent to Exposure 1, Span Rating of 16/0 or greater. APA Rated Sheathing.

2.3.4 Roof Sheathing

2.3.4.1 Plywood

C-D Grade, Exposure 1, with an Identification Index of not less than 24/0. Particle board is prohibited.

2.3.4.2 Structural-Use Panel

Sheathing grade with durability equivalent to Exposure 1, Span Rating of 24/0 or greater.

2.4 UNDERLAYMENT

Underlayment shall conform to one of the following:

2.4.1 Hardboard

AHA A135.4 service class, sanded one side, 1/4 inch thick, 4 feet wide.

2.4.2 Plywood

Plywood shall conform to APA PS 1, underlayment grade with exterior glue, or C-C (Plugged) exterior grade 11/32 inch thick, 4 feet wide.

2.4.3 Oriented Strand Board

Prohibited from use.

2.5 OTHER MATERIALS

2.5.1 Hardboard Underlayment

DOC/NIST PS58, service class, sanded on one side, 1/4 inch thick 4 feet wide.

2.5.2 Building Paper

FS UU-B-790, Type I, Grade D, Style 1.

2.5.3 Miscellaneous Wood Members

2.5.3.1 Nonstress Graded Members

Members shall include bridging, corner bracing, furring, grounds, and nailing strips. Members shall be in accordance with TABLE I for the species used. Sizes shall be as follows unless otherwise shown:

Member	Size (inch)
Bridging	1 x 3 or 1 x 4 for use between members

Member	Size (inch)
	2 x 12 and smaller; 2 x 4 for use between members larger than 2 x 12.
Corner bracing	1 x 4.
Furring	1 x 2.
Grounds	Plaster thickness by 1-1/2.
Nailing strips	1 x 3 or 1 x 4 when used as shingle base or interior finish, otherwise 2 inch stock.

2.5.3.2 Wood Bumpers

AREMA Eng Man, Industrial grade cross ties

2.5.3.3 Sill Plates

Sill plates shall be standard or number 2 grade.

2.5.3.4 Blocking

Blocking shall be standard or number 2 grade.

2.5.3.5 Rough Bucks and Frames

Rough bucks and frames shall be straight standard or number 2 grade.

2.6 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. Nails and fastenings for fire-retardant treated lumber and woodwork exposed to the weather shall be copper alloy.

2.6.1 Bolts, Nuts, Studs, and Rivets

ASME B18.2.1, ASME B18.5.2.1M, ASME B18.5.2.2M and ASME B18.2.2.

2.6.2 Anchor Bolts

ASTM A307, size as indicated, complete with nuts and washers.

2.6.3 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.

2.6.4 Lag Screws and Lag Bolts

ASME B18.2.1.

2.6.5 Wood Screws

ASME B18.6.1.

2.6.6 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.

2.6.7 Wire Nails

ASTM F 1667.

2.6.8 Timber Connectors

Unless otherwise specified, timber connectors shall be in accordance with TPI 1, APA EWS T300E or AITC TCM.

2.6.9 Clip Angles

Steel, 3/16 inch thick, size best suited for intended use; or zinc-coated steel or iron commercial clips designed for connecting wood members.

2.6.10 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.

2.6.11 Tie Straps

For joists supported by the lower flange of steel beams, provide 1/8 by 1-1/2 inch steel strap, 2 feet long, except as indicated otherwise.

2.6.12 Joist Anchors

For joists supported by masonry walls, provide anchors 3/16 by 1 1/2 inch steel tee or strap, bent and of length to provide 4 inches embedment into wall and 12 inches along joist except as indicated otherwise. For joists parallel to masonry or concrete walls, provide anchors 1/4 by 1-1/4 inch minimum cross-sectional area, steel strap, length as necessary to extend

over top of first three joists and into wall 4 inches, and with wall end of bend or pin type, except as indicated otherwise.

2.6.13 Door Buck Anchors

Metal anchors, 1/8 by 1-1/4 inch steel, 12 inches long, with ends bent 2 inches. Anchors shall be screwed to the backs of bucks and built into masonry or concrete. Locate 8 inches above sills and below heads and not more than 24 inches intermediately between. Anchorage of bucks to steel framing shall be as necessary to suit the conditions.

2.6.14 Metal Bridging

Where not indicated or specified otherwise, No. 16 U.S. Standard gage, cadmium-plated or zinc-coated.

2.6.15 Toothed Rings and Shear Plates

AF&PA T101.

2.6.16 Beam Anchors

Steel U-shaped strap anchors 1/4 inch thick by 1-1/2 inches wide, except as indicated otherwise.

2.6.17 Metal Framing Anchors

Construct anchors to the configuration shown using hot dip zinc-coated steel conforming to ASTM A653/A653M, G90. Steel shall be not lighter than 18 gage. Special nails supplied by the manufacturer shall be used for all nailing.

2.6.18 Panel Edge Clips

Extruded aluminum or galvanized steel, H-shaped clips to prevent differential deflection of roof sheathing.

2.7 AIR INFILTRATION BARRIER

Air infiltration barrier shall be building paper meeting the requirements of ASTM C 1136, Type IV, style optional or a tear and puncture resistant olefin building wrap (polyethylene or polypropylene) with a moisture vapor transmission rate of 125g per square meter per 24 hours in accordance with ASTM E 96/E 96M, Desiccant Method at 23 degrees C or with a moisture vapor transmission rate of 670g per square meter per 24 hours in accordance with ASTM E 96/E 96M, Water Method at 23 degrees C.

PART 3 EXECUTION

3.1 INSTALLATION

Conform to AF&PA T10 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. 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. 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. Use slate or steel shims when leveling joists, beams, and girders on masonry or concrete. Do not use shimming on wood or metal bearings. When joists, beams, and girders are placed on masonry or concrete, a wood base plate shall be positioned and leveled with grout. The joist, beam, or girder shall then be placed on the plate. When joists, beams, and girders are set into masonry or concrete, a pocket shall be formed into the wall. The joist, beam, or girder shall then be placed into the pocket and leveled with a steel shim.

3.1.1 Sills

Set sills level and square and wedge with steel or slate shims; point or grout with non-shrinking cement mortar to provide continuous and solid bearing. Anchor sills to the foundations as indicated. Where sizes and spacing of anchor bolts are not indicated, provide not less than 5/8 inch diameter bolts at all corners and splices and space at a maximum of 6 feet o.c. between corner bolts. Provide at least two bolts for each sill member. Lap and splice sills at corners and bolt through the laps or butt the ends and through-bolt not more than 6 inches from the ends. Provide bolts with plate washers and nuts. Bolts in exterior walls shall be zinc-coated.

3.1.1.1 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.

3.1.1.2 Anchors in Concrete

Except where indicated otherwise, Embed anchor bolts not less than 8 inches in poured concrete walls and provide each with a nut and a 2 inch diameter washer at bottom end. A bent end may be substituted for the nut and washer; bend shall be not less than 90 degrees. Powder-actuated fasteners spaced 3 feet o.c. may be provided in lieu of bolts for single thickness plates on concrete.

3.1.2 Beams and Girders

Set beams and girders level and in alignment and anchor to bearing walls, piers, or supports with U-shaped steel strap anchors. Embed anchors in concrete or masonry at each bearing and through-bolt to the beams or girders with not less than two bolts. Provide bolts not less than 1/2 inch in diameter and with plate washers under heads and nuts. Install beams and girders not indicated otherwise with 8 inch minimum end bearing on walls or supports. Install beams and girders into walls with 1/2 inch clearance at the top, end, and sides or standard steel wall-bearing boxes. Provide joints and splices over bearings only and bolt or spike together.

3.1.3 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 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 wall plate and to ceiling joists with no less than three 8-penny nails or bolted by angles. 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.

3.1.4 Joists

Provide joists of the sizes and spacing indicated, accurately and in alignment, and of uniform width. Joists shall have full bearing on sills, plates, beams, girders, and trusses; 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 joists built into masonry with a beveled fire cut so that the top of the joist does not enter the wall more than one inch or standard steel wall bearing boxes. 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.

3.1.4.1 Floor (Ceiling) Framing

Except where otherwise indicated joists shall have bearings not less than 4 inches on concrete or masonry and 1-1/2 inches on wood or metal. Joists, trimmers, headers, and beams framing into carrying members at the same relative levels shall be carried on joist hangers. Joists shall be lapped and spiked together at bearings or butted end-to-end with scab ties at joint and spiked to plates. Openings in floors shall be framed with headers and trimmers. Headers carrying more than two tail joists and trimmers supporting headers carrying more than one tail joist shall be doubled, unless otherwise indicated. Joists built into masonry shall be provided with a beveled fire cut so that the top of the joist does not enter the wall more than 1 inch or standard steel wall bearing boxes. Engineered wood joists shall be installed in accordance with distributor's instructions.

3.1.4.2 Doubled Joists

Provide under bearing walls and partitions running parallel with the floor joists, around stairways, chimneys, fireplaces, and at other openings where joists are cut and framed. Double, space for clearance, block apart 4 feet on center, rigidly frame, and spike together joists under partitions that are to receive ducts, pipes, and conduits.

3.1.4.3 Tie Straps

For joists supported by the lower flange of steel beams, provide straps at every fourth joist and the corresponding fourth joist on the opposite side. Tie joists across the top of the steel beam with a steel strap. Form straps to lie flat across the top of the beam and twist at the ends to provide flat contact with the side of each joist. Nail each strap at each end with three 10-penny nails spaced 2 inches o.c.

3.1.4.4 Joist Anchors

Provide anchors for each fourth joist supported by a masonry wall. Build wall end of anchors into the wall. Nail anchor to the joist with three 10-penny nails spaced 2 inches o.c. Anchor the first three joists parallel to concrete or masonry walls at bridging points, but not less than 8 feet o.c. from end walls. Let anchors into the tops of each joist and spike to the top of joist with one 10-penny nail. Extend anchors at least 4 inches into the wall.

3.1.5 Bridging

Provide bridging for floor and ceiling joists and for roof rafters having slopes of less than 1/3. Locate bridging as indicated and as specified herein. Provide bridging for spans greater than 6 feet, but do not exceed 8 feet maximum spacing between rows of bridging. Install rows of bridging uniformly. Provide metal or wood cross-bridging, except where solid bridging is indicated. Do not nail the bottom end of cross-bridging until the subfloor has been laid.

3.1.5.1 Wood Cross-Bridging

Provide wood cross-bridging not less than 2 by 3 nominal size. Nail wood cross-bridging at each end with three 8-penny nails for 2 by thick material.

3.1.5.2 Metal Cross-Bridging

Shall be the manufacturer's standard product, not less than 16 gage before forming and coating. Metal bridging shall be the compression type, lodged into or nailed to the wide faces of opposite joists at points diagonally across from each other near the bottoms and tops of joists.

3.1.6 Subflooring

3.1.6.1 Plywood and Structural-Use Panels

Apply best side up with the grain of outer plies or the long dimension at right angles to joists. Stagger end joints and locate over the centerline of joists. Support panel edges by nominal 2 by 4 members framed between joists so the edge joints of subfloor occur over the centerline of blocking. Allow 1/8 inch spacing at panel ends and 1/4 inch at panel

edges. Panels shall be continuous over two or more spans. Nail panels 6 inches o.c. at supported edges and 10 inches o.c. over intermediate bearing. Nails shall be 8-penny common or 6-penny threaded. Provide at least 1/2 inch clearance between subflooring and masonry or concrete walls. Subflooring may be installed with adhesive conforming to ASTM D 3498 and nails spaced at 12 inches on center unless otherwise shown.

3.1.6.2 Combination Subfloor-Underlayment

Apply with the grain of the face plies or the long dimension at right angles to joists. Panels shall be continuous over two or more spans. Stagger end joints of adjacent panels. Panel edges shall be T&G or supported by 2 by 4 members framed between joists so the edge joints of subfloor-underlayment occur over the centerline of blocking. Provide end joints of panels over the centerline of joists. Allow 1/8 inch spacing between panel edge and end joints. Nail panels 6 inches o.c. at ends and edges and 10 inches o.c. along intermediate bearings unless they are glue-nailed in accordance with APA E30. Nails shall be 8-penny coated common or 6-penny threaded. Provide at least 1/2 inch clearance between subfloor-underlayment and masonry or concrete walls. Lightly sand all joints to receive resilient flooring.

3.1.6.3 Wood

Subflooring shall be applied diagonally with end joints made over supports. Each board shall bear on at least three supports and shall be nailed at each support using two nails for boards 6 inches and less in width and three nails for boards more than 6 inches in width.

3.1.6.4 Depressed Subfloors

Provide depressed subfloors to receive ceramic and quarry tile floors. Nail cleats or ledgers of one by four material to the sides of joists to support the flooring material. Place the cleats at a depth below the top of the joists sufficient to allow the installation of the subflooring below the tops of joists. Snugly fit subflooring as specified herein between joists.

3.1.7 Underlayment

Install underlayment over subfloor just prior to laying of resilient flooring and protect from water and physical damage. Underlayment shall be plywood. Stagger end joints of underlayment with respect to each other, and stagger all joints with respect to paralleling panel joints in subfloor. Space panels 1/16 inch apart at ends and 1/8 inch apart at edges and at least 1/2 inch from concrete or masonry walls. Nail panels 6 inches o.c. along edges and 6 inches o.c. each way throughout panel, but not closer than 3/8 inch to panel edges. Nails shall be 4-penny annular ring or screw type and shall be countersunk 1/16 inch. Lightly sand all joints to receive resilient flooring.

3.1.8 Columns and Posts

Set columns and posts, plumb, in alignment, and with full and uniform bearing. Do not embed the bottom and bearing surfaces of posts or columns in concrete or set in direct contact with concrete slabs on grade. Provide post and beam construction with wood bolsters or steel post caps in such a manner that the post above will tier directly over the one below;

fabricate the assembly in a rigid and substantial manner using bolts or lag screws.

3.1.9 Wall Framing

3.1.9.1 Studs

Select studs for straightness and set plumb, true, and in alignment. In walls and partitions more than eight feet tall, provide horizontal bridging at not more than 8 feet o.c. using nominal 2 inch material of the same width as the studs; install the bridging flat. Sizes and spacing of studs shall be as indicated, but not greater than 16 inches on center. Double studs at jambs and heads of openings and triple at corners to form corner posts. Frame corner posts to receive sheathing, lath, and interior finish. Truss over openings exceeding 4 feet in width or use a header of sufficient depth. Toe-nail studs to sills or sole plates with four 8-penny nails or fasten with metal nailing clips or connectors. Anchor studs abutting concrete or masonry walls thereto near the top and bottom and at midheight of each story using expansion bolts or powder-actuated drive studs.

3.1.9.2 Plates

Use plates for walls and partitions of the same width as the studs to form continuous horizontal ties. Splice single plates; stagger the ends of double plates. Double top plates in walls and bearing partitions, built up of two nominal 2 inch thick members. Top plates for nonbearing partitions shall be single or double plates of the same size as the studs. Nail lower members of double top plates and single top plates to each stud and corner post with two 16-penny nails. Nail the upper members of double plates to the lower members with 10-penny nails, two near each end, and stagger 16 inches o.c. intermediately between. Nail sole plates on wood construction through the subfloor to each joist and header; stagger nails. Anchor sole plates on concrete with expansion bolts, one near each end and at not more than 6 feet o.c., or with powder-actuated fasteners, one near each end and at not more than 3 feet o.c. Provide plates cut for the passage of pipes or ducts with a steel angle as a tie for the plate and bearing for joist.

3.1.9.3 Firestops

Provide firestops for wood framed walls and partitions and for furred spaces of concrete or masonry walls at each floor level and at the ceiling line in the top story. Where firestops are not automatically provided by the framing system used, they shall be formed of closely fitted wood blocks of nominal 2 inch thick material of the same width as the studs and joists.

3.1.9.4 Diagonal Bracing

Provide diagonal bracing at all external corners and internal angles and at maximum 40 foot centers in stud walls, except that bracing may be omitted where diagonally applied wood sheathing, plywood or structural-use panel sheathing, 4 by 8 foot fiberboard sheathing, or gypsum board sheathing is used. Bracing shall be of 1 by 6 material, let into the exterior face of studs. Extend bracing from top plates to sill at an angle of approximately 45 degrees and double nail at each stud. When openings occur near corners, provide diagonal knee braces extending from the corner post above headers to top plates and from below window sills to

the main sill. Nail bracing at each bearing with two 8-penny nails.

3.1.10 Building Paper

Provide building paper where indicated. Apply paper shingle fashion, horizontally, beginning at the bottom of the wall. Lap edges 4 inches, and nail with one inch, zinc-coated roofing nails, spaced 12 inches o.c. and driven through tin discs.

3.1.11 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.

3.1.12 Trusses

Metal plate connected wood trusses shall be handled, erected, and braced in accordance with TPI HIB and as indicated.

3.1.13 Structural Glued Laminated Timber Members

Brace members before erection. Align members and complete all connections before removal of bracing. Unwrap individually wrapped members only after adequate protection by a roof or other cover has been provided. Treat scratches and abrasions of factory applied sealer with two brush coats of the same sealer used at the factory.

3.1.14 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.

3.1.15 Stair Framing

Cut carriages to exact shape required to receive treads and risers, with risers of uniform height and treads of uniform width. Provide trimmers, nailers, and blocking as required to support finish materials.

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 4435. Strips shall be grooved for edge venting; install at walls, curbs, and other vertical surfaces with a 1/4 to 1/2 inch air space.

3.2.1.2 Crickets, Cants, and Curbs

Provide wood saddles or crickets, cant strips, curbs for scuttles and ventilators, and at expansion joints, as indicated, specified, or necessary and of lumber.

3.2.2 Rough Wood Bucks

Size as 2 inch nominal thickness. Set wood bucks true and plumb. Anchor bucks to concrete or masonry with steel straps extending into the wall 8 inches minimum. Place anchors near the top and bottom of the buck and space uniformly at 2 foot maximum intervals.

3.2.3 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.

3.2.4 Wood Grounds

Provide for fastening wood trim, finish materials, and other items to plastered walls and ceilings. Install grounds in proper alignment and true with an 8 foot straightedge.

3.2.5 Wood Furring

Provide where shown and as necessary for facing materials specified. Except as shown otherwise, furring strips shall be nominal one by 3, continuous, and spaced 16 inches o.c. Erect furring vertically or horizontally as necessary. Nail furring strips to masonry. Do not use wood plugs. Provide furring strips around openings, behind bases, and at angles and corners. Furring shall be plumb, rigid, and level and shall be shimmed as necessary to provide a true, even plane with surfaces suitable to receive the finish required. Form furring for offsets and breaks in walls or ceilings on 1 by 4 wood strips spaced 16 inches o.c.

3.2.6 Wood Bumpers

Dress to the sizes indicated, and bevel edges. Bore, countersink, and bolt bumpers in place.

3.2.7 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.

3.2.8 Wood Sleepers

Run wood sleepers in lengths as long as practicable and stagger end joints in adjacent rows. Sleepers for gymnasium floors are specified in Section entitled "GHardwood Strip Flooring Systems."

3.2.9 Bridging

Wood bridging shall have ends accurately bevel-cut to afford firm contact and shall be nailed at each end with two nails. Metal bridging shall be installed as recommended by the manufacturer. The lower ends of bridging shall be driven up tight and secured after subflooring or roof sheathing has been laid and partition framing installed.

3.2.10 Corner Bracing

Corner bracing shall be installed when required by type of sheathing used or when siding, other than panel siding, is applied directly to studs. Corner bracing shall be let into the exterior surfaces of the studs at an angle of approximately 45 degrees, shall extend completely over wall plates, and shall be secured at each bearing with two nails.

3.2.11 Sill Plates

Sill plates shall be set level and square and anchor bolted at not more than 6 feet on centers and not more than 12 inches from end of each piece. A minimum of two anchors shall be used for each piece.

3.3 INSTALLATION OF TIMBER CONNECTORS

Installation of timber connectors shall conform to applicable requirements of AF&PA T101.

3.4 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 in 8 feet from a true plane.

3.5 WASTE MANAGEMENT

In accordance with the Waste Management Plan and as specified. Separate and reuse scrap sheet materials larger than 2 square feet, framing members larger than 24 inches, and multiple offcuts of any size larger

than 24 inches. Clearly separate damaged wood and other scrap lumber for acceptable alternative uses on site, including bracing, blocking, cripples, ties, and shims.

Separate treated, stained, painted, and contaminated wood and place in designated area for hazardous materials. Dispose of according to local regulations. Do not leave any wood, shavings, sawdust, or other wood waste buried in fill or on the ground. Prevent sawdust and wood shavings from entering the storm drainage system. Do not burn scrap lumber that has been pressure treated, or lumber that is less than one year old.

-- 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	(2010) American Softwood Lumber Standard

AMERICAN WOOD PROTECTION ASSOCIATION (AWPA)

AWPA M2	(2007) Standard for Inspection of Treated Wood Products
AWPA M4	(2002) Standard for the Care of Preservative-Treated Wood Products
AWPA P5	(2009) 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	(2010) Square and Hex Bolts and Screws (Inch Series)
ASME B18.2.2	(2010) 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)

ANSI/BHMA A156.9	(2010) Cabinet Hardware

HARDWOOD PLYWOOD AND VENEER ASSOCIATION (HPVA)

HPVA HP-1	(2009) American National Standard for Hardwood and Decorative Plywood

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI/NEMA LD 3	(2005) Standard for High-Pressure Decorative Laminates

NATIONAL HARDWOOD LUMBER ASSOCIATION (NHLA)

NHLA Rules	(2007) Rules for the Measurement & Inspection of Hardwood & Cypress

NORTHEASTERN LUMBER MANUFACTURERS ASSOCIATION (NELMA)

NELMA Grading Rules	(2006) Standard Grading Rules for Northeastern Lumber

REDWOOD INSPECTION SERVICE (RIS) OF THE CALIFORNIA REDWOOD ASSOCIATION (CRA)

RIS Grade Use	(1998) Redwood Lumber Grades and Uses

SOUTHERN PINE INSPECTION BUREAU (SPIB)

SPIB 1003	(2002) Standard Grading Rules for Southern Pine Lumber

U.S. DEPARTMENT OF COMMERCE (DOC)

DOC/NIST PS58	(1973) Basic Hardboard (ANSI A135.4)

WEST COAST LUMBER INSPECTION BUREAU (WCLIB)

WCLIB 17	(2000) Standard Grading Rules

WESTERN WOOD PRODUCTS ASSOCIATION (WWPA)

WWPA G-5	(1998) Western Lumber Grading Rules

WINDOW AND DOOR MANUFACTURERS ASSOCIATION (WDMA)

WDMA I.S. 4	(2009) Water-Repellent Preservative Non-Pressure Treatment for Millwork

WOOD MOULDING AND MILLWORK PRODUCERS ASSOCIATION (WMMPA)

WMMPA WM 6	(1987) Industry Standard for Non-Pressure Treating of Wood Millwork

1.2 SUBMITTALS

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

SD-02 Shop Drawings

Detail Drawings

SD-03 Product Data

Manufacturer's printed data, showing texture, density, catalog cuts, and installation instructions.

Manufacturer's printed data indicating the usage of engineered or recycled wood products, and environmentally safe preservatives.

SD-04 Samples

Fascias and Trim;

Samples shall be of sufficient size to show patterns, color ranges, and types, as applicable, of the material proposed to be used.

SD-07 Certificates

Certificates of grade

Certificates of compliance

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.

1.6.3 Hardboard

Materials shall bear a marking or statement identifying the producer and the applicable standard.

1.6.4 Pressure-Treated Lumber and Plywood

Each treated piece shall be inspected in accordance with AWPA M2.

1.6.5 Nonpressure-Treated Woodwork and Millwork

Mark, stamp, or label, indicating compliance with WDMA I.S. 4.

1.6.6 Fire-Retardant Treated Lumber

Each piece to bear Underwriters Laboratories label or the label of another nationally recognized independent testing laboratory.

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

Grading Rules	Species	Exterior and Interior Trim, Finish, and Frames
WWPA G-5 grading rules	Aspen Douglas Fir-Larch Douglas Fir-South Engelmann Spruce -Lodgepole Pine Engelmann Spruce Hem-Fir Idaho White Pine	All Species: C & Btr. Select (Choice & Btr Idaho White Pine) or Superior Finish. Western Red Cedar may be graded C & Btr. Select or A & Btr. per Special Western Red Cedar

TABLE OF GRADES FOR WOOD TO RECEIVE PAINT FINISH

Grading Rules	Species	Exterior and Interior Trim, Finish, and Frames Rules.
	Lodgepole Pine Mountain Hemlock Mountain Hemlock -Hem-Fir Ponderosa Pine-Sugar Pine (Ponderosa Pine -Lodgepole Pine) White Woods (Western Woods) Western Cedars Western Hemlock	
WCLIB 17 standard grading rules	Douglas Fir-Larch Hem-Fir Mountain Hemlock Sitka Spruce Western Cedars Western Hemlock	All Species: C & Btr VG, except A for Western Red Cedar
SPIB 1003 grading rules	Southern Pine	C & Btr
NHLA Rules	Cypress	C-Select
NELMA Grading Rules standard grading rules	Balsam Fir Eastern Hemlock-Tamarack Eastern Spruce Eastern White Pine Norway Pine Northern Pine Northern White Cedar	All Species: C-Select except C & Btr for Eastern White Pine and Norway Pine
RIS Grade Use standard specifications	Redwood	Clear Clear All Heart
NHLA Rules rules	Cypress	B Finish
	Red Gum Soft Elm Birch	Select or Btr (for interior use only)

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 Soffits: Exterior type, B-B medium density overlay.

b. Plywood for Shelving: Interior type, A-B Grade, any species group.

c. Plywood for Countertops: Exterior type, A-C Grade.

2.1.5 Hardwood Plywood

HPVA HP-1, Type II (Interior) Good (1) Grade, of thickness indicated.

2.1.6 Hardboard

DOC/NIST PS58, standard type, 1/4 inch thick.

2.1.7 Particleboard

Prohibited.

2.1.8 Stairs

Treads 1-1/4 inches thickness, clear red or white oak. Risers 1 inch nominal finish lumber.

2.1.9 Shoe Mold

Clear red or white oak, 1/2 by 5/8 inch unless otherwise indicated.

2.1.10 Wood Seats

Clear maple, oak, or other suitable hardwood, not less than 1-5/8 inches thick, with rounded edges. Provide stainless steel stanchions or brackets as indicated.

2.1.11 Catwalks

Boards, 1 by 6 inches nominal, species and grade equal to or exceeding 3 Common Hem-Fir under WWPA G-5.

2.2 SOFFITS

2.2.1 Hardboard and Plywood

Hardboard and plywood soffits shall be siding grade hardboard, 3/8 or 7/16 inch thick; plywood, APA PS 1, exterior type, Grade A-C, 11/32 inch thick for 24 inch on centers and 15/32 inch thick for 32 inch on centers maximum span with all edges supported.

2.3 FASCIAS AND TRIM

2.3.1 Wood

Fascias and trim, including exterior door and window casing, shall be species and grade listed in TABLE I at the end of this section. Sizes shall be as indicated. Metal corners may be furnished in lieu of wood cornerboards for horizontal siding; and if furnished, shall be galvanized steel and primed or aluminum and primed.

2.4 COUNTER TOPS

Provide laminated counter tops and solid surface counter tops as indicated in drawings.

2.4.1 Laminated Plastic

ANSI/NEMA LD 3.

2.4.1.1 Countertop Finish

Grade GP 50 or PF 42, satin finish. Color and pattern shall be as indicated with Finsih Schedule in drawings.

2.4.1.2 Backing Sheet

BK 20.

2.4.2 Solid Surface

Provide solid polymer material that is a homogeneous filled solid polymer; not coated, laminated or of a composite construction; meeting IAPMO Z124.3 and IAPMO Z124.6 requirements. Material shall have minimum physical and performance properties specified. Superficial damage to a depth of 0.01 inch shall be repairable by sanding or polishing. Material thickness shall be as indicated on the drawings. In no case shall material be less than 1/2 inch in thickness. Submit a minimum 4 by 4 inch sample of each color and pattern for approval. Samples shall indicate full range of color and pattern variation. Approved samples shall be retained as a standard for this work. Submit test report results from an independent testing laboratory attesting that the submitted solid polymer material meets or exceeds each of the specified performance requirements.

2.5 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 Paneling: 12 percent.

b. Interior Finish Lumber, Trim, and Millwork 1-1/4 Inches Nominal or Less in Thickness: 12 percent on 85 percent of the pieces and 15 percent on remainder.

c. Exterior Treated and Untreated Finish Lumber and Trim 4 inches Nominal or Less in Thickness: 19 percent.

d. Exterior Wood Siding: 15 percent.

e. Moisture content of other materials shall be in accordance with the applicable standards.

2.6 PRESERVATIVE TREATMENT OF WOOD PRODUCTS

2.6.1 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

napthenate, 3 percent zinc napthenate, or 1.8 percent copper-8-quinolinolate. Provide a liberal brushcoat of preservative treatment to field cuts and holes.

2.6.2 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:

Exterior wood molding and millwork within 18 inches of soil, in contact with water or concrete shall be preservative-treated in accordance with WMMPA WM 6. Exposed areas of treated wood that are cut or drilled after treatment shall receive a field treatment in accordance with AWPA M4. Items of all-heart material of cedar, cypress, or redwood will not require preservative treatment, except when in direct contact with soil.

2.7 HARDWARE

Provide sizes, types, and spacings of manufactured building materials recommended by the product manufacturer except as otherwise indicated or specified.

2.7.1 Wood Screws

ASME B18.6.1.

2.7.2 Bolts, Nuts, Lag Screws, and Studs

ASME B18.2.1 and ASME B18.2.2.

2.7.3 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.

2.7.4 Adjustable Shelf Standards

ANSI/BHMA A156.9, with shelf rests.

2.7.5 Vertical Slotted Shelf Standards

ANSI/BHMA A156.9, with shelf brackets.

2.7.6 Closet Hanger Rods

Chromium-plated steel rods, not less than 1 inch diameter by 18 gage. Rods may be adjustable with integral mounting brackets if smaller tube is 1 inch by 18 gage. Provide intermediate support bracket for rods more than 48 inches long.

2.8 FABRICATION

2.8.1 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.

2.8.2 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.

2.8.3 Countertops - Laminated Plastic

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 post-formed type with no-drip nose, cove moulding, and Style A back splash, and covered with ANSI/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.

2.8.4 Countertops - Solid Surface

Components shall be factory or shop fabricated to sizes and shapes indicated, to the greatest extent practical, in accordance with approved Shop Drawings and manufacturer's requirements. Provide factory cutouts for sinks, lavatories, and plumbing fixtures where indicated on the drawings. Contours and radii shall be routed to template, with edges smooth. Defective and inaccurate work will be rejected. Submit product data indicating product description, fabrication information, and compliance with specified performance requirements for solid polymer, joint adhesive, sealants, and heat reflective tape. Both the manufacturer of materials and the fabricator shall submit a detailed description of operations and processes in place that support efficient use of natural resources, energy efficiency, emissions of ozone depleting chemicals, management of water and operational waste, indoor environmental quality, and other production techniques supporting sustainable design and products.

Fabricate backsplashes and end splashes from 1/2 inch thick solid surfacing material to be 4 inches high and in accordance with shape as indicated on the drawings. Backsplashes and end splashes shall be provided for all counter tops and vanity tops. Backsplashes shall be shop fabricated.

One-piece vanity top and bowl fabrications shall be a standard pre-fabricated product provided by the solid polymer manufacturer. Units where indicated shall include a vanity top with integral sink bowl and backsplash.

2.8.5 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.

2.8.5.1 Cabinet Hardware

ANSI/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 bright 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 than3-1/2 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.

e. Provide locks on drawers and cabinets where indicated in drawings.

2.8.5.2 Finish

Wood surfaces: 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.

Laminated surfaces: Shall be selected from manufacturers' standard available selections. Selections shall include faux wood grains, solid colors, and multi-spec "matrix" colors. See Finish Schedule in drawings for color and pattern.

Solid surface products: Exposed finished surfaces and edges shall receive a uniform appearance. Exposed surface finish shall be semigloss; gloss rating of 25-50. See Finish Schedule in drawings for color and pattern.

2.8.6 Workbenches

Fabricate as indicated. Dovetail and glue drawer corners. Fasten frames with suitable wood screws or bolts. Sand exposed surfaces smooth, and ease exposed edges. Provide two side-mounted, metal, ball-bearing drawer slides for each door.

2.8.7 Casework With Transparent Finish (CTF)

2.8.7.1 AWI Quality Grade (CTF)

Custom grade.

2.8.7.2 Construction (CTF)

Details shall conform to reveal overlay design.

2.8.7.3 Exposed Parts

Red Oak specie.

2.8.7.4 Semi-Exposed Parts

As specified in the AWI Qual Stds for the grade selected.

2.8.8 Casework With High Pressure Laminate Finish (CHPL)

2.8.8.1 AWI Quality Grade (CHPL)

Custom grade.

2.8.8.2 Construction (CHPL)

Details shall conform to reveal overlay design.

2.8.8.3 Exposed Surfaces

High pressure laminate.

2.8.8.4 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 Door Frames

Set plumb and square. Provide solid blocking at not more than 16 inches o.c. for each jamb. Position blocking to occur behind hinges and lock strikes. Double wedge frames and fasten with finishing nails. Set nails for putty stopping.

3.1.4 Window Stools and Aprons

Provide stools with rabbet over window sill. Provide aprons with returns cut accurately to profile of member.

3.1.5 Bases

Flat member with a molded top. Fasten base to framing or to grounds. Nail shoe mold to the base. Set shoe mold or one-piece wood base after finish flooring is in place.

3.1.6 Finish Stair Work

Fit, nail, screw, bolt, and glue stair work together to form a strong rigid structure without squeaks or vibrations. Anchor newels and posts securely to rough stair framing. Cut newels, posts, and drops accurately around floor construction to make tight fit. Install balusters into treads and landings with glue. Install railing with straight runs following slope of stairs and with smooth curve turns. Return railing profile at ends and secure joints with bolts and nuts. Secure railing to posts and newels with concealed anchors. Support wall rails on metal brackets spaced near ends and not over 5 feet o.c.

3.2 SHELVING

1 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. Hook strips shall be 1 by 4 inches nominal and cleats 1 by 2 inches nominal. 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 Linen Closets

Unless indicated otherwise, linen closets shall have a counter shelf 20 inches wide located 36 inches above the floor, a lower shelf approximately 18 inches wide and 18 inches above the floor, and three upper shelves 11-1/4 inches wide located 14 inches above the counter shelf and 14 inches apart.

3.2.2 Storage & Janitor's Rooms

Provide storage rooms with shelves of size and arrangement as indicated, at a minimum provide 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.

3.2.3 Room Closets

Provide two shelves 11-1/4 inches wide. Support lower shelf by hook strips at back and ends, and provide full-length wood or metal clothes hanger rods unless indicated otherwise.

3.3 CLOTHES HANGER RODS

Provide clothes hanger rods where indicated and in closets having hook strips. Set rods parallel with front edges of shelves and support by sockets at each end and by intermediate brackets spaced not more than 4 feet o.c.

3.4 MISCELLANEOUS

3.4.1 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.

Provide solid surface counter top at toilet room lavatories.

Provide laminated plastic counter top at break room, circulation desk, and conference room casework.

3.4.2 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.

3.4.3 Workbenches

Construct as indicated. Install level, plumb, and tight against adjacent construction. Fasten to walls with screws or toggle bolts and to floors with expansion bolts.

3.4.4 Wood Seats

Support seats as indicated. Secure seats to supports with screws or bolts as required; countersink heads of and fill holes with hardwood filler, finished flush with tops of seats.

3.4.5 Wood Bumpers

Bore, countersink, and bolt in place where indicated.

3.4.6 Catwalks in Attic Spaces

Lay boards with 1 inch spaces between. Stagger end joints, with each joint on a support.

3.5 SIDING

3.5.1 Installation of Siding

Fit and position without springing or otherwise forcing into place. For siding to have a stain finish, set nails and stop with nonstaining putty to match finished siding. For siding to have a paint finish, drive nails flush.

3.5.2 Horizontal Siding

Make end joints over framing members and alternate so at least two boards will be between joints on same support. Uniformly distribute shorter pieces throughout area. Provide starter strips to establish proper slant for siding. Predrill ends of siding if necessary to prevent splitting when nailed.

3.5.3 Vertical Board Siding

Apply siding with horizontal joints only at locations indicated. Work each board into edge of previous course. Nail into supports at 24 inches on center with two nails, one blind if possible at or near joint with previous board, and one just outside board centerline.

3.5.4 Vertical Board and Batten Siding

Apply with horizontal joints only at locations indicated. Install each board with 1/2 inch space between it and previous board. Nail at center of board and into supports at 24 inches on center. Center battens over space between boards and nail down center at 16 inches on center.

3.5.5 Panel Siding

Apply panels with edges at joints spaced in accordance with manufacturer's recommendations. Shiplapped edges or square edges covered with battens shall be primed for paint finish, sealed for stain finish. Back all edges with framing members. Nail panels at edges 6 inches on center and at intermediate supports 12 inches on center. Edge nailing to be 3/8 inch from edges. For shiplap joints, nail 3/8 inch from visible joint and at a location to penetrate lap with previous panel. When panel siding is part of an engineered shear wall or used as wall-bracing, nail shiplap joints to supports with double rows of nails. Space battens at 12 or 16 inches on center as indicated and nail down center at 24 inches on center.

3.5.6 Epoxy-Aggregate Coated Panels

Panels shall be installed where shown. Installation shall be as recommended by the manufacturer of the panels.

3.6 SOFFITS

3.6.1 Wood

Panels shall be applied with edges at joints spaced in accordance with manufacturer's instructions and with all edges backed with framing members. Panels shall be nailed 3/8 inch from edges at 6 inches on center and at intermediate supports at 12 inches on center. Panels shall be installed using the maximum practical lengths.

3.7 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.

3.8 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 42 13

METAL WALL PANELS
05/11

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 ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 501.1	(2017) Standard Test Method for Water Penetration of Windows, Curtain Walls and Doors Using Dynamic Pressure
AAMA 800	(2016) Voluntary Specifications and Test Methods for Sealants

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI S100	(2012) North American Specification for the Design of Cold-Formed Steel Structural Members
AISI SG03-3	(2002; Suppl 2001-2004; R 2008) Cold-Formed Steel Design Manual Set

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7	(2017) Minimum Design Loads for Buildings and Other Structures

AMERICAN WELDING SOCIETY (AWS)

AWS A5.1/A5.1M	(2012) Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding
AWS D1.1/D1.1M	(2015; Errata 1 2015; Errata 2 2016) Structural Welding Code - Steel
AWS D1.2/D1.2M	(2014) Structural Welding Code - Aluminum

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M	(2014) Standard Specification for Carbon Structural Steel
ASTM A123/A123M	(2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A606/A606M	(2008) Standard Specification for Steel Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved

	Atmospheric Corrosion Resistance
ASTM A653/A653M	(2018) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A755/A755M	(2018) Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products
ASTM A780/A780M	(2009; R 2015) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A924/A924M	(2018) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM A1008/A1008M	(2016) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable
ASTM B117	(2016) Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM C920	(2018) Standard Specification for Elastomeric Joint Sealants
ASTM D522/D522M	(2014) Mandrel Bend Test of Attached Organic Coatings
ASTM D523	(2014; R 2018) Standard Test Method for Specular Gloss
ASTM D610	(2008; R 2019) Standard Practice for Evaluating Degree of Rusting on Painted Steel Surfaces
ASTM D714	(2002; R 2017) Standard Test Method for Evaluating Degree of Blistering of Paints
ASTM D822	(2013) Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings
ASTM D968	(2017) Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive
ASTM D1056	(2014) Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber
ASTM D1308	(2013) Effect of Household Chemicals on Clear and Pigmented Organic Finishes

ASTM D1654	(2008; R 2016; E 2017) Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
ASTM D1667	(2017) Standard Specification for Flexible Cellular Materials - Poly (Vinyl Chloride) Foam (Closed-Cell)
ASTM D2244	(2016) Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates
ASTM D2247	(2015) Testing Water Resistance of Coatings in 100% Relative Humidity
ASTM D2794	(1993; R 2019) Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
ASTM D3359	(2017) Standard Test Methods for Rating Adhesion by Tape Test
ASTM D3363	(2005; E 2011; R 2011; E 2012) Film Hardness by Pencil Test
ASTM D4214	(2007; R 2015) Standard Test Method for Evaluating the Degree of Chalking of Exterior Paint Films
ASTM D4587	(2011) Standard Practice for Fluorescent UV-Condensation Exposures of Paint and Related Coatings
ASTM D5894	(2016) Standard Practice for Cyclic Salt Fog/UV Exposure of Painted Metal, (Alternating Exposures in a Fog/Dry Cabinet and a UV/Condensation Cabinet)
ASTM E72	(2015) Conducting Strength Tests of Panels for Building Construction
ASTM E84	(2018a) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E283	(2004; R 2012) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
ASTM E331	(2000; R 2016) Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
ASTM E1592	(2005; R 2012) Structural Performance of

	Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference
ASTM G152	(2013) Operating Open Flame Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials
ASTM G153	(2013) Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials

METAL BUILDING MANUFACTURERS ASSOCIATION (MBMA)

MBMA MBSM	(2012) Metal Building Systems Manual

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM AMP 500	(2006) Metal Finishes Manual

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA 1793	(2012) Architectural Sheet Metal Manual, 7th Edition

UNDERWRITERS LABORATORIES (UL)

UL Bld Mat Dir	(updated continuously online) Building Materials Directory

1.2 DEFINITIONS

Metal Wall Panel: Metal wall panels, attachment system components and accessories necessary for a complete weather-tight wall system.

1.3 DESCRIPTION OF WALL PANEL SYSTEM

Factory color finished, galvanized metal wall panel system with exposed fastener attachment. Panel profile must be as shown on drawings.

1.3.1 Metal Wall Panel General Performance

Comply with performance requirements, conforming to AISI S100, without failure due to defective manufacture, fabrication, installation, or other defects in construction. Wall panels and accessory components must conform to the following standards:

ASTM A1008/A1008M
ASTM A123/A123M
ASTM A36/A36M
ASTM A653/A653M
ASTM A606/A606M
ASTM A755/A755M for metallic coated steel sheet for exterior coil pre-painted applications.
ASTM A780/A780M for repair of damage or uncoated areas of hot-dipped galvanized coating.
ASTM A924/A924M for metallic coated steel sheet
ASTM D522/D522M for applied coatings
UL Bld Mat Dir

1.3.2 Structural Performance

Maximum calculated fiber stress must not exceed the allowable value in the AISI or AA manuals; a one third overstress for wind is allowed. Midspan deflection under maximum design loads is limited to L/180. Contract drawings show the design wind loads and the extent and general assembly details of the metal siding. Contractor must provide design for members and connections not shown on the drawings. Siding panels and accessories must be the products of the same manufacturer.

Provide metal wall panel assemblies complying with the load and stress requirements in accordance with ASTM E1592. Wind Load force due to wind action governs the design for panels.

Wall systems and attachments are to resist the wind loads as determined by ASTM E72 and ASCE 7 in the geographic area where the construction will take place, in pounds per square foot. Submit five copies of wind load tests and seismic tests to the Contracting Officer.

1.3.3 Air Infiltration

Air leakage must conform to the limits through the wall assembly area when tested according to ASTM E283.

1.3.4 Water Penetration Under Static Pressure

No water penetration when tested according to ASTM E331.

1.3.5 Water Penetration Under Dynamic Pressure

No evidence of water leakage when tested according to AAMA 501.1.

1.4 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Submit Documentation for the following items:

Qualification of Manufacturer;
Qualification of Installation Contractor;
Qualification of Welders;
Sample Warranty;

SD-02 Shop Drawings

Installation Drawings ;

SD-03 Product Data

Submit Manufacturer's data indicating percentage of recycle material in wall panels to verify sustainable acquisition compliance.

Submit Manufacturer's catalog data for the following items:

Wall Panels;

Factory Color Finish
Closure Materials
Pressure Sensitive Tape
Sealants and Caulking
Galvanizing Repair Paint
Enamel Repair Paint
Accessories

SD-04 Samples

Submit as required each of the following samples:

Wall Panels, 12 inches long by actual panel width;
Fasteners;
Metal Closure Strips, 10 inches long of each type;

Color chart and chips ;

Submit manufacturer's color charts and chips, approximately 4 by 4 inches, showing full range of colors, textures and patterns available for wall panels with factory applied finishes.

SD-05 Design Data

Wind load design analysis;

As applicable, submit the following wind load design analysis data, to include, but not limited to:

wind speed
exposure category,co-efficient,importance factor
type of facility
negative pressures for each zone
methods and requirements of attachment

SD-06 Test Reports

Submit test reports for the following in accordance with the referenced articles in this section.

Leakage Tests;
Wind Load Tests;
Coating Tests;
Chalking Tests;
Seismic Tests;

SD-07 Certificates

Submit certificates for the following items showing conformance with referenced standards contained in this section:

Coil Stock;
Fasteners;
Galvanizing Repair Paint;
Enamel Repair Paint;

SD-08 Manufacturer's Instructions

Include detailed application instructions and standard manufacturer drawings altered as required by these specifications.

Installation of Wall panels;

SD-09 Manufacturer's Field Reports

Submit seven bound copies of the Manufacturer's Field Reports;

SD-11 Closeout Submittals

Warranty;
Maintenance Instructions;

20 year "No Dollar Limit" warranty for labor and material

1.5 QUALITY ASSURANCE

1.5.1 Pre-Installation Conference

Upon notification of submittal receipt and approval by the Contracting Officer; and prior to the commencement of the work, the Contractor must attend a pre-installation conference to review the following:

a. Drawings and Specifications.

b. Qualification of Installer, Qualification of Welders.

c. Sustainable acquisition

d. Approved Warranty

e. Sample wall panels, 12 inches long by actual panel width

f. Sample metal closure strips, 10 inches long of each type

g. Color charts and chips

h. Coatings and base metal tests, chalking tests

i. Construction schedule, availability of materials, Installer's personnel, equipment and facilities required to progress with the work without delay.

j. Methods and procedures related to installation of wall panels, including manufacturer's written instructions. Explicitly identify in writing, differences between manufacturer's instructions and the specified requirements.

k. Support conditions for compliance with requirements, including alignment between and attachment to structural members.

l. Flashing, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.

m. Governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.

n. Temporary protection requirements for metal wall panel assembly during and after installation.

o. Wall panel observation and repair procedures after metal wall panel installation. Provide detailed written instructions including copies of Safety Data Sheets for maintenance and repair materials, and manufacturer's maintenance instructions.

1.5.1.1 Installation Drawings

Installation shop drawings for wall panels, flashing, accessories, and anchorage systems must indicate completely dimensioned structural frame and erection layouts, openings in the wall, special framing details, and construction details at corners, building intersections and flashing, location and type of mastic and metal filler strips.

1.5.1.2 Wind Load Design Analysis

Wind design analysis must include wall plan delineating dimensions and attachment patterns for each zone. Wind design analysis must be prepared and sealed by Licensed Project Engineer in the geographic area where the construction will take place.

1.5.2 Manufacturer's Technical Representative

The representative must have authorization from manufacturer to approve field changes and be thoroughly familiar with the products and installations in the geographical area where construction will take place.

1.5.3 Qualification of Manufacturer

Certify that metal wall panel system manufacturer has a minimum of five (5) years experience in manufacturing metal wall system and accessory products.

Manufacturer must also provide engineering services by an authorized engineer; currently licensed in the geographical area where construction will take place, having a minimum of four (4) years experience as an engineer knowledgeable in wind load design analysis, protocols and procedures per MBMA MBSM, "Metal Building Systems Manual"; ASCE 7, and ASTM E1592.

Provide certified engineering calculations, using the products submitted, for Wind load requirements in accordance with ASCE 7.

1.5.3.1 Manufacturer's Certificates

Also provide the following certifications from the manufacturer:

Coil Stock
Fasteners
Galvanizing Repair Paint
Enamel Repair Paint

Submit certification from coil stock manufacturer or supplier that the machinery used will form the provided coil stock without warping, waviness, or rippling that is not a part of the panel profile, and without damage, abrasion or marring of the finish coating.

Provide evidence that products used within this specification are manufactured in the United States.

1.5.4 Certified Qualification of Installation Contractor

The installation contractor must be approved and certified by the metal wall panel manufacturer prior to beginning the installation of the metal wall panel system. Subcontracting by Certified Contractor for the metal wall panel work is not permitted.

1.5.4.1 Qualifications for Welding Work

Qualification of welders and welding must conform to AWS A5.1/A5.1M, AWS D1.1/D1.1M for steel or AWS D1.2/D1.2M for aluminum.

1.5.5 Single Source

Obtain each type of metal wall panels, clips, closure materials and other accessories from the standard products of the single source from a single manufacturer to operate as a complete system for the intended use.

1.5.6
Manufacturer's Maintenance Instructions

Provide manufacturer's detailed written instructions including copies of Safety Data Sheets for maintenance and repair materials.

1.6 DELIVERY, HANDLING, AND STORAGE

Deliver and protect package components, sheets, metal wall panels, and other manufactured items to prevent damage or deformation during transportation and handling.

Unload, store, and erect metal wall panels in a manner to prevent bending, warping, twisting, and surface damage.

Stack and store metal wall panels horizontally on platforms or pallets, covered with suitable weather-tight and ventilated covering to ensure dryness, with positive slope for drainage of water. Do not store metal wall panels in contact with other materials that might cause staining, denting, or other surface damage.

Retain strippable protective covering on metal wall panel until actual installation.

1.7 PROJECT CONDITIONS

1.7.1 Field Measurements

Verify locations of wall framing and opening dimensions by field measurements before metal wall panel fabrication and indicate measurements on Shop Drawings.

1.7.2 Weather Limitations

Proceed with installation preparation only when existing and forecasted weather conditions permit Work to proceed without water entering into wall system or building.

1.8 WARRANTY

Warranty must conform to the Sample Warranty as reviewed and approved by the Contracting Officer.

1.8.1 20 Year "No Dollar Limit" Warranty for Labor and Material

Furnish manufacturer's no-dollar-limit warranty for the metal wall panel system. The warranty period is to be no less than twenty (20) years from the date of Government acceptance of the work. The warranty is to be issued directly to the Government. The warranty is to provide that if within the warranty period the metal wall panel system shows evidence of corrosion, perforation, rupture or excess weathering due to deterioration of the wall panel system resulting from defective materials and correction of the defective workmanship is to be the responsibility of the metal wall panel system manufacturer. Repairs that become necessary because of defective materials and workmanship while metal wall panel system is under warranty are to be performed within 24 hours after notification, unless additional time is approved by the Contracting Officer. Failure to perform repairs within 24 hours of notification will constitute grounds for having emergency repairs performed by others and not void the warranty.

PART 2 PRODUCTS

2.1 FABRICATION

Unless approved otherwise, fabricate and finish metal wall panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes and as necessary to fulfill indicated and specified performance requirements. Comply with indicated profiles and with dimensional and structural requirements.

Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel. Fabricate metal wall panel side laps with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will seal weather-tight and minimize noise from movements within panel assembly.

2.1.1 Sheet Metal Accessories

Fabricate flashing and trim to comply with recommendations in SMACNA 1793 that apply to the design, dimensions, metal, and other characteristics of item indicated:

a. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.

b. End Seams: fabricate nonmoving end seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

c. Sealed Joints: form non-expansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA 1793.

d. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.

e. Fabricate cleats and attachment devices of size and metal thickness recommended by SMACNA 1793 or by metal wall panel manufacturer for application, but not less than thickness of metal being secured.

2.2 PANEL MATERIALS

2.2.1 Steel Sheet

Roll-form steel wall panels to the specified profile, with fy= 50 ksi, 22 gauge and depth as indicated. Material must be plumb and true, and within the tolerances listed:

a. Galvanized Steel Sheet conforming to ASTM A653/A653M and AISI SG03-3.

c. Individual panels must be continuous length to cover the entire length of any unbroken wall area with no joints or seams and formed without warping, waviness, or ripples that are not part of the panel profile and free of damage to the finish coating system.

d. Provide panels with thermal expansion and contraction consistent with the type of system specified.

1. Profile and coverage to be a minimum height and width from manufacturer's standard for the indicated wall area.

2. Profile to be a 3/4 inch high rib at 6 inches o.c., 38 inch overall width with 36 inch coverage and exposed fasteners.

9. Smooth, flat Surface Texture.

2.2.2 Factory Color Finish

Comply with NAAMM AMP 500 for recommendations for applying and designating finishes. Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved samples and are assembled or installed to minimize contrast.

All panels are to receive a factory-applied Kynar 500/Hylar 5000 finish consisting of a baked-on top-coat with a manufacturer's recommended prime coat conforming to the following:

2.2.2.1 Metal Preparation

Carefully prepare all metal surface for painting on a continuous process coil coating line by alkali cleaning, hot water rinsing, application of chemical conversion coating, cold water rinsing, sealing with acid rinse, and thorough drying.

2.2.2.2 Prime Coating

Apply a base coat of epoxy paint, specifically formulated to interact with the top-coat, to the prepared surfaces by roll coating to a dry film thickness of 0.20 plus 0.05 mils. Prime coat must be oven cured prior to application of finish coat.

2.2.2.3 Exterior Finish Coating

Roll coat the finish coating over the primer by roll coating to dry film

thickness of 0.80 plus 5 mils (3.80 plus 0.50 mils for Vinyl Plastisol) for a total dry film thickness of 1.00 plus 0.10 mils (4.00 plus 0.10 mils for Vinyl Plastisol). Oven-cure finish coat.

2.2.2.4 Interior Finish Coating

Apply a wash-coat on the reverse side over the primer by roll coating to a dry film thickness of 0.30 plus 0.05 mils for a total dry film thickness of 0.50 plus 0.10 mils. Oven-cured the wash coat.

2.2.2.5 Color

Provide exterior finish color as to be selected by the Contracting Officer from the manufacturer's standard color chart.

2.2.2.6 Physical Properties

Coating must conform to the industry and manufacturer's standard performance criteria as listed by the following certified test reports:

General:	ASTM D5894 and ASTM D4587
Abrasion:	ASTM D968
Adhesion:	ASTM D3359
Chalking:	ASTM D4214
Chemical Pollution:	ASTM D1308
Color Change and Conformity:	ASTM D2244
Creepage:	ASTM D1654
Cyclic Corrosion Test:	ASTM D5894
Flame Spread:	ASTM E84
Flexibility:	ASTM D522/D522M
Formability:	ASTM D522/D522M
Gloss at 60 and 85 degrees:	ASTM D523
Humidity:	ASTM D2247 and ASTM D714
Oxidation:	ASTM D610
Pencil Hardness:	ASTM D3363
Reverse Impact:	ASTM D2794
Salt Spray:	ASTM B117

Weatherometer:	ASTM G152, ASTM G153 and ASTM D822

2.3 MISCELLANEOUS METAL FRAMING

Cold-formed metallic-coated steel sheet conforming to ASTM A653/A653M and specified in Section 05 40 00 COLD-FORMED METAL FRAMING unless otherwise indicated.

2.3.1 Fasteners for Miscellaneous Metal Framing

Type, material, corrosion resistance, size and sufficient length to penetrate the supporting member a minimum of 1 inch with other properties required to fasten miscellaneous metal framing members to supporting members and substrates in accordance with the wall panel manufacturer's and ASCE 7 requirements.

2.4 FASTENERS

2.4.1 General

2.4.1.1 Exposed Fasteners

Provide corrosion resistant fasteners for wall panels, made of coated steel, aluminum, 305 - series corrosion resisting stainless steel, or nylon capped steel compatible with the sheet panel or flashing and of a type and size recommended by the manufacturer to meet the performance requirements and design loads.

Fasteners for accessories must be the manufacturer's standard. Provide an integral metal washer matching the color of attached material with compressible sealing EPDM gasket approximately 3/32 inch thick.

2.4.1.2 Hidden Fasteners

Provide corrosion resistant fasteners recommended by the manufacturer to meet the performance requirements and design loads.

2.4.1.3 Screws

Screws to be corrosion resistant coated steel, aluminum and/or 305 - series stainless steel being the type and size recommended by the manufacturer to meet the performance requirements.

2.4.1.4 Rivets

Rivets to be closed-end type, corrosion resistant coated steel, aluminum or stainless steel where watertight connections are required.

2.4.1.5 Attachment Clips

Fabricate clips from steel hot-dipped galvanized in accordance with ASTM A653/A653M, Z275 G 90 or Series 300 stainless steel. Size, shape, thickness and capacity as required meeting the insulation thickness and design load criteria specified.

2.5 ACCESSORIES

2.5.1 General

All accessories must be compatible with the metal wall panels. Sheet metal flashing, trim, metal closure strips, caps and similar metal accessories must not be less than the minimum thickness specified for the wall panels. Exposed metal accessories/finishes to match the panels furnished, except as otherwise indicated. Molded foam rib, ridge and other closure strips must be non-absorbent closed-cell or solid-cell synthetic rubber or pre-molded neoprene to match configuration of the panels.

2.5.2 Rubber Closure Strips

Provide closed-cell, expanded cellular rubber conforming to ASTM D1056 and ASTM D1667; extruded or molded to the configuration of the specified wall panel and in lengths supplied by the wall panel manufacturer.

2.5.3 Metal Closure Strips

Provide factory fabricated steel closure strips to be the same gauge and thickness, color, finish and profile of the specified wall panel.

2.5.4 Joint Sealants

2.5.4.1 Sealants and Caulking

Provide approved gun type sealants for use in hand- or air-pressure caulking guns at temperatures above 40 degrees F (or frost-free application at temperatures above 10 degrees F with minimum solid content of 85 percent of the total volume. Sealants must dry with a tough, durable surface skin which permit remaining soft and pliable underneath, providing a weather-tight joint. No migratory staining is permitted on painted or unpainted metal, stone, glass, vinyl, or wood.

Prime all joints receiving sealants with a compatible one-component or two-component primer as recommended by the wall panel manufacturer.

2.5.4.2 Shop-Applied

Sealant for shop-applied caulking must be non-curing butyl compliant with AAMA 800 to ensure the sealant's plasticity at the time of field erection.

2.5.4.3 Field-Applied

Sealant for field-applied caulking must be an approved gun grade, non-sag one component polysulfide or two-component polyurethane with an initial maximum Shore A durometer hardness of 25, and conforming to ASTM C920, Type II. Color to match panel colors.

2.5.4.4 Pressure Sensitive Tape

Provide pressure sensitive tape sealant, 100 percent solid with a release paper backing; permanently elastic, non-sagging, non-toxic and non-staining as approved by the wall panel manufacturer.

2.6 SHEET METAL FLASHING AND TRIM

2.6.1 Fabrication

Shop fabricate sheet metal flashing and trim where practicable to comply with recommendations in SMACNA 1793 that apply to design, dimensions, metal, and other characteristics of item indicated. Obtain field measurements for accurate fit before shop fabrication.

Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.

2.7 REPAIR OF FINISH PROTECTION

Repair paint for color finish enameled wall panel must be compatible paint of the same formula and color as the specified finish furnished by the wall panel manufacturer. Provide 2 quarts of repair paint matching the specified wall panels.

PART 3 EXECUTION

3.1 EXAMINATION

Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal wall panel supports, and other conditions affecting performance of the Work.

Examine primary and secondary wall framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal wall panel manufacturer, UL, ASTM, ASCE 7 and as required for the geographical area where construction will take place.

Examine solid wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.

Examine roughing-in for components and systems penetrating metal wall panels to verify actual locations of penetrations relative to seam locations of metal wall panels before metal wall panel installation.

Submit to the Contracting Officer a written report, endorsed by Installer, listing conditions detrimental to performance of the Work. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

Clean substrates of substances harmful to insulation, including removing projections capable of interfering with insulation attachment. Miscellaneous framing installation, including sub-purlins, girts, angles, furring, and other miscellaneous wall panel support members and anchorage must be according to metal wall panel manufacturer's written instructions.

3.3 WALL PANEL INSTALLATION

Provide full length metal wall panels, from sill to eave as indicated, unless otherwise indicated or restricted by shipping limitations. Anchor metal wall panels and other components of the Work securely in place, with

provisions for thermal and structural movement in accordance with MBMA MBSM.

Erect wall panel system in accordance with the approved erection drawings, the printed instructions and safety precautions of the manufacturer.

Sheets are not to be subjected to overloading, abuse, or undue impact. Bent, chipped, or defective sheets shall not be applied.

Sheets must be erected true and plumb and in exact alignment with the horizontal and vertical edges of the building, securely anchored, and with the indicated eave, and sill.

Work is to allow for thermal movement of the wall panel, movement of the building structure, and to provide permanent freedom from noise due to wind pressure.

Field cutting metal wall panels by torch is not permitted.

3.3.1 Steel Wall Panels

Use stainless-steel fasteners for exterior surfaces and galvanized steel fasteners for interior surfaces.

3.3.2 Anchor Clips

Anchor metal wall panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.

3.3.3 Metal Protection

Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal wall panel manufacturer.

3.3.4 Joint Sealers

Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal wall panel manufacturer.

3.4 FASTENER INSTALLATION

Anchor metal wall panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.

3.5 FLASHING, TRIM AND CLOSURE INSTALLATION

3.5.1 General Requirements

Comply with performance requirements, manufacturer's written installation instructions, and SMACNA 1793. Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams to form permanently watertight and weather resistant.

Install sheet metal work is to form weather-tight construction without waves, warps, buckles, fastening stresses or distortion, and allow for expansion and contraction. Cutting, fitting, drilling, and other operations in connection with sheet metal required to accommodate the work of other trades is to be performed by sheet metal mechanics.

3.5.2 Metal Flashing

Install exposed metal flashing at building corners, sills and eaves, junctions between metal siding and walling. Exposed metal flashing must be the same material, color, and finish as the specified metal wall panel.

Fasten flashing at a minimum of 8 inches on center, except where flashing is held in place by the same screws that secure covering sheets.

Flashing is to be furnished in at least 8 foot lengths. Exposed flashing is to have 1 inch locked and blind-soldered end joints, and expansion joints at intervals of not more than 16 feet.

Exposed flashing and flashing subject to rain penetration to be bedded in the specified joint sealant.

Isolate flashing which is in contact with dissimilar metals by means of the specified asphalt mastic material to prevent electrolytic deterioration.

Form drips to the profile indicated, with the edge folded back 1/2 inch to form a reinforced drip edge.

3.5.3 Closures

Install metal closure strips at open ends of corrugated or ribbed pattern walls, and at intersection of wall and wall unless open ends are concealed with formed eave flashing; and in other required areas.

Install mastic closure strips at intersection of the wall with metal walling; top and bottom of metal siding; heads of wall openings; and in other required locations.

3.6 WORKMANSHIP

Make lines, arises, and angles sharp and true. Free exposed surfaces from visible wave, warp, buckle, and tool marks. Fold back exposed edges neatly to form a 1/2 inch hem on the concealed side. Make sheet metal exposed to the weather watertight with provisions for expansion and contraction.

Make surfaces to receive sheet metal plumb and true, clean, even, smooth, dry, and free of defects and projections which might affect the application. For installation of items not shown in detail or not covered by specifications conform to the applicable requirements of SMACNA 1793. Provide sheet metal flashing in the angles formed where roof decks abut walls, curbs, ventilators, pipes, or other vertical surfaces and wherever indicated and necessary to make the work watertight.

3.7 ACCEPTANCE PROVISIONS

3.7.1 Erection Tolerances

Erect metal wall panels straight and true with plumb vertical lines correctly lapped and secured in accordance with the manufacturer's written instructions.

3.7.2 Leakage Tests

Finished application of metal wall panels are to be subject to inspection and test for leakage by request of the Contracting Officer, Architect/Engineer. Conduct inspection and tests at no cost to the Government.

Inspection and testing is to be made promptly after erection to permit correction of defects and the removal and replacement of defective materials.

3.7.3 Repairs to Finish

Scratches, abrasions, and minor surface defects of finish may be repaired with the specified repair materials. Finished repaired surfaces must be uniform and free from variations of color and surface texture.

Repaired metal surfaces that are not acceptable to the project requirements and/or Contracting Officer are to be immediately removed and replaced with new material.

3.7.4 Paint-Finish Metal Siding

Paint-finish metal siding will be tested for color stability by the Contracting Officer during the manufacturer's specified guarantee period.

Panels that indicate color changes, fading, or surface degradation, determined by visual examination, must be removed and replaced with new panels at no expense to the Government.

New panels will be subject to the specified tests for an additional year from the date of their installation.

3.8 FIELD QUALITY CONTROL

3.8.1 Construction Monitoring

Make visual inspections as necessary to ensure compliance with specified requirements. Additionally, verify the following:

a. Materials comply with the specified requirements.

b. All materials are properly stored, handled and protected from damage. Damaged materials are removed from the site.

c. Framing and substrates are in acceptable condition, in compliance with specification, prior to application of wall panels.

d. Panels are installed without buckles, ripples, or waves and in uniform alignment and modulus.

e. Side laps are formed, sealed, fastened or seam locked as required.

f. The proper number, type, and spacing of attachment clips and fasteners are installed.

g. Installer adheres to specified and detailed application parameters.

h. Associated flashing and sheet metal are installed in a timely manner in accord with the specified requirements.

Provide seven bound copies of Manufacturer's Field Reports to the Contracting Officer two weeks prior to project close-out.

3.9 CLEAN-UP AND DISPOSAL

Clean all exposed sheet metal work at completion of installation. Remove metal shavings, filings, nails, bolts, and wires from work area. Remove grease and oil films, excess sealants, handling marks, contamination from steel wool, fittings and drilling debris and scrub the work clean. Exposed metal surfaces must be free of dents, creases, waves, scratch marks, solder or weld marks, and damage to the finish coating.

Collect and place scrap/waste materials in containers. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site; transport demolished materials from government property and legally dispose of them.

-- End of Section --

SECTION 07 84 00

FIRESTOPPING
05/10

PART 1 GENERAL

1.1 SUMMARY

Furnish and install tested and listed firestopping 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.

a. Through-penetrations include the annular space around pipes, tubes, conduit, wires, cables and vents.

b. 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 and at the intersection of shaft assemblies and adjoining fire resistance rated assemblies.

1.2 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 E119	(2014) Standard Test Methods for Fire Tests of Building Construction and Materials
ASTM E1399/E1399M	(1997; E 2013;R 2013) Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems
ASTM E1966	(2015) Fire-Resistive Joint Systems
ASTM E2174	(2014b) Standard Practice for On-Site Inspection of Installed Fire Stops
ASTM E2307	(2015a) Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-story Test Apparatus
ASTM E2393	(2010a) Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers

ASTM E814	(2013a) Standard Test Method for Fire Tests of Through-Penetration Fire Stops
ASTM E84	(2015a) Standard Test Method for Surface Burning Characteristics of Building Materials

FM GLOBAL (FM)

FM 4991	(2013) Approval of Firestop Contractors
FM APP GUIDE	(updated on-line) Approval Guide http://www.approvalguide.com/

UNDERWRITERS LABORATORIES (UL)

UL 1479	(2015) Fire Tests of Through-Penetration Firestops
UL 2079	(2004; Reprint Dec 2014) Tests for Fire Resistance of Building Joint Systems
UL 723	(2008; Reprint Aug 2013) Test for Surface Burning Characteristics of Building Materials
UL Fire Resistance	(2014) Fire Resistance Directory

1.3 SEQUENCING

Coordinate the specified work with other trades. Apply firestopping materials, at penetrations of pipes and ducts, prior to insulating, unless insulation meets requirements specified for firestopping. Apply firestopping materials. at building joints and construction gaps, 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. Firestop material shall be inspected and approved prior to final completion and enclosing of any assemblies that may conceal installed firestop.

1.4 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Firestopping System;

SD-03 Product Data

Firestopping Materials;

SD-06 Test Reports

Inspection;

SD-07 Certificates

Inspector Qualifications
Firestopping Materials
Installer Qualifications;

1.5 QUALITY ASSURANCE

1.5.1 Installer

Engage an experienced Installer who is:

a. FM Research approved in accordance with FM 4991, operating as a UL Certified Firestop Contractor, 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. Submit documentation of this experience. 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 installer qualifications 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. The installer shall obtain from the manufacturer and submit written certification of training, and retain proof of certification for duration of firestop installation.

1.5.2 Inspector Qualifications

The inspector shall have a minimum of two years experience in construction field inspections of firestopping systems, products, and assemblies. The inspector shall be completely independent of, and divested from, the installer, the manufacturer, and the supplier of any material or item being inspected. The inspector shall not be a competitor of the installer, the contractor, the manufacturer, or supplier of any material or item being inspected. Include in the qualifications submittal a notarized statement assuring compliance with the requirements stated herein.

1.6 DELIVERY, STORAGE, AND HANDLING

Deliver materials in the original unopened packages or containers showing name of the manufacturer and the brand name. Store materials off the ground, protected from damage and exposure to elements and temperatures in accordance with manufacturer requirements. Remove damaged or deteriorated materials from the site. Use materials within their indicated shelf life.

PART 2 PRODUCTS

2.1 FIRESTOPPING SYSTEM

Submit 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 judgment, derived from similar UL system designs or other tests, shall be submitted for review and approval prior to installation. Submittal must 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" "T" and "L" ratings, and type of application.

Also, submit a written report indicating locations of and types of penetrations and types of firstopping used at each location; record type by UL list printed numbers.

2.2 FIRESTOPPING MATERIALS

Provide firestopping materials, supplied from a single domestic manufacturer, consisting of commercially manufactured, asbestos-free, nontoxic products FM APP GUIDE approved, or UL listed, for use with applicable construction and penetrating items, complying with the following minimum requirements:

2.2.1 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 E84 or UL 723. Material shall be an approved firestopping material as listed in UL Fire Resistance or by a nationally recognized testing laboratory.

2.2.2 Toxicity

Material shall be nontoxic and carcinogen free to humans at all stages of application or during fire conditions and shall not contain hazardous chemicals or require harmful chemicals to clean material or equipment.

2.2.3 Fire Resistance Rating

Firestop systems shall be UL Fire Resistance listed or FM APP GUIDE approved with "F" rating at least equal to fire-rating of fire wall or floor in which penetrated openings are to be protected. Where required, firestop systems shall also have "T" rating at least equal to the fire-rated floor in which the openings are to be protected.

2.2.3.1 Through-Penetrations

Firestopping materials for through-penetrations, as described in paragraph SYSTEM DESCRIPTION, shall provide fire resistance ratings in accordance with ASTM E814 or UL 1479. Fire resistance ratings shall be as follows:

2.2.3.1.1 Penetrations of Fire Resistance Rated Walls, Partitions, Floors, Roofs or other Assemblies

Rating shall be equal to that of the construction where the penetration occurs.

2.2.3.2 Construction Joints and Gaps

Fire resistance ratings of construction joints, as described in paragraph SYSTEM DESCRIPTION, and gaps such as those between floor slabs and curtain walls shall be the same as the construction in which they occur. Construction joints and gaps shall be provided with firestopping materials

and systems that have been tested in accordance with ASTM E119, ASTM E1966 or UL 2079 to meet the required fire resistance rating. Curtain wall joints shall be provided with firestopping materials and systems that have been tested in accordance with ASTM E2307 to meet the required fire resistance rating. Systems installed at construction joints shall meet the cycling requirements of ASTM E1399/E1399M or UL 2079. All joints at the intersection of the top of a fire resistance rated wall and the underside of a fire-rated floor, floor ceiling, or roof ceiling assembly shall provide a minimum class II movement capability.

2.2.4 Material Certification

Submit certificates attesting that firestopping material complies with the specified requirements. For all intumescent firestop materials used in through penetration systems, manufacturer shall provide certification of compliance with UL 1479.

PART 3 EXECUTION

3.1 PREPARATION

Areas to receive firestopping must 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 must be sound and capable of supporting device. Prepare surfaces as recommended by the manufacturer.

3.2 INSTALLATION

Completely fill void spaces with firestopping material regardless of geometric configuration, subject to tolerance established by the manufacturer. Firestopping systems for filling floor voids 4 inches or more in any direction must be capable of supporting the same load as the floor is designed to support or be protected by a permanent barrier to prevent loading or traffic in the firestopped area. Install firestopping in accordance with manufacturer's written instructions. Provide tested and listed firestop systems 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. Replace thermal insulation with a material having equal thermal insulating and firestopping characteristics.

3.2.2 Fire Dampers

Install and firestop fire dampers in accordance with Section 23 73 33 AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEM. Firestop installed with fire damper must be tested and approved for use in fire damper system. Firestop installed with fire damper must be tested and approved for use in fire damper system.

3.2.3 Data and Communication Cabling

Cabling for data and communication applications shall be sealed with re-enterable firestopping products and devices as indicated, or as required by Camp Lejeune Base Telephone and Communications Department.

3.2.3.1 Re-Enterable Devices

Firestopping devices shall be pre-manufactured modular devices, containing built-in self-sealing intumescent inserts. Firestopping devices shall allow for cable moves, additions or changes without the need to remove or replace any firestop materials. Devices must be capable of maintaining the fire resistance rating of the penetrated membrane at 0 percent to 100 percent visual fill of penetrants; while maintaining "L" rating of <10 cfm/sf measured at ambient temperature and 400 degrees F at 0 percent to 100 percent visual fill.

3.2.3.2 Re-Sealable Products

Provide firestopping pre-manufactured modular products, containing self-sealing intumescent inserts. Firestopping products shall allow for cable moves, additions or changes. Devices shall be capable of maintaining the fire resistance rating of the penetrated membrane at 0 percent to 100 percent visual fill of penetrants.

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 Contracting Officer. The inspector must 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. 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.

3.3.1 Inspection Standards

Inspect all firestopping in accordance to ASTM E2393 and ASTM E2174 for firestop inspection, and document inspection results to be submitted.

3.3.2 Inspection Reports

Submit inspection report stating that firestopping work has been inspected and found to be applied according to the manufacturer's recommendations and the specified requirements.

-- End of Section --

SECTION 07 92 00

JOINT SEALANTS

10/03

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 920 (2002) Elastomeric Joint Sealants

1.2 SUBMITTALS

The following shall be submitted 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). A copy of the Material Safety Data Sheet shall be provided 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

The ambient temperature shall be within the limits of 40 and 90 degrees F when sealant is applied.

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. Elastomeric sealant containers shall be labeled 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.

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

ASTM C 920, Type S or M, Grade NS, Class 12.5, Use NT. Location(s) of sealant shall be as follows:

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.	_____
b. Perimeter of frames at doors, windows, and access panels which adjoin exposed interior concrete and masonry surfaces.	_____
c. Joints of interior masonry walls and partitions which adjoin columns, pilasters, concrete walls, and exterior walls unless otherwise detailed.	_____
d. Joints between edge members for acoustical tile and adjoining vertical surfaces.	_____
e. Interior locations, not otherwise indicated or specified, where small voids exist between 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.	_____
g. Joints formed between tile floors and tile base cove; joints between tile and dissimilar materials; joints occuring where substrates change.	_____
h. Behind escutcheon plates at valve pipe penetrations and showerheads in showers.	_____

Colors shall match conditions where sealant is to be applied. Where there is any question about the appropriate color to use, the Contracting Officer shall make the final selection.

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 joints in horizontal surfaces, provide

ASTM C 920, Type S or M, Grade P, Class 25, Use T. Location(s) and color(s) of sealant shall be 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 - typical all situations _____
b.	Joints between new and existing exterior masonry walls.	_____
c.	Masonry joints where shelf angles occur.	_____
d.	Joints in wash surfaces of stonework.	_____
e.	Expansion and control joints.	_____
f.	Interior face of expansion joints in exterior concrete or masonry walls where metal expansion joint covers are not required.	_____
g.	Voids where items pass through exterior walls.	_____
h.	Metal reglets, where flashing is inserted into masonry joints, and where flashing is penetrated by coping dowels.	_____
i.	Metal-to-metal joints where sealant is indicated or specified.	_____
j.	Joints between ends of gravel stops, fascias, copings, and adjacent walls.	_____
k.	Exterior joints between pre-cast concrete units forming decorative horizontal cornice band.	_____

2.1.3 Floor Joint Sealant

ASTM C 920, Type S or M, Grade P, Class 25, Use T. Location(s) and color(s) of sealant shall be as follows:

	LOCATION	COLOR
a.	Seats of metal thresholds for exterior doors.	_____
b.	Control and expansion joints in floors, slabs, ceramic tile, and walkways.	_____

Colors shall match adjacent materials where sealant is to be applied. Where there is any question about the appropriate color to use, the Contracting Officer shall make the final selection.

2.1.4 Preformed Sealant

Preformed sealant shall be polybutylene or isoprene-butylene based pressure sensitive weather resistant tape or bead sealant capable of sealing out moisture, air and dust when installed as recommended by the manufacturer. At temperatures from minus 30 to plus 160 degrees F, the sealant shall be non-bleeding and shall have no loss of adhesion.

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. Backing shall be 25 to 33 percent oversize for closed cell and 40 to 50 percent oversize for open cell material, unless otherwise indicated. Backstop material shall be compatible with sealant. Do not use oakum or other types of absorptive materials as backstops.

2.5 CLEANING SOLVENTS

Provide type(s) recommended by the sealant manufacturer, except do not use solvents for aluminum and bronze surfaces that will be in contact with sealant.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

Surfaces shall be clean, dry to the touch, and free from dirt frost, moisture, grease, oil, wax, lacquer, paint, or other foreign matter that would tend to destroy or impair adhesion. Oil and grease shall be removed with solvent and surfaces shall 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, the sealant manufacturer shall be contacted 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, the materials shall be removed by sandblasting or wire brushing. Laitance, efflorescence and loose mortar shall be removed from the joint cavity.

3.1.4 Wood Surfaces

Wood surfaces to be in contact with sealants shall be 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:

JOINT WIDTH	JOINT DEPTH	
	Minimum	Maximum
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, stone:		
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 inches	1/2 inch	5/8 inch
Over 2 inches	(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 shall not be required on metal surfaces.

3.3.2 Masking Tape

Masking tape may be placed on the finish surface on one or both sides of a joint cavity to protect adjacent finish surfaces from primer or sealant smears. Masking tape shall be removed within 10 minutes after joint has been filled and tooled. Any residue shall be cleaned from surfaces, and damage caused by tape or cleaning must be repaired and paint touched-up.

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 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. Sealant shall be uniformly smooth and free of wrinkles. Upon completion of sealant application, roughen partially filled or unfilled joints, apply sealant, and tool smooth as specified. Sealer shall be applied 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; Errata 2009) Structural Welding Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM A 653/A 653M	(2009) 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	(2009) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM C 578	(2009e1) Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
ASTM C 591	(2008a) Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation
ASTM C 612	(2004e1) Mineral Fiber Block and Board Thermal Insulation
ASTM D 2863	(2008) 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 E 283	(2004) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure

	Differences Across the Specimen
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)

ANSI/BHMA A156.115	(2006) Hardware Preparation in Steel Doors and Steel Frames

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 252	(2007) Standard Methods of Fire Tests of Door Assemblies
NFPA 80	(2006; Errata 2008; Errata 2008) Standard for Fire Doors and Other Opening Protectives

STEEL DOOR INSTITUTE (SDI/DOOR)

SDI/DOOR 111	(2004) 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; Rev thru Apr 2009) 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

Weatherstripping

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

Weatherstripping

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. When "custom hollow metal doors" are provided in lieu of "standard steel doors," provide additional details and data sufficient for comparison to SDI/DOOR A250.8 requirements.

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 BLAST RESISTANT DOORS AND GLAZING

Exterior personnel doors shall be blast resistant per Section 08 39 54 Blast Resistant Doors.

Glazing and view lites in blast resistant doors and adjacent to blast resistant doors shall also be blast resistant per Section 08 39 54 Blast Resistant Doors. Blast resistant glazing shall be in accordance with ASTM F 2248 and ASTM E 1300.

Exterior doors entering into areas that are mechanical rooms are not blast resistant unless scheduled otherwise in project drawings.

2.2 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.

2.2.1 Classification - Level, Performance, Model

2.2.1.1 Heavy Duty Doors

Level 2 Heavy Duty Doors are not used on this project.

SDI/DOOR A250.8, Level 2, physical performance Level B, Model 1, with core construction as required by the manufacturer for interior doors, of size(s) and design(s) indicated.

2.2.1.2 Extra Heavy Duty Doors (Interior SD)

Level 3 Extra Heavy Duty Doors shall be provided for interior steel doors.

SDI/DOOR A250.8, Level 3, physical performance Level A, Model 1 with core construction as required by the manufacturer for 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.

2.2.1.3 Maximum Duty Doors (Exterior SD)

Level 4 Maximum Duty Doors shall be provided for exterior doors.

SDI/DOOR A250.8, Level 4, physical performance Level A, Model 1 with inulated core construction. Doors to be 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.

2.3 ACCESSORIES

2.3.1 Astragals

For pairs of exterior steel doors which are not scheduled to have aluminum astragals or removable mullions, provide overlapping steel astragals with the doors. See Section 08 71 00 DOOR HARDWARE.

2.3.2 Moldings

Provide moldings around glass of interior and exterior doors and louvers of interior doors. Moldings and glass installation shall comply with blast resistance standards of door where they occur. 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.

2.4 INSULATION CORES

Insulated cores shall be one of the types 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; or

c. Mineral board: ASTM C 612, Type I.

2.5 STANDARD STEEL FRAMES

Where blast resistant doors are provided, provide new blast resistant steel frames as part of the blast resistant assembly.

SDI/DOOR A250.8, Level 4, except as otherwise specified. Manufacture from finest quality cold rolled steel. For interior frames use at least 16 gage steel. For exterior frames use at least 14 gage hot dipped galvanized steel. Form frames to sizes and shapes indicated, with welded corners or knock-down field-assembled corners. Provide steel frames for doors, transoms, sidelights, mullions, cased openings, and interior glazed panels or view lites, unless otherwise indicated.

2.5.1 Welded Frames

Provide welded frames for doors occurring in walls constructed new as part of this project.

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.

2.5.2 Knock-Down Frames

Knock-down frames are permitted only where frame will be installed into an existing wall or opening, unless Welded Frames are specifically stated or indicated to be provided.

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.

2.5.3 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.

2.5.4 Removeable Mullions

Blast resistant pairs of doors shall have removeable mullions of the type and installation as required to maintain the blast reistance requirements.

Pairs of doors, other than blast resistant doors, shall have removeable keyed mullions.

See Section 08 71 00 DOOR HARDWARE for Hardware Schedule and see Door and Frame Schedule on drawings.

2.5.5 Stops and Beads

Form stops and beads from 20 gage steel minimum. 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.

2.5.6 Cased Openings

Fabricate frames for cased openings of same material, gage, and assembly as specified for metal door frames, except omit door stops and preparation for hardware.

2.5.7 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.

2.5.7.1 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

d. Solid plaster partitions: Secure anchors solidly to back of frames and tie into the lath. Provide adjustable top strut anchors on each side of frame for fastening to structural members or ceiling construction above. Size and type of strut anchors shall be as recommended by the frame manufacturer.

2.5.7.2 Floor Anchors

Provide floor anchors drilled for 3/8 inch anchor bolts at bottom of each jamb member. Where floor fill occurs, terminate bottom of frames at the indicated finished floor levels and support by adjustable extension clips resting on and anchored to the structural slabs.

2.6 FIRE DOORS AND FRAMES

Provide fire doors as scheduled on drawings and as required by NFPA 80 and this specification. The requirements of NFPA 80 shall take precedence over details indicated or specified.

2.6.1 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 over.

2.6.2 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.

2.6.3 Astragal on Fire Doors

On pairs of labeled fire doors, conform to NFPA 80 and UL requirements.

2.7 WEATHERSTRIPPING

As specified in Section 08 71 00 DOOR HARDWARE. If not specified in Section 08 71 00, the following shall apply:

2.7.1 Integral Gasket

Black synthetic rubber gasket with tabs for factory fitting into factory slotted frames, or extruded neoprene foam gasket made to fit into a continuous groove formed in the frame. Insert gasket in groove after frame is finish painted. Air leakage of weatherstripped doors shall not exceed 1.25 cubic feet per minute of air per square foot of door area when tested in accordance with ASTM E 283.

2.8 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 ANSI/BHMA A156.115. 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, lightproof, or soundproof 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.

2.9 FINISHES

2.9.1 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.

2.9.2 Hot-Dip Zinc-Coated and Factory-Primed Finish

Provide for exterior doors and steel doors that occur in high humidity locations, such as toilet and shower rooms.

Fabricate scheduled steel 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.

2.9.3 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.

2.10 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. On wraparound frames for masonry partitions, provide a throat opening 1/8 inch larger than the actual masonry thickness.

2.10.1 Grouted Frames

For frames to be installed in exterior masonry walls, fill 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.

2.11 PROVISIONS FOR GLAZING

Materials are specified in Section 08 39 54, BLAST RESISTANT DOORS.

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. Where frames require ceiling struts or overhead bracing, anchor frames to the struts or bracing. Where located in masonry walls, 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 Doors and Frames

Install fire doors and frames, including hardware, in accordance with NFPA 80.

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 21 00

WOOD DOORS

09/99

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 1048	(2004) Standard Specification for Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass
ASTM E 152	(1981ae2) Fire Tests of Door Assemblies

CONSUMER PRODUCT SAFETY COMMISSION (CPSC)

16 CFR 1201	Safety Standard for Architectural Glazing Materials

GLASS ASSOCIATION OF NORTH AMERICA (GANA)

GANA Standards Manual	(2001) Tempering Division's Engineering Standards Manual

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 252	(2003) Fire Tests of Door Assemblies
NFPA 80	(1999) Fire Doors and Fire Windows

UNDERWRITERS LABORATORIES (UL)

UL 10B	(1997; Rev thru Oct 2001) 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

The following shall be submitted 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 ; descriptive data of head and jamb weatherstripping with installation instructions shall be included. Drawings and data shall indicate door type and construction, sizes, thickness, methods of assembly, door louvers, and glazing.

SD-03 Product Data

Doors;

Accessories

Water-resistant sealer

Sample warranty

Fire resistance rating;

SD-04 Samples

Doors

Prior to the delivery of wood doors, submit a sample section of each type of door which shows the stile, rail, veneer, finish, and core construction.

Door finish color;

Submit a minimum of three color selection samples for selection by the Contracting Officer.

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 undamaged condition and protect against damage and dampness. Stack doors flat under cover. Support on blocking, a minimum of 4 inches 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

Warranty shall 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 indicated.

2.1.1 Interior Flush Doors

Provide staved lumber core, Type II flush doors conforming to WDMA I.S. 1-A. Use 1 3/4" thick, PC-5 particle board solid core 5-ply flush wood doors by Algoma, Eggers, Marshall, or approved equal. Furnish doors with plain sliced veneer faces and matching edge strips. Veneer may be either red oak or white birch, whichever is selected shall be the same for all wood doors on project.

2.1.2 Fire Doors

See door schedule for doors required to be fire rated. Doors specified or indicated to have a fire resistance rating shall conform to the requirements of UL 10B, ASTM E 152, 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.

2.1.3 Sound Transmission Class (STC)

Provide STC as indicated in Door Schedule on drawings, if any.

2.2 ACCESSORIES

2.2.1 Door Light Openings and Glazing

Provide glazed openings with the manufacturer's standard wood moldings except that moldings for doors to receive natural finish shall be of the same species and color as the face veneers. Moldings for flush doors shall be lip type. Provide glazed openings in fire-rated doors with fire rated frames.

Glazing in interior doors and view lites shall be safety glazing material ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated), Type I, Class 1 (transparent), Quality q3, 1/4 inch thick, conforming to ASTM C 1048, GANA Standards Manual, and conforming to 16 CFR 1201. Color shall be clear.

2.2.2 Additional Hardware Reinforcement

Provide fire rated doors with hardware reinforcement blocking. Size of lock blocks shall be as required to secure the hardware specified. Top, bottom and intermediate rail blocks shall measure 5 inches minimum by full

core width. Reinforcement blocking shall be in compliance with the manufacturer's labeling requirements and shall not be mineral material similar to the core.

2.3 FABRICATION

2.3.1 Marking

Each door shall bear a stamp, brand, or other identifying mark indicating quality and construction of the door.

2.3.2 Quality and Construction

Identify the standard on which the construction of the door was based and identify doors having a Type I glue bond.

2.3.3 Preservative Treatment

Exterior doors shall be water-repellent preservative treated and so marked at the plant in accordance with WDMA I.S. 4.

2.3.4 Adhesives and Bonds

WDMA I.S. 1-A. Use Type I bond for exterior doors and Type II bond for interior doors. Adhesive for doors to receive a natural finish shall be nonstaining.

2.3.5 Prefitting

At the Contractor's option, doors may be provided factory pre-fit. Doors shall be sized and machined at the factory by the door manufacturer in accordance with the standards under which they are produced. The work shall include sizing, bevelling edges, mortising, and drilling for hardware and providing necessary beaded openings for glass and louvers. Provide the door manufacturer with the necessary hardware samples, and frame and hardware schedules as required to coordinate the work.

2.3.6 Finishes

2.3.6.1 Field Painting

Wood doors shall be pre-finished by manufacturer with a natural stain finish.

2.3.6.2 Color

Provide wood doors with a natural stain Door finish color.

2.3.7 Water-Resistant Sealer

Provide a water-resistant sealer compatible with the specified finish as approved and as recommended by the door manufacturer.

2.4 SOURCE QUALITY CONTROL

Stiles of "B" and "C" label fire doors utilizing standard mortise leaf hinges shall meet the following performance criteria:

a. Split resistance: Average of ten test samples shall be 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: Average of ten test samples shall be 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 inches. Door warp shall not exceed 1/4 inch when measured in accordance with WDMA I.S. 1-A.

3.1.1 Fire Doors

Where scheduled, provide fire doors in accordance with NFPA 80. Do not paint over labels.

-- End of Section --

SECTION 08 33 23

OVERHEAD COILING (ROLLING) DOORS

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.

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7-10	(2010; Change 2010; Change 2011; Errata 2011; Change 2011) Minimum Design Loads for Buildings and Other Structures

ASME INTERNATIONAL (ASME)

ASME B29.400	(2001; R 2008) Combination, "H" Type Mill Chains, and Sprockets

ASTM INTERNATIONAL (ASTM)

ASTM A153/A153M	(2009) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A27/A27M	(2010) Standard Specification for Steel Castings, Carbon, for General Application
ASTM A307	(2010) Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
ASTM A36/A36M	(2008) Standard Specification for Carbon Structural Steel
ASTM A48/A48M	(2003; R 2008) Standard Specification for Gray Iron Castings
ASTM A53/A53M	(2010) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A653/A653M	(2011) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A666	(2010) Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar

ASTM A780/A780M	(2009) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A924/A924M	(2010a) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM B221	(2008) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM B221M	(2007) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric)
ASTM D2000	(2012) Standard Classification System for Rubber Products in Automotive Applications
ASTM E330	(2002; R 2010) Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference
ASTM F568M	(2007) Standard Specification for Carbon and Alloy Steel Externally Threaded Metric Fasteners

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 80	(2010; TIA 10-2) Standard for Fire Doors and Other Opening Protectives

UNDERWRITERS LABORATORIES (UL)

UL Bld Mat Dir	(2011) Building Materials Directory

1.2 DESCRIPTION

Overhead coiling doors to be counterbalanced doors by methods of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed or self-lubricating bearings for rotating members. Doors to be coiling type, with interlocking slats, complete with anchoring and door hardware, guides, hood, and operating mechanisms, and designed for use on openings as indicated.

Fire-rated doors and ratings, if required, are indicated. Fire-rated door assemblies must bear the Underwriters Laboratories, Warnock Hersey, Factory Mutual or other nationally recognized testing laboratory label for the rating listed on the drawings. Provide a permanent label for each door showing the manufacturer's name and address and the model/serial number of the door.

Oversized fire-rated door assemblies must be provided with a listing agency oversize label, or a certificate signed by an official of the manufacturing company certifying that the door and operator have been designed to meet the specified requirements.

1.3 PERFORMANCE REQUIREMENTS

1.3.1 Wind Loading

Design and fabricate door assembly to withstand the wind loading pressure of at least 25 pounds per square foot with a maximum deflection of 1/120 of the opening width. Provide test data showing compliance with ASTM E330. Sound engineering principles may be used to interpolate or extrapolate test results to door sizes not specifically tested Complete assembly must meet or exceed the requirements of ASCE 7-10.

1.3.2 Fire-Rated Doors, Frames, and Hardware

Provide fire-rated doors, frames, and hardware which are tested, rated, and labeled in accordance with Underwriters Laboratories, Factory Mutual or Warnock Hersey. The labels must indicate the rating in hours, per NFPA 80 of duration of exposure to fire, with a letter following the hourly rating to designate the location for which the assembly is designed and the temperature rise on the unexposed face of the door at the end of 30 minutes of fire exposure.

Provide and attach metal UL labels to each item of hardware in accordance with requirements specified in the UL Bld Mat Dir.

1.3.3 Operational Cycle Life

All portions of the door, hardware and operating mechanism that are subject to movement, wear, or stress fatigue must be designed to operate through a minimum number of 10 cycles per day. One complete cycle of door operation is defined as when the door is in the closed position, moves to the fully open position, and returns to the closed position.

1.3.4 Blast Resistance

Overhead Coiling Doors are not required to be blast resistant.

1.4 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Provide fabrication drawings that show complete assembly with hardware and framing details for the following items:

Overhead Coiling Doors

Counterbalancing Mechanism

Manual Door Operators

Bottom Bar

Guides

Mounting Brackets

Overhead Drum

Hood

Painting

Submit Installation Drawings in accordance with paragraph entitled, "Overhead Coiling Door Assemblies," of this section.

SD-03 Product Data

Submit manufacturer's catalog data for the following items listing all accessories including supports, locks and latches, and weather stripping.

Overhead Coiling Doors

Hardware

Counterbalancing Mechanism

Manual Door Operators

ELECTRIC DOOR OPERATORS

Fire-Rated Door Assembly

SD-05 Design Data

Submit equipment and performance data for the following items in accordance with the paragraph entitled, "Performance Requirements," of this section.

Overhead Coiling Doors

Hardware

Counterbalancing Mechanism

Manual Door Operators

Fire-Rated Door

SD-10 Operation and Maintenance Data

Submit Operation and Maintenance Manuals for Overhead Coiling Door Assemblies , including the following items:

Materials

Devices

Procedures

Manufacture's Brochures

Parts Lists

Cleaning

1.5 OVERHEAD COILING DOOR DETAIL SHOP DRAWINGS

Provide installation drawings for overhead coiling door assemblies which show elevations of each door type, shape and thickness of materials, finishes, details of joints and connections, and details of guides and fittings, rough opening dimensions, location and description of hardware, anchorage locations, and counterbalancing mechanism and door operator details. Show locations of replaceable fusible links wiring diagrams for power, signal and controls. Include a schedule showing the location of each door with the drawings.

Contractor must submit 6 copies of the Operation and Maintenance Manuals 30 calendar days prior to testing the Overhead Coiling Door Assemblies. Update and resubmit data for final approval no later than 30 calendar days prior to contract completion.

Provide operation and maintenance manuals which are consistent with manufacturer's standard brochures, schematics, printed instructions, general operating procedures, and safety precautions. Provide test data that is legible and of good quality.

1.6 WARRANTY, OPERATION AND MAINTENANCE DATA

Submit Operation and Maintenance Manuals for Overhead Coiling Door Assemblies, including the following items:

Materials

Devices

Manual Door Operators

Hood

Counterbalancing Mechanism

Painting

Procedures

Manufacture's Brochures

Parts Lists

Contractor must furnish a written guarantee that the helical spring and counterbalance mechanism are free from defects in material and workmanship and that they will remain so for not less than two years after completion and acceptance of the project.

Contractor must warrant that upon notification by the Government, he will immediately make good any defects in material, workmanship, and door operation within the same time period covered by the guarantee, at no cost to the Government.

1.7 DELIVERY AND STORAGE

Delivered doors to the jobsite wrapped in a protective covering with the brands and names clearly marked thereon. Store doors in a dry location

that is adequately ventilated and free from dirt and dust, water, and other contaminants, and in a manner that permits easy access for inspection and handling.

PART 2 PRODUCTS

2.1 OVERHEAD COILING DOORS

2.1.1 Curtain Materials and Construction

Provide curtain slats which are fabricated from steel sheets conforming to ASTM A653/A653M, Grade A, with the additional requirement of a minimum yield point of 33,000 psi. Provide sheets which are galvanized in accordance with ASTM A653/A653M and ASTM A924/A924M.

Fabricate doors from interlocking cold-rolled slats, with section profiles as specified, designed to withstand the specified wind loading. Provide slats which are continuous without splices for the width of the door.

2.1.2 Non-Insulated Curtains

Form Curtains from manufacturer's standard shapes of interlocking slats.

2.1.3 Curtain Bottom Bar

Curtain bottom bars must be pairs of angles from the manufacturer's standard steel, stainless and aluminum extrusions not less than 2.0 by 2.0 inches by 0.188 inch. Steel extrusions must conform to ASTM A36/A36M. Stainless steel extrusions conforming to ASTM A666, Type 304. Aluminum extrusions conforming to ASTM B221 or(ASTM B221M). Galvanize angles and fasteners in accordance with ASTM A653/A653M and ASTM A924/A924M. Coat welds and abrasions with paint conforming to ASTM A780/A780M.

2.1.4 Locks

Provide end and/or wind locks of cast steel conforming to ASTM A27/A27M, Grade B; galvanized in accordance with ASTM A653/A653M, ASTM A153/A153M and ASTM A924/A924M and secured at every other curtain slat.

2.1.5 Weather Stripping

Weather-stripping at the door-head and jamb must be 1/8-inch thick sheet of natural or neoprene rubber with air baffles, secured to the insides of hoods with galvanized-steel fasteners through continuous galvanized-steel pressure bars at least 5/8-inch wide and 1/8-inch thick.

Threshold weather-stripping must be 1/8-inch thick sheet natural or neoprene rubber secured to the bottom bars.

Provide weather-stripping of natural or neoprene rubber conforming to ASTM D2000.

2.1.6 Locking Devices

Slide Bolt to engage through slots in tracks for locking by padlock, located on both left and right jamb sides, operable from coil side.

Locking Device Assembly which includes cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage

through slots in tracks.

Provide Chain Lock Keeper which suitable for a standard padlock.

2.1.7 Safety Interlock

Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.1.8 Overhead Drum

Fabricate drums from nominal 0.028-inch thick, hot-dip galvanized steel sheet with G90 (Z275) zinc coating, complying with ASTM A653/A653M.

2.2 HARDWARE

All hardware must conform to ASTM A153/A153M, ASTM A307, ASTM F568M, and ASTM A27/A27M.

2.2.1 Guides

Fabricate curtain jamb guides from the manufacturer's standard angles or channels of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for track adjustment.

2.2.2 Equipment Supports

Fabricate door-operating equipment supports from the manufacturer's standard steel shapes and plates conforming to ASTM A36/A36M, galvanized in accordance with ASTM A653/A653M and ASTM A924/A924M. Size the shapes and plates in accordance with the industry standards for the size, weight, and type of door installation..

2.3 COUNTERBALANCING MECHANISM

Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed or self-lubricating bearings for rotating members.

2.3.1 Brackets

Provide the manufacturer's standard mounting brackets of either cast iron or cold-rolled steel with one located at each end of the counterbalance barrel conforming to ASTM A48/A48M.

2.3.2 Counterbalance Barrels

Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, welded or seamless carbon-steel pipe, conforming to ASTM A53/A53M, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 inch per foot of span under full load.

2.3.3 Spring Balance

One or more oil-tempered, heat-treated steel helical torsion springs installed within the barrel capable of producing sufficient torque to assure easy operation of the door curtain. Provide and size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.

2.3.4 Torsion Rod for Counter Balance

Fabricate rod from the manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

2.4 MANUAL DOOR OPERATORS

2.4.1 Manual Chain-Hoist Door Operators

Provide door operators which consist of an endless steel hand chain, chain-pocket wheel, guard, and a geared reduction unit of at least a 3 to 1 ratio with a maximum 25 lbf required pull for operation.

Provide chain hoists to have a self-locking mechanism allowing the curtain to be stopped at any point in its upward or downward travel and to remain in that position until moved to the fully open or closed position. Provide hand chains of cadmium-plated alloy steel conforming to ASME B29.400. Yield point of the chain must be at least three times the required hand-chain pull.

Provide chain sprocket wheels of cast iron conforming to ASTM A48/A48M.

2.5 ELECTRIC DOOR OPERATORS

Electric door operators not required on this project.

2.6 FIRE-RATED DOOR ASSEMBLY

Provide fire-rated door assemblies with the dimensions, fire rating, and operating type indicated. If electric operators and assemblies are provided, they shall not interfere with manufacturer's standard interconnecting fusible links.

Provide door manufacturer's standard interconnecting fusible links for door assemblies on both sides of the wall opening.

2.6.1 Fire Ratings

Provide fire-rated door assemblies complying with NFPA 80 Standard for Fire Doors and Other Opening Protectives and UL Fire Resistance - Volume 3.

2.7 SURFACE FINISHING

Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Noticeable variations in the same metal component are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved samples and are assembled or installed to minimize contrast.

PART 3 EXECUTION

3.1 GENERAL

Install overhead coiling door assembly, anchors and inserts for guides, brackets, motors, switches, hardware, and other accessories in accordance with approved detail drawings and manufacturer's written instructions. Upon completion of installation, doors must be free from all distortion.

Install overhead coiling doors, motors, hoods, and operators at the mounting locations as indicated for each door in the contract documents and as required by the manufacturer.

Install overhead coiling doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility and as required by the manufacturer.

3.2 FIELD PAINTED FINISH

Steel doors and frames which are to be field painted must be in accordance with Section 09 90 00 PAINTS AND COATINGS and manufacturer's written instructions. Protect weather stripping from paint. Finishes must be free of scratches or other blemishes.

Color anticpated is "Battleship Gray". Final color selection shall be by Contracting Officer.

3.3 ACCEPTANCE PROVISIONS

After installation, adjust hardware and moving parts. Lubricate bearings and sliding parts as recommended by manufacturer to provide smooth operating functions for ease movement, free of warping, twisting, or distortion of the door assembly.

Adjust seals to provide weather-tight fit around entire perimeter.

Engage a factory-authorized service representative to perform startup service and checks according to manufacturer's written instructions.

Test the door opening and closing operation when activated by controls or alarm-connected fire-release system. Adjust controls and safeties. Replace damaged and malfunctioning controls and equipment. Reset door-closing mechanism after successful test.

Test and make final adjustment of new doors at no additional cost to the Government.

3.3.1 Maintenance and Adjustment

Not more than 90 calendar days after completion and acceptance of the project, the Contractor must examine, lubricate, test, and re-adjust doors as required for proper operation.

3.3.2 CLEANING

Clean doors in accordance with manufacturer's approved instructions.

-- End of Section --

SECTION 08 39 54

BLAST RESISTANT DOORS

08/09

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 BEARING MANUFACTURERS ASSOCIATION (ABMA)

ABMA 11	(1990; R 2008) Load Ratings and Fatigue Life for Roller Bearings
ABMA 9	(1990; R 2008) Load Ratings and Fatigue Life for Ball Bearings

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 325	(2011) Steel Construction Manual
ANSI/AISC 360	(2010) Specification for Structural Steel Buildings

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI S100	(2007; Supp 1: 2009; Supp 2: 2010) North American Specification for the Design of Cold-Formed Steel Structural Members

AMERICAN WELDING SOCIETY (AWS)

AWS A2.4	(2007) Standard Symbols for Welding, Brazing and Nondestructive Examination
AWS A5.4/A5.4M	(2006) Specification for Stainless Steel Electrodes for Shielded Metal Arc Welding
AWS D1.1/D1.1M	(2010) Structural Welding Code - Steel
AWS D1.3/D1.3M	(2008; Errata 2008) Structural Welding Code - Sheet Steel
AWS D1.4/D1.4M	(2011) Structural Welding Code - Reinforcing Steel

ASTM INTERNATIONAL (ASTM)

ASTM A123/A123M	(2009) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM A153/A153M	(2009) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A242/A242M	(2004; R 2009) Standard Specification for High-Strength Low-Alloy Structural Steel
ASTM A307	(2010) Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
ASTM A325	(2010) Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A354	(2007a) Standard Specification for Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners
ASTM A36/A36M	(2008) Standard Specification for Carbon Structural Steel
ASTM A449	(2010) Standard Specification for Hex Cap Screws, Bolts, and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use
ASTM A490	(2010ae1) Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength
ASTM A500/A500M	(2010a) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A501	(2007) Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
ASTM A514/A514M	(2005; R 2009) Standard Specification for High-Yield-Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding
ASTM A529/A529M	(2005; R 2009) Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality
ASTM A534	(2009) Standard Specification for Carburizing Steels for Anti-Friction Bearings
ASTM A563	(2007a) Standard Specification for Carbon and Alloy Steel Nuts
ASTM A572/A572M	(2007) Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel

ASTM A574	(2011) Standard Specification for Alloy Steel Socket-Head Cap Screws
ASTM A588/A588M	(2010) Standard Specification for High-Strength Low-Alloy Structural Steel with 50 ksi (345 MPa) Minimum Yield Point, with Atmospheric Corrosion Resistance
ASTM A606/A606M	(2009a) Standard Specification for Steel Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance
ASTM A618/A618M	(2004; R 2010) Standard Specification for Hot-Formed Welded and Seamless High-Strength Low-Alloy Structural Tubing
ASTM A653/A653M	(2011) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A780/A780M	(2009) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A792/A792M	(2010) Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
ASTM E283	(2004) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
ASTM E90	(2009) Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
ASTM F 436	(2011) Hardened Steel Washers
ASTM F 568M	(2007) Standard Specification for Carbon and Alloy Steel Externally Threaded Metric Fasteners
ASTM F 835	(2004e1) Alloy Steel Socket Button and Flat Countersunk Head Cap Screws

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

ANSI/BHMA A156.3	(2008) Exit Devices
ANSI/BHMA A156.4	(2008) Door Controls - Closers
ANSI/BHMA A156.8	(2010) Door Controls - Overhead Stops and Holders

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 101	(2012; Amendment 1 2012) Life Safety Code
NFPA 252	(2008) Standard Methods of Fire Tests of Door Assemblies
NFPA 80	(2010; TIA 10-2) Standard for Fire Doors and Other Opening Protectives
NFPA 80A	(2012) Recommended Practice for Protection of Buildings from Exterior Fire Exposures

1.2 SYSTEM DESCRIPTION

Provide a blast resistant door which fits a Door Description as follows: Structural steel doors shall be flush mounted in frames. Hollow metal doors shall be flush mounted in frames. Doors shall be the manually operated, side hinged, swinging type. Each door assembly shall include the door, frame, anchors, hardware, and accessories and shall be provided by a single manufacturer. Frames and anchors shall be capable of transferring blast and rebound reactions to the adjacent supporting structure. Resistance to blast shall be demonstrated either by design calculations or tests on prototype door assemblies.

1.2.1 Design Requirements

1.2.1.1 Static Material Strength

Obtain the static values for minimum yield strength (or yield point) and (ultimate) tensile strength for steel from the applicable material specification. For tensile strength specified in terms of a tensile strength range, the lowest tensile strength specified shall be selected for design. Structural steel having a minimum static yield strength (or yield point) less than 50 ksi shall be designed using an average yield strength computed as 1.1 times the minimum static yield strength or yield point. If the minimum static yield for structural steel exceeds 50 ksi, the expected yield strength used for design shall be equal to the minimum specified static yield strength or yield point without increase.

1.2.1.2 Dynamic Material Strength

Compute the dynamic material strength by applying a dynamic increase factor that accounts for the increase in material strength due to strain rate effects. The dynamic increase factor for structural steel in flexure shall be applied to the average yield strength and shall be 1.29, 1.19, and 1.09 for structural steel having a minimum yield strength (or yield point) of 36, 50, and 100 ksi, respectively. The dynamic increase factor for structural steel having a minimum yield strength (or yield point) between these values shall be obtained by interpolation.

Optionally, for structural steel in these yield ranges, the dynamic increase factor shall be determined by a detailed analysis that accounts for the time to yield. The dynamic increase factor for structural steel having a minimum yield exceeding 100 ksi shall be 1.0.

1.2.1.3 Structural Member Design

Obtain structural steel section properties for rolled shapes from AISC 325,

AISC 325, or steel manufacturers' catalogs. The plastic moment capacity for single plate sections and sections built up from plates and shapes shall be computed as the average of the elastic and plastic section modulus multiplied by the dynamic yield strength, unless otherwise approved. Shear, welds, local buckling, and web crippling of structural steel shall be designed in accordance with AISC 325, the plastic design provisions of ANSI/AISC 360, or by other approved methods except that for blast design, the load factors and resistance factors shall be equal to 1.0 and the dynamic yield strength shall be substituted for the static yield stress.

Hollow metal doors shall be designed in accordance with AISI S100 except that for blast design, the dynamic yield strength shall be substituted for the static yield point.

1.2.1.4 Dynamic Analysis and Deformation

Design the door using an equivalent single degree of freedom or other approved dynamic analysis method. The maximum door deformation shall be selected by the door manufacturer except that the maximum deformation in flexure shall not exceed the deformation limits specified or indicated. The deformation of structural steel members having a minimum yield strength or yield point greater than 65 ksi shall not exceed the elastic deflection. The ductility ratio for flexural members in hollow metal doors shall not exceed 1.0.

1.2.1.5 Rebound Resistance

Rebound resistance shall be the specified or indicated percentage of the door resistance at initial peak response.

1.2.2 Blast Effects

1.2.2.1 Overpressure

The spatial distribution of overpressure shall be uniform unless otherwise specified or indicated.

1.2.2.2 Overpressure Direction

For overpressure identified as seating and for overpressure directions not otherwise specified or indicated, the positive phase overpressure shall be in the direction that causes the door to seat toward the frame. For overpressure identified as unseating, the positive phase overpressure shall be in the direction that causes the door to unseat away from the frame.

1.2.3 Blast Door Operation

Measure the force required to set the door in motion from the 90-degree open position, and measure the force required to engage and release the latches at the latch handle with the door in the normal closed position.

1.2.4 Other Submittals Requirements

The following shall be submitted:

a. Detailed fabrication and assembly drawings for special doors or standard doors with appreciable modifications, indicating the door

location and showing dimensions, materials, fabrication methods, hardware, and accessories in sufficient detail to enable the Contracting Officer to check compliance with contract documents. These drawings need not be submitted for standard doors for which manufacturer's catalog data is submitted. Weld symbols used shall conform to AWS A2.4.

b. Data on standard blast doors consisting of catalog cuts, brochures, circulars, specifications, and product data that show complete dimensions and completely describe overpressure ratings, rebound ratings, doors, frames, anchors, hardware, and accessories. Manufacturer's instructions for installation and field testing.

c. Detailed structural analysis and design calculations demonstrating resistance to blast when blast resistance is not demonstrated by prototype tests. Design calculations shall demonstrate adequacy under the blast effects specified or indicated. Include in the design calculations a sketch of the overpressure waveform; dimensioned sketches of blast resisting elements such as door members, frame members, latches, and hinges; section properties for blast resisting members including built-up sections; the standard under which steel is produced; static and dynamic material strength properties; the resistance, stiffness, mass, elastic natural period, and elastic deflection for flexural members; and the peak deflection, peak support rotation, and time to peak deflection for door members in flexure. Design calculations shall cover initial response, rebound, and all secondary items such as shear, welds, local buckling, web crippling, hinges, and latches.

d. Steel mill reports covering the number, chemical composition, and tension properties for structural quality steels. When blast resistance is demonstrated by calculations, a certificate stating that the door assembly provided was manufactured using the same materials, dimensions, and tolerances shown in the calculations. When blast resistance is demonstrated by prototype testing, a certificate stating that door and frame provided was manufactured using the same materials, dimensions, and tolerances as the tested prototype and listing the hardware and frame anchors required to achieve blast resistance. Each certificate shall be signed by an official authorized to certify in behalf of the manufacturer and shall identify the door assembly and date of shipment or delivery to which the certificate applies.

e. Information, for DOOR DESCRIPTION, bound in manual form consisting of manufacturer's safety precautions, preventative maintenance and schedules, troubleshooting procedures, special tools, parts list, and spare parts data. All material shall be cross referenced to the door designations shown on the drawings.

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Installation

SD-03 Product Data

Door Description
Design Requirements
Manufacturer's Field Service

SD-06 Test Reports

Tests
Tests, Inspections, and Verifications
Fire Rating Test and Inspection
Prototype Static Test
Prototype Blast Test

SD-07 Certificates

Materials
Fire-Rated Door Assemblies
Thermal Insulation
Sound Rating Test

SD-10 Operation and Maintenance Data

Door Description

1.4 QUALITY ASSURANCE

Welders, welding operators, and weld inspectors shall be qualified in accordance with AWS D1.1/D1.1M except that welders performing arc welding of steel sheet and strip shall be qualified in accordance with AWS D1.3/D1.3M.

1.5 DELIVERY, STORAGE,AND HANDLING

Store door assemblies, delivered and placed in storage, with protection from weather and dirt, dust, and contaminants.

1.6 WARRANTY

Furnish manufacturer's written warranty covering the blast door assembly for 2 years after acceptance by the Government. Warranty shall provide for repair and replacement of the blast door assembly and individual hardware and accessory items in the event of malfunction due to defects in design, materials, and workmanship except that the warranty need not cover finishes provided by others.

PART 2 PRODUCTS

Blast Resistant Doors and Door Assemblies shall be provided in accordance with UFC 4-010-01 DoD MINIMUM ANTITERRORISM STANDARDS FOR BUILDINGS. The applicable version shall be the version available on the date the project is released for bid.

Exterior doors shall be blast resistant unless specified or indicated otherwise. Exterior door(s) entering mechanical rooms that do not provide personnel access to other parts of the building are not required to be blast resistant.

The UFC 4-010-01 defined Level of Protection applicable to Building AS4135 is "VERY LOW".

As per UFC 4-010-01, 12 December 2018, item 3-2, Standard 1. Standoff Distance: Existing buildings within and installation perimeter are exampt from this stnadard.

Per Table C-1, the stated design standoff distance is 104 feet.

2.1 MATERIALS

Only structural quality steel materials, for which tension properties have been obtained, shall be used to resist blast except that commercial quality steel sheet and strip shall be permitted for prototype tested hollow metal doors. Select steel used in the door, door frame, and door frame anchors, and non stainless steel fasteners that resist blast, from the materials specified.

2.1.1 Structural Tubing

Structural tubing shall conform to ASTM A500/A500M, ASTM A501, or ASTM A618/A618M.

2.1.2 Structural Steel

As applicable, structural steel bars, plates, and shapes shall conform to ASTM A36/A36M, ASTM A242/A242M, ASTM A529/A529M, ASTM A572/A572M, or ASTM A588/A588M. Quenched and tempered steel plate shall conform to ASTM A514/A514M.

2.1.3 Steel Sheet and Strip

Steel sheet and strip shall conform to ASTM A653/A653M, Type A, B, and C; ASTM A653/A653M; ASTM A606/A606M; or ASTM A792/A792M, Grades 33, 37, 40, and 50.

2.1.4 Fasteners

Steel studs and bolts shall conform to ASTM A307, ASTM A325, ASTM A354, ASTM A449, or ASTM A490 as applicable. Steel nuts shall conform to ASTM A563. Hardened circular, beveled, and clipped washers shall conform to ASTM F 436. Steel hex cap screws shall conform to ASTM F 568M. Steel socket-headed cap screws shall conform to ASTM A574. Steel button and flat-headed countersunk cap screws shall conform to ASTM F 835.

2.2 HARDWARE

2.2.1 Hinges

2.2.1.1 General Requirements

Hinges shall be specially manufactured to support the door and to resist blast induced loading. The number of hinges shall be determined by the blast door manufacturer. Welds used in hinges shall be continuous. Attach hinges to the door and frame using mechanical fasteners, except that full surface hinges for doors with locks shall be attached to the door and frame by welding or approved tamper-resistant mechanical fasteners and hinges for doors with locks shall have approved nonremovable pins. Load ratings and fatigue life for ball and roller bearings shall be determined in accordance with ABMA 9 and ABMA 11 as applicable and, unless otherwise approved, the bearing steel shall conform to ASTM A534. Hinges

shall be capable of operating for the minimum number of cycles specified without failure or excessive wear under the door service loads where one cycle consists of swinging the door back and forth between the normal closed position and the 90-degree open position, where failure or excessive wear means that the latches do not seat properly or the door does not swing smoothly due to hinge failure or wear, and where door service loads consist of the door weight plus any loads produced by hardware. Rolling bearings shall be factory grease lubricated and either sealed or provided with easily accessible lubrication fittings.

2.2.2 Latching System

2.2.2.1 Latching Points

The number of latching points shall be determined by the door manufacturer.

2.2.2.2 Latching System Operation

Latching systems shall be capable of operating for the same number of cycles specified for the door hinges where one latch operating cycle consists of engaging and releasing using the handle. Latches shall remain engaged until manually released and shall not release under blast loads or rebound.

2.2.3 Keying

Keying shall conform to Section 08 71 00 DOOR HARDWARE. Change keys for locks shall be stamped with change number and the inscription "U.S. Property - Do Not Duplicate." Unless otherwise specified, two change keys shall be provided for each lock. Locks shall be furnished with the manufacturer's standard construction key system. Verify keying with Contracting Officer.

2.2.4 Exit Device

Latches (latch bolts) shall release by depressing the actuation bar using a force of not more than 15 lbf applied perpendicular to the door in the swing direction. The exit device shall conform to the finish test values specified in ANSI/BHMA A156.3 and shall be of stainless steel construction and plain design with straight, beveled, or smoothly rounded sides, corners, and edges. The function numbers for exit devices shall be as defined in ANSI/BHMA A156.3. See Section 08 71 00 DOOR HARDWARE.

2.2.5 Door Stop

Door stops shall be designed to resist the impact of the door. The stop shall not scratch or scar the door finish when the door is opened against the stop.

2.2.6 Surface Door Closer

The surface door closer shall conform to ANSI/BHMA A156.4. The size and grade shall be selected by the door manufacturer.

2.2.7 Overhead Door Holder

Overhead door holder shall be surface mounted. The holder shall have a spring or other device to cushion the door action and shall limit the door swing at degrees as shown or as suited to door location. Overhead door

holders for hollow metal doors weighing less than 200 pounds shall conform to ANSI/BHMA A156.8.

2.2.8 Door Silencer

Rubber door silencers shall cushion the impact of the door against the frame so that steel-to-steel contact is not made during closing.

2.2.9 Optical Device

Provide where scheduled. The optical device (spy hole) shall be wide angle and shall not be breeched or dislodged by the specified or indicated blast overpressure. The device shall permit observation from the seating face of the door and shall be located approximately 5 feet above the seating side floor and approximately centered between the stiles.

2.3 ACCESSORIES

2.3.1 Subframe

At the Contractor's option, a subframe can be provided and built into the structure prior to installation of the frame. The subframe and subframe anchors shall be capable of transferring blast and rebound reactions to the adjacent structure, and the frame shall be capable of transferring these reactions to the subframe. The subframe shall be fabricated in the same manner specified for the frame.

2.3.2 Nameplate

Each door assembly shall have a permanently affixed nameplate that displays the manufacturer's name, place and year of manufacture, and the applicable peak overpressure, impulse, and rebound rating.

2.3.3 Removable Threshold

The sill shall be flush with the adjacent floor when the threshold is removed. The removable threshold shall be attached using approved countersunk mechanical fasteners.

2.4 FABRICATION

2.4.1 Shop Assembly

Welding shall be in accordance with AWS D1.1/D1.1M except that arc welding of steel sheet and strip shall be in accordance with AWS D1.3/D1.3M and welding of concrete reinforcing bars shall be in accordance with AWS D1.4/D1.4M. Stainless steel shall be welded using electrodes conforming to AWS A5.4/A5.4M. Structural steel doors shall be of welded construction. Fabricated steel shall be well-formed to shape and size, with sharp lines and angles. Intermediate and corner joints shall be coped or mitered. Exposed welds shall be dressed smooth. The stiles and top of built-up structural steel doors shall be closed using channel shapes or plates. When feasible, faceplates for structural steel doors shall be one piece. When one-piece faceplates are not feasible, plates shall be joined using full penetration groove weld butt joints or other approved welds. Hollow metal door frames shall be pressed steel or structural steel with welded joints. Steel frames or subframes installed in masonry walls shall be provided with adjustable anchors. Hollow metal doors shall be of unitized grid construction with welded grid junctions

and shall have flat, one-piece face sheets spot welded to each face of the grid system. The edges of hollow metal doors shall be closed with seams continuously welded. Hollow metal doors shall be neat in appearance, free from warpage and buckle, and suitable reinforcing shall be provided for hardware.

2.4.2 Mullion

Mullions for double doors shall be fabricated in the same manner specified for frames. Fixed mullions shall be welded to the frame. Removable mullions shall be attached to the frame with mechanical fasteners that are accessible for mullion removal or, in lieu of the removable mullion, an astragal shall be provided at the seating face of the inactive door leaf. Doors shall seat directly against the mullion, and the mullion or astragal shall be capable of transferring the door reactions to the frame.

2.4.3 Thermal Insulation

The interior cells between the unitized grid shall be completely filled with thermal insulation material. The U value through the door (panel) shall not exceed 0.24 Btu per square foot per hour per degree F. Submit certification or test report for thermal insulated doors listing the type of hardware used to achieve the rating; see paragraph SOUND RATING TEST below.

2.4.4 Shop Finishing

Shop priming of steel surfaces shall conform to Section 09 90 00 PAINTS AND COATINGS, except that surfaces that will be embedded in concrete need not be primed and hollow metal doors shall be either dipped in primer after welding is completed, or exposed surfaces shall be primed and interior surfaces coated with an approved rust inhibitor. Galvanizing of doors and frames shall conform to ASTM A123/A123M or other approved methods. Surfaces that will be embedded in concrete need not be galvanized and the interior of hollow metal doors may be treated with an approved rust inhibitor in lieu of galvanizing. Galvanizing of exposed portions of concrete anchors, non stainless steel fasteners, and hardware other than factory finished hardware shall conform to ASTM A153/A153M or other approved methods.

2.5 BLAST DOOR ASSEMBLIES

Provide assembly in accordance with the specified level of protection and the applicable version of UFC 4-010-01 and related requirements.

2.6 TESTS, INSPECTIONS, AND VERIFICATIONS

Submit shop and field operating test reports that include values for opening and closing forces and times, forces required to operate latches, and a description of all operating tests performed.

2.6.1 Prototype Static Test

Static tests on prototype door assemblies shall demonstrate that the door will resist the blast overpressure. Static tests will be accepted only if the door and frame proposed are manufactured using the same materials, dimensions, and tolerances as those in the prototype static test and the static overpressure used in the test is at least two times the blast overpressure. Static test reports shall be supplemented with calculations

that demonstrate rebound resistance when rebound is not tested.

2.6.2 Prototype Blast Test

Blast tests on the prototype door assembly shall demonstrate that the door will resist the overpressure waveform. Blast tests will be accepted only if the door and frame proposed are manufactured using the same materials, dimensions, and tolerances as those in the prototype blast tests. The rise time of the test waveform shall be zero or subject to approval. Submit certified test reports demonstrating blast resistance. Include in the test reports the name and location of the testing agency or laboratory, a description of the testing apparatus, the date of the tests, a description of the door specimen tested, descriptions of loadings, the value of measured peak door deflection and peak permanent set and analysis and interpretation of test results.

2.6.3 Shop Operating Test

Prior to shipment, each door assembly shall be fully erected in a supporting structure and tested for proper operation. Such testing shall include opening, closing, and operating all moving parts to ensure smooth operation and proper clearance, fit, and seating. Determine the operating forces and opening and closing times.

2.6.4 Air Leakage Test

Factory test each door assembly for which door seals or thermal insulation is specified for air leakage rate in accordance with ASTM E283. The rate of air leakage per unit length of crack shall not exceed 0.20 cfm using a pressure difference of 1.57 psf. Prototype tests can be substituted for door assembly tests when the prototype door, frame, and hardware tested are equivalent to that provided or when otherwise approved.

2.6.5 Sound Rating Test

The sound transmission class (STC) rating shall be determined in accordance with ASTM E90.

2.6.6 Fire Rating Test and Inspection

Fire-rated door assemblies shall bear the listing identification label of the UL, or other nationally recognized testing laboratory qualified to perform tests of fire door assemblies in accordance with NFPA 252 and having a listing for the tested assemblies. Doors exceeding the size for which listing label service is offered shall be inspected in accordance with NFPA 80, NFPA 80A, and NFPA 101. A letter may be submitted by the testing laboratory (in lieu of a UL listing for fire door assemblies) which identifies the submitted product by manufacturer and type or model and certifies that it has tested a sample assembly and issued a current listing. Submit certificate of inspection conforming to NFPA 80, NFPA 80A, and NFPA 101 for fire doors exceeding the size for which label service is available.

PART 3 EXECUTION

3.1 INSTALLATION

Install doors and frames in accordance with the manufacturer's written instructions. Pressed steel frames for hollow metal doors shall be fully

grouted. Exposed surfaces shall be finish painted in accordance with Section 09 90 00 PAINTS AND COATINGS. Galvanized surfaces damaged prior to final acceptance shall be repaired in accordance with ASTM A780/A780M to the same thickness as the original galvanizing.

3.2 TESTS

After installation is completed, field test each door for operation, clearance, fit, and seating by operating the door and hardware through at least 10 operating cycles. Test door and hardware operation using the forces specified. Provide personnel and equipment required to perform field testing. Unless waived, perform all field tests in the presence of the Contracting Officer. After testing is completed, prepare test reports and furnish three copies.

3.3 MANUFACTURER'S FIELD SERVICE

Perform installation and testing of door assemblies under the supervision of the door manufacturer's erection representative.

-- End of Section --

SECTION 08 51 13

ALUMINUM WINDOWS

08/09

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 ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 1503	(1998) Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections
AAMA 2605	(2005) Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels
AAMA 701	(2004) Voluntary Specification for Pile Weather Strip
AAMA 902	(1999) Voluntary Specification for Sash Balances
AAMA/WDMA/CSA 101/I.S.2/A440	(2008; Update 1 2008; Update 2 2008; Update 3 2009) North American Fenestration Standard/Specification for Windows, Doors, and Skylights

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
ASTM E 330	(2002) Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference
ASTM E 331	(2000; R 2009) Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
ASTM E 547	(2000) Water Penetration of Exterior Windows

GREEN SEAL (GS)

GS-36	(2000) Commercial Adhesives

NATIONAL FENESTRATION RATING COUNCIL (NFRC)

NFRC 100	(2004) Procedure for Determining Fenestration Product U-Factors
NFRC 200	(2004) Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 101	(2008; Amendment 2009) Life Safety Code

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

Energy Star	(1992; R 2006) Energy Star Energy Efficiency Labeling System

1.2 CERTIFICATION

Each prime window unit must bear the AAMA Label warranting that the product complies with AAMA 101. Certified test reports attesting that the prime window units meet the requirements of AAMA 101, including test size, will be acceptable in lieu of product labeling.

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Windows;

Fabrication Drawings;

SD-03 Product Data

Windows;

Hardware;

Fasteners;

Window performance;

THERMAL-BARRIER WINDOWS;

MULLIONS;

Submit documentation indicating percentage of post-industrial and post-consumer recycled content per unit of product. Indicate relative dollar value of recycled content products to total dollar value of products included in project.

Screens;

Weatherstripping;

Accessories;

Adhesives;

Submit manufacturer's product data, indicating VOC content.

Thermal performance;

Submit documentation for Energy Star qualifications.

SD-04 Samples

Window Sample;

Finish Sample;

SD-05 Design Data

Structural calculations for deflection;

Design Analysis;

Submit design analysis with calculations showing that the design of each different size and type of aluminum window unit and its anchorage to the structure meets the minimum antiterrorism standards required by UFC 4-010-01 "DoD Minimum Antiterrorism Standards for Buildings" and paragraph "Minimum Antiterrorism Performance" below, unless conformance is demonstrated by Standard Airblast Test results. Calculations verifying the structural performance of each window proposed for use, under the given loads, shall be prepared and signed by a registered Professional Engineer. The window components and anchorage devices to the structure, as determined by the design analysis, shall be reflected in the shop drawings.

SD-06 Test Reports

Minimum condensation resistance factor

SD-10 Operation and Maintenance Data

Windows, Data Package 1;

When not labeled, identify types in Operation and Maintenance Manual.

1.4 QUALITY ASSURANCE

1.4.1 Shop Drawing Requirements

Provide drawings that indicate elevations of windows, full-size sections, thickness and gages of metal, fastenings, proposed method of anchoring, size and spacing of anchors, details of construction, method of glazing, details of operating hardware, mullion details, method and materials for

weatherstripping, method of attaching screens, material and method of attaching subframes, stools, casings, sills, trim, installation details, and other related items.

1.4.2 Sample Requirements

1.4.2.1 Finish Sample Requirements

Submit color chart of standard factory color coatings. Factory-finish color coating is to be provided.

1.4.2.2 Window Sample Requirements

Submit one full-size corner of each window type proposed for use. Where screens or weatherstripping is required, fit sample with such items that are to be used.

1.4.3 Design Data Requirements

Submit calculations to substantiate compliance with deflection requirements and Minimum Antiterrorism Performance criteria. A registered Professional Engineer must provide calculations.

Submit design analysis with calculations showing that the design of each different size and type of aluminum window unit and its anchorage to the structure meets the requirements of paragraph "Minimum Antiterrorism Performance Criteria". Calculations verifying the structural performance of each window proposed for use, under the given loads, must be prepared and signed by a registered professional engineer. Reflect the window components and anchorage devices to the structure, as determined by the design analysis, in the shop drawings.

1.4.4 Test Report Requirements

Submit test reports for each type of window attesting that identical windows have been tested and meet the requirements specified herein for conformance to AAMA 101 including test size, and minimum condensation resistance factor (CRF), and Minium Antiterrorism windows.

1.5 DELIVERY AND STORAGE

Deliver windows to project site in an undamaged condition. Use care in handling and hoisting windows during transportation and at the jobsite. Store windows and components out of contact with the ground, under a weathertight covering, so as to prevent bending, warping, or otherwise damaging the windows. Repair damaged windows to an "as new" condition as approved. If windows can not be repaired, provide a new unit.

1.6 PROTECTION

Protect finished surfaces during shipping and handling using the manufacturer's standard method. Do not apply coatings or lacquers to surfaces to which calking and glazing compounds must adhere.

1.7 FIELD MEASUREMENTS

Take field measurements prior to preparation of the drawings and fabrication.

1.8 PERFORMANCE REQUIREMENTS

1.8.1 Minimum Antiterrorism Performance Criteria

Windows must meet the minimum antiterrorism related performance criteria.

Blast Resistant Windows shall be provided in accordance with UFC 4-010-01 DoD MINIMUM ANTITERRORISM STANDARDS FOR BUILDINGS. The applicable version shall be the version available on the date the project is released for bid.

The UFC 4-010-01 defined Level of Protection applicable to Building AS4135 is "VERY LOW".

As per UFC 4-010-01, 12 December 2018, item 3-2, Standard 1. Standoff Distance: Existing buildings within and installation perimeter are exampt from this stnadard.

Per Table C-1, the stated design standoff distance is 104 feet.

If any portion of the blast resistance requirements in this specification section is in conflict with UFC 4-010-01, the UFC 4-010-01 requirements shall take precedence.

1.8.1.1 Glazing

Single pane glazing must have laminated glass as specified in Section 08 81 00 GLAZING and as required to meet the minimum antiterrorism standards.

Double pane insulated glazing must have laminated glass as the inboard (interior) glazing as specified in Section 08 81 00 GLAZING.

1.8.1.2 Aluminum Window Frames

Restrict aluminum framing members deflections of edges of glazing they support to L/160 under an equivalent 3-second duration loading of 12 pounds per square foot (psf), where L denotes the length of the glazing supported edge. (L is to be based on edge length of glazing in frame and not on the distance between anchors that fasten frame to the structure.)

The glazing frame bite for the window frames must be adequate to accept the width of structural silicone sealant or glazing tape as specified in paragraph "Provisions for Glazing" below.

1.8.1.3 Window Frame Anchors

Fasten window frames to the supporting structure with anchors designed to resist forces generated by a 3-second duration load of 130 pounds per square foot (psf) acting on the entire window unit.

1.8.2 Wind Loading Design Pressure

Design window components, including mullions, hardware, and anchors, to withstand a wind-loading design pressure of at least 60 pounds per square foot (psf).

1.8.3 Tests

Test windows proposed for use in accordance with AAMA/NWWDA 101/I.S.2 for

the particular type and quality window specified.

Perform tests by a nationally recognized independent testing laboratory equipped and capable of performing the required tests. Submit the results of the tests as certified laboratory reports required herein.

Minimum design load for a uniform-load structural test must be 50 psf.

1.9 DRAWINGS

Submit the Fabrication Drawings for aluminum window units showing complete window assembly including hardware, weatherstripping, and subframe assembly details.

1.10 WINDOW PERFORMANCE

Aluminum windows must meet the following performance requirements. Perform testing requirements by an independent testing laboratory or agency.

1.10.1 Structural Performance

Structural test pressures on window units must be for positive load (inward) and negative load (outward) in accordance with ASTM E 330. After testing, there will be no glass breakage, permanent damage to fasteners, hardware parts, support arms or actuating mechanisms or any other damage which could cause window to be inoperable. There must be no permanent deformation of any main frame, sash or ventilator member in excess of the requirements established by AAMA 101 for the window types and classification specified in this section.

1.10.2 Air Infiltration

Air infiltration must not exceed the amount established by AAMA 101 for each window type when tested in accordance with ASTM E 283.

1.10.3 Water Penetration

Water penetration must not exceed the amount established by AAMA 101 for each window type when tested in accordance with ASTM E 547 or ASTM E 331.

1.10.4 Thermal Performance

Thermal transmittance for thermally broken aluminum windows with insulating glass must not exceed a U-factor of 0.30 Btu/hr-ft^2-F determined according to NFRC 100, and a solar heat gain coefficient (SHGC) of 0.25 Btu/hr-ft^2-F determined according to NFRC 200. Provide window units that comply with the U.S. Department of Energy, Energy Star Window Program for the Southern Climate Zone.

1.10.5 Life Safety Criteria

Provide windows that conform to NFPA 101 Life Safety Code when rescue and/or second means of escape are indicated.

1.10.6 Sound Attenuation

The window unit must have a minimum STC of 41 with the window glazed with two pieces of 1/4 inch thick glass (inner lite is laminated) with the

window glazed with 1/2 inch air space between two pieces of 1/4 inch thick glass when tested in accordance with AAMA/WDMA/CSA 101/I.S.2/A440 acoustical performance.

1.10.7 Blast Resistance

Window and glazing shall be blast resistant in compliance with the UFC 4-010-01 DOD MINIMUM ANTITERRORISM STANDARDS FOR BUILDINGS.

1.10.7.1 Computational Design Analysis Method

Window frames, mullions, and sashes shall be designed to the criteria listed herein. Computational design analysis shall include calculations verifying the structural performance of each window proposed for use, under the given static equivalent loads.

Aluminum window framing members shall restrict deflections of edges of glazing they support to L/160 under an equivalent 3-second duration loading of 130 pounds per square foot (psf), where L denotes the length of the glazing supported edge. (L is to be based on edge length of glazing in frame and not on the distance between anchors that fasten frame to the structure.)

The glazing frame bite for the window frames shall be adequate to accept the width of structural silicone sealant or glazing tape as specified in paragraph "Provisions for Glazing" below.

Window frames shall be anchored to the supporting structure with anchors designed to resist forces generated by a 3-second duration load of 260 pounds per square foot (psf) acting on the entire window unit.

1.10.7.2 Alternate Dynamic Design Analysis Method

As an alternative to the static equivalent load design approach described above, window framing members, anchors, and glazing may be designed using a dynamic analysis to prove the window system will provide performance equivalent to or better than the hazard rating associated with the applicable level of protection for the project.

1.10.7.3 Standard Airblast Test Method

As an alternative to either of the Computational Design Analysis Methods, each Minimum Antiterrorism window type shall be tested for evaluation of hazards generated from airblast loading in accordance with ASTM F 1642 by an independent testing agency regularly engaged in blast testing. For proposed window systems that are of the same type as the tested system but of different size, the test results may be accepted provided the proposed window size is within the range from 25 percent smaller to 10 percent larger in area, than the tested window. Proposed windows of a size outside this range shall require testing to evaluate their hazard rating. Testing may be by shocktube or arena test. The test shall be performed on the entire proposed window system, which shall include, but not be limited to, the glazing, its framing system, operating devices, and all anchorage devices. Anchorage of the window frame or subframe shall replicate the method of installation to be used for the project. The minimum airblast loading parameters for the test shall be as follows: Peak positive pressure of 40 kPa and positive phase impulse of 285 kPa-msec. The hazard rating for the proposed window systems, as determined by the rating criteria of ASTM F 1642, shall not exceed the "Very Low Hazard" rating

(i.e. the "No Break", "No Hazard", "Minimal Hazard" and "Very Low Hazard" ratings are acceptable. "Low Hazard" and "High Hazard" ratings are unacceptable). Results of window systems previously tested by test protocols other than ASTM F 1642 may be accepted provided the required loading, hazard level rating, and size limitations stated herein are met.

1.11 QUALIFICATION

Window manufacturer must specialize in designing and manufacturing the type of aluminum windows specified in this section, and have a minimum of 10 years of documented successful experience. Manufacturer must have the facilities capable of meeting contract requirements, single-source responsibility and warranty.

1.12 WARRANTY

Provide Manufacturer's standard performance guarantees or warranties that extend beyond a 1 year period.

PART 2 PRODUCTS

2.1 WINDOWS

Provide prime windows that comply with AAMA/WDMA/CSA 101/I.S.2/A440 and the requirements specified herein. In addition to compliance with AAMA/WDMA/CSA 101/I.S.2/A440, window framing members for each individual light of glass must not deflect to the extent that deflection perpendicular to the glass light exceeds L/175 of the glass edge length when subjected to uniform loads at specified design pressures.

Provide Structural calculations for deflection to substantiate compliance with deflection requirements. Provide windows of types, performance classes, performance grades, combinations, and sizes indicated or specified.

Design windows to accommodate hardware, glass, weatherstripping, screens, and accessories to be furnished. Each window must be a complete factory assembled unit with or without glass installed. Dimensions shown are minimum. Provide windows with insulating glass and thermal break necessary to achieve a minimum Condensation Resistance Factor (CRF) of 50 when tested in accordance with AAMA 1503.

Glazed systems (including frames and glass) will be Energy Star labeled products as appropriate to climate zone and as applicable to window type, with a whole-window Solar Heat Gain Coefficient (SHGC) maximum of .30 determined according to NFRC 200 procedures. Glazed systems must have a U-factor maximum of .35 Btu per square foot times hr times degree F in accordance with NFRC 100.

2.1.1 Hung Windows (H)

Single Hung, Type H-HC-60 (Optional Performance Grade). Test and rate sash balance to conform with AAMA 902.

Provide with insulated double pane glazing.

Design windows, mullions, hardware, and anchors to withstand the wind loading and blast resistance specified.

2.1.1.1 Window Materials

Window frames and sash members, mullions, mullion covers, screen frames, and glazing beads shall be fabricated in accordance with AAMA/WDMA/CSA 101/I.S.2/A440.

Weatherstripping will be woven wool pile weatherstripping 0.210 inch thick, conforming to AAMA 701, or polypropylene multifilament fiber weatherstripping installed in an integral weatherstripping groove in the sash or frame, and flexible polyvinylchloride weatherstripping installed in the sill member.

2.1.2 Fixed Windows (F)

Fixed windows shall match Hung Windows (H) in construction, quality, glazing, etc.

2.1.3 Glass and Glazing

Materials are specified in Section 08 81 00 GLAZING.

2.1.4 Calking and Sealing

Are specified in Section 07 92 00 JOINT SEALANTS.

2.1.5 Weatherstripping

AAMA/WDMA/CSA 101/I.S.2/A440.

2.2 FABRICATION

Fabrication of window units must comply with AAMA/WDMA/CSA 101/I.S.2/A440.

2.2.1 Provisions for Glazing

Design windows and rabbets suitable for glass thicknesses specified. For minimum antiterrorism windows, attach glazing to its supporting frame using structural silicone sealant or adhesive glazing tape. The width of the structural silicone sealant bead must be at least equal to, but not larger than two times the thickness designation of the glass to which it adheres. The width of the adhesive glazing tape will be at least equal to two times, but not more than four times the thickness designation of the glass to which it adheres. Design sash for double glazing and for securing glass with glazing clips, glazing channels, or glazing compound.

2.2.2 Weatherstripping

Provide for ventilating sections of all windows to ensure a weather-tight seal meeting the infiltration requirements specified in AAMA/WDMA/CSA 101/I.S.2/A440. Provide easily replaceable factory-applied weatherstripping. Use molded vinyl, molded or molded-expanded neoprene or molded or expanded Ethylene Propylene Diene Terpolymer (EPDM) compression-type weatherstripping for compression contact surfaces. Use treated woven pile or wool, or polypropylene or nylon pile bonded to nylon fabric and metal or plastic backing strip weatherstripping for sliding surfaces. Do no use neoprene or polyvinylchloride weatherstripping where they will be exposed to direct sunlight.

2.2.3 Fasteners

Fabricated from 100 percent re-melted steel. Use fasteners as standard with the window manufacturer for windows, trim, and accessories. Self-tapping sheet-metal screws are not acceptable for material more than 1/16 inch thick.

2.2.4 Adhesives

Comply with applicable regulations regarding toxic and hazardous materials, GS-36, and as specified in Section 07 92 00 JOINT SEALANTS.

2.2.5 Drips and Weep Holes

Provide continuous drips over heads of top ventilators. Where fixed windows adjoin ventilators, drips must be continuous across tops of fixed windows. Provide drips and weep holes as required to return water to the outside.

2.2.6 Combination Windows

Windows used in combination must be the same class and grade and will be factory assembled. Where factory assembly of individual windows into larger units is limited by transportation considerations, prefabricate, match mark, transport, and field assemble.

2.2.7 Mullions and Transom Bars

Provide mullions between multiple window units which meet the design pressure of 60 psf. Provide mullions with a thermal break. Secure mullions and transom bars to adjoining construction and window units in such a manner as to permit expansion and contraction and to form a weathertight joint. Provide mullion covers on the interior and exterior to completely close exposed joints and recesses between window units and to present a neat appearance.

2.2.8 Accessories

Provide windows complete with necessary hardware, fastenings, clips, fins, anchors, glazing beads, and other appurtenances necessary for complete installation and proper operation.

2.2.8.1 Hardware

AAMA/WDMA/CSA 101/I.S.2/A440. The item, type, and functional characteristics must be the manufacturer's standard for the particular window type. Provide hardware of suitable design and of sufficient strength to perform the function for which it is used. Equip all operating ventilators with a lock or latching device which can be secured from the inside.

2.2.8.2 Fasteners

Provide concealed anchors of the type recommended by the window manufacturer for the specific type of construction. Anchors and fasteners must be compatible with the window and the adjoining construction. Provide a minimum of three anchors for each jamb located approximately 6 inches from each end and at midpoint.

2.2.8.3 Window Anchors

Anchoring devices for installing windows must be made of aluminum, cadmium-plated steel, stainless steel, or zinc-plated steel conforming to AAMA/WDMA/CSA 101/I.S.2/A440.

2.2.9 Finishes

Exposed aluminum surfaces must be factory finished with an organic coating. White and medium bornze must be included in color selections plus at least 5 other color choices. All windows shall have the same finish.

2.2.9.1 Organic Coating

Clean and prime exposed aluminum surfaces. Provide a high-performance finish in accordance with AAMA 2605, including 10 years Florida exposure and 4000 hours humidity tests. Finish shall be total dry film thickness of not less than 1.2 mils. Finish shall be a resin coating containing 70% fluoropolymer; thermosetting. Coating shall be minimum one primer coat and one color coat. Application shall be electrostatic spray and oven bake by approved applicator. Pretreatment shall be five-stage; zinc chromate conversion coating.

2.2.10 Screens

AAMA/WDMA/CSA 101/I.S.2/A440. Provide one insect screen for each operable exterior sash or ventilator. Design screens to be rewirable, easily removable from inside the building, and to permit easy access to operating hardware.

2.3 THERMAL-BARRIER WINDOWS

Provide thermal-barrier windows, complete with accessories and fittings, where indicated.

Specify material and construction except as follows:

a. Aluminum alloy must be 6063-T6.

b. Frame construction, including operable sash, must be factory-assembled and factory-sealed inner and outer aluminum completely separated from metal-to-metal contact. Join assembly by a continuous, concealed, low conductance divider housed in an interlocking extrusion of the inner frame. Metal fasteners, straps, or anchors will not bridge the connection between the inner and outer frame.

c. Operating hardware for each sash must consist of spring-loaded nylon cushion blocks and pin locks designed to lock in predetermined locations.

d. Sash must be completely separated from metal-to-metal contact by means of woven-pile weatherstripping, plastic, or elastomeric separation members.

e. Operating and storm sash will be factory-glazed with the type of glass indicated and of the quality specified in Section 08 81 00 GLAZING.

2.4 MULLIONS

Provide mullions between multiple-window units where indicated.

Mullions and mullion covers must be the profile indicated, reinforced as required for the specified wind loading, and securely anchored to the adjoining construction. Mullion extrusion will include serrations or pockets to receive weatherstripping, sealant, or tape at the point of contact with each window flange.

Mullion assembly must include aluminum window clamps or brackets screwed or bolted to the mullion and the mullion cover.

Mullion cover must be screw-fastened to the mullion unless otherwise indicated.

Mullion reinforcing members shall be fabricated of the materials specified in AAMA/WDMA/CSA 101/I.S.2/A440 and meet the specified design loading.

PART 3 EXECUTION

3.1 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
Metal Casing	0.0625 inch	1.59 mm
Aluminum Tube	0.0625 inch	1.59 mm
(Diameter)	1 inch	25 mm

3.2 INSTALLATION

3.2.1 Method of Installation

Install in accordance with the window manufacturer's printed instructions and details. Build in windows as the work progresses or install without forcing into prepared window openings. Set windows at proper elevation, location, and reveal; plumb, square, level, and in alignment; and brace, strut, and stay properly to prevent distortion and misalignment. Protect ventilators and operating parts against accumulation of dirt and building materials by keeping ventilators tightly closed and locked to frame. Bed screws or bolts in sill members, joints at mullions, contacts of windows with sills, built-in fins, and subframes in mastic sealant of a type recommended by the window manufacturer. Install and caulk windows in a manner that will prevent entrance of water and wind. Fasten insect screens securely in place.

3.2.2 Dissimilar Materials

Where aluminum surfaces are in contact with, or fastened to masonry, concrete, wood, or dissimilar metals, except stainless steel or zinc, protect the aluminum surface from dissimilar materials as recommended in the Appendix to AAMA/WDMA/CSA 101/I.S.2/A440. Do not coat surfaces in contact with sealants after installation with any type of protective

material.

3.2.3 Anchors and Fastenings

Make provision for securing units to each other, to masonry, and to other adjoining construction. Windows installed in masonry walls must have head and jamb members designed to recess into masonry wall not less than 7/16 inch.

3.2.4 Adjustments After Installation

After installation of windows and completion of glazing and field painting, adjust all ventilators and hardware to operate smoothly and to provide weathertight sealing when ventilators are closed and locked. Lubricate hardware and operating parts as necessary. Adjust single and double hung windows to operate with maximum applied force of 25 pounds in either direction, not including breakaway friction force. Verify that products are properly installed, connected, and adjusted.

3.3 CLEANING

Clean interior and exterior surfaces of window units of mortar, plaster, paint spattering spots, and other foreign matter to present a neat appearance, to prevent fouling of weathering surfaces and weather-stripping, and to prevent interference with the operation of hardware. Replace all stained, discolored, or abraded windows that cannot be restored to their original condition with new windows.

-- 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 A156.15	(2006) Closer Holder Release Devices
BHMA A156.16	(2002) Auxiliary Hardware
BHMA A156.17	(2004) Self Closing Hinges & Pivots
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	(2005; Errata 2006; TIA 2006; TIA 2006) Life Safety Code, 2006 Edition
NFPA 80	(2007) 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	(2007) 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

SD-11 Closeout Submittals

Key Bitting

1.3 HARDWARE SCHEDULE

Prepare and submit hardware schedule in the following form:

Hardware Item	Quantity	Size	Reference Publication Type No.	Finish	Mfr. Name and Catalog No.	Key Control Symbols	UL Mark (If fire rated and listed)	BHMA Finish Designation
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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, pivots, and closers of one lock, hinge, pivot, 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 and removable cores to the Contracting Officer, either directly or by certified mail. Deliver construction master keys with the locks.

PART 2 PRODUCTS

Coordinate hardware on exterior doors with blast resistance requirements. Provide hardware complying with the blast resistance requirements where applicable.

The following are acceptable hardware manufacturers:

1. Hinges: Hager, McKinney, Stanley
2. Continuous Gear Hinges: ABH, Select, Stanley
3. Cylinders: Best, Falcon, Arrow, Eagle
4. Door Closers: LCN, Norton, Stanley, Ryobi
5. Locks, Latches: Best, Sargent, Corbin-Russwin
6. Silencers, Stops & Flush Bolts: Baldwin, Burns, Rockwood
7. Kick Plates, & Misc.: Baldwin, Burns, Rockwood, Ives
8. Weatherstrip: National Guard, Reese, Zero
9. Push/Pulls: Hagar, Baldwin, Burns, Rockwood
10. Exit Devices: Precision, Sargent, Von Duprin
11. Thresholds: National Guard, Reese, Zero, Pemko
12. Overhead Stops/Holders: Norton, ABH, Rixson, Sargent
13. Electronics: Rixson, Best, RCI, SDC
14. Auto Operators: Hunter, Besam, Horton

Other manufacturer's not listed are permitted if products are equal in performance and construction. Due to changes in product lines and models, just because a manufacturer is listed it does not necessarily mean their product is approved. Contractor must verify that items bid and provided are equal to or better in quality of performance and construction than those specified. Architect shall make final decision on what is equal quality.

Contractor's bid shall be based on level of performance and construction of brands, models, finishes, and features as specified or equal.

Th eabove requirement applies because hardware performance specifications alone taht are based on ANSI and other certifications often do not adequately define quality levels of hardware items as evidenced by the vast range of product costs and quality levels available that all meet many of the standards. For example, product A and B may both comply with a certification standard, but product brand/model A costs $270 and product brand/model B costs $850. Regardless of the certification, product A is clearly inferior t product B. Product A is not as durable, as corrision resistant, or as maintenance free as product B. Do not substitute inferior quality products in lieu of those specified.

2.1 TEMPLATE HARDWARE

Provide hardware to be applied to metal or to prefinished doors 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. See Door Schedule in drawings for doors that must be fire rated.

2.3 EXISTING OPENINGS

See schedules on drawings for existing doors, frames, and other items to remain and existing doors, frames, and other items to be removed and new provided. Contractor shall feild verify rough opening dimensions and other items as ncessary; modify scheduled dimensions of new frames and doors as necessary at no additional cost to Government.

2.4 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.

General requirements for projects at Camp Lejeune:

1. Provide Series 4000, Grade 1, locks and latches with 2-3/4 inch backset.

2. Provide interchangeable cores with seven pin tumblers.

3. All locks shall have interchangeable cores by Best Lock Corp., Arrow Lock Corp., Falcon Lock, or Eagle.

4. For offices, entrances, classrooms, and maintenance shops, provide

lock function F81, unless F82 or F84 is more appropriate.

5. For mechanical rooms and pipe chases, provide lock function F86 (storeroom lock, outside knob always rigid).

6. For sleeping room doors, provide one deadbolt, E2151, with concealed mounting screws, and one passage latchset, F75.

7. For Bachelor Enlisted Quarters, a separate master keying system is required for each floor of each building.

See hardware schedule for more specific requirements per door.

2.4.1 Hinges

BHMA A156.1, 4-1/2 by 4-1/2 inch unless otherwise indicated or scheduled. 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. Hinges shall be stainless steel in accrodance with ANSI A5112 unless specifically scheculed otherwise.

2.4.2 Pivots

BHMA A156.4.

2.4.3 Spring Hinges

BHMA A156.17.

2.4.4 Locks and Latches

2.4.4.1 Bored Locks and Latches

BHMA A156.2, Series 4000, Grade 1 with 2.75 inch backset.

2.4.5 Exit Devices

BHMA A156.3, Grade 1. Provide adjustable strikes for rim type devices. Provide touch bars in lieu of conventional crossbars and arms. Center case cover, touch bar end cap, case end cap, and touch bar trim shall be satin stainless steel. Mechanism case shall be anodized aluminum to match the appearance of stainless steel.

Where exit devices are provided on double doors, provide a removable mullion. Vertical rod devices shall only be provided if installation of a removable mullion is not possible.

Exit devices shall be rated for heavy traffic, and UL listed Panic Hardware (FVSR) SA163 (N) and tested in accordance to ANSI A156.3, 1989, Grade 1.
Device shall be security level with two peice security latchbolt.

2.4.6 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 with products from Best Lock Corp., Arrow Lock Corp., Falcon

Lock, or Eagle 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.

2.4.7 Keying System

Provide grand master keying system. Provide construction interchangeable cores. Provide key cabinet as specified.

2.4.8 Lock Trim

Cast, forged, or heavy wrought construction and commercial plain design.

2.4.8.1 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. Provide lever handles return to within 1/2 inch of the door face.

2.4.8.2 Texture

Provide knurled or abrasive coated knobs or lever handles where specified in paragraph entitled "Hardware Schedule" and for doors which may be accessible to blind persons and which lead to dangerous areas, janitor's closets, and mechanical rooms.

2.4.9 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 two additional control keys for removable cores. Stamp each key with appropriate key control symbol and "U.S. property - Do not duplicate." Do not place room number on keys.

2.4.10 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.

2.4.11 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.

2.4.11.1 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.

2.4.12 Overhead Holders

BHMA A156.8.

2.4.13 Closer Holder-Release Devices

BHMA A156.15.

2.4.14 Door Protection Plates

BHMA A156.6.

2.4.14.1 Sizes of Armor, Mop, and Kick Plates

2 inch less than door width for single doors; one inch less than door width for pairs of doors. Provide 16 inch kick plates for flush doors and one inch less than height of bottom rail for panel doors. Provide a minimum 16 inch armor plates for flush doors and 16 inch high armor plates on fire doors. Provide 16 inch mop plates. If scheduled kick plate is larger, provide the larger size.

2.4.15 Door Stops and Silencers

BHMA A156.16. Silencers Type L03011. Provide three silencers for each single door, two for each pair.

2.4.16 Thresholds

BHMA A156.21. Use J35100, with vinyl or silicone rubber insert in face of stop, for exterior doors opening out, unless specified otherwise.

2.4.17 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. 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:

2.4.17.1 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.

2.4.17.2 Interlocking Type

Zinc or bronze not less than 0.018 inch thick.

2.4.17.3 Spring Tension Type

Spring bronze or stainless steel not less than 0.008 inch thick.

2.4.18 Rain Drips

Extruded aluminum, not less than 0.08 inch thick, clear anodized. Set drips in sealant and fasten with stainless steel screws.

2.4.18.1 Door Rain Drips

Approximately 1-1/2 inch high by 5/8 inch projection. Align bottom with bottom edge of door.

2.4.18.2 Overhead Rain Drips

Approximately 1-1/2 inch high by 2-1/2 inch projection, with length equal to overall width of door frame. Align bottom with door frame rabbet.

2.4.19 Special Tools

Provide special tools, such as spanner and socket wrenches and dogging keys, required to service and adjust hardware items.

2.5 FASTENERS

Provide fasteners of proper type, quality, size, quantity, and finish with hardware. Provide stainless steel. Provide fasteners of type necessary to accomplish a permanent installation.

2.6 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 aluminum paint finish for surface door closers, and except BHMA 600 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. Furnish exit devices in BHMA 626 finish in lieu of BHMA 630 finish. Match exposed parts of concealed closers to lock and door trim. Match hardware finish for aluminum doors to the doors.

2.7 KEY CABINET AND CONTROL SYSTEM

BHMA A156.5, Type E8331 (25 hooks).

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.

3.1.1.2 Interlocking Type Weather Stripping

Provide interlocking, self-adjusting type on heads and jambs and flexible hook type at sills. Nail weather stripping to door one inch on centerand to heads and jambs at 4 inch on center

3.1.1.3 Spring Tension Type Weather Stripping

Provide spring tension type on heads and jambs. Provide bronze nails with bronze, stainless steel nails with stainless steel. Space nails not more than 1-1/2 inch on center.

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 by Contracting Officer. 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

Door Hardware Schedule
INTERIOR/EXTERIOR REPAIRS, BLDG AS4135
MARINE CORPS BASE, CAMP LEJEUNE, NC

SET #01: blast resistant, entrance lockset
Doors: R101A, R108B, R109B, R111B, R112, R113

3	HINGES	BB1199 4 1/2 X 4 1/2 NRP	US32D	HA
1	LOCKSET	93K-7AB15DS3 STD	626	BE
1	CLOSER	UNI-7500-H SN-134	689	NO
1	SADDLE THRESHOLD	424 X DW	AL	NGP
1	GASKETING	127 NA 1 X DW + 2 X DH		NGP
1	DOOR BOTTOM	319 V X DW	AL	NGP
3	HMF SILENCER	SR64		IV

110 degree swing

SET #02: blast resistant, entrance lockset, pair of doors
Doors: R105A(PR), R107C(PR)

6	HINGES	BB1199 4 1/2 X 4 1/2 NRP	US32D	HA
1	FLUSH BOLT	FB458 12" (top)	US26D	IV
1	FLUSH BOLT	FB458 6" (bottom)	US26D	IV
1	LOCKSET	93K-7AB15DS3 STD	626	BE
1	CLOSER	UNI-7500-H SN-134	689	NO
2	DUST PROOF STRIKES	DP2		IV
1	SADDLE THRESHOLD	424 X DW	AL	NGP
1	GASKETING	127 NA 1 X DW + 2 X DH		NGP
2	DOOR BOTTOM	319 V X DW	AL	NGP
1	ASTRAGAL SET	115 NA Full Height		NGP
4	HMF SILENCER	SR64		IV

110 degree swing

SET #03: mechanical room exterior pair of doors
Doors: R116(PR)

6	HINGES	BB1199 4 1/2 X 4 1/2 NRP	US32D	HA
1	FLUSH BOLT	FB458 12" (top)	US26D	IV
1	FLUSH BOLT	FB458 6" (bottom)	US26D	IV
1	STOREROOM LOCKSET	93K-7D15DS3 STD	626	BE
2	DUST PROOF STRIKES	DP2		IV
1	SADDLE THRESHOLD	424 X DW	AL	NGP
1	GASKETING	127 NA 1 X DW + 2 X DH		NGP
2	DOOR BOTTOM	319 V X DW	AL	NGP
1	ASTRAGAL SET	115 NA Full Height		NGP
4	HMF SILENCER	SR64		IV

110 degree swing

SET #04: exterior, mechanical/electrical, storage room lockset
Doors: R115

3	HINGES	BB1199 4 1/2 X 4 1/2 NRP	US32D	HA
1	STOREROOM LOCKSET	93K-7D15DS3 STD	626	BE
1	SADDLE THRESHOLD	424 X DW	AL	NGP
1	GASKETING	127 NA 1 X DW + 2 X DH		NGP
2	DOOR BOTTOM	319 V X DW	AL	NGP
3	HMF SILENCER	SR64		IV

110 degree swing

SET #05: entrance lockset, closer with hold-open
Doors: R101B

3	HINGES	BB1199 4 1/2 X 4 1/2 NRP	US32D	HA
1	LOCKSET	93K-7AB15DS3 STD	626	BE
1	CLOSER	UNI-7500-H SN-134	689	NO
1	WALL STOP	236W	US26D	HA
1	SADDLE THRESHOLD	424 X DW	AL	NGP
3	HMF SILENCER	SR64		IV

110 degree swing

SET #06: offices and similar rooms, not fire-rated
Doors: R105B, R106, R110, R202, R203

3	HINGES	BB1191 4 1/2 X 4 1/2 NRP	US32D	HA
1	LOCKSET	93K-7B15DS3 STD	626	BE
1	WALL STOP	236W	US26D	HA
3	HMF SILENCER	SR64		

110 degree swing

SET #07: entrance lockset, without closer , 110
Doors: R107B, R111A

3	HINGES	BB1199 4 1/2 X 4 1/2 NRP	US32D	HA
1	LOCKSET	93K-7AB15DS3 STD	626	BE
1	WALL STOP	236W	US26D	HA
3	HMF SILENCER	SR64		IV

110 degree swing

SET #08: entrance lockset, without closer, 180
Doors: R114

3	HINGES	BB1199 4 1/2 X 4 1/2 NRP	US32D	HA
1	LOCKSET	93K-7AB15DS3 STD	626	BE
1	WALL STOP	236W	US26D	HA
3	HMF SILENCER	SR64		IV

180 degree swing

SET #09: electrical, communications
Doors: R102, R204

3	HINGES	BB1191 4 1/2 X 4 1/2 NRP	US32D	HA
1	STOREROOM LOCKSET	93K-7D15DS3 STD	626	BE
1	WALL STOP	236W	US26D	HA
3	HMF SILENCER	SR64		

180 degree swing

SET #10: gang toilets, push/pull
Doors: R103A, R104A

3	HINGES	BB1199 4 1/2 X 4 1/2 NRP	US32D	HA
1	PUSH PLATE	30S 4 x 16	US32D	HA
1	DOOR PULL	30E 4 x 16	US32D	HA
1	CLOSER	UNI-7500-H SN-134	689	NO
1	WALL STOP	236W	US26D	HA
1	PROTECTION PLATE	190S 16" x DW-2"	US32D	HA
1	MOP PLATE	190S 16" x DW-2"	US32D	HA
3	HMF SILENCER	SR64		IV

110 degree swing

SET #11: janitor
Doors: R102

3	HINGES	BB1191 4 1/2 X 4 1/2 NRP	US32D	HA
1	STOREROOM LOCKSET	93K-7D15DS3 STD	626	BE
1	WALL STOP	236W	US26D	HA
3	HMF SILENCER	SR64		

180 degree swing

SET #12: passage set
Doors: R103B

3	HINGES	BB1191 4 1/2 X 4 1/2 NRP	US32D	HA
1	LOCKSET	93K-7N15DS3 STD	626	BE
1	WALL STOP	236W	US26D	HA
3	HMF SILENCER	SR64		

110 degree swing

SET #13: entrance lockset, pair of doors
Doors: R108A(PR), R109A(PR)

6	HINGES	BB1199 4 1/2 X 4 1/2 NRP	US32D	HA
1	FLUSH BOLT	FB458 12" (top)	US26D	IV
1	FLUSH BOLT	FB458 6" (bottom)	US26D	IV
1	LOCKSET	93K-7AB15DS3 STD	626	BE
2	DUST PROOF STRICKS	DP2		IV
1	SADDLE THRESHOLD	424 X DW	AL	NGP
1	ASTRAGAL SET	115 NA Full Height		NGP
2	WALL STOP	236W	US26D	HA
4	HMF SILENCER	SR64		IV

180 degree swing

General Hardware Schedule Notes:

1. If hardware scheduled does not comply with the fire rating listed in the Door Schedule on the drawings, provide the appropriate fire rated hardware that is available in the same hardware series as that scheduled.

2. See Door Schedule in project drawings for additional locations where aluminum saddle thresholds may be required.

3. Before ordering hardware, Contractor shall review hardware and functions with Contracting Officer. Contracting Officer shall make final selections.

4. Products equal in performance and construction as listed in Part 2 of SECTION 08 71 00 shall be acceptable as specified.

5. Where "DW" or "DH" is used in the DOOR HARDWARE SCHEDULE, it references the DOOR WIDTH or DOOR HEIGHT.

Manufacturers List

Code	Manufacturers Name*
BE	Best Lock
IV	H.B. Ives
KA	Kawneer
MC	McKinney
NGP	National Guard
NO	Norton
RO	Rockwood
RX	Rixson
HA	Hagar
TR	Trimco
VO	Von Duprin

Finishes List

Finish	Finish Description
626	Satin Chromium Plated
US26D	Chromium Plated, Dull
US32D	Stainless Steel, Dull/Satin
P	Primed for Painting
AL	Aluminum
689	Aluminum Painted
USP	Primed
SP28	Sprayed Aluminum

END of HARDWARE SCHEDULE

-- 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.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z97.1	(2004) Safety Glazing Materials Used in Buildings

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	(2009) Standard Specification for Laminated Architectural Flat Glass
ASTM C 1184	(2005) Standard Specification for Structural Silicone Sealants
ASTM C 509	(2006) Elastomeric Cellular Preformed Gasket and Sealing Material
ASTM C 669	(2000) Glazing Compounds for Back Bedding and Face Glazing of Metal Sash
ASTM C 864	(2005) Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers
ASTM C 920	(2008) Standard Specification for Elastomeric Joint Sealants
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 1300	(2007e1) Determining Load Resistance of Glass in Buildings
ASTM E 2010	(2001) Positive Pressure Fire Tests of

	Window Assemblies
ASTM E 413	(2004) Rating Sound Insulation
ASTM E 773	(2001) Accelerated Weathering of Sealed Insulating Glass Units
ASTM E 774	(1997) Classification of the Durability of Sealed Insulating Glass Units
ASTM E 90	(2004) Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

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

NATIONAL FENESTRATION RATING COUNCIL (NFRC)

NFRC 100	(2004) Procedure for Determining Fenestration Product U-Factors
NFRC 200	(2004) Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 252	(2007) Standard Methods of Fire Tests of Door Assemblies
NFPA 257	(2006) Fire Test for Window and Glass Block Assemblies
NFPA 80	(2006; Errata 2008; Errata 2008) Standard for Fire Doors and Other Opening Protectives

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

Energy Star	(1992; R 2006) Energy Star Energy Efficiency Labeling System

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-378	(Basic; Notice 1) Putty Linseed Oil Type, (for Wood-Sash-Glazing

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-04 Samples

Insulating Glass

Plastic Sheet

Glazing Compound

Glazing Tape

Sealant

Two 8 x 10 inch samples of each of the following: tinted glass, patterned glass, heat-absorbing glass, and insulating glass units.

Three samples of each indicated material. Samples of plastic sheets shall be minimum 5 by 7 inches.

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.

Documentation for Energy Star qualifications.

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 SYSTEM DESCRIPTION

Glazing systems shall be fabricated and installed watertight and airtight to withstand thermal movement and wind loading without glass breakage, gasket failure, deterioration of glazing accessories, and defects in the work. Glazed panels shall comply with the safety standards, as indicated in accordance with ANSI Z97.1. Glazed panels shall comply with indicated wind/snow loading in accordance with ASTM E 1300.

1.4 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.

1.5 ENVIRONMENTAL REQUIREMENTS

Do not start glazing work until the outdoor temperature is above40 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.

1.6 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

For interior view window, sidelights or similar glazing (i.e., pass and observation windows), provide 1/4 inch thick tempered glass.

Type I, Class 1 (clear), Quality q4 (A). Provide for glazed openings not indicated or specified otherwise.

2.1.2 Wired Glass

Where fire-rated windows or glass panels in fire-rated doors are scheduled or indicated, glass shall be 1/4 inch thick wired glass, UL listed and

shall be rated for 45 or 20 minutes (see door schedule) when tested in accordance with ASTM E 2010. Wired glass shall be Type II flat type, Class 1 - translucent, Quality q8 - glazing, Form 1 - wired and polished both sides. Wire mesh shall be polished stainless steel Mesh 1 - diamond. Wired glass for fire-rated windows shall bear an identifying UL label or the label of a nationally recognized testing agency, and shall be rated for 20 or 45 minutes (as scheduled) when tested in accordance with NFPA 257. Wired glass for fire-rated doors shall be tested as part of a door assembly in accordance with NFPA 252.

2.1.3 Patterned Glass

Type II, Class 1 (translucent), Form 3 (patterned), Quality q7 (decorative), Finish f1 (patterned one side), Pattern p1 (linear), 1/4 inch thick. Provide wherever windows occur in restrooms or other private areas.

2.1.4 Laminated Glass

Laminated glass shall be provided in blast resistant assemblies. Blast resistant glass is required in exterior windows, exterior view panels, and view panels in exterior doors. In double pane insulated installations, laminated glass shall be provided in the inboard (interior) pane.

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 minimum 1/4 inch.

2.1.5 Tempered Glass

Tempered glass shall be provided in:

a. interior windows
b. interior view panels
c. view panels in interior doors

unless assembly is indicated or scheduled to be fire-rated or blast resistant.

ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated), Type I, Class 1 (transparent), Quality q3, 1/4 inch thick,. Color shall be clear. Provide wherever safety glazing material is indicated or specified.

2.2 INSULATING GLASS UNITS

Insulated units shall be double pane, nominal 1 inch thick, composed of 1/4 inch laminated glass on the inboard (interior) pane, 1/2 inch air space, and 1/4 inch annealed clear glass on the outboard (exterior) pane. Provide patterned obscure glass for outboard pane where window occurs in a toilet, shower or similar private area.

Entire assembly shall comply with blast resistance DOD anti-terrorism standards. If there is a conflict in the specificed requirements, the blast resistance requirements shall take precedence.

Two panes of glass separated by a dehydrated 1/2 inch airspace, filled with argon gas, or 0.63 inches of aerogel and hermetically sealed. Glazed systems (including frames) shall be Energy Star labeled products as

appropriate to climate zone and as applicable to window type, with a whole-window Solar Heat Gain Coefficient (SHGC) maximum of 0.30 determined according to NFRC 200 procedures. Glazed panels and curtain walls shall have a U-factor maximum of 0.35 Btu per square foot x hr x degree F in accordance with NFRC 100.

Exterior insulated unit shall include soft coat low E glass.

Glazing shall meet or exceed a luminous efficacy of 1.0. Glazed panels shall be rated for not less than 35 Sound Transmission Class (STC) when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 413.

Dimensional tolerances shall be as specified in IGMA TR-1200. The units shall meet CBA Grade requirement when tested in accordance with ASTM E 773 and ASTM E 774, Class A. Spacer shall be black, roll-formed, thermally broken aluminum, 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.

2.3 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 Putty and Glazing Compound

Glazing compound shall conform to ASTM C 669 for face-glazing metal sash. Putty shall be linseed oil type conforming to CID A-A-378for face-glazing primed wood sash. Putty and glazing compounds shall not be used with insulating glass or laminated glass.

2.3.2 Glazing Compound

ASTM C 669. Use for face glazing metal sash. Do not use with insulating glass units or laminated glass.

2.3.3 Sealants

Provide elastomeric sealants. Provide structural sealants as applicable.

2.3.3.1 Elastomeric Sealant

ASTM C 920, Type S, Grade NS, Class 12.5, Use G. Use for channel or stop glazing metal sash. Sealant shall be chemically compatible with setting blocks, edge blocks, sealing tapes, and with sealants used in manufacture of insulating glass units. Color of sealant shall be white.

2.3.3.2 Structural Sealant

ASTM C 1184, Type S.

2.3.4 Joint Backer

Joint backer shall have a diameter size at least 25 percent larger than joint width; type and material as recommended in writing by glass and sealant manufacturer.

2.3.5 Preformed Channels

Neoprene, vinyl, or rubber, as recommended by the glass manufacturer for the particular condition.

2.3.6 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.

2.3.7 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.

2.3.8 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.

2.3.8.1 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.

2.3.8.2 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.

2.3.8.3 Aluminum Framing Glazing Gaskets

Glazing gaskets for aluminum framing shall be permanent, elastic, non-shrinking, non-migrating, watertight and weathertight.

2.3.9 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 Patterned Glass

Set glass with one patterned surface with the smooth surface on the weather side. When used for interior partitions, place the patterned surface in same direction in all openings.

3.2.3 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.

3.2.4 Installation of Wire Glass

Install glass for fire doors in accordance with installation requirements of NFPA 80.

3.2.5 Installation of Laminated Glass

Sashes which are to receive laminated glass shall be weeped to the outside to allow water drainage into the channel.

3.2.6 Plastic Sheet

Conform to manufacturer's recommendations for edge clearance, type of sealant and tape, and method of installation.

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. 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 29 00

GYPSUM BOARD

08/09

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 A108.11	(1992) Interior Installation of Cementitious Backer Units
ANSI/CTI A108/A118/A136.1	(2005) Specification for the Installation of Ceramic Tile

ASTM INTERNATIONAL (ASTM)

ASTM C 1002	(2007) Standard Specification for 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	(2009) Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base
ASTM C 1396/C 1396M	(2006a) Standard Specification for Gypsum Board
ASTM C 36/C 36M	(2003e1) Gypsum Wallboard
ASTM C 475/C 475M	(2002; R 2007) Joint Compound and Joint Tape for Finishing Gypsum Board
ASTM C 840	(2008) Application and Finishing of Gypsum Board
ASTM C 954	(2007) Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness

GYPSUM ASSOCIATION (GA)

GA 214	(2007) Recommended Levels of Gypsum Board Finish

GA 216 (2007) Application and Finishing of Gypsum Board

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Cementitious backer units

Water-Resistant Gypsum Backing Board

Accessories

Submit for each type of gypsum board and for cementitious backer units.

Gypsum Board;

Joint Treatment Materials

Submit manufacturer's product data, indicating VOC content.

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

SD-10 Operation and Maintenance Data

Waste Management

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 5 years of documented successful experience.

1.6 SCHEDULING

The gypsum wall board shall be taped, spackled and primed before the installation of highly-emitting materials.

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. Gypsum board shall contain a minimum of 5 percent post-consumer recycled content, or a minimum of 20 percent post-industrial recycled content. Gypsum board may contain post-consumer or post-industrial recycled content.

2.1.1.1 Regular

Provide 5/8 inch Regular Type X.

2.1.2 Regular Water-Resistant Gypsum Backing Board

Provide 5/8 inch Type X, ASTM C 630/C 630M, with mold growth preventing additives.

Water-resistant gypsum board is also commonly referred to as moisture-resistant gypsum board.

2.1.3 Cementitious Backer Units

ANSI/CTI A108/A118/A136.1.

Provide 5/8 inch thick cementitiuos backer units (cement board) where the board thickness must match 5/8 inch gypsum board.

2.1.4 Joint Treatment Materials

ASTM C 475/C 475M. 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.

2.1.4.1 Embedding Compound

Specifically formulated and manufactured for use in embedding tape at gypsum board joints and compatible with tape, substrate and fasteners.

2.1.4.2 Finishing or Topping Compound

Specifically formulated and manufactured for use as a finishing compound.

2.1.4.3 All-Purpose Compound

Specifically formulated and manufactured to serve as both a taping and a finishing compound and compatible with tape, substrate and fasteners.

2.1.4.4 Setting or Hardening Type Compound

Specifically formulated and manufactured for use with fiber glass mesh tape.

2.1.4.5 Joint Tape

Use cross-laminated, tapered edge, reinforced paper, or fiber glass mesh tape recommended by the manufacturer.

2.1.5 Fasteners

2.1.5.1 Nails

Not permitted.

2.1.5.2 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.

2.1.5.3 Staples

Not permitted.

2.1.6 Adhesives

Not permitted.

2.1.7 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.

2.1.8 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 not be bonded together with an adhesive. Treat edges of cutouts for plumbing pipes, screwheads, and joints with water-resistant compound as recommended by the gypsum board manufacturer. Provide type of gypsum board for use in each system specified herein as indicated.

Install gypsum board so that joints are supported. Install such that vertical joints occur over studs. Install such that horizontal joints occur over light gage purlins or over field cut stud bracing as indicated.

In wet or humid areas, such as toilet rooms, janitor's closets, shower rooms, kitchens, and other similar areas, provide moisture/water resistant gypsum board with mold prevention additives.

3.2.1 Application of Single-Ply Gypsum Board to Wood Framing

Apply in accordance with ASTM C 840, System I or GA 216.

3.2.2 Application of Gypsum Board to Steel Framing and Furring

Apply in accordance with ASTM C 840, System VIII or GA 216.

3.2.3 Arches and Bending Radii

Apply gypsum board in accordance with ASTM C 840, System IX or GA 216.

3.2.4 Board for Wall Tile or Tile Base Applied with Adhesive

Provide cementitious backer units as indicated.

3.3 APPLICATION OF CEMENTITIOUS BACKER UNITS

3.3.1 Application

Provide as a backing surface wherever ceramic or similar tile occurs, applicable to wet areas such as toilet rooms, tubs, shower enclosures, saunas, steam rooms, gang shower rooms. Apply cementitious backer units in accordance with ANSI A108.11 with 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.

In dry areas, asphalt impregnated felt paper membrane is not required.

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 walls and ceilings to receive a heavy-grade wall covering or heavy textured finish before painting to Level 3 in accordance with GA 214.

Finish all other 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 Level 5

Wherever gypsum board is to receive paint finish, or where severe, up or down lighting conditions occur, finish gypsum wall surface in accordance

to GA 214 Level 5. 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 PATCHING

Patch surface defects in gypsum board to a smooth, uniform appearance, ready to receive finishes.

3.7 WASTE MANAGEMENT

Identify manufacturer's policy for collection or return of remaining construction scrap, unused material, demolition scrap, and packaging material. Institute demolition and construction recycling to take advantage of manufacturer's programs. When such a service is not available, seek local recyclers to reclaim the materials.

-- End of Section --

SECTION 09 30 00

CERAMIC TILE, QUARRY TILE, AND PAVER TILE

08/10

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 A185/A185M	(2007) Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
ASTM C 1026	(2010) Standard Test Method for Measuring the Resistance of Ceramic Tile to Freeze-Thaw Cycling
ASTM C 1027	(2009) Standard Test Method for Determining Visible Abrasion Resistance of Glazed Ceramic Tile
ASTM C 1028	(2007e1) Standard Test Method for 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/C 150M	(2009) Standard Specification for Portland Cement
ASTM C 206	(2003; R 2009) Standard Specification for Finishing Hydrated Lime
ASTM C 207	(2006) Standard Specification for Hydrated Lime for Masonry Purposes
ASTM C 241/C 241M	(2009) Standard Specification for Abrasion Resistance of Stone Subjected to Foot Traffic
ASTM C 33/C 33M	(2011) Standard Specification for Concrete Aggregates
ASTM C 373	(1988; R 2006) Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fired Whiteware

Products

ASTM C 648	(2004; R 2009) Breaking Strength of Ceramic Tile
ASTM D 2103	(2010) Standard Specification for Polyethylene Film and Sheeting
ASTM D 226/D 226M	(2009) Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing

MARBLE INSTITUTE OF AMERICA (MIA)

MIA Design Manual	(2003) Dimension Stone Design Manual

TILE COUNCIL OF NORTH AMERICA (TCNA)

TCA Hdbk	(2010) Handbook for Ceramic Tile Installation

1.2 SYSTEM DESCRIPTION

1.2.1 General Requirements

For materials like Tile, Accessories, and marble Thresholds submit Samples of sufficient size to show color range, pattern, type and joints.

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Drawings

SD-03 Product Data

Tile
Setting-Bed
Mortar, Grout, and Adhesive

SD-04 Samples

Tile
Marble Thresholds
Grout

SD-06 Test Reports

SD-07 Certificates

Tile
Mortar, Grout, and Adhesive

SD-11 Closeout Submittals

Tile;

Reinforcing Wire Fabric;

1.4 QUALITY ASSURANCE

Dimension and draw detail drawings at a minimum scale of 1/4 inch = 1 foot. Include drawings of pattern at inside corners, outside corners, termination points and location of all equipment items such as thermostats, switch plates, mirrors and toilet accessories mounted on surface. Submit drawings showing ceramic tile pattern elevations and floor plans.

1.5 DELIVERY, STORAGE, AND HANDLING

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 store them under cover in accordance with manufacturer's printed instructions.

1.6 ENVIRONMENTAL REQUIREMENTS

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.

1.7 WARRANTY

Provide manufacturer's standard performance guarantees or warranties that extend beyond a 1-year period.

1.8 EXTRA MATERIALS

Supply an extra two percent of each type tile used in clean and marked cartons.

PART 2 PRODUCTS

2.1 TILE

Conform to TCA Hdbk 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.

Floor tile shall be 1 inch by 1 inch or 2 inch by 2 inch.

Tile base shall be a coved tile base extending up to create a minimum 4 inch tall base. Base shall be a single coved base tile nominal 4 inch height, and nominal length of 4 inches or 6 inches.

Submit manufacturer's catalog data and preprinted installation and cleaning instructions plus a master grade certificate for tile.

2.2 SETTING-BED

Compose the setting-bed of the following materials:

2.2.1 Aggregate for Concrete Fill

Conform to ASTM C 33/C 33M 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/C 150M 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 Reinforcing Wire Fabric

Conform to ASTM A185/A185M for wire fabric. Provide 2 by 2 inch mesh, 16/16 wire.

2.3 WATER

Provide potable water.

2.4 MORTAR, GROUT, AND ADHESIVE

Submit certificates indicating conformance with specified requirements. Conform to the following for mortar, grout, adhesive, and sealant:

2.4.1 Dry-Set Portland Cement Mortar

TCA Hdbk.

2.4.2 Latex-Portland Cement Mortar

TCA Hdbk.

2.4.3 Epoxy Resin Grout

TCA Hdbk.

2.4.4 Sealants

Comply with applicable regulations regarding toxic and hazardous materials and as specified.

2.4.5 Cementitious Backer Board

Provide cementitious backer units, for use as tile substrate as indicated in drawings, in accordance with TCA Hdbk. Furnish at least 1/2 inch thick cementitious backer units, provide 5/8 inch thick where indicated in drawings.

2.5 MARBLE THRESHOLDS

Provide marble threshold at transition from ceramic tile floor finish to other floor finish.

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 white or light gray in color as approved by the Contracting Officer. Provide minimum 12.0 marble abrasion when tested in accordance with ASTM C 241/C 241M.

2.6 MEMBRANE MATERIALS

Conform to ASTM D 226/D 226M, Type 1 for 15 pound waterproofing membrane, asphalt-saturated building felt. Conform to ASTM D 2103 4 mil for polyethylene film.

PART 3 EXECUTION

3.1 PREPARATORY WORK AND WORKMANSHIP

Inspect surface to receive tile in conformance to the requirements of TCA Hdbk 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.
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 FLOOR TILE

Install floor tile in accordance with TCA Hdbk method mortar bed method. Install shower receptors in accordance with TCA Hdbk.

3.3.1 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 TCA Hdbk for workable mortar bed materials and installation. Conform to TCA Hdbk for cured mortar bed materials and installation. Provide minimum 1/4 inch to maximum 3/8 inch joints in uniform width.

3.3.2 Dry-Set and Latex-Portland Cement

Use Latex-Portland cement mortar to install tile directly over properly cured, plane, clean concrete slabs in accordance with TCA Hdbk. Use Latex Portland cement when installing porcelain ceramic tile.

3.3.3 Ceramic Tile Grout

Prepare and install ceramic tile epoxy grout in accordance with TCA Hdbk.

3.3.4 Waterproofing

Shower pans are specified in Section 22 00 00 PLUMBING, GENERAL PURPOSE. Provide BUILT-UP BITUMINOUS WATERPROOFING for waterproofing under concrete fill.

3.4 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.

3.5 EXPANSION JOINTS

Form and seal joints as specified in Section 07 92 00 JOINT SEALANTS.

3.5.1 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.

3.6 ACCESSORIES

Provide ceramic tile accessories at cerimac tile showers as follows:

Soap Dish: Shaped ceramic soap dish - one at each shower stall.

Robe/towel Hooks: Ceramic hook/pin - one at each shower stall.

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.

3.8 WASTE MANAGEMENT

Separate waste, including metal and cardboard, in accordance with the Waste Management Plan. Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in designated containers and areas. Close and seal tightly partly used sealant and adhesive containers and store in protected, well-ventilated, fire-safe area at moderate temperature. Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in designated containers and areas and dispose of properly.

3.9 COLORS

Colors are indicated in drawings. See finish schedule and related notes. Contracting Officer reserves the right to make final selections from manufacturer's available colors that differ from those indicated.

Grout Color: Select a medium to dark grout color suitable for the tile color where it occurs. Note that in a short period of time, light grout colors get dirty, dark, uneven in color, and unattractive in appearance. Select a grout that is as dark as possible and still matches the adjacent tile.

-- 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	(2009a) Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
ASTM C 423	(2008a) 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	(2008) Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels
ASTM E 1264	(2008) Acoustical Ceiling Products
ASTM E 1414	(2006) Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum
ASTM E 1477	(1998a; R 2008) Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers
ASTM E 580/E 580M	(2009) Application of Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels in Areas Requiring Moderate Seismic Restraint
ASTM E 795	(2005) Mounting Test Specimens During Sound Absorption Tests

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-310-04	(2007) Seismic Design for Buildings

1.2 SYSTEM DESCRIPTION

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. The location and extent of acoustical treatment shall be as shown on the approved detail drawings.

1.2.1 Ceiling Attenuation Class and Test

Provide a ceiling system with an attenuation class (CAC) as specified or greater when determined in accordance with ASTM E 1414.

In areas indicated to have a ceiling sound barrier, provide fixture attenuators over light fixtures and other ceiling penetrations, and provide nominal 4" thick acoustical blanket insulation adjacent to partitions, laid on top of ceilng extending 3 feet out from partition in both directions.

1.2.2 Ceiling Sound Absorption

Determine NRC in accordance with ASTM C 423 Test Method.

1.2.3 Light Reflectance

Determine light reflectance factor in accordance with ASTM E 1477 Test Method.

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Approved Detail Drawings;

Drawings showing suspension system, method of anchoring and fastening, details, and reflected ceiling plan.

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 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
Acoustic Ceiling Tiles;

Two samples of each type of acoustical unit and each type of suspension grid tee section showing texture, finish, and color.

SD-06 Test Reports

Ceiling Attenuation Class and Test;

Manufuacturer's data attesting that acoustical ceiling systems meet specified sound transmission requirements.

SD-07 Certificates

Acoustical Units
Acoustic Ceiling Tiles

Certificate attesting that the mineral based acoustical units furnished for the project contain recycled material and showing an estimated percent of such material.

1.4 DELIVERY, STORAGE. AND HANDLING

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.

1.8 EXTRA MATERIALS

Furnish 10 spare tiles, from the same lot as those installed, of each color and type installed.

PART 2 PRODUCTS

2.1 ACOUSTICAL UNITS

Conform acoustical units to ASTM E 1264, Class A, and the following

requirements:

2.1.1 Affirmative Procurement

Mineral Wool, Cellulose, and Laminated Paperboard used in acoustic ceiling tiles are materials listed in the EPA's Comprehensive Procurement Guidelines (CPG) (http://www.epa.gov/cpg/). EPA's recommended Recovered Materials Content Levels for Mineral Wool, Cellulose, Structural Fiberboard and Laminated Paperboard are:

Product	Material	Percent of Post Consumer Materials	Percent of Total Recovered Materials
Laminate Paperboard	Post Consumer Paper	100	100
Rock Wool	Slag	75	
Cellulose	Post Consumer Paper	75	75

a. The recommended recovered materials content levels are based on the weight (not volume) of materials in the insulating core only.

b. For informational purposes, a list of known sources for acoustical ceiling tiles using recycled material is provided in the EPA/CPG Supplier database at http://www.ergweb2.com/cpg4review/user/cpg_search.cfm.

c. Note that the Contractor is not limited to these sources. A product meeting CPG recycle requirements from other sources may be submitted for the Government's approval.

d. Submit recycled material content data for acoustic ceiling tiles indicating compliance with affirmative procurement.

e. Submit total weight and volume quantities of acoustic ceiling tiles with recycle material.

2.1.2 Units for Exposed-Grid System

a. Type: III (non-asbestos mineral fiber with painted finish).

b. Flame Spread: Class A, 25 or less

c. Pattern: Fissured.

d. Minimum NRC: 0.55 when tested on mounting Type E-400 of ASTM E 795.

e. Minimum Light Reflectance Coefficient: LR-1, 0.82 or greater.

f. Nominal size: 24 by 24 inch.

g. Edge detail: Angled Tegular.

h. Finish: Factory-applied standard finish.

i. Minimum CAC: 33.

i. Weight: Units shall weigh 1 psf or greater.

j. Decription: Angled Tegular edged, 5/8" fissured panel.

Basis of design is Armstrong commercial ceiling tile, Cortega Lay-in #816. Equal products by other manufacturer's that meet the specified standards are acceptable.

2.2 SUSPENSION SYSTEM

Provide standard exposed-grid suspension system conforming to ASTM C 635/C 635M for heavy-duty systems. Provide surfaces exposed to view of aluminum or steel 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 standard corners. 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. Conform seismic details to the guidance in UFC 3-310-04 and ASTM E 580/E 580M.

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, zinc-coated steel wire.

2.4 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.

2.5 COLORS AND PATTERNS

Use standard white color and standard pattern for acoustical units and suspension system components.

PART 3 EXECUTION

3.1 INSTALLATION

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 metal or wood roof 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 required for fire resistance rating. Units shall weigh 1 psf or greater or include hold-down clips.

3.2 CEILING ACCESS PANELS

Locate panels for ceiling access to equipment 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.

At completion of project, contractor shall inspect all ceilings and replace damaged or discolored tiles. Replacement tile shall not reduce the number of extra materials and tiles that are specified to be provided to government.

-- End of Section --

SECTION 09 67 23.13

STANDARD RESINOUS FLOORING

08/10

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 D2240	(2005; R 2010) Standard Test Method for Rubber Property - Durometer Hardness
ASTM D4259	(1988; R 2006) Standard Practice for Abrading Concrete

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Installation Drawings

SD-03 Product Data

Manufacturer's Catalog Data

Epoxy Undercoat

Urethane Mortar

Flakes

Urethane Sealer

SD-04 Samples

Hardboard Mounted Epoxy Flooring

SD-05 Design Data

Physical Properties

Design Mix Data

Urethane Mortar

SD-06 Test Reports

Records of Inspection

SD-07 Certificates

Listing of Product Installations

Referenced Standards Certificates

Warranty

1.3 ADMINISTRATIVE REQUIREMENTS

Submit installation drawings for heavy duty epoxy flooring systems clearly designating the areas of application.

1.3.1 Product Data

Within 30 days of contract award, submit manufacturer's catalog data for the following items:

a. Urethane Mortar

b. Epoxy Undercoat

c. Flakes

d. Urethane Sealer

1.3.2 Design Mix Data

Within 30 days of contract award, submit design mix data for the following items, including a complete list of ingredients and admixtures:

a. Urethane Mortar

b. Epoxy Undercoat

c. Urethane Sealer

Ensure applicable test reports verify the mix has been successfully tested and meets design requirements.

1.4 QUALITY ASSURANCE

Prior to commencement of work, submit referenced standards certificates for the following, showing conformance with the referenced standards contained in this section:

a. Urethane Mortar

b. Epoxy Undercoat

c. Flakes

d. Urethane Sealer

Submit a sample records of inspection plan, including the records of corrective action to be taken.

1.4.1 Qualifications

Submit a listing of product installations for heavy duty epoxy flooring including identification of at least 5 units, similar to those proposed for use, that have been in successful service for a minimum period of 5 years. Identify purchaser, address of installation, service organization, and date of installation.

Ensure floor system applicators are experienced in the application of troweled urethane flakes aggregate thin-set floor topping.

1.4.2 Sampling

Submit hardboard mounted epoxy flooring samples not less than 12 inch square for each required color.

Provide panels showing nominal thickness of finished toppings, color, and texture of finished surfaces. Finished floor toppings and the approved samples are to match in color and texture.

1.5 DELIVERY, HANDLING, AND STORAGE

Protect materials from weather, soil, and damage during delivery, storage, and construction. Deliver materials in original packages, containers, or bundles bearing brand name and name of material.

Maintain materials used in the installation of floor topping at a temperature between 65 and 85 degrees F.

PART 2 PRODUCTS

2.1 RESINOUS FLOORING

Resinous Flooring shal be a nominal 3/16 inch (5mm) thick system comprised of a penetrating three-component urethae primer, a high performance four-component mortar consisting of urethane resin, curing agent, selected, graded aggregates and inorganic pigments, two-component epoxy undercoat, brightly colored 1/16 inch flake broadcast, and two coats of a high performance two-component clear urethane sealer.

2.1.1 Physical Properties

Provide flooring system in which physical properties of topping, including aggregate, when tested in accordance with standards or procedures referenced below, are as follows:

PROPERTY	TEST METHOD	REQUIREMENT
Compressive strength	ASTM C579	10,000 psi
Tensile strength	ASTM C307	1,750 psi

PROPERTY	TEST METHOD	REQUIREMENT
Flexural strength	ASTM C580	4,300 psi
Hardness, Shore D	ASTM D2240	85 - 90
Bond strength	ASTM D4541	>400 psi (100% concrete failure
Impact resistance	ASTM D4226	>160 inch lbs.
Abrasion resistance	ASTM D4060 Taber Agrader CS-17 wheel	0.1 gm max. weight loss
Coefficient of friction	ASTM D2047	0.65 - 0.79
Cure rate at 77 degree F 8 hours for foot traffic 12 hours for normal operations		

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Safety Precautions

Prior to application in confined spaces of toppings and coatings containing flammable or toxic properties, provide forced ventilation to ensure that vapor concentration is kept at acceptable limits recommended by the manufacturer of the product.

Erect "NO SMOKING" signs, and prohibit smoking or use of spark- or flame-producing devices within 50 feet of any mixing or placing operation involving flammable materials.

Provide personnel required to handle, mix, or apply toppings containing toxic or flammable properties with such items of personal protective equipment and apparel for eye, skin, and respiratory protection as are recommended by the manufacturer of the product. Ensure all personnel are trained in the appropriate use and wearing of personal protection equipment.

Accomplish sand blasting under approved controlled conditions with respect to sand and dust control to prevent damage to personnel and facility.

3.2 PREPARATION

Prior to applying resinous flooring material, inspect substrate and immediately report any unsatisfactory conditions that exist and repair.

3.2.1 Concrete Subfloor

3.2.1.1 New Concrete Floors

Do not commence installation of floor topping until concrete has cured a minimum of 28 calendar days. Verify concrete floor is straight, properly sloped, and has suface type finish as recommended by manufacturer. Ensure concrete is moist cured with burlap or polyethylene. Do not use curing agents, methods, or materials which prevent proper bonding of resinous flooring. Prior to applying the prime coat, clean concrete surface by an approved method.

3.2.1.2 Existing Concrete Floors

Clean existing concrete floors, with hard troweled or contaminated areas in conformance with ASTM D4259, and ensure concrete is free of all paint, sealers, curing agents, oil, grease, moisture, dirt or any other contaminants. Remove any loose or corroded segments of existing concrete and patch with a grouting compound as recommended by the resinous flooring manufacturer. Prepare concrete with mechanical means and include use of a scabbler, scarifier, or shot blast machine for removal of bond inhibiting materials such as curing compounds or laitance. Fill all cracks with an elastomeric jointing compound compatible with the resinous flooring system used.

3.2.2 Protection

In addition to the protection of adjacent surfaces during installation, provide areas used to store and mix materials with a protective covering under the materials. After application of the sealer coats, protect finished flooring during the remainder of the construction period. In areas of expected minimum or moderate traffic, cover floors with 70-pound kraft paper, a 30-30-30 waterproof kraft paper, or an approved substitute, with strips taped together and edges secured to prevent roll-up. Place vegetable fiberboard, plywood, or other suitable material that does not mar the flooring over the paper to protect areas used as passages by workmen and areas subject to floor damage because of subsequent building operations. Upon completion of construction, remove the protection, clean flooring and, where necessary, repair, reseal, or both, at no additional cost to the Government.

3.3 APPLICATION

General: Apply each component of resinous flooring system in compliance with manufacturer's direction to produce a uniform monolithic wearing surface of thickness indicated, uninterrupted except at divider strips, sawn joints or other joints (if any), indicated or required. Temperature and floor condition shall be as stated in manufacturer's written requirments.

Primer: Mix and apply primer over properly prepared substrate with strict adherence to manufacturer's installation procedures and coverage rates. Coordinate timing of primer application with application of troweled mortar to ensure optimum adhesion between resionous flooring materials and

substrate.

Troweled Mortar: Mix mortar material according to manufacturer's recommended procedures. Uniformly spread mortar over substrate using manufacturer's specially designed screed box adjusted to manufacturer's recommended height. Hand trowel apply mixed material over freshly primed substrate using steel finishing trowels or power trowel material.

Undercoat: Remove any surface irregularities by lightly abrading and vacuuming the floor surface. Mix and apply aundercoat with strict adjearance to manufacturer's installatin procedures and coverage rates.

Broadcast: Immediately broadcast colored flakes into the undercoat by hand to refusal. Strict adherence to manufacturer's installation procedures and coverage rates is imperative.

Sealer: Remove excess unbonded flakes by lightly brushing and vacuuming the floor surface. Mix and apply sealer with strict adherence to manufacturer's installation procedures.

Sanding: Lightly sand the floor with 80 grit sandpaper on a rotary sander. Remove all dust by vacuuming the floor surface.

Second Sealer Coat: Mix and apply sealer with strict adherence to manufacturer's installation installation procedures.

3.4 FIELD QUALITY CONTROL

3.4.1 Repairing

Remove and replace damaged or unacceptable portions of completed work with new work to match adjacent surfaces at no additional cost to the Government.

3.5 CLEANING

Cure resinous flooring materials in compliance with manufacturer's directions, taking care to prevent contamination during each stage of application and prior to completion of curing process. Close aea of application for a minimum of 24 hours.

Protect resinous flooring materials from damage and wear during construction operations. Provide temporary covering in accordance with manufacturer's recommendations, if necessary. Contractor is responsible for protection of flooring and cleaning.

Cleaning: Remove temporary protection. Clean resinous flooring just prior to final inspection. Use cleaning materials and procedures as directed by flooring manufacturer.

3.6 WARRANTY

Submit a 2 year written warranty for all materials and installation work to the Contracting Officer.

-- End of Section --

SECTION 09 90 00

PAINTS AND COATINGS

05/11

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 0100	(2001; Supplements 2002-2008) Documentation of the Threshold Limit Values and Biological Exposure Indices

ASTM INTERNATIONAL (ASTM)

ASTM D235	(2002; R 2007) Mineral Spirits (Petroleum Spirits) (Hydrocarbon Dry Cleaning Solvent)
ASTM D2824	(2006) Aluminum-Pigmented Asphalt Roof Coatings, Non-Fibered, Asbestos Fibered, and Fibered without Asbestos
ASTM D4214	(2007) Standard Test Method for Evaluating the Degree of Chalking of Exterior Paint Films
ASTM D4263	(1983; R 2005) Indicating Moisture in Concrete by the Plastic Sheet Method
ASTM D4444	(2008) Use and Calibration of Hand-Held Moisture Meters
ASTM D523	(2008) Standard Test Method for Specular Gloss
ASTM D6386	(2010) Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting
ASTM F 1869	(2011) Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

MASTER PAINTERS INSTITUTE (MPI)

MPI 1	(Oct 2009) Aluminum Paint
MPI 10	(Oct 2009) Exterior Latex, Flat, MPI Gloss Level 1

MPI 101	(Oct 2009) Epoxy Anti-Corrosive Metal Primer
MPI 107	(Oct 2009) Rust Inhibitive Primer (Water-Based)
MPI 108	(Oct 2009) High Build Epoxy Coating, Low Gloss
MPI 11	(Oct 2009) Exterior Latex, Semi-Gloss, MPI Gloss Level 5
MPI 113	(Oct 2009) Exterior Pigmented Elastomeric Coating (Water Based)
MPI 116	(Oct 2009) Epoxy Block Filler
MPI 119	(Oct 2009) Exterior Latex, Gloss
MPI 13	(Oct 2009) Exterior Solvent-Based Semi-Transparent Stain
MPI 134	(Oct 2009) Galvanized Primer (Waterbased)
MPI 138	(Oct 2009) Interior High Performance Latex, MPI Gloss Level 2
MPI 139	(Oct 2009) Interior High Performance Latex, MPI Gloss Level 3
MPI 140	(Oct 2009) Interior High Performance Latex, MPI Gloss Level 4
MPI 141	(Oct 2009) Interior High Performance Latex MPI Gloss Level 5
MPI 144	(Oct 2009) Institutional Low Odor / VOC Interior Latex, MPI Gloss Level 2
MPI 145	(Oct 2009) Institutional Low Odor / VOC Interior Latex, MPI Gloss Level 3
MPI 146	(Oct 2009) Institutional Low Odor/VOC Interior Latex, MPI Gloss Level 4
MPI 147	(Oct 2009) Institutional Low Odor / VOC Interior Latex, Semi-Gloss, MPI Gloss Level 5
MPI 151	(Oct 2009) Interior W.B. Light Industrial Coating, MPI Gloss Level 3
MPI 153	(Oct 2009) Interior W.B. Light Industrial Coating, Semi-Gloss, MPI Gloss Level 5
MPI 154	(Oct 2009) Interior W.B. Light Industrial Coating, Gloss, MPI Gloss Level 6

MPI 16	(Oct 2009) Exterior Latex-Based Solid Hide Stain
MPI 161	(Oct 2009) Exterior W.B. Light Industrial Coating, MPI Gloss Level 3
MPI 163	(Oct 2009) Exterior W.B. Light Industrial Coating, Semi-Gloss, MPI Gloss Level 5
MPI 164	(Oct 2009) Exterior W.B. Light Industrial Coating, Gloss, MPI Gloss Level 6
MPI 19	(Oct 2009) Inorganic Zinc Rich Primer
MPI 2	(Oct 2009) Aluminum Heat Resistant Enamel (up to 427 C and 800 F
MPI 21	(Oct 2009) Heat Resistant Enamel, Gloss (up to 205 degrees C and 400 degrees F), MPI Gloss Level 6
MPI 22	(Oct 2009) Aluminum Paint, High Heat (up to 590 degrees C and 1100 degrees F.
MPI 23	(Oct 2009) Surface Tolerant Metal Primer
MPI 26	(Oct 2009) Cementitious Galvanized Metal Primer
MPI 27	(Oct 2009) Exterior / Interior Alkyd Floor Enamel, Gloss
MPI 31	(Oct 2009) Polyurethane, Moisture Cured, Clear Gloss
MPI 39	(Oct 2009) Interior Latex-Based Wood Primer
MPI 4	(Oct 2009) Interior/Exterior Latex Block Filler
MPI 42	(Oct 2009) Latex Stucco and Masonry Textured Coating
MPI 44	(Oct 2009) Interior Latex, MPI Gloss Level 2
MPI 45	(Oct 2009) Interior Alkyd Primer Sealer
MPI 46	(Oct 2009) Interior Enamel Undercoat
MPI 47	(Oct 2009) Interior Alkyd, Semi-Gloss, MPI Gloss Level 5
MPI 48	(Oct 2009) Interior Alkyd, Gloss, MPI Gloss Level 6
MPI 49	(Oct 2009) Interior Alkyd, Flat, MPI Gloss Level 1

MPI 5	(Oct 2009) Exterior Alkyd Wood Primer
MPI 50	(Oct 2009) Interior Latex Primer Sealer
MPI 51	(Oct 2009) Interior Alkyd, Eggshell, MPI Gloss Level 2
MPI 52	(Oct 2009) Interior Latex, MPI Gloss Level 3
MPI 54	(Oct 2009) Interior Latex, Semi-Gloss, MPI Gloss Level 5
MPI 56	(Oct 2009) Interior Oil Modified Urethane Clear Gloss
MPI 57	(Oct 2009) Interior Oil Modified Urethane Clear Satin
MPI 59	(Oct 2009) Interior/Exterior Floor Enamel, Low Gloss
MPI 6	(Oct 2009) Exterior Latex Wood Primer
MPI 60	(Oct 2009) Interior/Exterior Latex Floor Paint, Low Gloss
MPI 68	(Oct 2009) Interior/Exterior Latex Floor Enamel, Gloss
MPI 7	(Oct 2009) Exterior Oil Wood Primer
MPI 71	(Oct 2009) Polyurethane, Moisture Cured, Clear, Flat
MPI 72	(Oct 2009) Polyurethane, Two Component, Pigmented, Gloss
MPI 77	(Oct 2009) Epoxy Gloss
MPI 79	(Oct 2009) Alkyd Anti-Corrosive Metal Primer
MPI 8	(Oct 2009) Exterior Alkyd, Flat, MPI Gloss Level I
MPI 9	(Oct 2009) Exterior Alkyd, Gloss, MPI Gloss Level 6
MPI 90	(Oct 2009) Interior Wood Stain, Semi-Transparent
MPI 94	(Oct 2009) Exterior Alkyd, Semi-Gloss, MPI Gloss Level 5
MPI 95	(Oct 2009) Quick Drying Primer for Aluminum

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS SP-01	(2000) Environmentally Preferable Product Specification for Architectural and Anti-Corrosive Paints

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC Guide 6	(2004) Guide for Containing Surface Preparation Debris Generated During Paint Removal Operations
SSPC Guide 7	(2004; E 2004) Guide to the Disposal of Lead-Contaminated Surface Preparation Debris
SSPC PA 1	(2000; E 2004) Shop, Field, and Maintenance Painting of Steel
SSPC PA Guide 3	(1982; E 1995) A Guide to Safety in Paint Application
SSPC Paint 18	(1982; E 2004) Chlorinated Rubber Intermediate Coat Paint
SSPC SP 1	(1982; E 2004) Solvent Cleaning
SSPC SP 10/NACE No. 2	(2007) Near-White Blast Cleaning
SSPC SP 12/NACE No.5	(2002) Surface Preparation and Cleaning of Metals by Waterjetting Prior to Recoating
SSPC SP 2	(1982; E 2004) Hand Tool Cleaning
SSPC SP 3	(1982; E 2004) Power Tool Cleaning
SSPC SP 6/NACE No.3	(2007) Commercial Blast Cleaning
SSPC SP 7/NACE No.4	(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) Guide and Reference Photographs for Steel Surfaces Prepared by Hand and Power Tool Cleaning
SSPC VIS 4/NACE VIS 7	(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; Errata 1-2010; Changes 1-3 2010; Changes 4-6 2011) Safety and Health Requirements Manual

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-PRF-680	(2010; Rev C) Degreasing Solvent
MIL-STD-101	(1970; 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 1910.1025	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-02 Shop Drawings

Piping identification

Submit color stencil codes

SD-03 Product Data

Coating

Manufacturer's Technical Data Sheets

Indicate VOC content.

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

Qualification Testing laboratory for coatings

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.

SD-11 Closeout Submittals

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 on a minimum of five similar projects within the past two 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.

1.4.1.2 Testing Procedure

Provide Batch Quality Conformance Testing for specified products, as defined by and performed by MPI. As an alternative to Batch Quality Conformance Testing, the Contractor may provide Qualification Testing for specified products above to the appropriate MPI product specification, using the third-party laboratory approved under the paragraph "Qualification Testing" laboratory for coatings. The qualification testing lab report shall include the backup data and summary of the test results. The summary shall list all of the reference specification requirements and the result of each test. The summary shall clearly indicate whether the tested paint meets each test requirement. Note that Qualification Testing may take 4 to 6 weeks to perform, due to the extent of testing required.

Submit name, address, telephone number, FAX number, and e-mail address of the independent third party laboratory selected to perform testing of

coating samples for compliance with specification requirements. Submit documentation that laboratory is regularly engaged in testing of paint samples for conformance with specifications, and that employees performing testing are qualified. If the Contractor chooses MPI to perform the Batch Quality Conformance testing, the above submittal information is not required, only a letter is required from the Contractor stating that MPI will perform the testing.

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 0100 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 GOVERNMENT SAFETY 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 0100, 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. Additional guidance is given in SSPC Guide 6 and SSPC Guide 7. Testing samples did not indicate LBP, but due to the age of the building contractor should take necessary precautions for employee safety. Contractor to coordinate paint preparation activities with this specification section.

e. Not used.

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, unless humidity level is high enough to prohibit proper drying of paint. If high humidity is a problem, condition space as recommended by manufacturer.

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, including gypsum board, carpets, ceiling panels, and similar materials.

1.10 COLOR SELECTION

Colors of finish coats shall be as indicated or specified. Where not indicated or specified, colors shall be selected by the Contracting Officer. Manufacturers' names and color identification are used for the purpose of color identification only. Named products are acceptable for use only if they conform to specified requirements. Products of other manufacturers are acceptable if the colors approximate colors indicated and the product conforms to specified requirements.

Tint each coat progressively darker to enable confirmation of the number of coats.

Color, texture, and pattern of wall coating systems shall be as directed by Contracting Officer. Colors stated in drawings and specifications are typically for reference only and final selection shall be by Contracting Officer.

1.11 LOCATION AND SURFACE TYPE TO BE PAINTED

1.11.1 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.

1.11.1.1 Exterior Painting

Includes new surfaces, existing coated surfaces, and existing uncoated

surfaces, of the building and appurtenances. Also included are existing coated surfaces made bare by cleaning operations.

1.11.1.2 Interior Painting

Includes new surfaces, existing uncoated surfaces, and existing coated surfaces of the buildings 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 painted metal deck; and

b. Other contiguous surfaces.

1.11.2 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.

f. The exposed underside of galvanized roof decking if it has not been previously painted.

g. Pre-finished surfaces.

1.11.3 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.

1.11.3.1 Fire Extinguishing Sprinkler Systems

Clean, pretreat, prime, and paint 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.

1.11.4 Exterior Painting of Site Work Items

Field coat the following items:

New Surfaces	Existing Surfaces
a. None	None
b. _____	_____
c. _____	_____

1.11.5 Definitions and Abbreviations

1.11.5.1 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.

1.11.5.2 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.

1.11.5.3 DFT or dft

Dry film thickness, the film thickness of the fully cured, dry paint or coating.

1.11.5.4 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.

1.11.5.5 EPP

Environmentally Preferred Products, a standard for determining environmental preferability in support of Executive Order 13101.

1.11.5.6 EXT

MPI short term designation for an exterior coating system.

1.11.5.7 INT

MPI short term designation for an interior coating system.

1.11.5.8 micron / microns

The metric measurement for 0.001 mm or one/one-thousandth of a millimeter.

1.11.5.9 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.

1.11.5.10 mm

The metric measurement for millimeter, 0.001 meter or one/one-thousandth of a meter.

1.11.5.11 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 at 60 degrees	Units at 85 degrees
G1	Matte or Flat	0 to 5	10 max

Gloss Level	Description	Units at 60 degrees	Units at 85 degrees
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 D523. Historically, the Government has used Flat (G1 / G2), Eggshell (G3), Semi-Gloss (G5), and Gloss (G6).

1.11.5.12 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.

1.11.5.13 Paint

See Coating definition.

1.11.5.14 REX

MPI short term designation for an exterior coating system used in repainting projects or over existing coating systems.

1.11.5.15 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. 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 D235. 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 or damaged during construction 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 D4214, 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 D4214, 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 where rust shows through existing coatings.

d. Surfaces designated by the Contracting Officer.

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/NACE No.3, or SSPC SP 10/NACE No. 2. Brush-off blast remaining surface in accordance with SSPC SP 7/NACE No.4; Water jetting to SSPC SP 12/NACE No.5 WJ-4 may be used to remove loose coating and other loose materials. Use inhibitor as recommended by coating manufacturer to prevent premature rusting. 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/NACE No.3/SSPC SP 12/NACE No.5 WJ-3 or SSPC SP 10/NACE No. 2/ SSPC SP 12/NACE No.5 WJ-2.

c. Metal Floor Surfaces to Receive Nonslip Coating: Clean in accordance with SSPC SP 10/NACE No. 2 or SSPC SP 12/NACE No.5 WJ-2.

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/NACE No.4, SSPC SP 6/NACE No.3, and SSPC SP 10/NACE No. 2. 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/NACE No.5. As a visual reference, cleaned surfaces shall be similar to photographs in SSPC VIS 4/NACE VIS 7.

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 D6386, 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/NACE No.5 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.

c. Galvanized With Severe Deteriorated Coating or Severe Rusting: Water jet to SSPC SP 12/NACE No.5 WJ3 degree of cleanliness. Or, spot abrasive blast rusted areas as described for steel in SSPC SP 6/NACE No.3, and waterjet to SSPC SP 12/NACE No.5, WJ3 to remove existing coating.

3.3.4 Non-Ferrous Metallic Surfaces

Aluminum and aluminum-alloy, lead, copper, and other nonferrous metal surfaces.

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 Terne-Coated Metal Surfaces

Solvent clean surfaces with mineral spirits, ASTM D235. Wipe dry with clean, dry cloths.

3.3.6 Existing Surfaces with a Bituminous or Mastic-Type Coating

Remove chalk, mildew, and other loose material by washing with a solution of 1/2 cup trisodium phosphate, 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 1/2 cup trisodium phosphate, 1/4 cuphousehold 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 1/2 cup trisodium phosphate, 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 D4263 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 D4263. New plaster to be coated shall have a maximum moisture content of 8 percent, when measured in accordance with ASTM D4444, 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.

3.4.3 Existing Asbestos Cement Surfaces

Remove oily stains by solvent cleaning with mineral spirits, MIL-PRF-680, ASTM D235. Remove loose dirt, dust, and other deleterious substances by brushing with a soft brush or rubbing with a dry cloth prior to application of the first coat material. Do not wire brush or clean using other abrasive methods. Surfaces shall be dry and clean prior to application of the coating.

3.5 PREPARATION OF WOOD AND PLYWOOD SURFACES

3.5.1 New, Existing Uncoated, and Existing Coated 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. Scrape to remove loose coatings. Lightly sand to roughen the entire area of previously enamel-coated wood surfaces.

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 D4444, 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 and Fire, Smoke, Water, and Color Marker Stained Existing Coated Surface: 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 wood doors, windows, frames, and trim before wood becomes dirty, warped, or weathered.

3.5.2 Wood Floor Surfaces, Natural Finish

a. Initial Surface Cleaning: As specified in paragraph entitled "Surface Preparation."

b. Existing Loose Boards and Shoe Molding: Before sanding, renail loose boards. Countersink nails and fill with an approved wood filler. Remove shoe molding before sanding and reinstall after completing other work. At Contractor's option, new shoe molding may be provided in lieu of reinstalling old. New wood molding shall be same size, wood species, and finish as the existing.

c. Sanding and Scraping: Sanding of wood floors is specified in Section 09 64 29 WOOD STRIP FLOORING or 09 64 66 WOOD ATHLETIC FLOORING. Floors of oak or similar open-grain wood shall be filled with wood filler recommended by the finish manufacturer and the excess filler removed.

d. Final Cleaning: After sanding, sweep and vacuum floors clean. Do not walk on floors thereafter until specified sealer has been applied and is dry.

3.5.3 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.

e. Floors: For nonslip surfacing on level floors, as the intermediate coat is applied, cover wet surface completely with almandite garnet, Grit No. 36, with maximum passing U.S. Standard Sieve No. 40 less than 0.5 percent. When the coating is dry, use a soft bristle broom to sweep up excess grit, which may be reused, and vacuum up remaining residue before application of the topcoat. For nonslip surfacing on ramps, provide MPI 77 with non-skid additive, applied by roller in accordance with manufacturer's instructions.

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	
EXTERIOR	
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
INTERIOR	
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

Table	
Division 10.	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.

d. Wood Floors to Receive Natural Finish: Thin first coat 2 to 1 using thinner recommended by coating manufacturer. Apply all coatings at rate of 300 to 350 square feet per gallon. Apply second coat not less than 2 hours and not over 24 hours after first coat has been applied. Apply with lambs wool applicators or roller as recommended by coating manufacturer. Buff or lightly sand between intermediate coats as recommended by coating 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. Set aside extra paint for future color matches or reuse by the Government.

3.13 PAINT TABLES

All DFT's are minimum values. Use only materials having a minimum MPI "Environmentally Friendly" E1 or better rating based on VOC (EPA Method 24) content levels. 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

HL4>DIVISION 3: EXTERIOR CONCRETE PAINT TABLE		
A. New and uncoated existing and Existing, previously painted concrete; vertical surfaces, including undersides of balconies and soffits but excluding tops of slabs:		
1. Latex		
New; MPI EXT 3.1A-G2 (Flat) / Existing; MPI REX 3.1A-G2 (Flat)		
Primer: MPI 10	Intermediate: MPI 10	Topcoat: MPI 10
System DFT: 3.5 mils		
New; MPI EXT 3.1A-G5 (Semigloss) / Existing; MPI EXT 3.1A-G5 (Semigloss)		
Primer: MPI 11	Intermediate: MPI 11	Topcoat: MPI 11
System DFT: 3.5 mils		
New; MPI EXT 3.1A-G6 (Gloss) / Existing; MPI REX 3.1A-G6 (Gloss)		
Primer: MPI 119	Intermediate: MPI 119	Topcoat: MPI 119
Primer as recommended by manufacturer. Topcoat: Coating to match adjacent surfaces.		
B. New and uncoated existing and Existing, previously painted concrete, textured system; vertical surfaces, including undersides of balconies and soffits but excluding tops of slabs:		
1. Latex Aggregate		
New; MPI EXT 3.1B-G2 (Flat) / Existing; MPI REX 3.1B-G2 (Flat)		
Primer: MPI 42	Intermediate: MPI 10	Topcoat: MPI 10
System DFT: Per Manufacturer		
New; MPI EXT 3.1B-G5 (Semigloss) / Existing; MPI REX 3.1B-G5 (Semigloss)		
Primer: MPI 42	Intermediate: MPI 11	Topcoat: MPI 11

HL4>DIVISION 3: EXTERIOR CONCRETE PAINT TABLE		
System DFT: Per Manufacturer		
New; MPI EXT 3.1B-G6 (Gloss) / Existing; MPI REX 3.1B-G6 (Gloss)		
Primer: MPI 42	Intermediate: MPI 119	Topcoat: MPI 119
System DFT: Per Manufacturer		
Texture - Medium. Surface preparation and number of coats in accordance with manufacturer's instructions. Topcoat: Coating to match adjacent surfaces.		
C. New and uncoated existing and Existing, previously painted concrete, elastomeric System; vertical surfaces, including undersides of balconies and soffits but excluding tops of slabs:		
1. Elastomeric Coating		
New; MPI EXT 3.1F / Existing; MPI REX 3.1F		
Primer: Per Manufacturer	Intermediate: MPI 113	Topcoat: MPI 113
System DFT: 16 mils		
Primer as recommended by manufacturer. Topcoat: Coating to match adjacent surfaces. Surface preparation and number of coats in accordance with manufacturer's instructions.		
NOTE: Apply sufficient coats of MPI 113 to achieve a minimum dry film thickness of 16 mils.		
D. New and uncoated existing and Existing, previously painted concrete: walls and bottom of swimming pools.		
1. Chlorinated Rubber		
New; / Existing;		
Primer: SSPC Paint 18	Intermediate: SSPC Paint 18	Topcoat: SSPC Paint 18
System DFT: Per Manufacturer		
NOTE: Thin first coat (primer) with 1 part of approved thinner to 4 parts of paint by volume.		

HL4>DIVISION 3: EXTERIOR CONCRETE PAINT TABLE		
E. New and Existing Cementitious composition board (including Asbestos cement board):		
1. Latex		
New; MPI EXT 3.3A-G5 (Semigloss) / Existing; MPI REX 3.3A-G5 (Semigloss)		
Primer: MPI 11	Intermediate: MPI 11	Topcoat: MPI 11
System DFT: 4.5 mils		
New; MPI EXT 3.3A-G6 (Gloss) / Existing; MPI REX 3.3A-G6 (Gloss)		
Primer: MPI 119	Intermediate: MPI 119	Topcoat: MPI 119
System DFT: 4.5 mils		
Topcoat: Coating to match adjacent surfaces.		

DIVISION 4: EXTERIOR CONCRETE MASONRY UNITS PAINT TABLE			
A. New and Existing concrete masonry on uncoated surface:			
1. Latex			
New; MPI EXT 4.2A-G1 (Flat) / Existing; MPI REX 4.2A-G1 (Flat)			
Block Filler: MPI 4	Primer: N/A	Intermediate: MPI 10	Topcoat: MPI 10
System DFT: 11 mils			

DIVISION 4: EXTERIOR CONCRETE MASONRY UNITS PAINT TABLE			
New; MPI EXT 4.2A-G5 (Semigloss) / Existing; MPI REX 4.2A-G5 (Semigloss)			
Block Filler: MPI 4	Primer: N/A	Intermediate: MPI 11	Topcoat: MPI 11
System DFT: 11 mils			
New; MPI EXT 4.2A-G6 (Gloss) / Existing; MPI REX 4.2A-G6 (Gloss)			
Block Filler: MPI 4	Primer: N/A	Intermediate: MPI 119	Topcoat: MPI 119
Topcoat: Coating to match adjacent surfaces.			
B. New and Existing concrete masonry, textured system; on uncoated surface:			
1. Latex Aggregate			
New; MPI EXT 4.2B-G1 (Flat) / Existing; MPI REX 4.2B-G1 (Flat)			
Primer: MPI 42	Intermediate: MPI 42	Topcoat: MPI 10	
System DFT: Per Manufacturer			
New; MPI EXT 4.2B-G5 (Semigloss) / Existing; MPI REX 4.2B-G5 (Semigloss)			
Primer: MPI 42	Intermediate: MPI 42	Topcoat: MPI 11	
System DFT: Per Manufacturer			
New; MPI EXT 4.2B-G6 (Gloss) / Existing; MPI REX 4.2B-G6 (Gloss)			
Primer: MPI 42	Intermediate: MPI 42	Topcoat: MPI 119	
System DFT: Per Manufacturer			
Texture - Fine Medium Course. Surface preparation and number of coats in accordance with manufacturer's instructions. Topcoat: Coating to match adjacent surfaces.			
C. New and Existing concrete masonry, elastomeric System; on uncoated surface:			
1. Elastomeric Coating			
New; MPI EXT 4.2D / Existing; MPI REX 4.2D			
Primer: Per Manufacturer	Intermediate: MPI 113	Topcoat: MPI 113	

DIVISION 4: EXTERIOR CONCRETE MASONRY UNITS PAINT TABLE
System DFT: 16 mils
Primer as recommended by manufacturer. Topcoat: Coating to match adjacent surfaces. Surface preparation and number of coats in accordance with manufacturer's instructions.
NOTE: Apply sufficient coats of MPI 113 to achieve a minimum dry film thickness of 16 mils.

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: MPI 23	Intermediate: MPI 94	Topcoat: MPI 94
System DFT: 5.25 mils		
New; MPI EXT 5.1Q-G6 (Gloss) / Existing; MPI REX 5.1D-G6		
Primer: MPI 23	Intermediate: MPI 9	Topcoat: MPI 9
System DFT: 5.25 mils		
B. New Steel that has been blast-cleaned to SSPC SP 6/NACE No.3:		
1. Alkyd		
New; MPI EXT 5.1D-G5 (Semigloss) / Existing; MPI REX 5.1D-G5		
Primer: MPI 79	Intermediate: MPI 94	Topcoat: MPI 94
System DFT: 5.25 mils		
New; MPI EXT 5.1D-G6 (Gloss) / Existing; MPI REX 5.1D-G6		

DIVISION 5: EXTERIOR METAL, FERROUS AND NON-FERROUS PAINT TABLE		
Primer: MPI 79	Intermediate: MPI 9	Topcoat: MPI 9
System DFT: 5.25 mils		
C. Existing steel that has been spot-blasted to SSPC SP 6/NACE No.3:		
1. Surface previously coated with alkyd or latex:		
Waterborne Light Industrial Coating		
MPI REX 5.1C-G5 (Semigloss)		
Spot Primer: MPI 79	Intermediate: MPI 163	Topcoat: MPI 163
System DFT: 5 mils		
MPI REX 5.1C-G6 (Gloss)		
Spot Primer: MPI 79	Intermediate: MPI 164	Topcoat: MPI 164
System DFT: 5 mils		
2. Surface previously coated with epoxy:		
Waterborne Light Industrial		
a. MPI REX 5.1L-G5 (Semigloss)		
Spot Primer: MPI 101	Intermediate: MPI 163	Topcoat: MPI 163
System DFT: 5 mils		
MPI REX 5.1L-G6 (Gloss)		
Spot Primer: MPI 101	Intermediate: MPI 164	Topcoat: MPI 164
System DFT: 5 mils		
Pigmented Polyurethane		
b. MPI REX 5.1H-G6 (Gloss)		

DIVISION 5: EXTERIOR METAL, FERROUS AND NON-FERROUS PAINT TABLE		
Spot Primer: MPI 101	Intermediate: MPI 108	Topcoat: MPI 72
System DFT: 8.5 mils		
D. New and existing steel blast cleaned to SSPC SP 10/NACE No. 2:		
1. Waterborne Light Industrial		
MPI EXT 5.1R-G5 (Semigloss)		
Primer: MPI 101	Intermediate: MPI 108	Topcoat: MPI 163
System DFT: 8.5 mils		
MPI EXT 5.1R-G6 (Gloss)		
Primer: MPI 101	Intermediate: MPI 108	Topcoat: MPI 164
System DFT: 8.5 mils		
2. Pigminted Polyurethane		
2. Pigmented Polyurethane		
MPI EXT 5.1J-G6 (Gloss)		
Primer: MPI 101	Intermediate: MPI 108	Topcoat: MPI 72
System DFT: 8.5 mils		
E. Metal floors (non-shop-primed surfaces or non-slip deck surfaces) with non-skid additive (NSA), load at manufacturer's recommendations:		
1. Alkyd Floor Enamel		
MPI EXT 5.1S-G6 (Gloss)		
Primer: MPI 79	Intermediate: MPI 27	Topcoat: MPI 27 (plus NSA)
System DFT: 5.25 mils		
EXTERIOR GALVANIZED SURFACES		

DIVISION 5: EXTERIOR METAL, FERROUS AND NON-FERROUS PAINT TABLE		
F. New Galvanized surfaces:		
1. Cementitious primer / Latex		
MPI EXT 5.3A-G1 (Flat)		
Primer: MPI 26	Intermediate: MPI 10	Topcoat: MPI 10
System DFT: 4.5 mils		
MPI EXT 5.3A-G5 (Semigloss)		
Primer: MPI 26	Intermediate: MPI 11	Topcoat: MPI 11
System DFT: 4.5 mils		
MPI EXT 5.3A-G6 (Gloss)		
Primer: MPI 26	Intermediate: MPI 119	Topcoat: MPI 119
System DFT: 4.5 mils		
2. Waterborne Primer / Latex		
MPI EXT 5.3H-G1 (Flat)		
Primer: MPI 134	Intermediate: MPI 10	Topcoat: MPI 10
System DFT: 4.5 mils		
MPI EXT 5.3H-G5 (Semigloss)		
Primer: MPI 134	Intermediate: MPI 11	Topcoat: MPI 11
System DFT: 4.5 mils		
MPI EXT 5.3H-G6 (Gloss)		
Primer: MPI 134	Intermediate: MPI 119	Topcoat: MPI 119
System DFT: 4.5 mils		
3. Waterborne Primer / Waterborne Light Industrial Coating		

DIVISION 5: EXTERIOR METAL, FERROUS AND NON-FERROUS PAINT TABLE		
MPI EXT 5.3J-G5 (Semigloss)		
Primer: MPI 134	Intermediate: MPI 163	Topcoat: MPI 163
System DFT: 4.5 mils		
MPI EXT 5.3J-G6 (Gloss)		
Primer: MPI 134	Intermediate: MPI 164	Topcoat: MPI 164
System DFT: 4.5 mils		
4. Epoxy Primer / Waterborne Light Industrial Coating		
MPI EXT 5.3K-G5 (Semigloss)		
Primer: MPI 101	Intermediate: MPI 163	Topcoat: MPI 163
System DFT: 5 mils		
MPI EXT 5.3K-G6 (Gloss)		
Primer: MPI 101	Intermediate: MPI 164	Topcoat: MPI 164
System DFT: 5 mils		
5. Pigmented Polyurethane		
MPI EXT 5.3L-G6 (Gloss)		
Primer: MPI 101	Intermediate: N/A	Topcoat: MPI 72
System DFT: 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: MPI 134	Intermediate: N/A	Topcoat: MPI 163

DIVISION 5: EXTERIOR METAL, FERROUS AND NON-FERROUS PAINT TABLE		
System DFT: 4.5 mils		
2. Pigmented Polyurethane		
MPI REX 5.3D-G6 (Gloss)		
Primer: MPI 101	Intermediate: N/A	Topcoat: MPI 72
System DFT: 5 mils		
H. Galvanized surfaces with severely deteriorated coating or rusting:		
1. Waterborne Light Industrial Coating		
MPI REX 5.3L-G5 (Semigloss)		
Primer: MPI 101	Intermediate: MPI 108	Topcoat: MPI 163
System DFT: 8.5 mils		
MPI REX 5.3L-G6 (Gloss)		
Primer: MPI 101	Intermediate: MPI 108	Topcoat: MPI 164
System DFT: 8.5 mils		
2. Pigmented Polyurethane		
MPI REX 5.3K-G6 (Gloss)		
Primer: MPI 101	Intermediate: MPI 108	Topcoat: MPI 72
System DFT: 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-G1 (Flat)		
Primer: MPI 95	Intermediate: MPI 8	Topcoat: MPI 8

DIVISION 5: EXTERIOR METAL, FERROUS AND NON-FERROUS PAINT TABLE		
System DFT: 5 mils		
MPI EXT 5.4F-G5 (Semigloss)		
Primer: MPI 95	Intermediate: MPI 94	Topcoat: MPI 94
System DFT: 5 mils		
MPI EXT 5.4F-G6 (Gloss)		
Primer: MPI 95	Intermediate: MPI 9	Topcoat: MPI 9
System DFT: 5 mils		
2. Waterborne Light Industrial Coating		
MPI EXT 5.4G-G3 (Eggshell)		
Primer: MPI 95	Intermediate: MPI 161	Topcoat: MPI 161
System DFT: 5 mils		
MPI EXT 5.4G-G5 (Semigloss)		
Primer: MPI 95	Intermediate: MPI 163	Topcoat: MPI 163
System DFT: 5 mils		
MPI EXT 5.4G-G6 (Gloss)		
Primer: MPI 95	Intermediate: MPI 164	Topcoat: MPI 164
System DFT: 5 mils		
J. Existing roof surfaces previously coated:		
1. Aluminum Pigmented Asphalt Roof Coating		
ASTM D2824: Sufficient coats to provide not less than 8 mils of finished coating system (without asbestos fibers).		
2. Aluminum Paint		

DIVISION 5: EXTERIOR METAL, FERROUS AND NON-FERROUS PAINT TABLE		
MPI REX 10.2D		
Primer: MPI 107	Intermediate: MPI 1	Topcoat: MPI 1
System DFT: 3.5 mils		
K. Surfaces adjacent to painted surfaces; Mechanical, Electrical, Fire extinguishing sprinkler systems including valves, conduit, hangers, supports,exposed copper piping, 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-G1 (Flat)		
Primer: MPI 79	Intermediate: MPI 8	Topcoat: MPI 8
System DFT: 5.25 mils		
MPI EXT 5.1D-G5 (Semigloss)		
Primer: MPI 79	Intermediate: MPI 94	Topcoat: MPI 94
System DFT: 5.25 mils		
MPI EXT 5.1D-G6 (Gloss)		
Primer: MPI 79	Intermediate: MPI 9	Topcoat: MPI 9
System DFT: 5.25 mils		
2. Waterborne Light Industrial Coating		
MPI EXT 5.1C-G3 (Eggshell)		
Primer: MPI 79	Intermediate: MPI 161	Topcoat: MPI 161
System DFT: 5 mils		
MPI EXT 5.1C-G5 (Semigloss)		
Primer: MPI 79	Intermediate: MPI 163	Topcoat: MPI 163

DIVISION 5: EXTERIOR METAL, FERROUS AND NON-FERROUS PAINT TABLE		
System DFT: 5 mils		
MPI EXT 5.1C-G6 (Gloss)		
Primer: MPI 79	Intermediate: MPI 164	Topcoat: MPI 164
System DFT: 5 mils		
L. Hot metal surfaces including smokestacks subject to temperatures up to 400 degrees F.		
1. Heat Resistant Enamel		
MPI EXT 5.2A		
Primer: MPI 21	Intermediate: Surface preparation and number of coats per manufacturer's instructions.	Topcoat: Surface preparation and number of coats per manufacturer's instructions.
System DFT: Per Manufacturer		
M. Ferrous metal subject to high temperature, up to 750 degrees F:		
1. Inorganic Zinc Rich Coating		
MPI EXT 5.2C		
Primer: MPI 19	Intermediate: Surface preparation and number of coats per manufacturer's instructions.	Topcoat: Surface preparation and number of coats per manufacturer's instructions.
System DFT: Per Manufacturer		
2. Heat Resistant Aluminum Enamel		
MPI EXT 5.2B (Aluminum Finish)		
Primer: MPI 2	Intermediate: Surface preparation and number of coats per manufacturer's instructions.	Topcoat: Surface preparation and number of coats per manufacturer's instructions.

DIVISION 5: EXTERIOR METAL, FERROUS AND NON-FERROUS PAINT TABLE		
System DFT: Per Manufacturer		
N. New surfaces and Existing surfaces made bare cleaning to SSPC SP 10/NACE No. 2 subject to temperatures up to 1100 degrees F:		
1. Heat Resistant Coating		
MPI EXT 5.2D		
Primer: MPI 22	Intermediate: Surface preparation and number of coats per manufacturer's instructions.	Topcoat: Surface preparation and number of coats per manufacturer's instructions.
System DFT: Per Manufacturer		

DIVISION 6: EXTERIOR WOOD; DRESSED LUMBER, PANELING, DECKING, SHINGLES PAINT TABLE		
A. New and existing, uncoated Dressed lumber, Wood and plywood, trim, including top, bottom and edges of doors not otherwise specified:		
1. Alkyd		
MPI EXT 6.3B-G5 (Semigloss)		
Primer: MPI 7	Intermediate: MPI 94	Topcoat: MPI 94
System DFT: 5 mils		
MPI EXT 6.3B-G6 (Gloss)		
Primer: MPI 7	Intermediate: MPI 9	Topcoat: MPI 9
System DFT: 5 mils		
2. Latex		
MPI EXT 6.3A-G1 (Flat)		
Primer: MPI 7	Intermediate: MPI 10	Topcoat: MPI 10
MPI EXT 6.3A-G5 (Semigloss)		

DIVISION 6: EXTERIOR WOOD; DRESSED LUMBER, PANELING, DECKING, SHINGLES PAINT TABLE		
Primer: MPI 7	Intermediate: MPI 11	Topcoat: MPI 11
System DFT: 5 mils		
MPI EXT 6.3A-G6 (Gloss)		
Primer: MPI 7	Intermediate: MPI 119	Topcoat: MPI 119
System DFT: 5 mils		
3. Waterborne Solid Color Stain		
MPI EXT 6.3K		
Primer: MPI 7	Intermediate: MPI 16	Topcoat: MPI 16
System DFT: 4.25 mils		
B. Existing, dressed lumber, Wood and plywood, trim including top, bottom and edges of doors previously coated with an alkyd / oil based finish coat not otherwise specified:		
1. Alkyd		
MPI REX 6.3B-G5 (Semigloss)		
Primer: MPI 5	Intermediate: MPI 94	Topcoat: MPI 94
System DFT: 5 mils		
MPI REX 6.3B-G6 (Gloss)		
Primer: MPI 5	Intermediate: MPI 9	Topcoat: MPI 9
System DFT: 5 mils		
2. Latex		
MPI REX 6.3A-G1 (Flat)		
Primer: MPI 5	Intermediate: MPI 10	Topcoat: MPI 10
System DFT: 5 mils		
MPI REX 6.3A-G5 (Semigloss)		
Primer: MPI 5	Intermediate: MPI 11	Topcoat: MPI 11

DIVISION 6: EXTERIOR WOOD; DRESSED LUMBER, PANELING, DECKING, SHINGLES PAINT TABLE		
System DFT: 5 mils		
MPI REX 6.3A-G6 (Gloss)		
Primer: MPI 5	Intermediate: MPI 119	Topcoat: MPI 119
System DFT: 5 mils		
C. Existing, dressed lumber, Wood and plywood, trim, including top, bottom and edges of doors previously coated with a latex / waterborne finish coat not otherwise specified:		
1. Latex		
MPI REX 6.3L-G1 (Flat)		
Primer: MPI 6	Intermediate: MPI 10	Topcoat: MPI 10
System DFT: 5 mils		
MPI REX 6.3L-G5 (Semigloss)		
Spot Primer: MPI 6	Intermediate: MPI 11	Topcoat: MPI 11
System DFT: 4.5 mils		
MPI REX 6.3L-G6 (Gloss)		
Spot Primer: MPI 6	Intermediate: MPI 119	Topcoat: MPI 119
System DFT: 4.5 mils		
2. Waterborne Solid Color Stain		
MPI REX 6.3K (Stain)		
Spot Primer: MPI 6	Intermediate: MPI 16	Topcoat: MPI 16
System DFT: 4 mils		
D. New, Uncoated wood siding:		
1. Semi-Transparent Stain		
MPI EXT 6.3D		
Spot Primer: N/A	Intermediate: MPI 13	Topcoat: MPI 13
System DFT: N/A		

DIVISION 6: EXTERIOR WOOD; DRESSED LUMBER, PANELING, DECKING, SHINGLES PAINT TABLE		
E. Existing, previously stained wood siding:		
1. Latex		
MPI REX 6.2K-G1 (Flat)		
Primer: MPI 5	Intermediate: MPI 10	Topcoat: MPI 10
System DFT: 4.5 mils		
MPI REX 6.2K-G5 (Semigloss)		
Primer: MPI 5	Intermediate: MPI 11	Topcoat: MPI 11
System DFT: 4.5 mils		
F. Existing Uncoated or previously semitransparent stained wood siding:		
1. Semi-Transparent Stain		
MPI REX 6.3D		
Spot Primer: N/A	Intermediate: MPI 13	Topcoat: MPI 13
System DFT: Per Manufacturer		
G. Wood: Steps, platforms, floors of open porches, and with non-skid additive (NSA), load at manufacturer's recommendations.:		
1. Latex Floor Paint		
MPI EXT 6.3A-G2 (Flat)		
Primer: MPI 5	Intermediate: MPI 60 plus NSA	Topcoat: MPI 60 plus NSA
System DFT: 4.5 mils		
MPI EXT 6.5A-G6 (Gloss)		
Primer: MPI 5	Intermediate: MPI 68 plus NSA	Topcoat: MPI 68 plus NSA
System DFT: 4.5 mils		
2. Alkyd Floor Paint		

DIVISION 6: EXTERIOR WOOD; DRESSED LUMBER, PANELING, DECKING, SHINGLES PAINT TABLE		
MPI EXT 6.5B-G2 (Flat)		
Primer: MPI 59	Intermediate: MPI 59 plus NSA	Topcoat: MPI 59 plus NSA
System DFT: 5 mils		
MPI EXT 6.5B-G6 (Gloss)		
Primer: MPI 27	Intermediate: MPI 27 plus NSA	Topcoat: MPI 27 plus NSA
System DFT: 5 mils		

DIVISION 9: EXTERIOR STUCCO PAINT TABLE		
A. New and Existing stucco:		
1. Latex		
New; MPI EXT 9.1A-G1 (Flat) / Existing; MPI REX 9.1A-G2 (Flat)		
Primer: MPI 10	Intermediate: MPI 10	Topcoat: MPI 10
System DFT: 4.5 mils		
New; MPI EXT 9.1A-G5 (Semigloss) / Existing; MPI REX 9.1A-G5 (Semigloss)		
Primer: MPI 11	Intermediate: MPI 11	Topcoat: MPI 11
System DFT: 4.5 mils		
New; MPI EXT 9.1A-G6 (Gloss) / Existing; MPI REX 9.1A-G6 (Gloss)		
Primer: MPI 119	Intermediate: MPI 119	Topcoat: MPI 119
System DFT: 4.5 mils		
Primer as recommended by manufacturer. Topcoat: Coating to match adjacent surfaces. On existing stucco, apply primer based on surface condition.		

DIVISION 9: EXTERIOR STUCCO PAINT TABLE		
B. New and Existing stucco, elastomeric system:		
1. Elastomeric Coating		
New; MPI EXT 9.1C / Existing; MPI REX 9.1C		
Primer: See note below.	Intermediate: MPI 113	Topcoat: MPI 113
System DFT: 16 mils		
Provide Primer recommended by manufacturer. Topcoat: Coating to match adjacent surfaces. Surface preparation, primer and 2 coats in accordance with manufacturer's instructions.		
NOTE: Apply sufficient coats of MPI 113 to achieve a minimum dry film thickness of 16 mils.		

DIVISION 10: EXTERIOR CLOTH COVERINGS AND BITUMINOUS COATED SURFACES PAINT TABLE		
A. Insulation and surfaces of insulation coverings (canvas, cloth, paper): (Interior and Exterior Applications)		
1. Latex		
MPI EXT 10.1A-G1 (Flat)		
Primer: N/A	Intermediate: MPI 10	Topcoat: MPI 10
System DFT: 3.2 mils		
MPI EXT 10.1A-G5 (Semigloss)		
Primer: N/A	Intermediate: MPI 11	Topcoat: MPI 11
System DFT: 3.2 mils		
MPI EXT 10.1A-G6 (Gloss)		
Primer: N/A	Intermediate: MPI 119	Topcoat: MPI 119
System DFT: 3.2 mils		
Topcoat: Coating to match adjacent surfaces.		

3.13.2 INTERIOR PAINT TABLES

DIVISION 3: INTERIOR CONCRETE PAINT TABLE		
A. New and uncoated existing and Existing, previously painted concrete; vertical surfaces, not specified otherwise:		
1. Latex		
New; MPI INT 3.1A-G2 (Flat) / Existing; MPI RIN 3.1A-G2 (Flat)		
Primer: MPI 50	Intermediate: MPI 44	Topcoat: MPI 44
System DFT: 4 mils		
New; MPI INT 3.1A-G3 (Eggshell) / Existing; MPI RIN 3.1A-G3 (Eggshell)		
Primer: MPI 50	Intermediate: MPI 52	Topcoat: MPI 52
New; MPI INT 3.1A-G5 (Semigloss) / Existing; MPI RIN 3.1A-G5 (Semigloss)		
Primer: MPI 50	Intermediate: MPI 54	Topcoat: MPI 54
System DFT: 4 mils		
2. High Performance Architectural Latex		
New; MPI INT 3.1C-G2 (Flat) / Existing; MPI RIN 3.1J-G2 (Flat)		
Primer: MPI 50	Intermediate: MPI 138	Topcoat: MPI 138
System DFT: 4 mils		
New; MPI INT 3.1C-G3 (Eggshell) / Existing; MPI RIN 3.1J-G3 (Eggshell)		
Primer: MPI 50	Intermediate: MPI 139	Topcoat: MPI 139
System DFT: 4 mils		
New; MPI INT 3.1C-G4 (Satin) / Existing; MPI RIN 3.1J-G4		
Primer: MPI 50	Intermediate: MPI 140	Topcoat: MPI 140
System DFT: 4 mils		
New; MPI INT 3.1C-G5 (Semigloss) / Existing; MPI RIN 3.1J-G5 (Semigloss)		
Primer: MPI 50	Intermediate: MPI 141	Topcoat: MPI 141
System DFT: 4 mils		

DIVISION 3: INTERIOR CONCRETE PAINT TABLE		
3. Institutional Low Odor / Low VOC Latex		
New; MPI INT 3.1M-G2 (Flat) / Existing; MPI RIN 3.1L-G2 (Flat)		
Primer: MPI 50	Intermediate: MPI 144	Topcoat: MPI 144
System DFT: 4 mils		
New; MPI INT 3.1M-G3 (Eggshell) / Existing; MPI RIN 3.1L-G3 (Eggshell)		
Primer: MPI 50	Intermediate: MPI 145	Topcoat: MPI 145
System DFT: 4 mils		
New; MPI INT 3.1M-G4 (Satin) / Existing; MPI RIN 3.1L-G4		
Primer: MPI 50	Intermediate: MPI 146	Topcoat: MPI 146
System DFT: 4 mils		
New; MPI INT 3.1M-G5 (Semigloss) / Existing; MPI RIN 3.1L-G5 (Semogloss)		
Primer: MPI 50	Intermediate: MPI 147	Topcoat: MPI 147
System DFT: 4 mils		
B. Concrete ceilings, uncoated:		
1. Latex Aggregate		
MPI INT 3.1N		
Primer: N/A	Intermediate: N/A	Topcoat: MPI 42
System DFT: Per Manufacturer		
Texture - Fine Medium Coarse. Surface preparation, number of coats, and primer in accordance with manufacturer's instructions. Topcoat: Coating to match adjacent surfaces.		
C. New and uncoated existing and Existing, previously painted Concrete in toilets, food-preparation, food-serving, restrooms, laundry areas, shower areas, areas requiring a high degree of sanitation, _____ and other high-humidity areas not otherwise specified except floors:		
1. Waterborne Light Industrial Coating		
New; MPI INT 3.1L-G3 (Eggshell) / Existing; MPI RIN 3.1C-G3 (Eggshell)		
Primer: MPI 151	Intermediate: MPI 151	
System DFT: 4.8 mils		

DIVISION 3: INTERIOR CONCRETE PAINT TABLE		
New; MPI INT 3.1L-G5 (Semigloss) / Existing; MPI RIN 3.1C-G5 (Semigloss)		
Primer: MPI 153	Intermediate: MPI 153	Topcoat: MPI 153
System DFT: 4.8 mils		
New; MPI INT 3.1L-G6 (Gloss) / Existing; MPI RIN 3.1C-G6 (Gloss)		
Primer: MPI 154	Intermediate: MPI 154	Topcoat: MPI 154
System DFT: 4.8 mils		
2. Alkyd		
New; MPI INT 3.1D-G3 (Eggshell) / Existing; RIN 3.1D-G3 (Eggshell)		
Primer: MPI 50	Intermediate: MPI 51	Topcoat: MPI 51
System DFT: 4.5 mils		
New; MPI INT 3.1D-G5 (Semigloss) / Existing; RIN 3.1D-G5 (Semigloss)		
Primer: MPI 50	Intermediate: MPI 47	Topcoat: MPI 47
System DFT: 4.5 mils		
New; MPI INT 3.1D-G6 (Gloss) / Existing; RIN 3.1D-G6 (Gloss)		
Primer: MPI 50	Intermediate: MPI 48	Topcoat: MPI 48
System DFT: 4.5 mils		
3. Epoxy		
New; MPI INT 3.1F-G6 (Gloss) / Existing; MPI RIN 3.1E-G6 (Gloss)		
Primer: MPI 77	Intermediate: MPI 77	Topcoat: MPI 77
System DFT: 4 mils		
Note: Primer may be reduced for penetration per manufacturer's instructions.		
D. New and uncoated existing and Existing, previously painted concrete: walls and bottom of swimming pools.		
1. Chlorinated Rubber		

DIVISION 3: INTERIOR CONCRETE PAINT TABLE		
Primer: SSPC Paint 18	Intermediate: SSPC Paint 18	Topcoat: SSPC Paint 18
System DFT: Per Manufacturer		
Note: Primer may be reduced for penetration per manufacturer's instructions.		
2. Epoxy		
New; MPI INT 3.1F / Existing; MPI RIN 3.1E		
Primer: MPI 77	Intermediate: MPI 77	Topcoat: MPI 77
System DFT: 4 mils		
Note: Primer may be reduced for penetration per manufacturer's instructions.		
E. New and uncoated existing and Existing, previously painted concrete floors in following areas _____:		
1. Latex Floor Paint		
New; MPI INT 3.2A-G2 (Flat) / Existing; MPI RIN 3.3A-G2 (Flat)		
Primer: MPI 60	Intermediate: MPI 60	Topcoat: MPI 60
System DFT: 5 mils		
2. Alkyd Floor Paint		
New; MPI INT 3.2B-G2 (Flat) / Existing; MPI RIN 3.2B-G2 (Flat)		
Primer: MPI 59	Intermediate: MPI 59	Topcoat: MPI 59
System DFT: 5 mils		
3. Epoxy		
New; MPI INT 3.2C-G6 (Gloss) / Existing; MPI REX 3.2C-G6 (Gloss)		
Primer: MPI 77	Intermediate: MPI 77	Topcoat: MPI 77
System DFT: 5 mils		
Note: Primer may be reduced for penetration per manufacturer's instructions.		

DIVISION 4: INTERIOR CONCRETE MASONRY UNITS PAINT TABLE			
A. New and uncoated Existing Concrete masonry:			
1. High Performance Architectural Latex			
MPI INT 4.2D-G2 (Flat)			
Filler: MPI 4	Primer: N/A	Intermediate: MPI 138	Topcoat: MPI 138
System DFT: 11 mils			
MPI INT 4.2D-G3 (Eggshell)			
Filler: MPI 4	Primer: N/A	Intermediate: MPI 139	
System DFT: 11 mils			
MPI INT 4.2D-G4 (Satin)			
Filler: MPI 4	Primer: N/A	Intermediate: MPI 140	Topcoat: MPI 140
System DFT: 11 mils			
MPI INT 4.2D-G5 (Semigloss)			
Filler: MPI 4	Primer: N/A	Intermediate: MPI 141	Topcoat: MPI 141
System DFT: 11 mils			
Fill all holes in masonry surface			
2. Institutional Low Odor / Low VOC Latex			
New; MPI INT 4.2E-G2 (Flat)			
Filler: MPI 4	Primer: N/A	Intermediate: MPI 144	
System DFT: 4 mils			
New; MPI INT 4.2E-G3 (Eggshell)			

DIVISION 4: INTERIOR CONCRETE MASONRY UNITS PAINT TABLE			
Filler: MPI 4	Primer: N/A	Intermediate: MPI 145	Topcoat: MPI 145
System DFT: 4 mils			
New; MPI INT 4.2E-G4 (Satin)			
Filler: MPI 4	Primer: N/A	Intermediate: MPI 146	
System DFT: 4 mils			
New; MPI INT 4.2E-G5 (Semigloss)			
Filler: MPI 4	Primer: N/A	Intermediate: MPI 147	Topcoat: MPI 147
System DFT: 4 mils			
B. Existing, previously painted Concrete masonry:			
1. High Performance Architectural Latex			
MPI RIN 4.2K-G2 (Flat)			
Spot Primer: MPI 50	Intermediate: MPI 138		Topcoat: MPI 138
System DFT: 4.5 mils			
MPI RIN 4.2K-G3 (Eggshell)			
Spot Primer: MPI 50	Intermediate: MPI 139		Topcoat: MPI 139
System DFT: 4.5 mils			
MPI RIN 4.2K-G4			
Spot Primer: MPI 50	Intermediate: MPI 140		Topcoat: MPI 140
System DFT: 4.5 mils			
MPI RIN 4.2K-G5 (Semigloss)			

DIVISION 4: INTERIOR CONCRETE MASONRY UNITS PAINT TABLE			
Spot Primer: MPI 50	Intermediate: MPI 141		Topcoat: MPI 141
System DFT: 4.5 mils			
2. Institutional Low Odor / Low VOC Latex			
Existing; MPI RIN 4.2L-G2 (Flat)			
Spot Primer: MPI 50	Intermediate: MPI 144		Topcoat: MPI 144
System DFT: 4 mils			
Existing; MPI RIN 4.2L-G3 (Eggshell)			
Spot Primer: MPI 50	Intermediate: MPI 145		
System DFT: 4 mils			
Existing; MPI RIN 4.2L-G4 (Satin)			
Spot Primer: MPI 50	Intermediate: MPI 146		Topcoat: MPI 146
System DFT: 4 mils			
Existing; MPI RIN 4.2L-G5 (Semigloss)			
Spot Primer: MPI 50	Intermediate: MPI 147		Topcoat: MPI 147
System DFT: 4 mils			
C. New and uncoated Existing Concrete masonry units in toilets, food-preparation, food-serving, restrooms, laundry areas, shower areas, areas requiring a high degree of sanitation, _____, and other high humidity areas unless otherwise specified:			
1. Waterborne Light Industrial Coating			
MPI INT 4.2K-G3(Eggshell)			
Filler: MPI 4	Primer: N/A	Intermediate: MPI 151	Topcoat: MPI 151
System DFT: 11 mils			
MPI INT 4.2K-G5(Semigloss)			

DIVISION 4: INTERIOR CONCRETE MASONRY UNITS PAINT TABLE			
Filler: MPI 4	Primer: N/A	Intermediate: MPI 153	Topcoat: MPI 153
System DFT: 11 mils			
MPI INT 4.2K-G6(Gloss)			
Filler: MPI 4	Primer: N/A	Intermediate: MPI 154	Topcoat: MPI 154
System DFT: 11 mils			
Fill all holes in masonry surface			
2. Alkyd			
MPI INT 4.2N-G3 (Eggshell)			
Filler: MPI 4	Primer: MPI 50	Intermediate: MPI 51	Topcoat: MPI 51
System DFT: 12 mils			
MPI INT 4.2N-G5 (Semigloss)			
Filler: MPI 4	Primer: MPI 50	Intermediate: MPI 47	Topcoat: MPI 47
System DFT: 12 mils			
MPI INT 4.2N-G6 (Gloss)			
Filler: MPI 4	Primer: MPI 50	Intermediate: MPI 48	Topcoat: MPI 48
System DFT: 12 mils			
Fill all holes in masonry surface			
3. Epoxy			
Filler: MPI 116	Primer: N/A	Intermediate: MPI 77	Topcoat: MPI 77
System DFT: 10 mils			
Fill all holes in masonry surface			

DIVISION 4: INTERIOR CONCRETE MASONRY UNITS PAINT TABLE		
D. Existing, previously painted, concrete masonry units in toilets, food-preparation, food-serving, restrooms, laundry areas, shower areas, areas requiring a high degree of sanitation, , and other high humidity areas unless otherwise specified:		
1. Waterborne Light Industrial Coating		
MPI RIN 4.2G-G3(Eggshell)		
Spot Primer: MPI 151	Intermediate: MPI 151	Topcoat: MPI 151
System DFT: 4.5 mils		
MPI RIN 4.2G-G5(Semigloss)		
Spot Filler: MPI 153	Intermediate: MPI 153	Topcoat: MPI 153
System DFT: 4.5 mils		
MPI RIN 4.2G-G6(Gloss)		
Spot Primer: MPI 154	Intermediate: MPI 154	Topcoat: MPI 154
System DFT: 4.5 mils		
2. Alkyd		
MPI RIN 4.2C-G3 (Eggshell)		
Spot Primer: MPI 50	Intermediate: MPI 51	Topcoat: MPI 51
System DFT: 4.5 mils		
MPI RIN 4.2C-G5 (Semigloss)		
Spot Primer: MPI 50	Intermediate: MPI 47	Topcoat: MPI 47
System DFT: 4.5 mils		
MPI RIN 4.2C-G6 (Gloss)		
Spot Primer: MPI 50	Intermediate: MPI 48	Topcoat: MPI 48
System DFT: 4.5 mils		

DIVISION 4: INTERIOR CONCRETE MASONRY UNITS PAINT TABLE		
3. Epoxy		
MPI RIN 4.2D-G6 (Gloss)		
Spot Primer: MPI 77	Intermediate: MPI 77	Topcoat: MPI 77
System DFT: 5 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), exposed copper piping, and miscellaneous metal items not otherwise specified except floors, hot metal surfaces, and new prefinished equipment:		
1. High Performance Architectural Latex		
MPI INT 5.1R-G2 (Flat)		
Primer: MPI 138	Intermediate: MPI 138	Topcoat: MPI 138
System DFT: 5 mils		
MPI INT 5.1R-G3 (Eggshell)		
Primer: MPI 79	Intermediate: MPI 139	Topcoat: MPI 139
System DFT: 5 mils		
MPI INT 5.1R-G5 (Semigloss)		
Primer: MPI 79	Intermediate: MPI 141	Topcoat: MPI 141
System DFT: 5 mils		
2. Alkyd		
MPI INT 5.1E-G2 (Flat)		
Primer: MPI 79	Intermediate: MPI 49	Topcoat: MPI 49
System DFT: 5.25 mils		
MPI INT 5.1E-G3 (Eggshell)		
Primer: MPI 79	Intermediate: MPI 51	Topcoat: MPI 51
System DFT: 5.25 mils		
MPI INT 5.1E-G5 (Semigloss)		
Primer: MPI 79	Intermediate: MPI 47	Topcoat: MPI 47

DIVISION 5: INTERIOR METAL, FERROUS AND NON-FERROUS PAINT TABLE		
INTERIOR STEEL / FERROUS SURFACES		
System DFT: 5.25 mils		
MPI INT 5.1E-G6 (Gloss)		
Primer: MPI 79	Intermediate: MPI 48	Topcoat: MPI 48
System DFT: 5.25 mils		
B. Metal floors (non-shop-primed surfaces or non-slip deck surfaces) with non-skid additive (NSA), load at manufacturer's recommendations:		
1. Alkyd Floor Paint		
MPI INT 5.1U-G6 (Gloss)		
Primer: MPI 79	Intermediate: MPI 27	Topcoat: MPI 27 (plus NSA)
System DFT: 5.25 mils		
2. Epoxy		
MPI INT 5.1L-G6 (Gloss)		
Primer: MPI 101	Intermediate: MPI 77	Topcoat: MPI 77 (plus NSA)
System DFT: 5.25 mils		
C. Metal in toilets, food-preparation, food-serving, restrooms, laundry areas, shower areas, 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-G3 (Eggshell)		
Primer: MPI 79	Intermediate: MPI 51	Topcoat: MPI 51
System DFT: 5.25 mils		
MPI INT 5.1E-G5 (Semigloss)		
Primer: MPI 79	Intermediate: MPI 47	Topcoat: MPI 47
System DFT: 5.25 mils		
MPI INT 5.1E-G6 (Gloss)		
Primer: MPI 79	Intermediate: MPI 48	Topcoat: MPI 48
System DFT: 5.25 mils		
2. Alkyd		
MPI INT 5.1T-G3 (Eggshell) For hand tool cleaning		
Primer: MPI 23	Intermediate: MPI 51	Topcoat: MPI 51

DIVISION 5: INTERIOR METAL, FERROUS AND NON-FERROUS PAINT TABLE		
INTERIOR STEEL / FERROUS SURFACES		
System DFT: 5.25 mils		
MPI INT 5.1T-G5 (Semigloss)		
Primer: MPI 23	Intermediate: MPI 47	Topcoat: MPI 47
System DFT: 5.25 mils		
MPI INT 5.1T-G6 (Gloss)		
Primer: MPI 23	Intermediate: MPI 48	Topcoat: MPI 48
System DFT: 5.25 mils		
D. Ferrous metal in concealed damp spaces or in exposed areas having unpainted adjacent surfaces as follows:		
1. Aluminum Paint		
MPI INT 5.1M		
Primer: MPI 79	Intermediate: MPI 1	Topcoat: MPI 1
System DFT: 4.25 mils		
E. Miscellaneous non-ferrous metal items not otherwise specified except floors, hot metal surfaces, and new prefinished equipment. Match surrounding finish:		
1. High Performance Architectural Latex		
MPI INT 5.4F-G2 (Flat)		
Primer: MPI 95	Intermediate: MPI 138	Topcoat: MPI 138
System DFT: 5 mils		
MPI INT 5.4F-G3 (Eggshell)		
Primer: MPI 95	Intermediate: MPI 139	Topcoat: MPI 139
System DFT: 5 mils		
MPI INT 5.4F-G4 (Satin)		
Primer: MPI 95	Intermediate: MPI 140	Topcoat: MPI 140
System DFT: 5 mils		
MPI INT 5.4F-G5 (Semigloss)		
Primer: MPI 95	Intermediate: MPI 141	Topcoat: MPI 141
System DFT: 5 mils		
2. Alkyd		

DIVISION 5: INTERIOR METAL, FERROUS AND NON-FERROUS PAINT TABLE		
INTERIOR STEEL / FERROUS SURFACES		
MPI INT 5.4J-G2 (Flat)		
Primer: MPI 95	Intermediate: MPI 49	Topcoat: MPI 49
System DFT: 5 mils		
MPI INT 5.4J-G3 (Eggshell)		
Primer: MPI 95	Intermediate: MPI 51	Topcoat: MPI 51
System DFT: 5 mils		
MPI INT 5.4J-G5 (Semigloss)		
Primer: MPI 95	Intermediate: MPI 47	Topcoat: MPI 47
System DFT: 5 mils		
MPI INT 5.4J-G6 (Gloss)		
Primer: MPI 95	Intermediate: MPI 48	Topcoat: MPI 48
System DFT: 5 mils		
F. Hot metal surfaces including smokestacks subject to temperatures up to 400 degrees F:		
1. Heat Resistant Enamel		
MPI INT 5.2A		
Primer: MPI 21	Intermediate: Surface preparation and number of coats per manufacturer's instructions.	Topcoat: Surface preparation and number of coats per manufacturer's instructions.
System DFT: Per Manufacturer		
G. Ferrous metal subject to high temperature, up to 750 degrees F:		
1. Inorganic Zinc Rich Coating		
MPI INT 5.2C		

DIVISION 5: INTERIOR METAL, FERROUS AND NON-FERROUS PAINT TABLE		
INTERIOR STEEL / FERROUS SURFACES		
Primer: MPI 19	Intermediate: Surface preparation and number of coats per manufacturer's instructions.	Topcoat: Surface preparation and number of coats per manufacturer's instructions.
System DFT: Per Manufacturer		
2. Heat Resistant Aluminum Paint		
MPI INT 5.2B (Aluminum Finish)		
Primer: MPI 2	Intermediate: Surface preparation and number of coats per manufacturer's instructions.	Topcoat: Surface preparation and number of coats per manufacturer's instructions.
System DFT: Per Manufacturer		
H. New surfaces and made bare cleaning to SSPC SP 10/NACE No. 2 subject to temperatures up to 1100 degrees F:		
1. High Heat Resistant Coating		
MPI INT 5.2D		
Primer: MPI 22	Intermediate: Surface preparation and number of coats per manufacturer's instructions.	Topcoat: Surface preparation and number of coats per manufacturer's instructions.
System DFT: Per Manufacturer		

DIVISION 6: INTERIOR WOOD PAINT TABLE		
A. New and Existing, uncoated Wood and plywood not otherwise specified:		
1. High Performance Architectural Latex		
MPI INT 6.4S-G3 (Eggshell)		
Primer: MPI 39	Intermediate: MPI 139	Topcoat: MPI 139

DIVISION 6: INTERIOR WOOD PAINT TABLE		
System DFT: 4.5 mils		
MPI INT 6.4S-G4 (Satin)		
Primer: MPI 39	Intermediate: MPI 140	Topcoat: MPI 140
System DFT: 4.5 mils		
MPI INT 6.4S-G5 (Semigloss)		
Primer: MPI 39	Intermediate: MPI 141	Topcoat: MPI 141
System DFT: 4.5 mils		
2. Alkyd		
MPI INT 6.4B-G3 (Eggshell)		
Primer: MPI 45	Intermediate: MPI 51	Topcoat: MPI 51
System DFT: 4.5 mils		
MPI INT 6.4B-G5 (Semigloss)		
Primer: MPI 45	Intermediate: MPI 47	Topcoat: MPI 47
System DFT: 4.5 mils		
MPI INT 6.4B-G6 (Gloss)		
Primer: MPI 45	Intermediate: MPI 48	Topcoat: MPI 48
System DFT: 4.5 mils		
3. Institutional Low Odor / Low VOC Latex		
New; MPI INT 6.3V-G2 (Flat)		
Primer: MPI 39	Intermediate: MPI 144	Topcoat: MPI 144
System DFT: 4 mils		
New; MPI INT 6.3V-G3 (Eggshell)		
Primer: MPI 39	Intermediate: MPI 145	Topcoat: MPI 145

DIVISION 6: INTERIOR WOOD PAINT TABLE		
System DFT: 4 mils		
New; MPI INT 6.3V-G4		
Primer: MPI 39	Intermediate: MPI 146	Topcoat: MPI 146
System DFT: 4 mils		
New; MPI INT 6.3V-G5 (Semigloss)		
Primer: MPI 39	Intermediate: MPI 147	Topcoat: MPI 147
System DFT: 4 mils		
B. Existing, previously painted Wood and plywood not otherwise specified:		
1. High Performance Architectural Latex		
MPI RIN 6.4B-G3 (Eggshell)		
Primer: MPI 46	Intermediate: MPI 139	Topcoat: MPI 139
System DFT: 4.5 mils		
MPI RIN 6.4B-G4 (Satin)		
Primer: MPI 46	Intermediate: MPI 140	Topcoat: MPI 140
System DFT: 4.5 mils		
MPI RIN 6.4B-G5 (Semigloss)		
Primer: MPI 46	Intermediate: MPI 141	Topcoat: MPI 141
System DFT: 4.5 mils		
2. Alkyd		
MPI RIN 6.4C-G3 (Eggshell)		
Primer: MPI 46	Intermediate: MPI 51	Topcoat: MPI 51
System DFT: 4.5 mils		
MPI RIN 6.4C-G5 (Semigloss)		
Primer: MPI 46	Intermediate: MPI 47	Topcoat: MPI 47
System DFT: 4.5 mils		
MPI RIN 6.4C-G6 (Gloss)		

DIVISION 6: INTERIOR WOOD PAINT TABLE		
Primer: MPI 46	Intermediate: MPI 48	Topcoat: MPI 48
System DFT: 4.5 mils		
3. Institutional Low Odor / Low VOC Latex		
Existing; MPI RIN 6.4D-G2 (Flat)		
Primer: MPI 39	Intermediate: MPI 144	Topcoat: MPI 144
System DFT: 4 mils		
Existing; MPI RIN 6.4D-G3 (Eggshell)		
Primer: MPI 39	Intermediate: MPI 145	Topcoat: MPI 145
System DFT: 4 mils		
Existing; MPI RIN 6.4D-G4		
Primer: MPI 39	Intermediate: MPI 146	Topcoat: MPI 146
System DFT: 4 mils		
Existing; MPI RIN 6.4D-G5 (Semigloss)		
Primer: MPI 39	Intermediate: MPI 147	Topcoat: MPI 147
System DFT: 4 mils		
C. New and Existing, previously finished or stained Wood and Plywood, except floors; natural finish or stained:		
1. Natural finish, oil-modified polyurethane		
New; MPI INT 6.4J-G4 / Existing; MPI RIN 6.4L-G4		
Primer: MPI 57	Intermediate: MPI 57	Topcoat: MPI 57
System DFT: 4 mils		
New; MPI INT 6.4J-G6 (Gloss) / Existing; MPI RIN 6.4L-G6 (Gloss)		
Primer: MPI 56	Intermediate: MPI 56	Topcoat: MPI 56
System DFT: 4 mils		
2. Stained, oil-modified polyurethane		
New; MPI INT 6.4E-G4 / Existing; MPI RIN 6.4G-G4		

DIVISION 6: INTERIOR WOOD PAINT TABLE			
Stain: MPI 90	Primer: MPI 57	Intermediate: MPI 57	Topcoat: MPI 57
System DFT: 4 mils			
New; MPI INT 6.4E-G6 (Gloss) / Existing; MPI RIN 6.4G-G6 (Gloss)			
Stain: MPI 90	Primer: MPI 56	Intermediate: MPI 56	Topcoat: MPI 56
System DFT: 4 mils			
3. Stained, Moisture Cured Urethane			
New; MPI INT 6.4V-G2 (Flat) / Existing; MPI RIN 6.4V-G2 (Flat)			
Stain: MPI 90	Primer: MPI 71	Intermediate: MPI 71	Topcoat: MPI 71
System DFT: 4 mils			
New; MPI INT 6.4V-G6 (Gloss) / Existing; MPI RIN 6.4V-G6 (Gloss)			
Stain: MPI 90	Primer: MPI 31	Intermediate: MPI 31	Topcoat: MPI 31
System DFT: 4 mils			
D. New and Existing, previously finished or stained Wood Floors; Natural finish or stained:			
1. Natural finish, oil-modified polyurethane			
New; MPI INT 6.5C-G6 (Gloss) / Existing; MPI RIN 6.5C-G6 (Gloss)			
Primer: MPI 56	Intermediate: MPI 56	Topcoat: MPI 56	
System DFT: 4 mils			
2. Natural finish, Moisture Cured Polyurethane			
New; MPI INT 6.5K-G6 (Gloss) / Existing; MPI RIN 6.5D-G6 (Gloss)			
Primer: MPI 31	Intermediate: MPI 31	Topcoat: MPI 31	
System DFT: 4 mils			
3. Stained, oil-modified polyurethane			
New; MPI INT 6.5B-G6 (Gloss) / Existing; MPI RIN 6.5B-G6 (Gloss)			

DIVISION 6: INTERIOR WOOD PAINT TABLE			
Stain: MPI 90	Primer: MPI 56	Intermediate: MPI 56	Topcoat: MPI 56
System DFT: 4 mils			
4. Stained, Moisture Cured Polyurethane			
New; MPI INT 6.5J-G6 (Gloss) / Existing; MPI RIN 6.5L-G6 (Gloss)			
Stain: MPI 90	Primer: MPI 31	Intermediate: MPI 31	Topcoat: MPI 31
System DFT: 4 mils			
E. New and Existing, previously coated Wood floors; pigmented finish:			
1. Latex Floor Paint			
New; MPI INT 6.5G-G2 (Flat) / Existing; MPI RIN 6.5J-G2 (Flat)			
Primer: MPI 45	Intermediate: MPI 60	Topcoat: MPI 60	
System DFT: 4.5 mils			
New; MPI INT 6.5G-G6 (Gloss) / Existing; MPI RIN 6.5J-G6 (Gloss)			
Primer: MPI 45	Intermediate: MPI 68	Topcoat: MPI 68	
System DFT: 4.5 mils			
2. Alkyd Floor Paint			
New; MPI INT 6.5A-G2 (Flat) / Existing; MPI RIN 6.5A-G2 (Flat)			
Primer: MPI 59	Intermediate: MPI 59	Topcoat: MPI 59	
System DFT: 4.5 mils			
New; MPI INT 6.5A-G6 (Gloss) / Existing; MPI RIN 6.5A-G6 (Gloss)			
Primer: MPI 27	Intermediate: MPI 27	Topcoat: MPI 27	
System DFT: 4.5 mils			
F. New and Existing, uncoated wood surfaces in toilets, food-preparation, food-serving, restrooms, laundry areas, shower areas, areas requiring a high degree of sanitation, otherwise specified:			

DIVISION 6: INTERIOR WOOD PAINT TABLE		
1. As specified in Section 09 96 59 HIGH-BUILD GLAZE COATINGS.		
2. Waterborne Light Industrial		
MPI INT 6.3P-G5 (Semigloss)		
Primer: MPI 45	Intermediate: MPI 153	Topcoat: MPI 153
System DFT: 4.5 mils		
MPI INT 6.3P-G6 (Gloss)		
Primer: MPI 45	Intermediate: MPI 154	Topcoat: MPI 154
System DFT: 4.5 mils		
3. Alkyd		
MPI INT 6.3B-G5 (Semigloss)		
Primer: MPI 45	Intermediate: MPI 47	Topcoat: MPI 47
System DFT: 4.5 mils		
MPI INT 6.3B-G6 (Gloss)		
Primer: MPI 45	Intermediate: MPI 48	Topcoat: MPI 48
System DFT: 4.5 mils		
G. Existing, previously painted wood surfaces in toilets, food-preparation, food-serving, restrooms, laundry areas, shower areas, areas requiring a high degree of sanitation, otherwise specified:		
1. As specified in Section 09 96 59 HIGH-BUILD GLAZE COATINGS.		
2. Waterborne Light Industrial Coating		
MPI RIN 6.3P-G5 (Semigloss)		
Primer: MPI 46	Intermediate: MPI 153	Topcoat: MPI 153
System DFT: 4.5 mils		
MPI RIN 6.3P-G6 (Gloss)		
Primer: MPI 46	Intermediate: MPI 154	Topcoat: MPI 154
System DFT: 4.5 mils		
3. Alkyd		

DIVISION 6: INTERIOR WOOD PAINT TABLE			
MPI RIN 6.3B-G5 (Semigloss)			
Primer: MPI 46	Intermediate: MPI 47		Topcoat: MPI 47
System DFT: 4.5 mils			
MPI RIN 6.3B-G6 (Gloss)			
Primer: MPI 46	Intermediate: MPI 48		Topcoat: MPI 48
System DFT: 4.5 mils			
H. New and Existing, previously finished or stained Wood Doors; Natural Finish or Stained:			
1. Natural finish, oil-modified polyurethane			
New; MPI INT 6.3K-G4 / Existing; MPI RIN 6.3K-G4			
Primer: MPI 57	Intermediate: MPI 57		Topcoat: MPI 57
System DFT: 4 mils			
New; MPI INT 6.3K-G6 (Gloss) / Existing; MPI RIN 6.3K-G6 (Gloss)			
Primer: MPI 56	Intermediate: MPI 56		Topcoat: MPI 56
System DFT: 4 mils			
Note: Sand between all coats per manufacturers recommendations.			
2. Stained, oil-modified polyurethane			
New; MPI INT 6.3E-G4 / Existing; MPI RIN 6.3E-G4			
Stain: MPI 90	Primer: MPI 57	Intermediate: MPI 57	Topcoat: MPI 57
System DFT: 4 mils			
New; MPI INT 6.3E-G6 (Gloss) / Existing; MPI RIN 6.3E-G6 (Gloss)			
Stain: MPI 90	Primer: MPI 56	Intermediate: MPI 56	Topcoat: MPI 56
System DFT: 4 mils			
Note: Sand between all coats per manufacturers recommendations.			

DIVISION 6: INTERIOR WOOD PAINT TABLE			
3. Stained, Moisture Cured Urethane			
New; MPI INT 6.4V-G2 (Flat) / Existing; MPI RIN 6.4V-G2 (Flat)			
Stain: MPI 90	Primer: MPI 71	Intermediate: MPI 71	Topcoat: MPI 71
System DFT: 4 mils			
New; MPI INT 6.4V-G6 (Gloss) / Existing; MPI RIN 6.4V-G6 (Gloss)			
Stain: MPI 90	Primer: MPI 31	Intermediate: MPI 31	Topcoat: MPI 31
System DFT: 4 mils			
Note: Sand between all coats per manufacturers recommendations.			
I. New and Existing, uncoated Wood Doors; Pigmented finish:			
1. Alkyd			
New; MPI INT 6.3B-G5 (Semigloss)			
Primer: MPI 45	Intermediate: MPI 47	Topcoat: MPI 47	
System DFT: 4.5 mils			
New; MPI INT 6.3B-G6 (Gloss)			
Primer: MPI 45	Intermediate: MPI 48	Topcoat: MPI 48	
System DFT: 4.5 mils			
Note: Sand between all coats per manufacturers recommendations.			
2. Pigmented Polyurethane			
New; MPI INT 6.1E-G6 (Gloss)			
Primer: MPI 72	Intermediate: MPI 72	Topcoat: MPI 72	
System DFT: 4.5 mils			
Note: Sand between all coats per manufacturers recommendations.			
J. Existing, previously painted Wood Doors; Pigmented finish:			
1. Alkyd			
New; MPI RIN 6.3B-G5 (Semigloss)			

DIVISION 6: INTERIOR WOOD PAINT TABLE		
Primer: MPI 46	Intermediate: MPI 47	Topcoat: MPI 47
System DFT: 4.5 mils		
New; MPI RIN 6.3B-G6 (Gloss)		
Primer: MPI 46	Intermediate: MPI 48	Topcoat: MPI 48
System DFT: 4.5 mils		
Note: Sand between all coats per manufacturers recommendations.		

DIVISION 9: INTERIOR PLASTER, GYPSUM BOARD, TEXTURED SURFACES PAINT TABLE		
A. New and Existing, previously painted Plaster and Wallboard not otherwise specified:		
1. Latex		
New; MPI INT 9.2A-G2 (Flat) / Existing; RIN 9.2A-G2 (Flat)		
Primer: MPI 50	Intermediate: MPI 44	Topcoat: MPI 44
System DFT: 4 mils		
New; MPI INT 9.2A-G3 (Eggshell) / Existing; RIN 9.2A-G3 (Eggshell)		
Primer: MPI 50	Intermediate: MPI 52	Topcoat: MPI 52
System DFT: 4 mils		
New; MPI INT 9.2A-G5 (Semigloss) / Existing; RIN 9.2A-G5 (Semigloss)		
Primer: MPI 50	Intermediate: MPI 54	Topcoat: MPI 54
System DFT: 4 mils		
2. High Performance Architectural Latex - High Traffic Areas		
New; MPI INT 9.2B-G2 (Flat) / Existing; MPI RIN 9.2B-G2 (Flat)		
Primer: MPI 50	Intermediate: MPI 138	Topcoat: MPI 138
System DFT: 4 mils		
New; MPI INT 9.2B-G3 (Eggshell) / Existing; MPI RIN 9.2B-G3 (Eggshell)		

DIVISION 9: INTERIOR PLASTER, GYPSUM BOARD, TEXTURED SURFACES PAINT TABLE		
Primer: MPI 50	Intermediate: MPI 139	Topcoat: MPI 139
System DFT: 4 mils		
New; MPI INT 9.2B-G5 (Semigloss) / Existing; MPI RIN 9.2B-G5 (Semigloss)		
Primer: MPI 50	Intermediate: MPI 141	Topcoat: MPI 141
System DFT: 4 mils		
3. Institutional Low Odor / Low VOC Latex		
New; MPI INT 9.2M-G2 (Flat) / Existing; MPI RIN 9.2M-G2 (Flat)		
Primer: MPI 50	Intermediate: MPI 144	Topcoat: MPI 144
System DFT: 4 mils		
New; MPI INT 9.2M-G3 (Eggshell) / Existing; MPI RIN 9.2M-G3 (Eggshell)		
Primer: MPI 50	Intermediate: MPI 145	Topcoat: MPI 145
System DFT: 4 mils		
New; MPI INT 9.2M-G4 (Satin) / Existing; MPI RIN 9.2M-G4 (Satin)		
Primer: MPI 50	Intermediate: MPI 146	Topcoat: MPI 146
System DFT: 4 mils		
New; MPI INT 9.2M-G5 (Semigloss) / Existing; MPI RIN 9.2M-G5 (Semigloss)		
Primer: MPI 50	Intermediate: MPI 147	Topcoat: MPI 147
System DFT: 4 mils		
B. New and Existing, previously painted Plaster and Wallboard in toilets, food-preparation, food-serving, restrooms, laundry areas, shower areas, areas requiring a high degree of sanitation, _____ and other high humidity areas not otherwise specified:		
1. Waterborne Light Industrial Coating		
New; MPI INT 9.2L-G5(Semigloss) / Existing; MPI RIN 9.2L-G5 (Semigloss)		
Primer: MPI 50	Intermediate: MPI 153	Topcoat: MPI 153
System DFT: 4 mils		
2. Alkyd		

DIVISION 9: INTERIOR PLASTER, GYPSUM BOARD, TEXTURED SURFACES PAINT TABLE		
New; MPI INT 9.2C-G5 (Semigloss) / Existing; MPI RIN 9.2C-G5 (Semigloss)		
Primer: MPI 50	Intermediate: MPI 47	Topcoat: MPI 47
System DFT: 4 mils		
3. Epoxy		
New; MPI INT 9.2E-G6 (Gloss) / Existing; MPI RIN 9.2D-G6 (Gloss)		
Primer: MPI 50	Intermediate: MPI 77	Topcoat: MPI 77
System DFT: 4 mils		

3.14 PROJECT PAINT SELECTOR GUIDE

Select paints from the above tables in accordance with the following instructions. For materials or surfaces not addressed herein, provide paint in accordance with manufacturer's recommendations applicable to the material, condition, location, and previous coatings (if any) on the surface in question.

3.14.1 EXTERIOR

As applicable:

Div. 3: Concrete

General application: Elastomeric Coating

Div. 4: Concrete Masonry Units

General application: Block filler, Elastomeric Coating

Div. 5: Metal, Ferrous, and Non-Ferrous

General application: Alkyd, gloss

Galvanized surfaces: Waterborne light industrial coating, gloss

Div. 6: Wood, Dressed Lumber, Paneling, Decking, Shingles

General application: Latex, gloss

Div. 9: Stucco

General application: Elastomeric Coating

Div. 10: Cloth (interior and exterior inusulation coverings)

General application: Latex, semigloss

3.14.2 INTERIOR

Div. 3: Concrete

General application: High Performance Architectural Latex*, semigloss
*if existing surface has alkyd, use alkyd, semigloss

Concrete ceilings: Latex Aggregate, Medium Texture

Sanitary, restrooms, high humidity locations: Alkyd, gloss.

Concrete floors: Polish, apply hardener, Clean and Seal

Div. 4: Concrete Masonry Units

General application: Block filler, High Performance Architectural Latex, semigloss

Sanitary, restrooms, high humidity locations: Alkyd, gloss

Div. 5: Metal, Ferrous, and Non-Ferrous

General application: High Performance Architectural Latex, gloss

Metal floors: Alkyd, gloss

Sanitary, restrooms, high humidiy locations: Alkyd, gloss

Div. 6: Wood

General application and Trim: High Performance Architectural Latex, semigloss

Stained: Natural finish, oil-modified polyurethane

Wood floors: See spec section for wood flooring

Sanitary, restrooms, high humidity locations: Alkyd, gloss

Wood doors: See spec section for wood doors (if applicable)

Div. 9: Plaster, Gypsum Board, Textured Surfaces

General application: High Performance Architectural Latex, eggshell

Sanitary, restrooms, high humidity locations: Alkyd, gloss

3.14.3 GENERAL PROJECT PAINTING NOTES

The PROJECT PAINT SELECTOR GUIDE is to be followed for locations and conditions as described. For locations, surfaces, or conditions not specifically addressed, select product that is most compatible to above selections and in accordance with manufacturer's written recommendations.

If multiple products are appropriate or if there is not a readily appropriate selection, contact the Contracting Officer for a final decision.

Colors are as indicated, see finish schedule, color schedule, and related notes. See Color Schedule on drawings. Contracting Officer reserves the right to select other colors from manufacturer's standard selections. Contracting Officer shall make final decision on colors.

-- 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; Reaffirmed 2009) Designation System for Aluminum Finishes

ASTM INTERNATIONAL (ASTM)

ASTM A 123/A 123M	(2009) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 167	(1999; R 2009) Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM A 385/A 385M	(2009) Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip)
ASTM B 221	(2008) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM B 86	(2010a) Standard Specification for Zinc and Zinc-Aluminum (ZA) Alloy Foundry and Die Castings
ASTM D 1972	(1997; R 2005) Standard Practice for Generic Marking of Plastic Products

INTERNATIONAL CODE COUNCIL (ICC)

ICC/ANSI A117.1	(2003; Errata 2007) Accessible and Usable Buildings and Facilities

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 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 manufacturer's Cleaning and Maintenance Instructions with Fabrication Drawings for review.

1.2.1 Plastic Identification

Verify that plastic products to be incorporated into the project are labeled in accordance with ASTM D 1972. Where products are not labeled, 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.

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Installation Drawings

SD-03 Product Data

Cleaning and Maintenance Instructions
Colors And Finishes
Solid Phenolic Panels
Anchoring Devices and Fasteners
Hardware and Fittings
Brackets
Door Hardware

Toilet Enclosures;
Urinal Screens;

Documentation indicating percentage of post-industrial and

post-consumer recycled content per unit of product. Indicate relative dollar value of recycled content products to total dollar value of products included in project.

SD-04 Samples

Colors and Finishes

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

Warranty

SD-10 Operation and Maintenance Data

Waste Management Plan
Plastic Identification

SD-11 Closeout Submittals

Toilet Enclosures
Urinal Screens

1.4 REGULATORY REQUIREMENTS

Conform to ICC/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 toilet partitions will be free of defects in materials, fabrication, finish, and installation and will remain so for a period of not less than 10 years after completion.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Solid Phenolic Panels

Provide solid phenloic core material with decorative matte finish melamine surface both sides with black phenolic-resin core and integrally bonded. Material shall be compression molded under heat and pressure and shall not

have any glue joints. Edges shall be black. Provide heavy duty commercial quality material and construction.

2.1.2 Anchoring Devices and Fasteners

Provide steel anchoring devices and fasteners hot-dipped galvanized after fabrication, in conformance with ASTM A 385/A 385M and ASTM A 123/A 123M. Conceal all galvanized anchoring devices.

2.1.3 Brackets

Wall brackets shall be two-ear continuous channel style. Provide stirrup style panel-to-pilaster brackets.

2.1.4 Hardware and Fittings

2.1.4.1 General Requirements

Conform hardware for the toilet partition system to CID A-A-60003 for the specified type and style of partitions. Provide hardware finish highly resistant to alkalis, urine, and other common toilet room acids. Comply latching devices and hinges for handicap compartments with 36 CFR 1191; provide stainless steel devices and hinges with door latches that operate without either tight grasping or twisting of the wrist of the operator.

a. Zinc-base alloy shall conform to ASTM B 86, Alloy AC41-A.

b. Aluminum shall conform to ASTM B 221.

e. Corrosion-resistant stainless steel shall conform to ASTM A 167, Type 304.

2.1.4.2 Finishes

a. Aluminum shall have a clear anodic coating conforming to AA DAF-45.

b. Corrosion-resistant stainless steel shall have a satin or brushed finish.

c. Exposed fasteners shall match the hardware and fittings.

2.1.5 Door Hardware

2.1.5.1 Hinges

Hinges shall be adjustable to hold in-swinging doors open at any angle up to 90 degrees and outswinging doors to 10 degrees. Provide self-lubricating hinges with the indicated swing. Hinges shall be the surface-mounted type and have the following type of return movement:

a. Gravity return movement

b. Spring-action cam return movement

2.1.5.2 Latch and Pull

Latch and pull shall be a combination rubber-faced door strike and keeper equipped with emergency access.

2.1.5.3 Coat Hooks

Coat hooks shall be combination units with hooks and rubber tipped pins.

2.2 PARTITION PANELS AND DOORS

Fabricate partition panels not less than 1/2 inch thick.

Fabricate doors, stiles, and pilasters not less than 3/4 inch thick.

2.2.1 Toilet Enclosures

Conform toilet enclosures to CID A-A-60003, Type I, floor mounted overhead braced. Furnish width, length, and height of toilet enclosures as shown. Provide solid phenolic, Finish 4; water resistant; graffiti resistant; non-absorbent. Enclosures shall contain a minimum of 20 percent post-industrial recycled contect. Provide grab bars to withstand a bending stress, shear stress, shear force, and a tensile force induced by 250 lbf. Grab bars shall not rotate within their fittings.

2.2.2 Urinal Screens

Conform urinal screens to CID A-A-60003, Type III, Style E wall hung. Provide solid phenolic, Finish 4, water resistant; graffiti resistant; non-absorbent. Enclosures shall contain a minimum of 20 percent post-industrial recycled contect. Secure wall hung urinal screens with 42 inch long, continuous flanges. Fabricate screens from the same types of panels and pilasters as the toilet partitions. Use corrosion-resistant steel fittings and fasteners.

2.3 OVERHEAD-BRACED PARTITIONS

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. Secure the stirrup to the pilaster with not less than a 3/16 inch bolt and nut after the pilaster is leveled. Secure the stirrup to the floor with not less than two lead expansion shields and sheetmetal screws. Fabricate overhead brace from a continuous extruded aluminum tube not less than 1 inch wide by 1-1/2 inch high, 0.125-inch wall thickness. Finish shall be AA-C22A31 in accordance with AA DAF-45. Set and secure brace into the top of each pilaster. Fabricate 3 inch high trim piece at the floor from not less than 0.030 inch thick corrosion-resistant stainless steel.

2.4 PILASTER SHOES

Provide shoes at pilasters to conceal floor-mounted anchorage. Pilaster shoes shall be stainless steel. Height shall be 3 inches.

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 finish shall be highly resistant to alkalis, urine, and other common toilet room acids. Hardware shall include hinges: gravity type, adjustable for door close positioning; nylon bearings; stainless steel 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, aluminum or 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.

See project finish schedule and related notes for recommended color for partitions. Contracting Officer reserves the right to make other selections from standard availabe colors.

2.6.2 Finishes No.4

Provide solid plastic fabricated of solid phenolic core with melamine facing sheets formed under high pressure rendering a single component section. Colors shall extend throughout the panel thickness. Provide exposed finish surfaces: smooth, waterproof, non-absorbent, and resistant to staining and marking with pens, pencils, or other writing devices. Solid plastic partitions shall not show any sign of deterioration when immersed in the following chemicals and maintained at a temperature of 80 degrees F for a minimum of 30 days:

a.	Acetic Acid (80 percent)	Hydrochloric Acid (40 percent)
b.	Acetone	Hydrogen Peroxide (30 percent)
c.	Ammonia (liquid)	Isopropyl Alcohol
d.	Ammonia Phosphate	Lactic Acid (25 percent)
e.	Bleach (12 percent)	Lime Sulfur
f.	Borax	Nicotine
g.	Brine	Potassium Bromide
h.	Caustic Soda	Soaps
i.	Chlorine Water	Sodium Bicarbonate
j.	Citric Acid	Trisodium Phosphate
k.	Copper Chloride	Urea; Urine
l.	Core Oils	Vinegar

PART 3 EXECUTION

3.1 PREPARATION

Take field measurements prior to the preparation of drawing and fabrication to ensure proper fits. 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 shall 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 shall 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 shall have a load-carrying strength of not less than 600 pounds per anchor.

d. Submit Installation Drawings for 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. Secure overhead brace to the pilaster face with not less than two fasteners per face. Expansion shields shall have a minimum 2-inch penetration into the concrete slab. Make tops of doors 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

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.

3.6 WASTE MANAGEMENT PLAN

Identify manufacturer's policy for collection or return of construction scrap, demolition scrap, unused material and packaging material. Institute demolition and construction waste separation and recycling to take advantage of manufacturer's programs. When such a service is not available, seek local recyclers to reclaim the materials.

-- 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-04 Samples

Finishes;
Accessory Items;

One sample of each accessory proposed for use. Incorporate approved samples into the finished work, provided they are identified and their locations noted.

SD-07 Certificates

Accessory Items

Certificate for each type of accessory specified, attesting that the items meet the specified requirements.

SD-10 Operation and Maintenance Data

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 as indicated or scheduled in drawings. Provide each accessory item complete with the necessary mounting plates of sturdy construction with corrosion resistant surface. Unless specifically shown otherwise, provide the following items as a minimum:

At each Men's watercloset: 1 Toilet Tissue Dispenser

At each Women's watercloset: 1 Toilet Tissue Dispenser

At each Women's watercloset: 1 Sanitary Napkin Disposer

At each Shower: 1 Shower Curtain Rod, 1 Shower Curtain, 2 Robe Hooks

At each Lavatory: 1 Soap Dispenser and 1 Paper Towel Dispenser

In each Women's Restroom: 1 Sanitary Napkin and Tampon Dispenser

Porcelain type, tile-wall accessories are specified in Section 09 31 00 CERAMIC TILE QUARRY TILE, AND PAVER TILE if they occur on a tile wall.

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 tamperproof design 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 mounting flange. Provide grab with 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 Paper Towel Dispenser (PTD)

Provide center pull towel dispenser constructed of high-impact plastic, surface mounted. Dispenser cover shall be a translcent smoked plastic. Towel capacity shall be medium duty towel roll with 2-ply sheets. Provide government with 4 unused rolls with each dispenser.

2.2.4 Combination Paper Towel Dispenser/Waste Receptacle (PTDWR)

Not requried.

Provide semi-recessed dispenser/receptacle with a capacity of 600 sheets of C-fold, single-fold, or quarter-fold towel. Design waste receptacle to be locked in unit and removable for service. Provide tumbler key locking mechanism. Provide waste receptacle capacity of 12 gallons. Fabricate a minimum 0.03 inch stainless steel welded construction unit with all exposed surfaces having a satin finish. Provide waste receptacle that accepts reusable liner standard for unit manufacturer.

2.2.5 Shower Curtain (SC)

Provide shower curtain, size to suit conditions. Provide anti-bacterial nylon/vinyl fabric curtain. Furnish in white or off-white translucent or opaque.

2.2.6 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.

2.2.7 Robe Hooks (RH)

Provide Type 304 stainless steel robe hook (towel pin) with 2" x 2" flange and that projects 3 3/8" from wall. (Comparable to Bobrick item B-677.)

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 Toilet Tissue Dispenser (TTD)

Provide Type II - surface mounted toilet tissue holder with two rolls of standard tissue mounted horizontally. Provide stainless steel, satin finish cabinet. Dispenser shall have removable spindle that does not require a key or other device to replace roll.

2.2.10 Sanitary Napkin Disposer (SND)

Provide SND constructed of 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, double access or surface mounted - whichever matches existing conditions.

2.2.11 Sanitary Napkin and Tampon Dispenser (SNTD)

Provide sanitary napkin and tampon dispenser surface mounted. Dispenser, including door of Type 304 stainless steel that dispense both napkins and tampons with a minimum capacity of 20 each. Furnish dispensing mechanism for coin operation, but capable of complimentary dispensing. Provide coin mechanisms with minimum denominations of 10 cents, 25 cents, 50 cents, and free. Hang doors with a full-length corrosion-resistant steel piano hinge and secure with a tumbler lock. Provide keys for coin box different from the door keys.

2.2.12 Baby Diaper Changing Station

Provide if indicated.

Semi-recessed installation. Provide blocking as required by manufacturer, and mount at height as recommended by manufacturer. (Changing surface, when unit is open, should be at approximately 34" to 36" AFF.)

Surface-Mounted Horizontal Design Baby Diaper Changing Station:
1. White color.
2. Materials. FDA approved injection-molded polypropylene.
3. Operation: Concealed pneumatic cylinder providing controlled, slow opening and closing of the changing station bed.
4. Hinge Mechanism: Reinforced full length steel-on-steel hinge.
5. Changing Surface: Contoured, concave and smooth.
6. Safety Straps: Replaceable, snap-lock, nylon protective holding straps.
7. Performance: When mounted to specification, unit tested to 250 lbs or greater and will deflect less than 1 degree from 90 degrees with a 200 lb static load placed in the center of the changing surface.
8. Mounting: Concealed 11 gauge plated steel mounting chassis with 16 inch centers and 6 mounting points the top 2 mounting points feature keyholes for ease of installation units include mounting hardware.
9. Features: No hinge structure exposed on interior or exterior surfaces; two bag hooks.

10. Instruction Graphics: Universal instruction graphics and safety messages in multiple languages.

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 Recessed Accessories

Fasten accessories with wood screws to studs, blocking or rough frame in wood construction. Set anchors in mortar in masonry construction. Fasten to metal studs or framing with sheet metal screws in metal construction.

3.1.2 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 or wood blocking secured to metal studs.

3.2 CLEANING

Clean material in accordance with manufacturer's recommendations. Do mot use alkaline or abrasive agents. Take precautions to avoid scratching or marring exposed surfaces.

-- End of Section --

SECTION 10 44 10

BUILDING ENUMERATION

01/07

PART 1 GENERAL

1.1 REFERENCES

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

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION (NCDOT)

NCDOT	(1995) Standard Specifications for Roads and Structures

1.2 BUILDING ENUMERATION

Provide at locations as indicated on building elevations or building floor plan in project drawings. If not shown in drawings, provide a placard for each exterior wall. Coordinate locations with Contracting Officer.

Provide at least four (4) building enumeration placards. If more placards are indicated in drawings, provide number as shown. Coordinate locations with Contracting Officer.

1.2.1 Enumeration

Provide rigidly attached new placards. Install placards after exterior cleaning and painting is completed.

1.2.2 Existing Placards

Remove existing placards and paint the wall surface as specified.

PART 2 PRODUCTS

2.1 NEW PLACARD

Shall be made of aluminum conforming to 6063-T58 which is 1/8-inch thick and of size adequate to provide 1-1/2 inch clear area outside all enumeration.

2.2 THE ENTIRE SIDE

Shall be surfaced with a reflective white finish.

2.3 NUMERALS AND LETTERS

Shall be solid black, five inches high, conforming to NCDOT, Standard Alphabets Series C.

2.4 PAINT

Shall be a product suited for permanent exterior use.

PART 3 EXECUTION

3.1 MOUNTING

Shall be rigid when placed on wall. Four holes 1/4-inch in diameter shall be provided in each sign and used for mounting. Mounting height is recommended at approximately 8 to 10 feet above grade, and shall be a minimum of four feet above grade. Request Contracting Officer's direction on where to mount placards.

-- 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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (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 shall match the drawings. After award, the Contractor shall provide the Contracting Officer with a list of the rooms and room numbers and request that the Contracting Officer edit the list to create a final room naming scheme. (Contractor may use the Area room names as stated on drawings as an initial guide to the proposed room names.)

PART 2 PRODUCTS

Permanent identification signs such as toilet rooms, mechanical rooms, janitor's closet, etc. shall be in accordance wtih ADA Title III with both raised letters and Grade II braille messages. Both letters and braille messages shall be raised a minimum of 1/32 inch. Engraved letters are not acceptable. Letters shall be either sans serif or simple serif, 1 1/2 inches in height and in all capitals. Signs shall be mounted 60 inches from the floor to the center of the sign on the wall adjacent to the latch side of the door. People reading the sign shall be able to stand within 3 inches of the sign without hitting anything or being hit by the door. If this placement is not possible, the sign shall be placed on the nearest adjacent wall. ADA requires an eggshell, matte, or other non-glare finish on permanent identification and directional signs.

Pictograms used as permanent identification signs shall appear in background areas at least 6 inches high and shall be accompanied by tactile letters and braille messages within a different background directly below the pictogram.

The international symbol of accessibility shall be displayed at the entrance of a building that is completely accessible. Non-accessible entrances shall have directions posted to accessible entrances.

Directional signs, unlike permanent identification signs, may include lowercase letters. Characters shall have a width to height ratio between 3:5 and 1:1, and a stroke width to height ratio between 1:5 and 1:10. Overhead signs shall have letters with 3 inch minimum height for capitals and shall be mounted so that the bottom edge is at least 80 inches above the ground.

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. Panels shall be 1/8 inch thick made from high pressure plastic laminate with integral text raised approximately 1/32" by blasting the non-text area away. Glued-on or "chemically welded" attachment of text is not acceptable. Text shall be approximately 1" tall in block letters without serif with the corresponding Braille text. Letter color and background color must contrast. Colors will be chosen from manufacturer's standard plastic selections. Design panels to be fixed to wall surface with adhesive.

2.5 LETTERS

Text shall be raised approximately 1/32" by blasting the non-text area away. Glued-on or "chemically welded" attachment of text is not acceptable. Text shall be approximately 1" tall in block letters without serif. Braille coresponding to the sign text shall also be included. Letter color and background color must contrast. Colors will be chosen from manufacturer's standard selections.

Recommended typeface is Helvetica Medium.

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 SIGNAGE

Signs must be attached flatly to wall (or door as appropriate). On doors to hazardous areas mount sign on center of door at height specified above. On double doors to hazardous areas mount sign on center of right hand leaf as viewed from side from which access is gained.

Contractor shall provide Contracting Officer with a DOOR SIGN SCHEDULE based on the AREA FINISH SCHEDULE, allowing adequate time for the Contracting Officer to meet with the occupants to review and finalize the schedule.

Quantity of signs:

a. A sign shall be provided for each door. For bid purposes, assume that each area sign has 3 numeric characters on the first line and the area name on the second line. Each sign shall have the area number of the area to be entered into. Toilet rooms shall have the area name and universal pictogram, with the area number beneath.

b. A sign shall be provided at each fire extinguisher cabinet shown on plans with text reading FIRE EXTINGUISHER.

c. At each fire alarm pull station shown on electrical plans provide one sign with text reading FIRE ALARM PULL STATION. Text shall be in two lines.

c. Include three (3) additional signs, assuming each with approximately 24 characters divided into two lines. Text for additional signs and mounting locations will be determined later.

d. Submitt a written list of all signage to Contracting Officer for approval prior to manufacturing signage. Contracting Officer shall return an edited or corrected list to Contractor. Final list may vary from, but shall not exceed, the total of specified quantities and sizes.

3.3 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 appropriate mounting heights, 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.

3.4 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.

3.5 ADJUST AND CLEAN

Repair damage to signs incurred during installation. Replace signs which cannot be repaired to new condition.

-- End of Section --

SECTION 10 50 20

HDP PLASTIC LOCKERS AND BENCHES
07/07

PART 1 GENERAL

Products:

a) Solid Plastic Lockers

b) Pedestal Benches

1.1 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

Assembly instructions

SD-04 Samples

Colors

1.2 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.

1.3 FIELD MEASUREMENTS

To ensure proper fits, make field measurements prior to the preparation of drawings and fabrication. Verify correct location.

1.4 QUALITY ASSURANCE

1.4.1 Colors

Provide a minimum of three material color samples, not less than 3 inches square, of each color. See drawings for color selection.

PART 2 PRODUCTS

2.1 TYPES

Lockers and benches must have the following type and size in the location and quantities indicated. Locker finish colors will be as selected.

2.1.1 Single and Double-Tier Lockers

Single-tier lockers shall be as follows:

Type STW-2: Single-tier locker 12 inches wide, 18 inches deep, and 72 inches high.

Double-tier lockers shall be as follows:

Type DTW-2: Double-tier locker 15 inches wide, 18 inches deep, and 72 inches high.

BHldg AS4135 - all lockers shall be single-tier STW-2.

2.1.2 Benches

Recycled Plastic Benches. Basis of design is the Victory Backless Benches, TBN-32, available from www.TreeTopProducts.com, The Bench Factory. Other similar products by other manufacturer's are acceptable that are equal in construction, quality and durability. Such as Model PB8-SPOE Recycled Plastic Sport Benches available from Belson Outdoors or the SMB Plastic Mall Bench available from Robinson Steel Co. at www.rsclockers.com.

Recycled plastic bench, 48 inches long, backless, portable, 19.5 inches wide, 16.25 inches high, 43 pounds.

Warranty: 50 year guarantee against breakage.

Select bench seat color from manufacturer's standard selection - cedar or desert tan recommended. Frame color shall be black.

2.2 MATERIAL

2.2.1 Locker

1. Locker material: Sides, backs, shelves, tops, bottoms, doors, door frames and continuous latch constructed from high-density polyethylene (HDPE).

a. Sides, shelves, tops, bottoms and backs fabricated from 3/8 inch (10 mm) HDPE.
b. Doors, door frames and continuous latch fabricated from 1/2 inch (13 mm) HDPE.
c. Slope tops fabricated from a single sheet of 3/8 inch (10 mm) HDPE.
d. Bases fabricated from 1/2 inch (13 mm) HDPE (if applicable).
e. End panels and flat top fabricated from 1/2 inch (13 mm) HDPE.

2. Door hinge: Continuous piano hinge fabricated from 16 gauge type 304 stainless steel.

2.2.2 Hardware and Accessories

1. Provide one plastic double coat hook for each opening in one and two tier lockers.
2. Provide one number plate for each opening.
3. Provide screws, anchors and angle brackets for locker base installation.

2.2.3 Colors

Color selection is indicated on drawings. For Contracting Officer's consideration provide smaples of manufacturer's standard selection of colors. Contracting Officer to make final selection.

2.3 FABRICATION

Locker:
1. Locker box fabricated from a single sheet of HDPE with corners fused together. Weld frame and shelves to box assembly.
2. Attach hinge to door and frame with vandal-resistant double threaded stainless steel screws.
3. Continuous latch securely attached to the entire length of the door with stainless steel screws, providing a full length latching mechanism capable of accepting several lock types.
4. Fabricate slope top from a single sheet of HDPE, grooved to permit bending to form a backing strip for attachment to wall.
5. Locking device: Hasp.
6. Provide openings at top and bottom of each door for ventilation.
7. Base: 4 inch high (if applicable).
8. End panels: Slope top for single and double locker configuration.
9. Factory finish:
   a. Tops, bottoms, side walls, backs and shelves, smooth white commercial grade.
   b. Door, door frames and continuous latch, slightly textured matte finish, color selected from manufacturer's standard.
   c. Hinge powder coated to match door and frame.
   d. Base color: Black (if applicable).
   e. End panel color to match locker colors.

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 with screws as indicated. Bolt adjacent lockers together. Adjust doors to operate freely without sticking or binding and to ensure they close tightly. Install accessories, number plates, end panels, sloped tops and other items.

Assemble benches and locate in areas as indicated in drawings. Benches are movable, not surface mounted.

3.2 NUMBERING SYSTEM

Install number plates on lockers consecutively with odd numbers on top and even numbers on bottom. Use a consecutive numbering system starting with 01.

3.3 FIELD QUALITY CONTROL

3.3.1 Testing

Test, adjust, align, and balance as necessary for a quality finished installation. 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 exterior and interio surfaces of the work, and the 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.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 1036 (1991; R 1997) Flat Glass

FACTORY MUTUAL ENGINEERING AND RESEARCH (FM)

FM P7825 (2002) Approval Guide

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 10 (1998) Potable Fire Extinguishers

UNDERWRITERS LABORATORIES (UL)

UL FPED (2002) Fire Protection Equipment Directory

1.2 SYSTEM DESCRIPTION

Provide fire extinguishers and fire extinguisher cabinets or wall mount brackets 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, 10 pound nominal charge weight having a minimum fire test rating of 2A:20B:C 20 pounds nominal charge weight having a minimum fire test rating of 4A:30B:C.

2.2 FIRE EXTINGUISHER CABINETS

Provide semi-recessed wall-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. 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 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.

If FE is indicated at existing wall provide surface mounted cabinet (not recessed), provide prefinished surface mounted cabinet similar to above.

2.3 FIRE EXTINGUISHER WALL MOUNT BRACKETS

Wall mounting brackets, for FE on open hanging brackets for installation without a cabinet, are permitted only where an FE is shown mounted on a column or where specifically indicated in drawings.

PART 3 EXECUTION

3.1 INSTALLATION

Install cabinets and brackets plumb and level. The top of installed extinguishers shall not be more that 5 feet above the finished floor. Provide fire extinguishers fully charged and ready for use.

SECTION 21 13 13.00 10

WET PIPE SPRINKLER SYSTEM, FIRE PROTECTION
05/09

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 SOCIETY OF SANITARY ENGINEERING (ASSE)

ASSE 1015	(2011) Performance Requirements for Double Check Backflow Prevention Assemblies and Double Check Fire Protection Backflow Prevention Assemblies - (ANSI approved 2010)

ASME INTERNATIONAL (ASME)

ASME B16.1	(2015) Gray Iron Pipe Flanges and Flanged Fittings Classes 25, 125, and 250
ASME B16.11	(2016) Forged Fittings, Socket-Welding and Threaded
ASME B16.21	(2011) Nonmetallic Flat Gaskets for Pipe Flanges
ASME B16.3	(2011) Malleable Iron Threaded Fittings, Classes 150 and 300
ASME B16.4	(2011) Standard for Gray Iron Threaded Fittings; Classes 125 and 250
ASME B16.9	(2012) Standard for Factory-Made Wrought Steel Buttwelding Fittings
ASME B18.2.2	(2015) Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series)

ASTM INTERNATIONAL (ASTM)

ASTM A135/A135M	(2009; R2014) Standard Specification for Electric-Resistance-Welded Steel Pipe
ASTM A183	(2014) Standard Specification for Carbon Steel Track Bolts and Nuts
ASTM A193/A193M	(2016) Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service and Other Special Purpose Applications

ASTM A449	(2014) Standard Specification for Hex Cap Screws, Bolts, and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use
ASTM A47/A47M	(1999; R 2014) Standard Specification for Ferritic Malleable Iron Castings
ASTM A53/A53M	(2012) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A536	(1984; R 2014) Standard Specification for Ductile Iron Castings
ASTM A795/A795M	(2013) Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use
ASTM F436	(2011) Hardened Steel Washers

FM GLOBAL (FM)

FM APP GUIDE	(updated on-line) Approval Guide http://www.approvalguide.com/

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-71	(2011; Errata 2013) Gray Iron Swing Check Valves, Flanged and Threaded Ends

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 13	(2016; TIA 16-1; TIA 16-2; TIA 16-3 2016; Errata 17-1; Errata 17-2) Standard for the Installation of Sprinkler Systems
NFPA 1963	(2014) Standard for Fire Hose Connections

NATIONAL INSTITUTE FOR CERTIFICATION IN ENGINEERING TECHNOLOGIES (NICET)

NICET 1014-7	(2012) Program Detail Manual for Certification in the Field of Fire Protection Engineering Technology (Field Code 003) Subfield of Automatic Sprinkler System Layout

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-310-04	(2013; with Change 1) Seismic Design for Buildings

UNDERWRITERS LABORATORIES (UL)

UL Fire Prot Dir	(Current) Fire Protection Equipment

Directory

1.2 SYSTEM DESCRIPTION

Furnish piping offsets, fittings, and any other accessories as required to provide a complete installation and to eliminate interference with other construction. Install sprinkler system over and under ducts, piping and platforms when such equipment can negatively effect or disrupt the sprinkler discharge pattern and coverage. Provide wet pipe sprinkler system in Building AS4135 for shop/support and office areas indicated on the drawings. Except as modified herein, the system shall be designed and installed in accordance with NFPA 13. Pipe sizes which are not indicated on drawings shall be determined by hydraulic calculation. Design any portions of the sprinkler system that are not indicated on the drawings including locating sprinklers, piping and equipment, and size piping and equipment when this information is not indicated on the drawings or is not specified herein. The design of the sprinkler system shall be based on hydraulic calculations, and the other provisions specified herein.

1.2.1 Hydraulic Design

Hydraulically design the system in shop areas to discharge a minimum density of 0.20 gpm/square foot over the hydraulically most demanding 2,500 square feet of floor area. The minimum pipe size for branch lines in gridded systems shall be 1-1/4 inch. Hydraulic calculations shall be in accordance with the Area/Density Method of NFPA 13. Water velocity in the piping shall not exceed 20 ft/s.

1.2.1.1 Hose Demand

Add an allowance for exterior hose streams of 250 gpm to the sprinkler system demand at the fire hydrant shown on the drawings closest to the point where the water service enters the building.

1.2.1.2 Basis for Calculations

The design of the system shall be based upon a water supply with a static pressure of 57, and a flow of 754 at a residual pressure of 55. Water supply shall be presumed available at the point of connection to existing. Hydraulic calculations shall be based upon the Hazen-Williams formula with a "C" value of 120 for steel piping, 150 for copper tubing, 140 for new cement-lined ductile-iron piping, and 100 for existing underground piping.

1.2.1.3 Hydraulic Calculations

Submit hydraulic calculations, including a drawing showing hydraulic reference points and pipe segments and as outlined in NFPA 13, except that calculations shall be performed by computer using software intended specifically for fire protection system design using the design data shown on the drawings. Software that uses k-factors for typical branch lines is not acceptable. Calculations shall be based on the water supply data shown on the drawings to substantiate that the design area used in the calculations is the most demanding hydraulically. Water supply curves and system requirements shall be plotted on semi-logarithmic graph paper so as to present a summary of the complete hydraulic calculation. Provide a summary sheet listing sprinklers in the design area and their respective hydraulic reference points, elevations, actual discharge pressures and actual flows. Elevations of hydraulic reference points (nodes) shall be

indicated. Documentation shall identify each pipe individually and the nodes connected thereto. Indicate the diameter, length, flow, velocity, friction loss, number and type fittings, total friction loss in the pipe, equivalent pipe length and Hazen-Williams coefficient for each pipe. For gridded systems, calculations shall show peaking of demand area friction loss to verify that the hydraulically most demanding area is being used. Also for gridded systems, a flow diagram indicating the quantity and direction of flows shall be included. A drawing showing hydraulic reference points (nodes) and pipe designations used in the calculations shall be included and shall be independent of shop drawings.

1.2.2 Sprinkler Coverage

Sprinklers shall be uniformly spaced on branch lines. In buildings protected by automatic sprinklers, sprinklers shall provide coverage throughout 100 percent of the building. This includes, but is not limited to, telephone rooms, electrical equipment rooms, boiler rooms, switchgear rooms, transformer rooms, and other electrical and mechanical spaces. Coverage per sprinkler shall be in accordance with NFPA 13, but shall not exceed 100 square feet for extra hazard occupancies, 130 square feet for ordinary hazard occupancies, and 225 square feet for light hazard occupancies.

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Shop Drawings;
As-Built Drawings

SD-03 Product Data

Fire Protection Related Submittals
Materials and Equipment;
Spare Parts
Preliminary Tests;
Final Acceptance Test;
Onsite Training;
Fire Protection Specialist;
Sprinkler System Installer;

SD-05 Design Data

Sway Bracing;
Hydraulic Calculations;

SD-06 Test Reports

Preliminary Test Report
Final Acceptance Test Report

SD-07 Certificates

Inspection by Fire Protection Specialist

SD-10 Operation and Maintenance Data

Operating and Maintenance Manuals;

1.4 QUALITY ASSURANCE

Compliance with referenced NFPA standards is mandatory. In the event of a conflict between specific provisions of this specification and applicable NFPA standards, this specification governS. Interpret reference to "authority having jurisdiction" to mean the Contracting Officer.

1.4.1 Fire Protection Specialist

Perform work specified in this section under the supervision of and certified by the Fire Protection Specialist who is an individual registered professional engineer who has passed the fire protection engineering written examination administered by the National Council of Examiners for Engineering and Surveys (NCEES) or who is certified as a Level III Technician by National Institute for Certification in Engineering Technologies (NICET) in the Automatic Sprinkler System Layout subfield of Fire Protection Engineering Technology in accordance with NICET 1014-7. Submit the name and documentation of certification of the proposed Fire Protection Specialists, no later than 14 days after the Notice to Proceed and prior to the submittal of the sprinkler system drawings and hydraulic calculations. The Fire Protection Specialist shall prepare and submit a list of the fire protection related submittals, no later than 7 days after the approval of the Fire Protection Specialist, from the Contract Submittal Register that relate to the successful installation of the sprinkler systems(s). The submittals identified on this list shall be accompanied by a letter of approval signed and dated by the Fire Protection Specialist when submitted to the Government. The Fire Protection Specialist shall be regularly engaged in the design and installation of the type and complexity of system specified in the contract documents, and shall have served in a similar capacity for at least three systems that have performed in the manner intended for a period of not less than 6 months.

1.4.2 Sprinkler System Installer

Work specified in this section shall be performed by the Sprinkler System Installer who is regularly engaged in the installation of the type and complexity of system specified in the contract documents, and who has served in a similar capacity for at least three systems that have performed in the manner intended for a period of not less than 6 months. Submit the name and documentation of certification of the proposed Sprinkler System Installer, concurrent with submittal of the Fire Protection Specialist Qualifications.

1.4.3 Shop Drawings

Shop Drawings shall conform to the requirements established for working plans as prescribed in NFPA 13. Submit 3 copies of the Sprinkler System shop drawings, no later than 21 days prior to the start of sprinkler system installation. Drawings shall include plan and elevation views demonstrating that the equipment will fit the allotted spaces with clearance for installation and maintenance. Each set of drawings shall include the following:

a. Descriptive index of drawings in the submittal with drawings listed in sequence by drawing number. A legend identifying device symbols,

nomenclature, and conventions used.

b. Floor plans drawn to a scale not less than 1/8" = 1'-0" which clearly show locations of sprinklers, risers, pipe hangers, seismic separation assemblies, sway bracing, inspector's test connections, drains, and other applicable details necessary to clearly describe the proposed arrangement. Each type of fitting used and the locations of bushings, reducing couplings, and welded joints shall be indicated.

c. Actual center-to-center dimensions between sprinklers on branch lines and between branch lines; from end sprinklers to adjacent walls; from walls to branch lines; from sprinkler feed mains, cross-mains and branch lines to finished floor and roof or ceiling. A detail shall show the dimension from the sprinkler and sprinkler deflector to the ceiling in finished areas.

d. Longitudinal and transverse building sections showing typical branch line and cross-main pipe routing as well as elevation of each typical sprinkler above finished floor.

e. Details of each type of riser assembly; pipe hanger; sway bracing for earthquake protection, and restraint of underground water main at point-of-entry into the building, and electrical devices and interconnecting wiring. Submit load calculations for sizing of sway bracing, for systems that are required to be protected against damage from earthquakes.

1.5 DELIVERY, STORAGE, AND HANDLING

All equipment delivered and placed in storage shall be housed in a manner to preclude any damage from the weather, humidity and temperature variations, dirt and dust, or other contaminants. Additionally, all pipes shall either be capped or plugged until installed.

1.6 EXTRA MATERIALS

Submit spare parts data for each different item of material and equipment specified. The data shall include a complete list of parts and supplies, with current unit prices and source of supply, and a list of parts recommended by the manufacturer to be replaced after 1 year and 3 years of service. Include a list of special tools and test equipment required for maintenance and testing of the products supplied.

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

Provide materials and equipment which are standard products of a manufacturer regularly engaged in the manufacture of such products and that essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening.

2.2 NAMEPLATES

All equipment shall have a nameplate that identifies the manufacturer's name, address, type or style, model or serial number, and catalog number.

2.3 REQUIREMENTS FOR FIRE PROTECTION SERVICE

Provide Materials and Equipment that have been tested by Underwriters Laboratories, Inc. and are listed in UL Fire Prot Dir or approved by Factory Mutual and listed in FM APP GUIDE. Where the terms "listed" or "approved" appear in this specification, such shall mean listed in UL Fire Prot Dir or FM APP GUIDE. Submit manufacturer's catalog data included with the Sprinkler System Drawings for all items specified herein. The data shall be highlighted to show model, size, options, etc., that are intended for consideration. Data shall be adequate to demonstrate compliance with all contract requirements. In addition, provide a complete equipment list that includes equipment description, model number and quantity.

2.4 UNDERGROUND PIPING COMPONENTS

2.4.1 Pipe

Existing, no work is planned. However, see Section 3.7.1.1 regarding flushing.

2.5 ABOVEGROUND PIPING COMPONENTS

Aboveground piping shall be steel .

2.5.1 Steel Piping Components

2.5.1.1 Steel Pipe

Except as modified herein, steel pipe shall be blackas permitted by NFPA 13 and shall conform to applicable provisions of ASTM A795/A795M, ASTM A53/A53M, or ASTM A135/A135M. Pipe in which threads or grooves are cut or rolled formed shall be Schedule 40 or shall be listed by Underwriters' Laboratories to have a corrosion resistance ratio (CRR) of 1.0 or greater after threads or grooves are cut or rolled formed. Pipe shall be marked with the name of the manufacturer, kind of pipe, and ASTM designation.

2.5.1.2 Fittings for Non-Grooved Steel Pipe

Fittings shall be cast iron conforming to ASME B16.4, steel conforming to ASME B16.9 or ASME B16.11, or malleable iron conforming to ASME B16.3. Fittings into which sprinklers, drop nipples or riser nipples (sprigs) are screwed shall be threaded type. Plain-end fittings with mechanical couplings, fittings that use steel gripping devices to bite into the pipe and segmented welded fittings shall not be used.

2.5.1.3 Grooved Mechanical Joints and Fittings

Joints and fittings shall be designed for not less than 175 psi service and shall be the product of the same manufacturer;segmented welded fittings shall not be used. Fitting and coupling houses shall be malleable iron conforming to ASTM A47/A47M, Grade 32510; ductile iron conforming to ASTM A536, Grade 65-45-12. Gasket shall be the flush type that fills the entire cavity between the fitting and the pipe. Nuts and bolts shall be heat-treated steel conforming to ASTM A183 and shall be cadmium plated or zinc electroplated.

2.5.1.4 Flanges

Flanges shall conform to NFPA 13 and ASME B16.1. Gaskets shall be non-asbestos compressed material in accordance with ASME B16.21, 1/16 inch thick, and full face or self-centering flat ring type.

2.5.1.5 Bolts, Nut, and Washers

Bolts shall be conform to ASTM A449, Type 1 and shall extend no less than three full threads beyond the nut with bolts tightened to the required torque. Nuts shall be hexagon type conforming to ASME B18.2.2 ASTM A193/A193M, Grade 5 . Washers shall meet the requirements of ASTM F436. Flat circular washers shall be provided under all bolt heads and nuts.

2.5.2 Pipe Hangers

Hangers shall be listed in UL Fire Prot Dir or FM APP GUIDE and of the type suitable for the application, construction, and pipe type and sized to be supported.

2.5.3 Valves

2.5.3.1 Control Valve and Gate Valve

Manually operated sprinkler control valve and gate valve shall be outside stem and yoke (OS&Y) type and shall be listed in UL Fire Prot Dir or FM APP GUIDE.

2.5.3.2 Check Valve

Check valve 2 inches and larger shall be listed in UL Fire Prot Dir or FM APP GUIDE. Check valves 4 inches and larger shall be of the swing type with flanged cast iron body and flanged inspection plate, shall have a clear waterway and shall meet the requirements of MSS SP-71, for Type 3 or 4.

2.6 WATERFLOW ALARM

Electrically operated, exterior-mounted, waterflow alarm bell shall be provided and installed in accordance with NFPA 13. Waterflow alarm bell shall be rated 24 VDC and shall be connected to the Fire Alarm Control Panel(FACP) in accordance with Section 28 31 76 INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM.

2.7 ALARM INITIATING AND SUPERVISORY DEVICES

2.7.1 Sprinkler Waterflow Indicator Switch, Vane Type

Switch shall be vane type with a pipe saddle and cast aluminum housing. The electro-mechanical device shall include a flexible, low-density polyethylene paddle conforming to the inside diameter of the fire protection pipe. The device shall sense water movements and be capable of detecting a sustained flow of 10 gpm or greater. The device shall contain a retard device adjustable from 0 to 90 seconds to reduce the possibility of false alarms caused by transient flow surges. The switch shall be tamper resistant and contain two SPDT (Form C) contacts arranged to transfer upon removal of the housing cover, and shall be equipped with a silicone rubber gasket to assure positive water seal and a dustproof cover

and gasket to seal the mechanism from dirt and moisture.

2.7.2 Valve Supervisory (Tamper) Switch

Switch shall be suitable for mounting to the type of control valve to be supervised open. The switch shall be tamper resistant and contain one set of SPDT (Form C) contacts arranged to transfer upon removal of the housing cover or closure of the valve of more than two rotations of the valve stem.

2.8 FIRE DEPARTMENT CONNECTION

Fire department connection shall be projecting type with cast brass body, matching wall escutcheon lettered "Auto Spkr" with a polished brass finish. The connection shall have two inlets with individual self-closing clappers, caps with drip drains and chains. Female inlets shall have 2-1/2 inch diameter American National Fire Hose Connection Screw Threads (NH) per NFPA 1963.

2.9 SPRINKLERS

Sprinklers with internal O-rings shall not be used. Sprinklers shall be used in accordance with their listed coverage limitations. Temperature classification shall be ordinary and/or intermediate . Sprinklers in high heat areas including attic spaces or in close proximity to unit heaters shall have temperature classification in accordance with NFPA 13. Extended coverage sprinklers shall not be used.

2.9.1 Recessed Sprinkler

Recessed sprinkler shall be white polyester quick-response type and shall have a nominal 1/2 inch or 17/32 inch orifice.

2.9.2 Pendent Sprinkler

Pendent sprinkler shall be of the fusible strut or glass bulb type, quick-response type with nominal 1/2 inch or 17/32 inch orifice. Pendent sprinklers shall have a white polyester finish.

2.9.3 Upright Sprinkler

Upright sprinkler shall be white polyester standard response and shall have a nominal 1/2 inch or 17/32 inch orifice.

2.9.4 Sidewall Sprinkler

Sidewall sprinkler shall have a nominal 1/2 inch orifice. Sidewall sprinkler shall have a white polyester finish. Sidewall sprinkler shall be the quick-response type.

2.10 ACCESSORIES

2.10.1 Sprinkler Cabinet

Spare sprinklers shall be provided in accordance with NFPA 13 and shall be packed in a suitable metal or plastic cabinet. Spare sprinklers shall be representative of, and in proportion to, the number of each type and temperature rating of the sprinklers installed. At least one wrench of each type required shall be provided.

2.10.2 Pendent Sprinkler Escutcheon

Escutcheon shall be one-piece metallic type with a depth of less than 3/4 inch and suitable for installation on pendent sprinklers. The escutcheon shall have a factory finish that matches the pendent sprinkler heads.

2.10.3 Pipe Escutcheon

Escutcheon shall be 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 set screw.

2.10.4 Sprinkler Guard

Guard shall be a steel wire cage designed to encase the sprinkler and protect it from mechanical damage. Guards shall be provided on sprinklers located within 7 feet of floor.

2.10.5 Identification Sign

Valve identification sign shall be minimum 6 inches wide by 2 inches high with enamel baked finish on minimum 18 gauge steel or 0.024 inch aluminum with red letters on a white background or white letters on red background. Wording of sign shall include, but not be limited to "main drain," "auxiliary drain," "inspector's test," "alarm test," "alarm line," and similar wording as required to identify operational components.

2.11 DOUBLE-CHECK VALVE BACKFLOW PREVENTION ASSEMBLY

Double-check backflow prevention assembly shall comply with ASSE 1015. The assembly shall have a bronze, cast-iron or stainless steel body with flanged ends. The assembly shall include pressure gauge test ports and OS&Y shutoff valves on the inlet and outlet, 2-positive-seating check valve for continuous pressure application, and four test cocks. Assemblies shall be rated for working pressure of 175 psi The maximum pressure loss shall be 6 psi at a flow rate equal to the sprinkler water demand, at the location of the assembly. A test port for a pressure gauge shall be provided both upstream and downstream of the double check backflow prevention assembly valves.

PART 3 EXECUTION

3.1 FIELD MEASUREMENTS

After becoming familiar with all details of the work, verify all dimensions in the field, and advise the Contracting Officer of any discrepancy before performing the work.

3.2 INSTALLATION REQUIREMENTS

The installation shall be in accordance with the applicable provisions of NFPA 13 and publications referenced therein. Installation of in-rack sprinklers shall comply with applicable provisions of NFPA 13.

3.3 INSPECTION BY FIRE PROTECTION SPECIALIST

Prior to ceiling installation and concurrent with the Final Acceptance Test Report, certification by the Fire Protection Specialist that the sprinkler system is installed in accordance with the contract

requirements, including signed approval of the Preliminary and Final Acceptance Test Reports. The Fire Protection Specialist shall: 1) inspect the sprinkler system periodically during the installation to assure that the sprinkler system is being provided and installed in accordance with the contract requirements, 2) witness the preliminary and final tests, and sign the test results, 3) after completion of the system inspections and a successful final test, certify in writing that the system has been installed in accordance with the contract requirements. Any discrepancy shall be brought to the attention of the Contracting Officer in writing, no later than three working days after the discrepancy is discovered.

3.4 ABOVEGROUND PIPING INSTALLATION

3.4.1 Protection of Piping Against Earthquake Damage

Seismically protect the system piping against damage from earthquakes. This requirement is not subject to determination under NFPA 13. Install the seismic protection of the system piping in accordance with UFC 3-310-04, NFPA 13 and Annex A. Include the required features identified therein that are applicable to the specific piping system.

3.4.2 Piping in Exposed Areas

Install exposed piping without diminishing exit access widths, corridors or equipment access. Exposed horizontal piping, including drain piping, shall be installed to provide maximum headroom.

3.4.3 Piping in Finished Areas

In areas with suspended or dropped ceilings and in areas with concealed spaces above the ceiling, piping shall be concealed above ceilings. Piping shall be inspected, tested and approved before being concealed. Risers and similar vertical runs of piping in finished areas shall be concealed.

3.4.4 Pendent Sprinklers

Drop nipples to pendent sprinklers shall consist of minimum 1 inch pipe with a reducing coupling into which the sprinkler shall be threaded. Hangers shall be provided on arm-overs to drop nipples supplying pendent sprinklers when the arm-over exceeds 12 inches for steel pipe. Where sprinklers are installed below suspended or dropped ceilings, drop nipples shall be cut such that sprinkler ceiling plates or escutcheons are of a uniform depth throughout the finished space. The outlet of the reducing coupling shall not extend more than 1 inch below the underside of the ceiling. On pendent sprinklers installed below suspended or dropped ceilings, the distance from the sprinkler deflector to the underside of the ceiling shall not exceed 4 inches. Recessed pendent sprinklers shall be installed such that the distance from the sprinkler deflector to the underside of the ceiling shall not exceed the manufacturer's listed range and shall be of uniform depth throughout the finished area. Pendent sprinklers in suspended ceilings shall be a minimum of 6 inches from ceiling grid.

3.4.5 Upright Sprinklers

Riser nipples or "sprigs" to upright sprinklers shall contain no fittings between the branch line tee and the reducing coupling at the sprinkler. Riser nipples exceeding 30 inches in length shall be individually

supported.

3.4.6 Pipe Joints

Pipe joints shall conform to NFPA 13, except as modified herein. Not more than four threads shall show after joint is made up. Welded joints will be permitted, only if welding operations are performed as required by NFPA 13 at the Contractor's fabrication shop, not at the project construction site. Flanged joints shall be provided where indicated or required by NFPA 13. Grooved pipe and fittings shall be prepared in accordance with the manufacturer's latest published specification according to pipe material, wall thickness and size. Grooved couplings, fittings and grooving tools shall be products of the same manufacturer. For copper tubing, 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, narrow-land micrometer, or other method specifically approved by the coupling manufacturer for the intended application. Groove width and dimension of groove from end of 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.

3.4.7 Reducers

Reductions in pipe sizes shall be made with one-piece tapered reducing fittings. The use of grooved-end or rubber-gasketed reducing couplings will not be permitted. When standard fittings of the required size are not manufactured, single bushings of the face type will be permitted. Where used, face bushings shall be installed with the outer face flush with the face of the fitting opening being reduced. Bushings shall not be used in elbow fittings, in more than one outlet of a tee, in more than two outlets of a cross, or where the reduction in size is less than 1/2 inch.

3.4.8 Pipe Penetrations

Cutting structural members for passage of pipes or for pipe-hanger fastenings will not be permitted. Pipes that must penetrate concrete or masonry walls or concrete floors shall be core-drilled and provided with pipe sleeves. Each sleeve shall be Schedule 40 galvanized steel, ductile iron or cast iron pipe and shall extend through its respective wall or floor and be cut flush with each wall surface. Sleeves shall provide required clearance between the pipe and the sleeve per NFPA 13. The space between the sleeve and the pipe shall be firmly packed with mineral wool insulation. Where pipes penetrate fire walls, fire partitions, or floors, pipes shall be fire stopped in accordance with Section 07 84 00 FIRESTOPPING. In penetrations that are not fire-rated or not a floor penetration, the space between the sleeve and the pipe shall be sealed at both ends with plastic waterproof cement that will dry to a firm but pliable mass or with a mechanically adjustable segmented elastomer seal.

3.4.9 Escutcheons

Escutcheons shall be provided for pipe penetration of ceilings and walls. Escutcheons shall be securely fastened to the pipe at surfaces through which piping passes.

3.4.10 Inspector's Test Connection

Unless otherwise indicated, test connection shall consist of 1 inch pipe connected to the remote branch line; a test valve located approximately 7 feet above the floor; a smooth bore brass outlet equivalent to the smallest orifice sprinkler used in the system; and a painted metal identification sign affixed to the valve with the words "Inspector's Test." The discharge orifice shall be located outside the building wall directed so as not to cause damage to adjacent construction or landscaping during full flow discharge.

3.4.11 Drains

Main drain piping shall be provided to discharge at a safe point outside the building. Auxiliary drains shall be provided as required by NFPA 13.

3.4.12 Installation of Fire Department Connection

Connection shall be mounted on the exterior wall approximately 3 feet above finished grade . The piping between the connection and the check valve shall be provided with an automatic drip in accordance with NFPA 13 and arranged to drain to the outside.

3.4.13 Identification Signs

Signs shall be affixed to each control valve, inspector test valve, main drain, auxiliary drain, test valve, and similar valves as appropriate or as required by NFPA 13. Hydraulic design data nameplates shall be permanently affixed to each sprinkler riser as specified in NFPA 13.

3.5 ELECTRICAL WORK

Except as modified herein, electric equipment and wiring shall be in accordance with Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Alarm signal wiring connected to the building fire alarm control system shall be in accordance with Section 28 31 76 INTERIOR FIRE ALARM AND FUTURE MASS NOTIFICATION SYSTEM. All wiring for supervisory and alarm circuits shall be a minimum #16 AWG solid copper installed in metallic tubing or conduit. Wiring color code shall remain uniform throughout the system.

3.6 PIPE COLOR CODE MARKING

Color code mark piping as specified in Section 09 90 00 PAINTS AND COATINGS.

3.7 PRELIMINARY TESTS

The system, including the underground water mains, and the aboveground piping and system components, shall be tested to assure that equipment and components function as intended. Submit proposed procedures for Preliminary Tests, no later than 14 days prior to the proposed start of the tests and proposed date and time to begin the preliminary tests. The underground and aboveground interior piping systems and attached appurtenances subjected to system working pressure shall be tested in accordance with NFPA 13. Upon completion of specified tests, submit 3 copies of the completed Preliminary Test Report, no later than 7 days after the completion of the Tests. The Report shall include both the Contractor's Material and Test Certificate for Underground Piping and the Contractor's Material and Test Certificate for Aboveground Piping. All

items in the Preliminary Tests Report shall be signed by the Fire Protection Specialist.

3.7.1 Aboveground Piping

3.7.1.1 Hydrostatic Testing

Aboveground piping shall be hydrostatically tested in accordance with NFPA 13 at not less than 200 psi or 50 psi in excess of maximum system operating pressure and shall maintain that pressure without loss for 2 hours. There shall be no drop in gauge pressure or visible leakage when the system is subjected to the hydrostatic test. The test pressure shall be read from a gauge located at the low elevation point of the system or portion being tested.

3.7.1.2 Backflow Prevention Assembly Forward Flow Test

Each backflow prevention assembly shall be tested at system flow demand, including all applicable hose streams, as specified in NFPA 13. Provide all equipment and instruments necessary to conduct a complete forward flow test, including 2.5 inch diameter hoses, playpipe nozzles, calibrated pressure gauges, pitot tube gauge, plus all necessary supports to safely secure hoses and nozzles during the test. At the system demand flow, the pressure readings and pressure drop (friction) across the assembly shall be recorded. Provide a metal placard on the backflow prevention assembly that lists the pressure readings both upstream and downstream of the assembly, total pressure drop, and the system test flow rate. The pressure drop shall be compared to the manufacturer's data.

3.7.2 Testing of Alarm Devices

Each alarm switch shall be tested by flowing water through the inspector's test connection. Each water-operated alarm devices shall be tested to verify proper operation.

3.7.3 Main Drain Flow Test

Following flushing of the underground piping, a main drain test shall be made to verify the adequacy of the water supply. Static and residual pressures shall be recorded on the certificate specified in paragraph SUBMITTALS. In addition, a main drain test shall be conducted each time after a main control valve is shut and opened.

3.8 FINAL ACCEPTANCE TEST

Begin the Final Acceptance Test only when the Preliminary Test Report has been approved. Submit proposed procedures for Final Acceptance Test, no later than 14 days prior to the proposed start of the tests, and proposed date and time to begin the Test, submitted with the procedures. Notification shall be provided at least 14 days prior to the proposed start of the test. Notification shall include a copy of the Contractor's Material & Test Certificates. The Fire Protection Specialist shall conduct the Final Acceptance Test and shall provide a complete demonstration of the operation of the system. This shall include operation of control valves and flowing of inspector's test connections to verify operation of associated waterflow alarm switches. After operation of control valves has been completed, the main drain test shall be repeated to assure that control valves are in the open position. Submit as-built shop drawings, at least 14 days after completion of the Final

Tests, updated to reflect as-built conditions after all related work is completed. Drawings shall be on reproducible full-size mylar film. In addition, the representative shall have available copies of as-built drawings and certificates of tests previously conducted. The installation shall not be considered accepted until identified discrepancies have been corrected and test documentation is properly completed and received. Submit 3 copies of the completed Final Acceptance Test Report no later than 7 days after the completion of the Final Acceptance Tests. All items in the Final Acceptance Report shall be signed by the Fire Protection Specialist.as specified.

3.9 ONSITE TRAINING

The Fire Protection Specialist shall conduct a training course for operating and maintenance personnel as designated by the Contracting Officer. Submit proposed schedule, at least 14 days prior to the start of related training. Training shall be provided for a period of 2 hours of normal working time and shall start after the system is functionally complete and after the Final Acceptance Test. Submit 6 Operating and Maintenance Manuals listing step-by-step procedures required for system startup, operation, shutdown, and routine maintenance, at least 14 days prior to field training. The manuals shall include the manufacturer's name, model number, parts list, list of parts and tools that should be kept in stock by the owner for routine maintenance including the name of a local supplier, simplified wiring and controls diagrams, troubleshooting guide, and recommended service organization (including address and telephone number) for each item of equipment. Each service organization submitted shall be capable of providing 4 hour on-site response to a service call on an emergency basis. The Onsite Training shall cover all of the items contained in the approved manuals.

-- End of Section --

SECTION 21 13 17.00 10

DRY PIPE SPRINKLER SYSTEM, FIRE PROTECTION
05/09

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 SOCIETY OF SANITARY ENGINEERING (ASSE)

ASSE 1015	(2011) Performance Requirements for Double Check Backflow Prevention Assemblies and Double Check Fire Protection Backflow Prevention Assemblies - (ANSI approved 2010)

ASME INTERNATIONAL (ASME)

ASME B16.1	(2015) Gray Iron Pipe Flanges and Flanged Fittings Classes 25, 125, and 250
ASME B16.11	(2016) Forged Fittings, Socket-Welding and Threaded
ASME B16.21	(2011) Nonmetallic Flat Gaskets for Pipe Flanges
ASME B16.3	(2011) Malleable Iron Threaded Fittings, Classes 150 and 300
ASME B16.4	(2011) Standard for Gray Iron Threaded Fittings; Classes 125 and 250
ASME B16.9	(2012) Standard for Factory-Made Wrought Steel Buttwelding Fittings
ASME B18.2.2	(2015) Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series)

ASTM INTERNATIONAL (ASTM)

ASTM A135/A135M	(2009; R2014) Standard Specification for Electric-Resistance-Welded Steel Pipe
ASTM A183	(2014) Standard Specification for Carbon Steel Track Bolts and Nuts
ASTM A449	(2014) Standard Specification for Hex Cap Screws, Bolts, and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use

ASTM A47/A47M	(1999; R 2014) Standard Specification for Ferritic Malleable Iron Castings
ASTM A53/A53M	(2012) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A536	(1984; R 2014) Standard Specification for Ductile Iron Castings
ASTM A795/A795M	(2013) Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use
ASTM F436	(2011) Hardened Steel Washers

FM GLOBAL (FM)

FM APP GUIDE	(updated on-line) Approval Guide http://www.approvalguide.com/

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-71	(2011; Errata 2013) Gray Iron Swing Check Valves, Flanged and Threaded Ends

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 13	(2016; TIA 16-1; TIA 16-2; TIA 16-3 2016; Errata 17-1; Errata 17-2) Standard for the Installation of Sprinkler Systems
NFPA 1963	(2014) Standard for Fire Hose Connections
NFPA 24	(2016; ERTA 2016) Standard for the Installation of Private Fire Service Mains and Their Appurtenances

NATIONAL INSTITUTE FOR CERTIFICATION IN ENGINEERING TECHNOLOGIES (NICET)

NICET 1014-7	(2012) Program Detail Manual for Certification in the Field of Fire Protection Engineering Technology (Field Code 003) Subfield of Automatic Sprinkler System Layout

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-310-04	(2013; with Change 1) Seismic Design for Buildings

UNDERWRITERS LABORATORIES (UL)

UL Bld Mat Dir	(updated continuously online) Building Materials Directory

UL Fire Prot Dir	(Current) Fire Protection Equipment Directory

1.2 SYSTEM DESCRIPTION

a. Furnish piping offsets, fittings, and any other accessories as required to provide a complete installation and to eliminate interference with other construction. Install sprinkler over and under ducts, piping and platforms when such equipment can negatively affect or disrupt the sprinkler discharge pattern and coverage.

b. Provide dry pipe sprinkler system in shed #1 attached to building. The sprinkler system shall provide fire sprinkler protection for the entire area. Except as modified herein, design and install the system in accordance with NFPA 13. Pipe sizes, which are not indicated on the drawings, shall be determined by hydraulic calculation. Gridded systems shall not be used.

c. Design any portions of the sprinkler system that are not indicated on the drawings or are not specified herein, including locating sprinklers, piping, and equipment, and size piping and equipment. Base the design of the sprinkler system on hydraulic calculations, and the other provisions specified herein.

1.2.1 Hydraulic Design

Hydraulically design the system to discharge a minimum density of 0.20 gpm per square foot over the hydraulically most demanding entire area of floor area. Provide hydraulic calculations in accordance with the Area\Density Method of NFPA 13. Water velocity in the piping shall not exceed 20 ft/s.

1.2.1.1 Hose Demand

Add an allowance for exterior hose streams of 250 gpm to the sprinkler system demand at the fire hydrant shown on the drawings closest to the point where the water service enters the building.

1.2.1.2 Basis for Calculations

Base the design of the system upon a water supply with a static pressure of 57, and a flow of 754 at a residual pressure of 55. Water supply shall be presumed available at the point of connection to existingexisting underground supply. Base hydraulic calculations upon the Hazen-Williams formula with a "C" value of 100 for black steel piping, 140 for new cement-lined ductile-iron piping, and 100 for existing underground piping.

a. Submit Hydraulic calculations, including a drawing showing hydraulic reference points and pipe segments. Outline hydraulic calculations as in NFPA 13, except that calculations shall be performed by computer using software intended specifically for fire protection system design using the design data shown on the drawings. Software that uses k-factors for typical branch lines is not acceptable. Calculations shall substantiate that the design area used in the calculations is the most demanding hydraulically.

b. Plot water supply curves and system requirements on semi-logarithmic graph paper so as to present a summary of the complete hydraulic calculation. Provide a summary sheet listing sprinklers in the design

area and their respective hydraulic reference points, elevations, actual discharge pressures and actual flows. Indicate elevations of hydraulic reference points (nodes). Documentation shall identify each pipe individually and the nodes connected thereto. Indicate for each pipe the diameter, length, flow, velocity, friction loss, number and type fittings, total friction loss in the pipe, equivalent pipe length and Hazen-Williams coefficient.

1.2.2 Sprinkler Coverage

Uniformly space sprinklers on branch lines. In buildings protected by automatic sprinklers, provide coverage throughout 100 percent of theShed #1. Coverage per sprinkler shall be in accordance with NFPA 13, but not exceeding 100 square feet for extra hazard occupancies, 130 square feet for ordinary hazard occupancies, and 225 square feet for light hazard occupancies.

1.2.3 System Volume Limitations

Where the volume of any individual system piping volume exceeds 500 gallons, provide the dry pipe valve with a quick-opening device. The maximum system capacity controlled by one dry pipe valve shall not exceed 750 gallons. Indicate the calculated volume of each system on the Sprinkler System Shop Drawings.

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Shop Drawings;
As-Built Drawings

SD-03 Product Data

List of Submittals
Materials and Equipment;
Spare Parts
Fire Protection Specialist;
Installer Qualifications;
Onsite Training;

SD-05 Design Data

Sway Bracing
Hydraulic Calculations;

SD-06 Test Reports

Preliminary Tests
Final Acceptance Test

SD-07 Certificates

Inspection by Fire Protection Specialist

SD-10 Operation and Maintenance Data

Operating and Maintenance Instructions;

1.4 QUALITY ASSURANCE

Compliance with referenced NFPA standards is mandatory. In the event of a conflict between specific provisions of this specification and applicable NFPA standards, this specification governs. Interpret reference to "authority having jurisdiction" to mean the Contracting Officer.

1.4.1 Fire Protection Specialist

Perform the work specified in this section under the supervision of and certified by the Fire Protection Specialist (FPS). Submit the name and documentation of certification of the proposed FPS, no later than 14 days after the Notice to Proceed and prior to the submittal of the sprinkler system shop drawings and hydraulic calculations. The FPS shall be a registered professional engineer or who is certified as a Level III Technician by National Institute for Certification in Engineering Technologies (NICET) in the Automatic Sprinkler System Layout subfield of Fire Protection Engineering Technology in accordance with NICET 1014-7. The FPS shall prepare and submit a list of submittals related to Fire Protection from the Contract Submittal Register that verify the successful installation of the sprinkler systems(s), no later than 7 days after the approval of the FPS. The submittals identified on this list shall be accompanied by a letter of approval signed and dated by the FPS when submitted to the Government. The FPS shall be regularly engaged in the design and installation of the type and complexity of system specified in the Contract documents, and shall have served in a similar capacity for at least three systems that have performed in the manner intended for a period of not less than 6 months.

1.4.2 Installer Qualifications

Work specified in this section shall be performed by the Sprinkler System Installer. Submit the name and documentation of certification of the proposed Sprinkler System Installer, concurrent with submittal of the FPS Qualifications. The Installer shall be regularly engaged in the installation of the type and complexity of system specified in the Contract documents, and shall have served in a similar capacity for at least three systems that have performed in the manner intended for a period of not less than 6 months.

1.4.3 Shop Drawings

Submit 3 copies of the Sprinkler System Drawings, on reproducible full-size mylar film, no later than 21 days prior to the start of sprinkler system installation. The drawings shall conform to the requirements established for working plans as prescribed in NFPA 13. Drawings shall include plan and elevation views demonstrating that the equipment will fit the allotted spaces with clearance for installation and maintenance; update the shop drawings to reflect as-built conditions after all related work is completed. Each set of drawings shall include the following:

a. Descriptive index of drawings in the submittal with drawings listed in sequence by drawing number. A legend identifying device symbols, nomenclature, and conventions used.

b. Floor plans drawn to a scale not less than 1/8" = 1'-0" which clearly show locations of sprinklers, risers, pipe hangers, seismic separation assemblies, sway bracing, inspector's test connections, drains, and other applicable details necessary to clearly describe the proposed arrangement. Indicate each type of fitting used and the locations of bushings, reducing couplings, and welded joints.

c. Actual center-to-center dimensions between sprinklers on branch lines and between branch lines; from end sprinklers to adjacent walls; from walls to branch lines; from sprinkler feed mains, cross-mains and branch lines to finished floor and roof or ceiling. A detail shall show the dimension from the sprinkler and sprinkler deflector to the ceiling in finished areas.

d. Longitudinal and transverse building sections showing typical branch line and cross-main pipe routing as well as elevation of each typical sprinkler above finished floor.

e. Details of each type of riser assembly; air supply system and piping; pipe hanger; sway bracing for earthquake protection, and restraint of underground water main at point-of-entry into the building, and electrical devices and interconnecting wiring.

1.5 DELIVERY, STORAGE, AND HANDLING

All equipment delivered and placed in storage shall be housed in a manner to preclude any damage from the weather, humidity and temperature variations, dirt and dust, or other contaminants. Additionally, all pipes shall either be capped or plugged until installed.

1.6 EXTRA MATERIALS

Submit spare parts data for each different item of material and equipment specified. The data shall include a complete list of parts and supplies, with current unit prices and source of supply, and a list of parts recommended by the manufacturer to be replaced after 1 year and 3 years of service. Include alist of special tools and test equipment required for maintenance and testing of the products supplied.

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

Provide materials and equipment which are standard products of a manufacturer regularly engaged in the manufacture of such products and that essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Submit manufacturer's catalog data included with the Sprinkler System Drawings for all items specified herein. Highlight the data to show model, size, options, etc., that are intended for consideration. Data shall be adequate to demonstrate compliance with all contract requirements. In addition, provide a complete equipment list that includes equipment description, model number and quantity.

2.2 NAMEPLATES

All equipment shall have a nameplate that identifies the manufacturer's name, address, type or style, model or serial number, and catalog number.

2.3 REQUIREMENTS FOR FIRE PROTECTION SERVICE

Materials and Equipment shall have been tested by Underwriters Laboratories, Inc. and listed in UL Fire Prot Dir or approved by Factory Mutual and listed in FM APP GUIDE. Where the terms "listed" or "approved" appear in this specification, such shall mean listed in UL Fire Prot Dir or FM APP GUIDE.

2.4 UNDERGROUND PIPING COMPONENTS

2.4.1 Pipe

Existing, no work is planned. However see Section 3.7.1.1 regarding flushing.

2.5 ABOVEGROUND PIPING COMPONENTS

2.5.1 Steel Pipe

Except as modified herein, steel pipe shall be black as permitted by NFPA 13 and shall conform to applicable provisions of ASTM A795/A795M, ASTM A53/A53M, or ASTM A135/A135M. Pipe in which threads or grooves are cut or rolled formed shall be Schedule 40 or shall be listed by Underwriters' Laboratories to have a corrosion resistance ratio (CRR) of 1.0 or greater after threads or grooves are cut or rolled formed. Pipe shall be marked with the name of the manufacturer, kind of pipe, and ASTM designation.

2.5.2 Fittings for Non-Grooved Steel Pipe

Fittings shall be cast iron conforming to ASME B16.4, steel conforming to ASME B16.9 or ASME B16.11, or malleable iron conforming to ASME B16.3. Steel press fittings shall be approved for fire protection systems. Fittings into which sprinklers, drop nipples or riser nipples (sprigs) are screwed shall be threaded type. Plain-end fittings with mechanical couplings, fittings that use steel gripping devices to bite into the pipe and segmented welded fittings shall not be used.

2.5.3 Grooved Mechanical Joints and Fittings

Joints and fittings shall be designed for not less than 175 psi service and shall be the product of the same manufacturer; segmented welded fittings shall not be used. Fitting and coupling houses shall be malleable iron conforming to ASTM A47/A47M, Grade 32510; ductile iron conforming to ASTM A536, Grade 65-45-12. Gaskets shall be of silicon compound and approved for dry fire protection systems. Gasket shall be the flush type that fills the entire cavity between the fitting and the pipe. Nuts and bolts shall be heat-treated steel conforming to ASTM A183 and shall be cadmium plated or zinc electroplated.

2.5.4 Flanges

Flanges shall conform to NFPA 13 and ASME B16.1. Gaskets shall be non-asbestos compressed material in accordance with ASME B16.21, 1/16 inch thick, and full face or self-centering flat ring type.

2.5.4.1 Bolts

Bolts shall be ASTM A449, Type 1 and shall extend no less than three full

threads beyond the nut with bolts tightened to the required torque.

2.5.4.2 Nuts

Nuts shall be hexagon type conforming to ASME B18.2.2.

2.5.4.3 Washers

Washers shall meet the requirements of ASTM F436. Flat circular washers shall be provided under all bolt heads and nuts.

2.5.5 Pipe Hangers

Hangers shall be listed in UL Fire Prot Dir or FM APP GUIDE and of the type suitable for the application, construction, and pipe type and size to be supported.

2.5.6 Valves

2.5.6.1 Control Valve and Gate Valve

Manually operated sprinkler control valve and gate valve shall be outside stem and yoke (OS&Y) type and shall be listed in UL Bld Mat Dir or FM APP GUIDE.

2.5.6.2 Check Valve

Check valve 2 inches and larger shall be listed in UL Bld Mat Dir or FM APP GUIDE. Check valves 4 inches and larger shall be of the swing type with flanged cast iron body and flanged inspection plate, shall have a clear waterway and shall meet the requirements of MSS SP-71, for Type 3 or 4.

2.6 DRY PIPE VALVE ASSEMBLY

The dry pipe valve shall be a latching differential type listed in UL Fire Prot Dir or FM APP GUIDE and shall be complete with trim piping, valves, fittings, pressure gauges, priming water fill cup, velocity drip check, drip cup, and other ancillary components as required for proper operation. The assembly shall include a quick-opening device by the same manufacturer as the dry pipe valve for systems over 500 gallons in capacity.

2.7 SUPERVISORY AIR SYSTEM

Provide an air supply system in accordance with NFPA 13. The connection pipe from the air compressor shall not be less than 1/2 inch in diameter and shall enter the system above the priming water level of the dry pipe valve. Install a check valve in the system supply air piping from the compressor. A shutoff valve of the renewable disc type shall be installed upstream of this check valve. The air supply system shall be sized to pressurize the sprinkler system to 40 psi within 20 minutes.

2.7.1 Air Compressor

Compressor shall be single stage oil-free type, air-cooled, electric-motor driven, equipped with a check valve, shutoff valve and pressure switch for automatic starting and stopping. Pressure switch shall be factory set to start the compressor at 30 psi and stop it at 40 psi. A safety relief

valve, set to operate at 65 psi, shall be provided.

2.7.2 Air Pressure Maintenance Device

Device shall be a pressure regulator that automatically reduces supply air to provide the pressure required to be maintained in the piping system. The device shall have a cast bronze body and valve housing complete with diaphragm assembly, spring, filter, ball check to prevent backflow, 1/16 inch restriction to prevent rapid pressurization of the system, and adjustment screw. The device shall be capable of reducing an inlet pressure of up to 100 psig to a fixed outlet pressure adjustable to 10 psig.

2.7.3 Air Supply Piping System

System shall be configured so that each dry pipe system is equipped with a separate pressure maintenance device, air compressor, shutoff valve, bypass valve and pressure gauge. Piping shall be galvanized steel in accordance with ASTM A795/A795M or ASTM A53/A53M.

2.7.4 Low Air Pressure Alarm Device

Each dry pipe valve trim shall be provided with a local alarm device consisting of a metal enclosure containing an alarm horn or bell, silence switch, green power-on light, red low-air alarm light and amber trouble light. Activate the alarm device by the low air pressure switch. Upon reduction of sprinkler system pressure to approximately 10 psig above the dry valve trip point pressure, the low air pressure switch shall actuate the audible alarm device and a red low-air alarm light. Restoration of system pressure shall cause the low-air alarm light to be extinguished and the audible alarm to be silenced. An alarm silence switch shall be provided to silence the audible alarm. An amber trouble light shall be provided which will illuminate upon operation of the silence switch and shall be extinguished upon return to its normal position.

2.8 WATERFLOW ALARM

Electrically operated, exterior-mounted, waterflow alarm bell shall be provided and installed in accordance with NFPA 13. Waterflow alarm bell shall be rated 24 VDC and shall be connected to the Fire Alarm Control Panel(FACP) in accordance with Section 28 31 76 INTERIOR FIRE ALARM AND FUTURE MASS NOTIFICATION SYSTEM

2.9 ALARM INITIATING AND SUPERVISORY DEVICES

2.9.1 Sprinkler Pressure (Waterflow) Alarm Switch

Pressure switch shall include a metal housing with a neoprene diaphragm, SPDT snap action switches and a 1/2 inch NPT male pipe thread. The switch shall have a maximum service pressure rating of 175 psi. There shall be two SPDT (Form C) contacts factory adjusted to operate at 4 to 8 psi. The switch shall be capable of being mounted in any position in the alarm line trim piping of the dry pipe valve.

2.9.2 Low Air Pressure Supervisory Switch

The pressure switch shall supervise the air pressure in system and shall be set to activate at 10 psi above the dry pipe valve trip point pressure. The switch shall have an adjustable range between 5 and 80 psi. The switch shall have screw terminal connection and shall be capable of

being wired for normally open or normally closed circuit.

2.9.3 Valve Supervisory (Tamper) Switch

Switch shall be suitable for mounting to the type of control valve to be supervised open. The switch shall be tamper resistant and contain one set of SPDT (Form C) contacts arranged to transfer upon removal of the housing cover or closure of the valve of more than two rotations of the valve stem.

2.10 FIRE DEPARTMENT CONNECTION

Fire department connection shall be projecting type with cast brass body, matching wall escutcheon lettered "Auto Spkr" with a brass finish. The connection shall have two inlets with individual self-closing clappers, caps with drip drains and chains. Female inlets shall have 2-1/2 inch diameter American National Fire Hose Connection Screw Threads (NH) in accordance with NFPA 1963.

2.11 SPRINKLERS

Sprinklers with internal O-rings shall not be used. Sprinklers shall be used in accordance with their listed coverage limitations. Areas where sprinklers are connected to or are a part of the dry pipe system shall be considered unheated and subject to freezing. Temperature classification shall be intermediateas indicated. Sprinklers in high heat areas including attic spaces or in close proximity to unit heaters shall have temperature classification in accordance with NFPA 13. Extended coverage sprinklers shall not be used.

2.11.1 Upright Sprinkler

Upright sprinkler shall be white polyester quick-response type and shall have a nominal 17/32 inch orifice.

2.12 ACCESSORIES

2.12.1 Sprinkler Cabinet

Spare sprinklers shall be provided in accordance with NFPA 13 and shall be packed in a suitable metal or plastic cabinet. Spare sprinklers shall be representative of, and in proportion to, the number of each type and temperature rating of the sprinklers installed. At least one wrench of each type required shall be provided.

2.12.2 Pipe Escutcheon

Escutcheon shall be 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 set screw.

2.12.3 Sprinkler Guard

Guard shall be a steel wire cage designed to encase the sprinkler and protect it from mechanical damage. Guards shall be provided on sprinklers located within 7-feet of floor.

2.12.4 Identification Sign

Valve identification sign shall be minimum 6 inches wide by 2 inches high

with enamel baked finish on minimum 18 gauge steel or 0.024 inch aluminum with red letters on a white background or white letters on red background. Wording of sign shall include, but not be limited to "main drain," "auxiliary drain," "inspector's test," "alarm test," "alarm line," and similar wording as required to identify operational components.

2.13 DOUBLE-CHECK VALVE BACKFLOW PREVENTION ASSEMBLY

Double-check backflow prevention assembly shall comply with ASSE 1015. The assembly shall have a bronze, cast-iron or stainless steel body with flanged ends. The assembly shall include pressure gauge test ports and OS&Y shutoff valves on the inlet and outlet, 2-positive-seating check valve for continuous pressure application, and four test cocks. Assemblies shall be rated for working pressure of 175 psi. The maximum pressure loss shall be 6 psi at a flow rate equal to the sprinkler water demand, at the location of the assembly. A test port for a pressure gauge shall be provided both upstream and downstream of the double check backflow prevention assembly valves.

PART 3 EXECUTION

3.1 EXAMINATION

After becoming familiar with all details of the work, verify all dimensions in the field, and advise the Contracting Officer of any discrepancy before performing the work.

3.2 INSTALLATION REQUIREMENTS

Install in accordance with the applicable provisions of NFPA 13 and publications referenced therein.

3.3 INSPECTION BY FIRE PROTECTION SPECIALIST

The Fire Protection Specialist shall inspect the sprinkler system periodically during the installation to assure that the sprinkler system installed in accordance with the contract requirements. The Fire Protection Specialist shall witness the preliminary and final tests, and shall sign the test results. The Fire Protection Specialist, after completion of the system inspections and a successful final test, shall certify in writing that the system has been installed in accordance with the contract requirements. Any discrepancy shall be brought to the attention of the Contracting Officer in writing, no later than three working days after the discrepancy is discovered. Submit, concurrent with the Final Acceptance Test Report, certification by the Fire Protection Specialist that the sprinkler system is installed in accordance with the contract requirements, including signed approval of the Preliminary and Final Acceptance Test Reports.

3.4 ABOVEGROUND PIPING INSTALLATION

3.4.1 Protection of Piping Against Earthquake Damage

Seismically protect the system piping against damage from earthquakes. This requirement is not subject to determination under NFPA 13. Install the seismic protection of the system piping, including sway bracing as required, in accordance with UFC 3-310-04, NFPA 13 and Annex A. Submit load calculations for sizing of sway bracing, for systems that are required to be protected against damage from earthquakes. Include the

required features identified therein that are applicable to the specific piping system.

3.4.2 Piping in Exposed Areas

Exposed piping shall be installed so as not diminish exit access widths, corridors, or equipment access. Exposed horizontal piping, including drain piping, shall be installed to provide maximum headroom.

3.4.3 Piping in Finished Areas

In areas with suspended or dropped ceilings and in areas with concealed spaces above the ceiling, piping shall be concealed above ceilings. Piping shall be inspected, tested and approved before being concealed. Risers and similar vertical runs of piping in finished areas shall be concealed.

3.4.4 Upright Sprinklers

Riser nipples or "sprigs" to upright sprinklers shall contain no fittings between the branch line tee and the reducing coupling at the sprinkler. Riser nipples exceeding 30 inches in length shall be individually supported.

3.4.5 Pipe Joints

Pipe joints shall conform to NFPA 13, except as modified herein. Not more than four threads shall show after joint is made up. Welded joints will be permitted, only if welding operations are performed as required by NFPA 13 at the Contractor's fabrication shop, not at the project construction site. Flanged joints shall be provided where indicated or required by NFPA 13. Grooved pipe and fittings shall be prepared in accordance with the manufacturer's latest published specification according to pipe material, wall thickness and size. Grooved couplings and fittings shall be from the same manufacturer. 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.

3.4.6 Reducers

Reductions in pipe sizes shall be made with one-piece tapered reducing fittings. The use of grooved-end or rubber-gasketed reducing couplings will not be permitted. When standard fittings of the required size are not manufactured, single bushings of the face type will be permitted. Where used, face bushings shall be installed with the outer face flush with the face of the fitting opening being reduced. Bushings shall not be used in elbow fittings, in more than one outlet of a tee, in more than two outlets of a cross, or where the reduction in size is less than 1/2 inch.

3.4.7 Pipe Penetrations

Cutting structural members for passage of pipes or for pipe-hanger fastenings will not be permitted. Pipes that must penetrate concrete or masonry walls or concrete floors shall be core-drilled and provided with pipe sleeves. Each sleeve shall be Schedule 40 galvanized steel, ductile iron or cast iron pipe and shall extend through its respective wall or floor and be cut flush with each wall surface. Sleeves shall provide required clearance between the pipe and the sleeve in accordance with

NFPA 13. The space between the sleeve and the pipe shall be firmly packed with mineral wool insulation. Where pipes penetrate fire walls, fire partitions, or floors, pipes shall be fire stopped in accordance with Section 07 84 00 FIRESTOPPING. In penetrations that are not fire-rated or not a floor penetration, the space between the sleeve and the pipe shall be sealed at both ends with plastic waterproof cement that will dry to a firm but pliable mass or with a mechanically adjustable segmented elastomer seal.

3.4.8 Escutcheons

Escutcheons shall be provided for pipe penetration of ceilings and walls. Escutcheons shall be securely fastened to the pipe at surfaces through which piping passes.

3.4.9 Inspector's Test Connection

Unless otherwise indicated, test connection shall consist of 1 inch pipe connected to the remote branch line; a test valve located approximately 7 feet above the floor; a smooth bore brass outlet equivalent to the smallest orifice sprinkler used in the system; and a painted metal identification sign affixed to the valve with the words "Inspector's Test." The discharge orifice shall be located outside the building wall directed so as not to cause damage to adjacent construction or landscaping during full flow discharge.

3.4.10 Drains

Provide main drain piping to discharge at a safe point outside the building. Auxiliary drains shall be provided as indicated and as required by NFPA 13. When the capacity of trapped sections of pipe is less than 3 gallons, the auxiliary drain shall consist of a valve not smaller than 1/2 inch and a plug or nipple and cap. When the capacity of trapped sections of piping is more than 3 gallons, the auxiliary drain shall consist of two 1 inch valves and one 2 x 12 inch condensate nipple or equivalent, located in an accessible location. Tie-in drains shall be provided for multiple adjacent trapped branch pipes and shall be a minimum of 1 inch in diameter. Tie-in drain lines shall be pitched a minimum of 1/2 inch per 10 feet.

3.4.11 Installation of Fire Department Connection

Connection shall be mounted on the exterior wall approximately 3 feet above finished grade. The piping between the connection and the check valve shall be provided with an automatic drip in accordance with NFPA 13 and arranged to drain to the outside.

3.4.12 Identification Signs

Signs shall be affixed to each control valve, inspector test valve, main drain, auxiliary drain, test valve, and similar valves as appropriate or as required by NFPA 13. Hydraulic design data nameplates shall be permanently affixed to each sprinkler riser as specified in NFPA 13.

3.5 ELECTRICAL WORK

Except as modified herein, electric equipment and wiring shall be in accordance with Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Alarm signal wiring connected to the building fire alarm control system shall be

in accordance with Section 28 31 76 INTERIOR FIRE ALARM AND FURTURE NOTIFICATION SYSTEM. All wiring for supervisory and alarm circuits shall be a minimum #16 AWG solid copper installed in metallic tubing or conduit. Wiring color code shall remain uniform throughout the system.

3.6 PIPE COLOR CODE MARKING

Color code mark piping as specified in Section 09 90 00 PAINTS AND COATINGS.

3.7 PRELIMINARY TESTS

The system, including the underground water mains and the aboveground piping and system components, shall be tested to assure that equipment and components function as intended. Submit proposed procedures for Preliminary Tests, no later than 14 days prior to the proposed start of the tests, also proposed date and time to begin the tests, with the Preliminary Tests Procedures. The underground and aboveground interior piping systems and attached appurtenances subjected to system working pressure shall be tested in accordance with NFPA 13 and NFPA 24. Upon completion of specified tests, submit complete certificates as specified and 3 copies of the completed Preliminary Tests Reports, no later than 7 days after the completion of the Preliminary Tests. The Preliminary Tests Report shall include both the Contractor's Material and Test Certificate for Underground Piping and the Contractor's Material and Test Certificate for Aboveground Piping. All items in the Preliminary Tests Report shall be signed by the Fire Protection Specialist.

3.7.1 Underground Piping

3.7.1.1 Flushing

Underground piping shall be flushed in accordance with NFPA 24. This includes the requirement to flush the lead-in connection to the fire protection system at a flow rate not less that the calculated maximum water demand rate of the system.

3.7.2 Aboveground Piping

3.7.2.1 Hydrostatic Testing

Aboveground piping shall be hydrostatically tested in accordance with NFPA 13 at not less than 200 psi or 50 psi in excess of maximum system operating pressure and shall maintain that pressure without loss for 2 hours. There shall be no drop in gauge pressure or visible leakage when the system is subjected to the hydrostatic test. The test pressure shall be read from a gauge located at the low elevation point of the system or portion being tested.

3.7.2.2 Air Pressure Test

As specified in NFPA 13, an air pressure leakage test at 50 psi shall be conducted for 24 hours. There shall be no drop in gauge pressure in excess of 1.5 psi for the 24 hours. This air pressure test is in addition to the required hydrostatic test.

3.7.2.3 Backflow Prevention Assembly Forward Flow Test

Each backflow prevention assembly shall be tested at system flow demand, including all applicable hose streams, as specified in NFPA 13. Provide all equipment and instruments necessary to conduct a complete forward flow test, including 2.5 inch diameter hoses, playpipe nozzles, calibrated pressure gauges, and pitot tube gauge. Provide all necessary supports to safely secure hoses and nozzles during the test. At the system demand flow, the pressure readings and pressure drop (friction) across the assembly shall be recorded. A metal placard shall be provided on the backflow prevention assembly that lists the pressure readings both upstream and downstream of the assembly, total pressure drop, and the system test flow rate. The pressure drop shall be compared to the manufacturer's data.

3.7.3 Testing of Alarm Devices

Each alarm initiating device, including pressure alarm switch, low air pressure switch, valve supervisory switch, and electrically-operated switch shall be tested for proper operation. Water motor alarm shall be tested. The connecting circuit to the building fire alarm system shall be inspected and tested.

3.7.4 Trip Tests of Dry Pipe Valves

Each dry pipe valve shall be trip-tested by reducing normal system air pressure through operation the inspector's test connection. Systems equipped with quick opening devices shall be first tested without the operation of the quick opening device and then with it in operation. Test results will be witnessed and recorded. Test results shall include the number of seconds elapsed between the time the test valve is opened and tripping of the dry valve; trip-point air pressure of the dry pipe valve; water pressure prior to valve tripping; and number of seconds elapsed between time the inspector's test valve is opened and water reaches the orifice.

3.7.5 Main Drain Flow Test

Following flushing of the underground piping, a main drain test shall be made to verify the adequacy of the water supply. Static and residual pressures shall be recorded on the certificate specified in paragraph SUBMITTALS. In addition, a main drain test shall be conducted each time after a main control valve is shut and opened.

3.8 FINAL ACCEPTANCE TEST

Final Acceptance Test shall begin only when the Preliminary Test Report has been approved. The Fire Protection Specialist shall conduct the Final Acceptance Test and shall provide a complete demonstration of the operation of the system. This shall include operation of control valves and flowing of inspector's test connections to verify operation of associated waterflow alarm switches. Submit proposed procedures for Final Acceptance Test, no later than 14 days prior to the proposed start of the tests and proposed date and time to begin Final Acceptance Test, with the Final Acceptance Test Procedures. Notification shall be provided at least 14 days prior to the proposed start of the test. Notification shall include a copy of the Contractor's Material & Test Certificates. After operation of control valves has been completed, the main drain test shall

be repeated to assure that control valves are in the open position. Each system shall be completely drained after each trip test. The system air supply system shall be tested to verify that system pressure is restored in the specified time. In addition, the Fire Protection Specialist shall have available copies of as-built drawings and certificates of tests previously conducted. Submit as-built shop drawings, at least 14 days after completion of the Final Tests. The installation shall not be considered accepted until identified discrepancies have been corrected and test documentation is properly completed and received. After the system has been tested and drained, the system shall be drained periodically for at least 2 weeks until it can be assured that water from the system has been removed. Submit 3 copies of the completed Final Acceptance Tests Reports, no later that 7 days after the completion of the Final Acceptance Tests. All items in the Final Acceptance Report shall be signed by the Fire Protection Specialist.

3.9 ONSITE TRAINING

The Fire Protection Specialist and Manufacturer's Representative shall conduct a training course for operating and maintenance personnel as designated by the Contracting Officer. Submit Proposed Onsite Training schedule, at least 14 days prior to the start of related training. Training shall be provided for a period of 2 hours of normal working time and shall start after the system is functionally complete and after the Final Acceptance Test. The Onsite Training shall cover all of the items contained in the approved Operating and Maintenance Instructions, submit 6 manuals listing step-by-step procedures required for system startup, operation, shutdown, and routine maintenance, at least 14 days prior to field training. The manuals shall include the manufacturer's name, model number, parts list, list of parts and tools that should be kept in stock by the owner for routine maintenance including the name of a local supplier, simplified wiring and controls diagrams, troubleshooting guide, and recommended service organization (including address and telephone number) for each item of equipment. Each service organization submitted shall be capable of providing 4 hour on-site response to a service call on an emergency basis.

-- End of Section --

SECTION 22 00 00

PLUMBING, GENERAL PURPOSE

12/07

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.

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	(2004; Addendas a,b,c,d,e,f,g,h,i,j,k,l,m,n,o,p,r,s,t,u,v,x,ak 2006; Supp to Addendas 2006; Errata 2007) Energy Standard for Buildings Except Low-Rise Residential Buildings, I-P Edition

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)

ASSE 1018	(2001) Trap Seal Primer Valves - Potable, Water Supplied

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 C606	(2006) Grooved and Shouldered Joints
AWWA C651	(2005; Errata 2005) Standard for Disinfecting Water Mains
AWWA C652	(2002) Disinfection of Water-Storage Facilities

ASME INTERNATIONAL (ASME)

ASME A112.19.2M	(2003) Standard for Vitreous China Plumbing Fixtures and Hydraulic Requirements for Water Closets and Urinals
ASME A112.19.5	(2005) Trim for Water-Closet Bowls, Tanks

	and Urinals
ASME A112.36.2M	(1991; R 2002) Cleanouts
ASME A112.6.1M	(1997; R 2002) 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	(1985; R 2004) Cast Bronze Threaded Fittings Classes 125 and 250
ASME B16.22	(2001; R 2005) Standard for Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
ASME B16.3	(1998; R 2006) Malleable Iron Threaded Fittings, Classes 150 and 300
ASME B16.4	(2006) Standard for Gray Iron Threaded Fittings; Classes 125 and 250
ASME B31.5	(2001; Addenda 2004) Refrigeration Piping and Heat Transfer Components

ASTM INTERNATIONAL (ASTM)

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 32	(2004) Standard Specification for Solder Metal
ASTM B 370	(2003) Standard Specification for Copper Sheet and Strip for Building Construction
ASTM B 42	(2002e1) Standard Specification for Seamless Copper Pipe, Standard Sizes
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 D 2665	(2007) Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings
ASTM D 2822	(2005) Asphalt Roof Cement
ASTM D 3311	(2006a) Drain, Waste, and Vent (DWV) Plastic Fittings Patterns
ASTM F 409	(2002) Thermoplastic Accessible and Replaceable Plastic Tube and Tubular Fittings

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

INTERNATIONAL CODE COUNCIL (ICC)

ICC A117.1	(2003; R 2004) Standard for Accessible and Usable Buildings and Facilities
ICC NCPC	(2006) North Carolina 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-58	(2002) Standard for Pipe Hangers and Supports - Materials, Design and Manufacture
MSS SP-69	(2003; R 2004) Standard for Pipe Hangers and Supports - Selection and Application

MSS SP-80	(2003) Bronze Gate, Globe, Angle and Check Valves

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 90A	(2002; Errata 2003; Errata 2005) Standard for the Installation of Air Conditioning and Ventilating Systems

NSF INTERNATIONAL (NSF)

NSF 14	(2007) Plastics Piping System Components and Related Materials
NSF 61	(2007) 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)

PL 102-486	(1992) Residential Energy Efficiency Ratings

1.2 SUBMITTALS

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

SD-03 Product Data

Fixtures

List of installed fixtures with manufacturer, model, and flow rate.

Flush valve water closets

Flush valve urinals

Wall hung lavatories

Drinking-water coolers

Shower Faucets

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.

SD-08 Manufacturer's Instructions

SD-10 Operation and Maintenance Data

Plumbing System.

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

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 Plumbing Fixtures

Water flow and consumption rates shall at a minimum comply with requirements in PL 102-486.

1.6 REGULATORY REQUIREMENTS

Unless otherwise required herein, plumbing work shall be in accordance with ICC NCPC.

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.

PART 2 PRODUCTS

2.1 MATERIALS

Materials for various services shall be in accordance with TABLES I and II. Pipe schedules shall be selected based on service requirements. Pipe fittings shall be compatible with the applicable pipe materials. Plastic pipe, fittings, and solvent cement shall meet NSF 14 and shall be NSF listed for the service intended. In line devices such as 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 lavatory faucets, 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. Plastic pipe shall not be installed in air plenums.

2.1.1 Pipe Joint Materials

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. Solder Material: Solder metal shall conform to ASTM B 32.

c. Solder Flux: Flux shall be liquid form, non-corrosive, and conform to ASTM B 813, Standard Test 1.

d. Rubber Gaskets for Cast-Iron Soil-Pipe and Fittings (hub and spigot type and hubless type): ASTM C 564.

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, odorproof and verminproof properties.

h. Hypochlorites: AWWA B300.

i. Liquid Chlorine: AWWA B301.

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. Pressure ratings shall be based upon the application. Valves shall conform to the following standards:

Description	Standard
Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends	MSS SP-110
Bronze Check Valves	MSS SP-80

2.4 FIXTURES

Fixtures shall be water conservation type, in accordance with ICC NCPC. 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. Plastic in contact with hot water shall be suitable for 180 degrees F water temperature.

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 accessible water closets. Provide wax bowl ring including plastic sleeve. Water flushing volume of the water closet and dual-flush flush valve combination shall not exceed 1.6 gallons per flush (normal)and 1.1 gallons per flush (reduced). Provide black 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.

2.4.2 Flush Valve Urinals

ASME A112.19.2M, white vitreous china, wall-mounted, wall outlet, integral trap, and extended side shields. Water flushing volume of the urinal and flush valve combination shall not exceed 0.125 gallon per flush. Anchor fixture to 12" CMU walls. Provide 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 Accessible Flush Valve Type Urinals

ASME A112.19.2M, white vitreous china, wall-mounted, wall outlet, integral trap, 14 inches long from wall to front of flare, and ASME A112.19.5 trim. Provide large diaphragm (not less than 2.625 inches upper chamber inside diameter at the point where the diaphragm is sealed between the

upper and lower chambers), nonhold-open flush valve of chrome plated cast brass conforming to ASTM B 584, including vacuum breaker and angle (control-stop) valve with back check. The water flushing volume of the flush valve and urinal combination shall not exceed 1.0 gallon per flush. Furnish urinal manufacturer's certification of conformance. Anchor fixture to 12" CMU walls. Mount urinal with front rim a maximum of 17 inches above floor and flush valve handle a maximum of 44 inches above floor for use by handicapped on wheelchair.

2.4.4 Wall Hung Lavatories

ASME A112.19.2M, 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 0.5 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.

2.4.5 Accessible Drinking-Water Coolers

AHRI 1010, bottle filling station, dual height, ADA compliant, wall-mounted bubbler style with ASME A112.6.1M concealed chair carrier, air-cooled R134A refrigeration unit, 4.75 gph minimum capacity, stainless steel splash receptor, and all stainless steel cabinet. Low bowl bubbler shall have 27 inch minimum knee clearance from front bottom of unit to floor and 36 inch maximum spout height above floor. High bowl/bubbler shall have 39 inch spout height. Bubblers shall also be controlled by push levers, by push bars, or touch pads one on each side or one on front and both sides of the cabinet.

2.5 DRAINS

2.5.1 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 where noted on the drawings. Primer shall meet ASSE 1018.

2.5.2 Shower Faucets

Provide single control pressure equalizing 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 2.2 GPM at 80 PSI per Energy Star requirements. Provide tubing mounted from behind the wall between faucets and shower heads. Provide separate globe valves or angle valves with union connections in each supply to faucet. Provide shower valve with lever type control handle.

2.6 TRAPS

Unless otherwise specified, traps shall be plastic per ASTM F 409. Traps shall be without a cleanout. 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.

2.7 ELECTRICAL WORK

Provide electrical motor driven equipment specified complete with motors, motor starters, and controls as specified herein and in Section 26 20 00, INTERIOR DISTRIBUTION SYSTEM. Provide internal wiring for components of packaged equipment as an integral part of the equipment. Provide high efficiency type, single-phase, fractional-horsepower alternating-current motors, including motors that are part of a system, corresponding to the applications in accordance with NEMA MG 11. Where indicated on drawings, provide polyphase, squirrel-cage medium induction motors with continuous ratings, including motors that are part of a system, that meet the efficiency ratings for premium efficiency motors in accordance with NEMA MG 1. Provide motors in accordance with NEMA MG 1 and of sufficient size to drive the load at the specified capacity without exceeding the nameplate rating of the motor.

Motors shall be rated for continuous duty with the enclosure specified. Motor duty requirements shall allow for maximum frequency start-stop operation and minimum encountered interval between start and stop. Motor torque shall be capable of accelerating the connected load within 20 seconds with 80 percent of the rated voltage maintained at motor terminals during one starting period.

Controllers and contactors shall have auxiliary contacts for use with the controls provided. Manual or automatic control and protective or signal devices required for the operation specified and any control wiring required for controls and devices specified, but not shown, shall be provided. For packaged equipment, the manufacturer shall provide controllers, including the required monitors and timed restart.

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.

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 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.

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. A full port ball 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 as allowed by NCPC. Exterior underground utilities shall be at least 12 inches below the finish grade 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 from existing building services. 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, 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 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. 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. 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.

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 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.

3.1.2.3 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.

3.1.2.4 Copper Tube and Pipe

a. 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.

3.1.2.5 Plastic Pipe

PVC pipe shall have joints made with solvent cement elastomeric, threading, (threading of Schedule 80 Pipe is allowed only where required for disconnection and inspection; threading of Schedule 40 Pipe is not allowed), or mated flanged.

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.

3.2 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. In addition, for water closets intended for handicap use, the flush valve handle shall be installed on the wide side of the enclosure.

3.2.3 Fixture Supports

Fixture supports for off-the-floor urinals shall be of the wall hangar type anchored to block wall. Grout cells where wang hangars are installed to assure secure mounting. Adjustability shall be provided to locate the fixture at the desired height and in proper relation to the wall.

3.2.3.1 Support for Solid Masonry Construction

Where a floor-anchored chair carrier cannot be used, a suitable wall hangar shall be imbedded in the masonry wall.

3.2.3.2 Support for Concrete-Masonry Wall Construction

Where a floor-anchored chair carrier cannot be used, a suitable wall hangar shall be fastened to the concrete wall using through bolts and a back-up plate.

3.2.4 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.

3.3 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.

3.4 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 TESTS, FLUSHING AND DISINFECTION

3.5.1 Plumbing System

The following tests shall be performed on the plumbing system.s. Water Supply Systems Tests. Visually check all new plumbing joints for leaks while under full building line pressure. Repair any leaks found.

3.5.2 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.

3.5.3 System Flushing

3.5.3.1 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.

3.5.3.2 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.

3.5.4 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. Operation of each fixture and fixture trim.

3.5.5 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.

3.6 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.

3.7 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.

3.8 TABLES

TABLE I
PIPE AND FITTING MATERIALS FOR
DRAINAGE, WASTE, AND VENT PIPING SYSTEMS

		SERVICE			
Item #	Pipe and Fitting Materials	A	B	C	D
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

TABLE I
PIPE AND FITTING MATERIALS FOR
DRAINAGE, WASTE, AND VENT PIPING SYSTEMS

Item #	Pipe and Fitting Materials	SERVICE A	B	C	D
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
3	Cast iron drainage fittings, threaded, ASME B16.12 for use with Item 6	X		X	X
4	Cast iron screwed fittings (threaded) ASME B16.4 for use with Item 10				X
5	Malleable-iron threaded fittings, galvanized ASME B16.3 for use with Item 6				X
6	Cast bronze threaded fittings, ASME B16.15				X
7	Polyvinyl Chloride plastic drain, waste and vent pipe and fittings, ASTM D 2665,	X	X	X	X

SERVICE:

A - Underground Building Soil and Waste
B - Aboveground Soil, Waste, Drain In Buildings
C - Underground Vent
D - Aboveground Vent
* - Hard Temper

TABLE II
PIPE AND FITTING MATERIALS FOR PRESSURE PIPING SYSTEMS

Item No.	Pipe and Fitting Materials	SERVICE A	B	C
1	Seamless copper pipe, ASTM B 42	X	X	X
2	Seamless copper water tube, ASTM B 88, ASTM B 88M	X**	X**	X***
3	Wrought copper and bronze solder-joint	X	X	X

TABLE II
PIPE AND FITTING MATERIALS FOR PRESSURE PIPING SYSTEMS

Item No.	Pipe and Fitting Materials	SERVICE A	B	C
	pressure fittings, ASME B16.22 for use with Items 1 and 2			

A - Cold Water Service Aboveground
B - Hot and Cold Water Distribution 180 degrees F Maximum Aboveground
C - 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

-- End of Section --

SECTION 22 15 14.00 40

GENERAL SERVICE COMPRESSED-AIR SYSTEMS, LOW PRESSURE
11/17

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)

AISC 360	(2016) Specification for Structural Steel Buildings

ASME INTERNATIONAL (ASME)

ASME B16.3	(2011) Malleable Iron Threaded Fittings, Classes 150 and 300
ASME B16.39	(2014) Standard for Malleable Iron Threaded Pipe Unions; Classes 150, 250, and 300
ASME B18.2.2	(2015) Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series)
ASME B31.3	(2016) Process Piping
ASME B40.100	(2013) Pressure Gauges and Gauge Attachments
ASME BPVC	(2010) Boiler and Pressure Vessels Code
ASME BPVC SEC VIII D1	(2015) BPVC Section VIII-Rules for Construction of Pressure Vessels Division 1

ASTM INTERNATIONAL (ASTM)

ASTM A197/A197M	(2000; R 2015) Standard Specification for Cupola Malleable Iron
ASTM A278/A278M	(2015) Standard Specification for Gray Iron Castings for Pressure-Containing Parts for Temperatures Up to 650 degrees F (350 degrees C)
ASTM A307	(2014; E 2017) Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
ASTM A53/A53M	(2012) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

ASTM A536	(1984; R 2014) Standard Specification for Ductile Iron Castings
ASTM B62	(2017) Standard Specification for Composition Bronze or Ounce Metal Castings
ASTM B733	(2015) Standard Specification for Autocatalytic (Electroless) Nickel-Phosphorus Coatings on Metal

COMPRESSED AIR AND GAS INSTITUTE (CAGI)

CAGI B19.1	(2010) Safety Standard for Compressor Systems

INTERNATIONAL SOCIETY OF AUTOMATION (ISA)

ISA 7.0.01	(1996) Quality Standard for Instrument Air

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-58	(1993; Reaffirmed 2010) Pipe Hangers and Supports - Materials, Design and Manufacture, Selection, Application, and Installation
MSS SP-72	(2010a) Ball Valves with Flanged or Butt-Welding Ends for General Service

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-1922	(Rev A; Notice 2) Shield, Expansion (Caulking Anchors, Single Lead)
CID A-A-1923	(Rev A; Notice 2) Shield, Expansion (Lag, Machine and Externally Threaded Wedge Bolt Anchors)
CID A-A-1924	(Rev A; Notice 2) Shield, Expansion (Self Drilling Tubular Expansion Shell Bolt Anchors
CID A-A-55614	(Basic; Notice 2) Shield, Expansion (Non-Drilling Expansion Anchors)

1.2 SUBMITTALS

SD-03 Product Data

Equipment and Performance Data

Aboveground Piping Materials

Piping Specialties

Supporting Elements

Air Compressors

Valves

Accessories

Miscellaneous Materials

SD-07 Certificates

Aboveground Piping Materials

Supporting Elements

Valves

Miscellaneous Materials

SD-10 Operation and Maintenance Data

Operation and Maintenance Manuals

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

In lieu of separate hangers, a shop drawing of trapeze hangers with solid or split-ring clamps may be submitted for approval.

2.1.1 Design Requirements

Provide equipment and performance data submitted for piping systems showing conformance with ASME Code.

2.2 EQUIPMENT

2.2.1 Piping Specialties

2.2.1.1 Compressed-Air Receivers

Ensure that the compressed air receivers conform to the sizes and capacities specified. Design such vessels for working pressures and service in accordance with the ASME BPVC SEC VIII D1, and label the receivers with this information.

Provide complete vessels, with connections for drain, supports, and other required accessories.

2.2.1.2 Pressure Gages

Ensure that the pressure gages conform to ASME B40.100 and are Type I, Class 1, (pressure) for the pressures indicated. Provide a pressure gage size that is 3 1/2 inches. Ensure the cases are constructed of corrosion-resistant steel conforming to the AISI 300 series

2.2.1.3 Line Strainers

Provide Y-type strainers with a removable basket. Ensure that strainers of 2 inch ips or smaller have screwed ends and that strainers of 2 1/2 inch ips or larger have flanged ends. Ensure that the body working pressure

rating exceeds the maximum service pressure of the system by at least 50 percent. Ensure that the body has cast-in arrows to indicate the direction of flow. Ensure that the strainer bodies fitted with screwed screen retainers have straight threads and are gasketed with nonferrous metal. Ensure that the strainer bodies fitted with bolted-on screen retainers have offset blowdown holes.Provide cast iron conforming to ASTM A278/A278M Class 30 body material. Where the system material is nonferrous, provide a nonferrous strainer body material.

Ensure the minimum free-hole area of the strainer element is equal to at least 3.4 times the internal area of connecting piping. Ensure that the strainer screens for air service have a mesh cloth smaller than 0.006 inch and that the screens have finished ends fitted to machined screen chamber surfaces to preclude bypass flow. Ensure that the strainer element material is AISI Type 304 corrosion-resistant steel.

2.2.2 Air Compressors

Provide a two-stage air compressor with cast iron cylinder, aluminum piston, suitable for shop air duty, complete with air tank, air dryer, water-cooledair cooler, and other appurtenances. Ensure that the compressor and installation conforms to CAGI B19.1. Ensure that the compressor capacity is as required for service and provide continuous control air when operating on a 1/3-on 2/3-off cycle. Provide an oil-level sight indicator on the compressor and a coalescing oil filter on the compressor discharge line. Provide mass-refrigerated air dryer that maintain the air in the system with a dew point low enough to prevent condensation at 13 degrees F at 18 psi main pressure. Locate the air dryer at the outlet of the tank. Ensure that the air delivered to the system conforms to ISA 7.0.01.

2.2.3 Valves

2.2.3.1 Ball Valves (BAV)

Ensure that ball valves conform to MSS SP-72 and are Style 1.

Provide valves rated for service at 175 or more psi at 200 degrees F.

For valve bodies of 2 inch ips or smaller, use screwed end connections constructed of Class A copper alloy.

Provide balls and stems for valves 2 inch or smaller ips are the manufacturer's standard Class A copper alloy with 900 Brinell hard chrome plating finish. Ensure that electroless nickel plating conforms to ASTM B733.

Design valves that allow flow from either direction and that will seal equally tight in either direction.

Ensure that valves have flow areas that are the same size as the pipe flow area.

Do not provide valves with ball seals kept in place by spring washers. Ensure that all valves have adjustable packing glands. Use tetrafluoroethylene seats and seals.

Ensure that valve body construction is such that torque from a pipe with a

valve in installed condition does not tend to disassemble the valve by stripping setscrews or by loosening body end inserts or coupling nuts. Ensure that torque from a pipe is resisted by a one-piece body between end connections or by bolts in shear where the body has a mating flange or surface-bolted construction.

2.2.3.2 Gage Cocks (GC)

Provide T-head or lever handle ground key gage cocks, with washer and screw, constructed of polished ASTM B62 bronze, and rated for125 psi saturated steam service. Ensure that end connections suit the service, with or without a union and nipple.

2.3 MATERIALS

2.3.1 Aboveground Piping Materials

2.3.1.1 Compressed Air Systems 125 Psig And Less

a. Type BCS Black Carbon Steel

For pipe 1/8 through 1 1/2 inches provide Schedule 40, furnace butt welded, black carbon steel, conforming to ASTM A53/A53M, Type F, Grade A.

For fittings 2 inches and under, provide 150 (psig) wsp, banded, black malleable iron, screwed, conforming to ASTM A197/A197M and ASME B16.3.

For unions 2 inches and under, provide 250 psig wsp, female, screwed, black malleable iron, with brass-to-iron seat and a ground joint conforming to ASME B16.39. Use ductile iron conforming to ASTM A536 for grooved pipe couplings.

For couplings 2 inches and under, provide standard weight, screwed, black carbon steel.

2.4 ACCESSORIES

2.4.1 Miscellaneous Materials

2.4.1.1 Bolting

For flange and general-purpose bolting, use hex-head bolts and conform to ASTM A307, Grade B. Ensure that the heavy hex-nuts conform to ASME B18.2.2. Square-head bolts are not acceptable.

2.4.1.2 Pipe Thread Compounds

Use tetrafluoroethylene tape at least 2 mils thick for pipe sizes to and including 1 inch ips.

Tetrafluoroethylene dispersions and other suitable compounds may be used for other applications upon approval by the Contracting Officer.

2.4.2 Supporting Elements

Provide all necessary piping system components and miscellaneous required supporting elements. Ensure that supporting elements are suitable for stresses imposed by system pressures and temperatures, and natural and other external forces.

Ensure that the supporting elements are UL-listed and conform to requirements of ASME B31.3, and MSS SP-58, except as otherwise noted. Type devices specified herein are defined in MSS standards unless otherwise noted.

2.4.2.1 Building Structure Attachments

Use concrete and masonry anchor devices that conform to requirements of CID A-A-1922, CID A-A-1923, CID A-A-1924, CID A-A-55614.

Install cast-in floor-mounted equipment anchor devices that provide adjustable positions.

Use built-in masonry anchor devices, unless otherwise approved by the Contracting Officer.

Do not use power-actuated anchoring devices to support mechanical systems components.

Ensure that beam clamps are center-loading Type 21, UL-listed, cataloged, and load-rated, and commercially manufactured.

Do not use C-clamps.

Construct concrete inserts in accordance with the requirements of MSS SP-58 for Type 18 hangars. When applied to piping of 2 inch ips or larger and where otherwise required by imposed loads, insert a 1-foot length of 1/2-inch reinforcing rod that is wired through wing slots. Proprietary designs for continuous inserts may be used upon approval by the Contracting Officer.

2.4.2.2 Horizontal Pipe Attachments

Use Type 6 solid malleable-iron pipe rings to support piping in sizes to and including 2 inch ips. Split-band rings may be used for piping up to 1 inch ips.

Use Types 1 attachments to support piping in sizes through 8 inch ips.

2.4.2.3 Vertical Pipe Attachments

Use Type 8 vertical pipe attachments.

2.4.2.4 Hanger Rods and Fixtures

Use only circular cross-section rod hangers to connect building structure attachments to pipe support devices. Pipe, straps, or bars of equivalent strength may be used for hangers only where approved by the Contracting Officer.

Provide turnbuckles, swing eyes, and clevises as required by support system to accommodate pipe accessibility and adjustment for load and pitch.

2.4.2.5 Supplementary Steel

Where it is necessary to frame structural members between existing members or where structural members are used in lieu of commercially rated supports, design and fabricate such supplementary steel in accordance with AISC 360.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Aboveground Piping System

3.1.1.1 Piping Systems

Fabricate and install piping systems in accordance with ASME B31.3, MSS SP-58, ASME BPVC, and applicable AWS requirements.

Fabricate pipe to measurements established on the job and carefully work the pipe into place without springing or forcing the pipe.

Ensure that pipe, tubing, fittings, valves, equipment, and accessories are clean and free of all foreign material before installation. Clean pipe by a method approved by the Contracting Officer. Purge lines with dry, oil-free compressed air after erection, but do not rely on purging for removing all foreign matter. Purge lines at a velocity equal to 1 1/2 times the maximum normal flow velocity. During construction, protect the open ends of pipe, fittings, and valves at all times to prevent foreign matter from entering the pipe. Except when connections are actually underway, install plugs or caps on all pipe and component openings. Use plugs or caps that are commercially manufactured products.

Install piping straight and true, with approved offsets around obstructions and with necessary expansion bends or fitting offsets essential to a satisfactory installation and as may be necessary to increase headroom or to avoid interference with the building construction, electric conduit, or facilities equipment.

Use standard long sweep pipe fittings for changes in direction. Do not use mitered joints or unapproved pipe bends.

Make tee connections with screwed tee fittings. Provide branch outlet fittings that are forged, flared for improved flow where attached to the run, reinforced against external strains, and designed to withstand full burst-pressure strength requirements. Provide tool space between parallel piping runs whenever threaded unions or couplings are installed.

Install horizontal piping with a grade of 1 inch per 100 feet.

Use eccentric reducers where required to permit proper drainage of pipe lines. Do not permit bushings for this purpose. Provide drain valves in piping systems at low points. Use pipe drains that consist of 1/2 inch globe valves with renewable disks and a 3/4 inch hose adapter.

Install piping in a manner that does not stress or strain connected equipment.

Make expansion bends in steel pipe from pipe sections and long-radius welding elbows that are 1 inch or larger. Ensure that expansion U-bends are cold-sprung and welded into the line. Anchor the line before removing the spreader from the expansion U-bend.

3.1.1.2 Joints

Ream pipe ends before joint connections are made.

Make up screwed joints with joint compound.

Apply joint compounds to the male thread only, and exercise care to prevent the compound from reaching the interior of the pipe.

Provide screwed unions wherever required to permit convenient removal of equipment, valves, and piping accessories from the piping system.

Use square-cut copper tubing for solder joints and use cutting and reaming tools to remove burrs. Clean the inside surfaces of fittings and the outside surfaces of tubes in the joint area before assembly of the joint. Apply the joint flux, solder, and heat source in accordance with the manufacturer's instructions, using capillary action to fill the socket space and achieve 100 percent of the shear-line strength capability. Ensure that the valves in copper piping have screwed ends with end adapters to suit mechanical connections, unless solder joining is specified for a given application. Remake copper joints that fail pressure tests with new materials, including pipe or tubing fittings and filler metal.3.1.1.3 Control and Instrument Air Tubing

Conceal tubing, except in mechanical rooms or areas where other piping is exposed.

Use hard-drawn copper tubing in exposed areas. Do not use annealed copper in concealed locations.

For supply system copper tubing, use wrought copper solder joint-type fittings, except at the connection to the apparatus where brass mechanical and ips thread adapter fittings are used. Tool-made bends in lieu of fittings are acceptable. Neatly nest multiple tube runs.

Mechanically attach tubing to supporting surfaces. Do not use adhesive to attach supports.

For copper tubing horizontal supports with less than 3 tubes use a rigid 1-inch by 3/8-inch metal channel, use a proprietary metal tube race for 3 or more tubes.

Systematically purge tubing with dry, oil-free compressed air to rid the system of impurities generated during joint-making and installation and atmospheric moisture before connection to control instruments.

3.1.1.4 General Service Valve Locations

Provide valves to permit isolation of branch piping and each equipment item from the balance of the system, to allow safe and convenient access without moving equipment, and to require a minimum of piping and equipment disassembly.

3.1.2 Compressed-Air Systems Identification

Protect and keep identification plates clean. Replace damaged and illegible identification plates at no additional expense.

Label and arrow piping at each point of entry and exit of piping passing through walls; at each change in direction, such as at elbows and tees; and in congested or hidden areas, at each point required to clarify service or indicate a hazard. Label each riser.

3.2 FIELD QUALITY CONTROL

3.2.1 Compressed-Air Systems Testing

Prior to acceptance of the work, pressure-test completed systems in the presence of the Contracting Officer.Only sections of piping modified by Contract work shall require testing.

Conduct testing in two stages: preliminary stage and acceptance stage, including gage tests.

Perform no testing until personnel not directly involved in the test have been evacuated from the area.

Contractor may conduct tests for their own purposes in addition to the preliminary test and the acceptance test specified below.

3.2.1.1 Preliminary Stage Tests

Conduct pneumatic tests with dry, oil-free compressed air.

Ensure that each system test includes a preliminary test in which the joints under test are swabbed with a standard high-strength film soap solution, so that bubbles, if any exist, can be observed at internal pressures of 5 psi or less.

When testing reveals that leakage exceeds specified limits, isolate and repair the leaks, replace defective materials where necessary, and retest the system until specified limits are met.

Other than standard piping plugs, caps and valves, only use commercially manufactured expandable elastomer plugs for sealing off piping for test purposes. Ensure that the published safe test pressure rating of any plug used is at least three times the actual test pressure being applied. During pneumatic testing or hydrostatic testing, evacuate personnel from areas where plugs are used.

Remove components that could be damaged by test pressure from the piping systems to be tested.

Perform valve-operating tests and drainage tests according to cited standards.

Check piping system components, such as valves, for proper operation under the system test pressure.

Do not add test media to a system during a test for a period specified or determined by the Contracting Officer.

Duration of a test is determined by the Contracting Officer and will be for a minimum of 15 minutes with a maximum of 24 hours. Test may be terminated by direction of the Contracting Officer at any point after it has been determined that the leakage rate is within limits.

3.2.1.2 Test Gages

Ensure that test gages conform to ASME B40.100 and have a dial size of

8-inches or larger. The maximum permissible scale range for a given test is such that the pointer during a test has a starting position at midpoint of the dial or within the middle third of the scale range. Ensure that the certification of accuracy and correction table bears a date no more than 90 calendar days before the gage is used in a test, and that it indicated the test gage number and the project number, unless otherwise approved by the Contracting Officer.

3.2.1.3 Acceptance Pressure Testing

Ensure that the testing takes place during steady-state ambient temperature conditions.

Test ferrous piping systems at 1-1/2 times the maximum operating pressure. Maintain test pressure for at least hours with an allowable pressure drop of 2 psi during that time unless otherwise approved by the Contracting Officer.

Test control and instrumentation tubing systems at 30 psi . Maintain the test pressure for at least 24 hours with essentially no pressure drop during that time.

Each acceptance test requires the signature of the Contracting Officer. Deliver two record copies to the Contracting Officer after acceptance.

3.3 ADJUSTING AND CLEANING

Remove rust and dirt from the bore and exterior surface of all piping and equipment. Clean pipeline strainers, temporary and permanent, during purging operations, after startup, and immediately prior to final acceptance by the Government.

Flush and clean new steel piping with a suitable degreasing agent, until visible grease, dirt, and other contaminants have been removed. Dispose of degreased waste material including the degreaser itself in accordance with written instructions received from the Environmental Authority having jurisdiction through the Contracting Officer and in accordance with all local, State, and Federal Regulations.

3.4 CLOSEOUT ACTIVITIES

Submit 6 copies of the operation and maintenance manuals 30 calendar days prior to testing the low-pressure compressed air system. Update and resubmit data for final approval no later than 30 calendar days prior to contract completion.

-- End of Section --

SECTION 23 03 00.00

BASIC MECHANICAL MATERIALS AND METHODS
04/17

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 B117	(2016) Standard Practice for Operating Salt Spray (Fog) Apparatus

INTERNATIONAL CODE COUNCIL (ICC)

ICC IFGC	(2015) International Fuel Gas Code
ICC IMC	(2015) International Mechanical Code
ICC IPC	(2015) International Plumbing Code

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1	(2016) Motors and Generators
NEMA MG 11	(1977; R 2012) Energy Management Guide for Selection and Use of Single Phase Motors

1.2 SUBMITTALS

Government approval is required for all submittals.

1.3 RELATED REQUIREMENTS

This section applies to all sections of Divisions: 21, FIRE SUPPRESSION; 22, PLUMBING; and 23, HEATING, VENTILATING, AND AIR CONDITIONING of this project specification, unless specified otherwise in the individual section.

1.4 QUALITY ASSURANCE

1.4.1 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 must have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year use must include applications of equipment and materials under similar circumstances and of similar size. The product must have been for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2 year period.

1.4.2 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.

1.4.3 Service Support

The equipment items must 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 must 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.

1.4.4 Manufacturer's Nameplate

For each item of equipment, provide 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.

1.4.5 Modification of References

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "must" 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.

1.4.5.1 Definitions

For the International Code Council (ICC) Codes referenced in the contract documents, advisory provisions must be considered mandatory, the word "should" is interpreted as "must." Reference to the "code official" must be interpreted to mean the "Contracting Officer." For Navy owned property, references to the "owner" must be interpreted to mean the "Contracting Officer." For leased facilities, references to the "owner" must be interpreted to mean the "lessor." References to the "permit holder" must be interpreted to mean the "Contractor."

1.4.5.2 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, must be applied appropriately by the Contracting Officer as authorized by his administrative cognizance and the FAR.

1.5 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.

1.6 ELECTRICAL REQUIREMENTS

Furnish motors, controllers, disconnects and contactors with their respective pieces of equipment. Motors, controllers, disconnects and contactors must 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. Controllers and contactors shall have a maximum of 120 volt control circuits, and must 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 must be included under the section that specified that motor or equipment. Power wiring and conduit for field installed equipment must be provided under and conform to the requirements of Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

1.6.1 Motor Voltage

Provide motors rated for the voltage supplied. Motors shall be suitable for use at 90% to 110% of the nominal voltage and shall have a service factor of at least 1.1 at that nominal voltage.

1.6.2 Single Phase Motor Efficiency

Unless otherwise specified, single-phase fractional-horsepower alternating-current motors must be high efficiency types corresponding to the applications listed in NEMA MG 11.

1.6.3 Poly Phase Motor Efficiency

Unless other specified polyphase squirrel-cage induction motors must be premium efficiency with continuous ratings that meet or exceed energy efficient ratings in accordance with Table 12-12 of NEMA MG 1

1.6.4 Three-Phase Motor Protection

Provide controllers for motors rated three horsepower and larger with electronic phase-voltage monitors designed to protect motors from phase-loss, undervoltage, and overvoltage. 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 must be thoroughly familiar with all parts of the installation and must be trained in operating theory as well as practical operation and maintenance work.

Instruction must 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 must 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.

1.9.2 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).

1.9.3 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 Manufacturer's Recommendations

All material and equipment shall be installed in accordance with the manufacturer's recommendations for the intended purpose. Use the more stringent methods when manufacturer's recommendations, and plan & specification requirements differ. The contractor shall notify the government of any conflicts between manufacturer's recommendations and plans & specification requirements.

3.2 International Construction Codes

All material, equipment and installation shall be in accordance with the ICC IFGC, ICC IPC, and ICC IMCunless noted otherwise on the drawings and/or specifications. The contractor shall notify the government of any conflicts between ICC code requirements and contract requirements.

3.3 PAINTING OF NEW EQUIPMENT

New equipment painting must be factory applied or shop applied, and must be as specified herein, and provided under each individual section.

3.3.1 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 must withstand 500 hours in a salt-spray fog test. Salt-spray fog test must be in accordance with ASTM B117, and for that test the acceptance criteria must be as follows: immediately after completion of the test, the paint must show no signs of blistering, wrinkling, or cracking, and no

loss of adhesion; and the specimen must 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 must 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 must be designed for the temperature service.

3.3.2 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 must 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 must 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 must 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 1 mil; and two coats of enamel applied to a minimum dry film thickness of 1 mil per coat.

b. Temperatures Between 120 and 400 Degrees F: Metal surfaces subject to temperatures between 120 and 400 degrees F must 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 must 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: _____

__ AC, Computer Room
__ AC, Package
__ AC, Package Terminal
__ Assembly, Trap line
__ Backflow Preventer
__ Boiler
__ Chiller, Air Cooled Recip
__ Chiller, Air Cooled Screw
__ Chiller, Air Cooled Scroll
__ Chiller, Water Cooled Recip
__ Chiller, Water Cooled Screw
__ Compressor, Control Air
__ Compressor, Industrial Air
__ Dryer, Refrigerated Air
__ Exchanger, Heat
__ Evaporator, Freezer
__ Evaporator, Refrigerator
__ Fan, Exhaust
__ Generator
__ Heater, Space
__ Heater, Unit
__ Heat Pump, Geo-Thermal
__ Heat Pump, Indoor Unit
__ Heat Pump, Outdoor Unit
__ Heat Pump, Package
__ Heat Pump, Package Terminal
__ Pump, Circulating, Chilled Water
__ Pump, Circulating, Domestic Water
__ Pump, Circulating, Dual Temp Water
__ Pump, Circulating, Heating Water
__ Pump, Condensate
__ Pump, Sump
__ Regulator, Temperature
__ Tank, Hot Water Storage
__ Tower, Cooling
__ Unit, Air Handling
__ Unit, AC Condensing
__ Unit, Freezer Condensing
__ Unit, Refrigerator Condensing
__ Unit, Fan Coil
__ Unit, TAB (Attach Room No. List)
__ Unit, VAV (Attach Room No. List)
__ Valve, Pressure Reducing
__ Valve, Steam Pilot
__ 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)_____

-- End of Section --

SECTION 23 05 92

TESTING/ADJUSTING/BALANCING: SMALL HEATING/VENTILATING/COOLING SYSTEMS

04/17

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.

ASSOCIATED AIR BALANCE COUNCIL (AABC)

AABC MN-1	1989 National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems

NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB)

NEBB Procedural Stds	1991 Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems

SHEET METAL & AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA TAB HVAC Sys	1993 HVAC Systems - Testing, Adjusting and Balancing

1.2 DESCRIPTION OF WORK

The work includes testing, adjusting, and balancing (TAB) of new and existing 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.

1.2.1 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, "Insulation for Mechanical Systems."

1.3 DEFINITIONS

a. Field check group: One or more systems of the same basic type; the subgroup of a "field check group" is a "system."

b. Out-of-tolerance data: Pertains only to field checking of certified DALT or TAB report. The term is defined as a measurement taken during field checking which does not fall within the range of plus 5 to minus 5 percent of the design for a specific parameter.

1.4 SUBMITTALS

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

SD-06 Test Reports

TAB Report

1.4.1 TAB Report

Submit TAB report with any/all known deficiencies in operation, performance, or air flow are clearly identified. The report shall be reported in the specified format including the following data:

a. Report Format: Submit completed report forms for each of the following; as a minimum, report all data as contained on standard NEBB Procedural Stds, AABC MN-1, OR SMACNA TAB HVAC Sys report forms as contained within the referenced standards:

(1) Air Systems

(a) Fan report for air handlers, exhaust fans, heat pumps, and energy recovery ventilators..

(b) Duct traverse supply/return/exhaust/relief/outside air ducts.

(c) Terminal supply, return, and exhaust outlets.

(d) Hot water coils - report entering/leaving, wet/dry bulb temperatures.

(e) DX cooling coils - report entering/leaving, wet/dry bulb temperatures and energy transferred.

(f) Energy recovering devices- report entering/leaving dry/wet bulb temperatures and energy transferred of both air streams.

(g) Unit heaters- report entering/leaving dry bulb temperatures and energy transferred.

(h) Condensing units/compressors/condensors - report rated/actual compressor amperages/voltages. Also, report condenser entering air temperature, both design and actual.

(2) Water Systems

(a) All pumps.

(b) All flow control balancing valves, circuit setters, flow orifices, venturis - report size, flow, measured pressure drop, setting, manufacturer, model.

(c) Hot water water coils.

The report shall be neatly bound with a waterproof cover. It shall contain a table of contents, with each page numbered. All report data shall be typed - handwritten data will not be acceptable.

a. 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 the TAB data was recorded.

b. 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.

1.5 QUALITY ASSURANCE

1.5.1 Modifications of References

Accomplish work in accordance with referenced publications of AABC or NEBB except as 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."

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 TAB PROCEDURES

3.1.1 TAB Field Work

Test, adjust, and balance the listed HVAC systems to the state of operation indicated on and specified in the contract design documents. Air systems and water systems shall be proportionately balanced and reported in the TAB report. Provide instruments and consumables required to accomplish the TAB work. Conduct TAB work, on the listed HVAC systems in conformance with the AABC MN-1, or NEBB Procedural Stds, except as modified by this section:

a. Workmanship: Conduct TAB work on specified HVAC systems until measured parameters are within plus or minus 5 percent of the design values, that is, the values specified or indicated on the contract documents, except outside air shall be plus 5 percent/minus 0 percent, exhaust shall be plus 0 percent/minus 5 percent.

3.1.2 Data From TAB Field Work

After all TAB work has been completed, prepare a handwritten, pre-final TAB report using all report forms complete as specified for the final TAB report. Except as approved otherwise by the Contracting Officer, in writing, the TAB work and the TAB report shall be considered incomplete until the TAB work is accomplished to within the accuracy range specified in the paragraph titled "Workmanship."

3.1.3 Quality Assurance For TAB Field Work

3.1.3.1 Field Check

Verbally notify the Contracting Officer that the field check of the pre-final, handwritten report can commence; give this verbal notice 48 hours in advance of when the field check of the pre-final report can commence. Do not schedule the field check of the pre-final report until the TAB work is accomplished to within the accuracy range specified in the paragraph titled "Workmanship" or written approval of the deviations from the requirements has been received from the Contracting Officer.

a. Recheck: During field check the Contractor shall recheck, in the presence of the Contracting Officer, random selections of all reported data recorded in the pre-final report.

b. Areas of Recheck: Points and areas of recheck shall be selected by the Contracting Officer.

c. Procedures: Measurements and test procedures shall be the same as was used for forming basis of the pre-final report.

d. Recheck Selections: Selections for recheck will not exceed 25 percent of the total number of reported data entries tabulated in the pre-final report.

3.1.3.2 Retests

If random tests reveal a measured value which is an out-of-tolerance quantity, the report is subject to disapproval at the Contracting Officers' discretion. In the event the report is disapproved, all systems shall be readjusted and tested; new data recorded; a new pre-final report submitted; and a new field check conducted at no additional cost to the Government.

3.1.3.3 Out-of-Tolerance Quantity

Out-of-tolerance quantity pertains to field checking of the pre-final report. The term is defined as measurement taken during field checking which does not fall within the range of plus 5 to minus 5 percent of the reported value for the specific parameter.

3.1.3.4 Report Acceptance

On completion, and approval, of the pre-final report field check, the Contractor shall prepare, assemble, and submit the final certified TAB report in the required format for final review/approval.

3.2 MARKING OF SETTINGS

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 certified TAB report.

3.3 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.

-- End of Section --

SECTION 23 07 00

INSULATION OF MECHANICAL SYSTEMS

03/11

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) Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
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 578	(2009e1) Standard Specification for Rigid, Cellular Polystyrene 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 C534/C534M	(2014) Standard Specification for Preformed Flexible Elastomeric Cellular

	Thermal Insulation in Sheet and Tubular Form
ASTM D 828	(1993) Tensile Breaking Strength of Paper and Paperboard
ASTM E 84	(2000a) Surface Burning Characteristics of Building Materials
ASTM E 96	(1997; Rev A) 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	(1996) Surface Burning Characteristics of Building Materials

1.2 SYSTEM DESCRIPTION

Provide 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 05 92, "Testing/Adjusting/Balancing: Small Heating/Ventilating/Cooling Systems" before applying field-applied insulation to air distribution systems.

1.3 DEFINITIONS

1.3.1 Finished Spaces

Spaces used for habitation or occupancy where rough surfaces are plastered, panelled, 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 on interior of the building shall have a flame-spread rating of not more than 25 and a smoke-developed rating of not more than 150 interior to the bulding.

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 types of insulation required and insulation thickness shall be as listed in Table I herein. Unless otherwise specified, insulate all fittings, flanges, and valves, except valve stems, hand wheels, and operators. Provide factory premolded, precut, 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 Flexible Unicellular Insulation

2.1.1.1 Recommended Adhesive

ASTM C 534. Provide adhesive as recommended by insulation manufacturer or conforming with MIL-A-24179, Type II, Class 1.

2.1.1.2 Polyolefin thermoplastic

Polyolefin thermoplastic meets ASTM C 534, except density.

2.1.1.3 Adhesive For Finishing Flexible Unicellular Insulation

MIL-A-3316, Class 1, Grade A.

2.1.1.4 Glass Cloth For Finishing Flexible Unicellular Insulation

MIL-C-20079, Type I, Class 1, 3, or 5.

2.1.2 Cellular Glass Insulation

ASTM C 552, Type II.

2.1.3 Cellular Phenolic Insulation

ASTM C 1136.

2.1.4 Mineral Fiber

ASTM C 547, Class I.

2.1.5 Calcium Silicate

ASTM C 533, Class I.

2.1.6 Cellular Polystyrene

ASTM C 578, Expanded Polystyrene (EPS).

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.

2.2 HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS INSULATION

Provide insulation on ducts 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, .75 pound per cubic foot nominal, 3.0 inches thick, minimum installed R8. 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, 1.5 inch thick.

2.2.3 All Types of Ductwork Located Outside

Provide ASTM C534/C534M Grade 1, Type II, flexible elastomeric cellular insulation, 1.5 inch thick. The weather jacket shall be either a sheet metal overlay or factory adhered multilayer (mylar and aluminum) covering.

2.2.4 Acoustically Lined Ducts

For tranfer air ductwork, line with sound absorbing material to attenuate the sound power from room to room. Additionally, provide external insulation as specified in paragraph entitled "Duct Insulation Not in Concealed Spaces."

2.2.5 Duct Insulation Finishes

2.2.5.1 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.

2.2.5.2 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.

2.3 ADHESIVES, SEALANTS, AND COATING COMPOUNDS

2.3.1 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.

2.3.2 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.

2.3.3 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.

2.3.4 Vapor Barrier Coating

MIL-C-19565, Type II, indoor only above surface temperature 60 degrees F, color white.

2.3.5 Weatherproof Coating

For outside applications provide a weatherproof coating recommended by the manufacturer of the insulation and jackets.

2.3.6 Flexible Unicellular Insulation Adhesive

MIL-A-24179, Type II, Class 1 or Type III.

2.4 ACCESSORY MATERIALS

2.4.1 Staples

ASTM A 167, Type 304 or 316 stainless steel outside-clinch type.

2.4.2 Anchor Pins

Provide anchor pins and speed washers recommended by insulation manufacturer.

2.4.3 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.

2.4.4 Wire

Soft annealed stainless steel, 0.047-inch nominal diameter.

2.4.5 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 all ductwork. Ensure full range of motion of equipment actuators. Modify insulation to avoid obstruction with valve handles, safety reliefs, 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. Chrome plated pipes;

c. Vibration isolating connections;

d. Adjacent insulation;

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 inerts and sheet metal sleeves. Insulate flanges, unions, valves, and fittings in accordance with manufacturer's published instructions. Tape all butt joints with adhesive backed insulation tape. On elastomeric insulation (Rubatex, Armorflex) located outside provide weather covering 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. 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 Expanded Cellular Polystyrene

Secure outer most layer of insulation with metal bands 9 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 1, 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 according to manufacturer's recommended method. 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.

3.2.6 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.

3.2.7 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.

3.2.8 Flanges, Unions, Valves and Fittings for Hot Piping

Flanges, Unions, Valves, and Fittings Insulation for Hot Piping: Factory fabricated removable and reusable insulation covers may be used. For inside domestic hot water; 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.

3.3 DUCT (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 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 PAINTING AND IDENTIFICATION

Paint in accordance with Section 09 90 00, "Paints and Coatings." Piping identification shall be as specified in other sections.

3.5 FIELD INSPECTION

Visually inspect to ensure that materials provided conform to specifications. Inspect installations progressively for compliance with requirements.

TABLE I

Piping Insulation Wall Thickness

Service	Material	Tube And Pipe Size (Inches) 1/4-1 1/4	1 1/2-3	3 1/2-5	6-& Larger	Vapor Barrier Required
Refrigerant Suction Pipe	Flexible Unicellular	3/4 (1.5)	3/4 (1.5)	1.5 (2.0)	1.5 (2.0)	Yes
Domestic Cold Water and Condensate Drains	Polyisocyanurate	1	1	1	1	Yes
	Cellular Glass	1.5	1.5	1.5	1.5	Yes
	Polystyrene	1	1	1	1	Yes
Domestic Hot Water	Polyisocyanurate	1	1	1.5	1.5	No
	Calcium Silicate	1.5	1.5	1.5	1.5	No
	Mineral Fiber	1	1	1.5	1.5	No
	Cellular Glass	1.5	1.5	1.5	1.5	No
	Cellular Phenolic	1	1	1	1	No
Heating Hot Water & Pipes (100 to 200 Degrees F)	Polyisocyanurate	1 (1.5)	1 (1.5)	1.5 (2.0)	1.5 (2.0)	No
	Calcium Silicate	1.5 (2.5)	2 (2.5)	2 (2.5)	2.5 (3.0)	No
	Mineral Fiber	1.5 (2.0)	1.5 (2.5)	2 (2.5)	2 (2.5)	No
	Cellular Glass	1.5 (2.5)	1.5 (2.5)	2 (2.5)	2.5 (3.0)	No
	Cellular Phenolic	1 (1.25)	1 (1.25)	1 (1.25)	1.5 1.5)	No

NOTE: Thickness in parenthesis are for:

(1) Cold piping - outside locations

(2) Hot Piping - outside locations, not including tunnels and crawl spaces.

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-- End of Section --

SECTION 23 09 23.13

BACnet DIRECT DIGITAL CONTROL SYSTEMS FOR HVAC
02/20

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	(2012) Laboratory Methods of Testing Dampers for Rating

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 135	(2012; Addenda AR 2013; Errata 1 2013; INT 1-9 2013; Errata 2 2013; INT 10-12 2014; Errata 3-4 2014; Addenda AI-AY 2014; INT 13-17 2015; Errata 5 2015) BACnet—A Data Communication Protocol for Building Automation and Control Networks
ASHRAE 135.1	(Errata 1 2015; INT 1 2013; Addenda O 2014) Method of Test for Conformance to BACnet

ARCNET TRADE ASSOCIATION (ATA)

ATA 878.1	(1999) Local Area Network: Token Bus

ASME INTERNATIONAL (ASME)

ASME B16.18	(2012) Cast Copper Alloy Solder Joint Pressure Fittings
ASME B16.22	(2013) Standard for Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
ASME B16.26	(2013) Standard for Cast Copper Alloy Fittings for Flared Copper Tubes
ASME B16.34	(2013) Valves - Flanged, Threaded and Welding End
ASME B16.5	(2013) Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24 Metric/Inch Standard
ASME B31.1	(2014; INT 1-47) Power Piping

ASME B40.100	(2013) Pressure Gauges and Gauge Attachments
ASME BPVC	(2010) Boiler and Pressure Vessels Code

ASTM INTERNATIONAL (ASTM)

ASTM A126	(2004; R 2014) Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM B117	(2011) Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM B32	(2008; R 2014) Standard Specification for Solder Metal
ASTM B75/B75M	(2011) Standard Specification for Seamless Copper Tube
ASTM B88	(2014) Standard Specification for Seamless Copper Water Tube
ASTM B88M	(2013) Standard Specification for Seamless Copper Water Tube (Metric)
ASTM D1238	(2013) Melt Flow Rates of Thermoplastics by Extrusion Plastometer
ASTM D1693	(2015) Standard Test Method for Environmental Stress-Cracking of Ethylene Plastics
ASTM D635	(2014) Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position
ASTM D638	(2014) Standard Test Method for Tensile Properties of Plastics
ASTM D792	(2013) Density and Specific Gravity (Relative Density) of Plastics by Displacement

CONSUMER ELECTRONICS ASSOCIATION (CEA)

CEA-709.1-D	(2014) Control Network Protocol Specification

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C62.41.1	(2002; R 2008) Guide on the Surges Environment in Low-Voltage (1000 V and Less) AC Power Circuits
IEEE C62.41.2	(2002) Recommended Practice on

	Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits
IEEE C62.45	(2002; R 2008) Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000v and less)AC Power Circuits

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 8802-3	(2000) Information Technology - Telecommunications and Information Exchange Between Systems - Local and Metropolitan Area Networks - Specific Requirements - Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD)Access Method and Physical Layer Specifications

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3-4 2014; AMD 4-6 2014) National Electrical Code
NFPA 72	(2013) National Fire Alarm and Signaling Code
NFPA 90A	(2015) Standard for the Installation of Air Conditioning and Ventilating Systems

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA 1966	(2005) HVAC Duct Construction Standards Metal and Flexible, 3rd Edition

UNDERWRITERS LABORATORIES (UL)

UL 1449	(2014;Reprint Mar 2015) Surge Protective Devices
UL 506	(2008; Reprint Oct 2013) Specialty Transformers
UL 508A	(2013; Reprint Jan 2014) Industrial Control Panels
UL 916	(2007; Reprint Aug 2014) Standard for Energy Management Equipment

1.2 DEFINITIONS

1.2.1 ANSI/ASHRAE Standard 135

ANSI/ASHRAE Standard 135: BACnet - A Data Communication Protocol for

Building Automation and Control Networks, referred to as "BACnet". ASHRAE developed BACnet to provide a method for diverse building automation devices to communicate and share data over a network.

1.2.2 ARCNET

ATA 878.1 - Attached Resource Computer Network. ARCNET is a deterministic LAN technology; meaning it's possible to determine the maximum delay before a device is able to transmit a message.

1.2.3 BACnet

Building Automation and Control Network; the common name for the communication standard ASHRAE 135. The standard defines methods and protocol for cooperating building automation devices to communicate over a variety of LAN technologies.

1.2.4 BACnet/IP

An extension of BACnet, Annex J, defines this mechanism using a reserved UDP socket to transmit BACnet messages over IP networks. A BACnet/IP network is a collection of one or more IP subnetworks that share the same BACnet network number. See also "BACnet Broadcast Management Device".

1.2.5 BACnet Internetwork

Two or more BACnet networks, possibly using different LAN technologies, connected with routers. In a BACnet internetwork, there exists only one message path between devices.

1.2.6 BACnet Network

One or more BACnet segments that have the same network address and are interconnected by bridges at the physical and data link layers.

1.2.7 BACnet Segment

One or more physical segments of BACnet devices on a BACnet network, connected at the physical layer by repeaters.

1.2.8 BBMD

BACnet Broadcast Management Device (BBMD). A communications device, typically combined with a BACnet router. A BBMD forwards BACnet broadcast messages to BACnet/IP devices and other BBMDs connected to the same BACnet/IP network. Every IP subnetwork that is part of a BACnet/IP network must have only one BBMD. See also "BACnet/IP".

1.2.9 BAS

Building Automation Systems, including DDC (Direct Digital Controls) used for facility automation and energy management.

1.2.10 BAS Owner

The regional or local user responsible for managing all aspects of the BAS operation, including: network connections, workstation management,

technical support, control parameters, and daily operation. The BAS Owner for this project is Camp Lejeune Public Works.

1.2.11 BIBBs

BACnet Interoperability Building Blocks. A collection of BACnet services used to describe supported tasks. BIBBs are often described in terms of "A" (client) and "B" (server) devices. The "A" device uses data provided by the "B" device, or requests an action from the "B" device.

1.2.12 BI

BACnet International, formerly two organizations: the BACnet Manufacturers Association (BMA) and the BACnet Interest Group - North America (BIG-NA).

1.2.13 BI/BTL

BACnet International/BACnet Testing Laboratories (Formerly BMA/BTL). The organization responsible for testing products for compliance with the BACnet standard, operated under the direction of BACnet International.

1.2.14 Bridge

Network hardware that connects two or more network (or BACnet internetwork) segments at the physical and data link layers. A bridge may also filter messages.

1.2.15 Broadcast

A message sent to all devices on a network segment.

1.2.16 Device

Any control system component, usually a digital controller, that contains a BACnet Device Object and uses BACnet to communicate with other devices. See also "Digital Controller".

1.2.17 Device Object

Every BACnet device requires one Device Object, whose properties represent the network visible properties of that device. Every Device Object requires a unique Object Identifier number on the BACnet internetwork. This number is often referred to as the device instance.

1.2.18 Device Profile

A collection of BIBBs determining minimum BACnet capabilities of a device, defined in ASHRAE Standard 135-2004, Annex L. Standard device profiles include BACnet Operator Workstations (B-OWS), BACnet Building Controllers (B-BC), BACnet Advanced Application Controllers (B-AAC), BACnet Application Specific Controllers (B-ASC), BACnet Smart Actuator (B-SA), and BACnet Smart Sensor (B-SS). Each device used in new construction is required to have a PICS statement listing BIBBs supported.

1.2.19 Digital Controller

An electronic controller, usually with internal programming logic and

digital and analog input/output capability, which performs control functions. In most cases, synonymous with a BACnet device described in this specification. See also "Device".

1.2.19.1 Terminal Device Controllers

Terminal device controllers typically are controllers with less control features, may have integrated actuators, and may be mounted directly on equipment (with enclosures).

1.2.19.2 Field Controllers

Field controllers typically have a greater capability for input/output and customization, do not have integral actuators, are mounted in an enclosure not on the equipment and are used for equipment such as VAV air handlers.

1.2.19.3 Plant Controllers

Plant controllers are typically used to control various equipment in mechanical rooms such as pumps, heat exchangers, and chillers.

1.2.19.4 Supervisory Building Controller (SBC)

The Supervisory Building Controller is used to coordinate all equipment in a building, input scheduling, and is used as a connection point for transferring configuration files to the other controllers. The SBC shall communicate with other controllers and equipment through a BACnet MS/TP bus. Depending on approvals and capabilities, the SBC may be used as a point of connection between the Camp Lejeune EMCS network (IP) and the building level control network (BACnet MS/TP).

1.2.20 Direct Digital Control (DDC)

Digital controllers performing control logic. Usually the controller directly senses physical values, makes control decisions with internal programs, and outputs control signals to directly operate switches, valves, dampers, and motor controllers.

1.2.21 DDC System

A network of digital controllers, communication architecture, and user interfaces. A DDC system may include programming, sensors, actuators, switches, relays, factory controls, operator workstations, and various other devices, components, and attributes.

1.2.22 Energy Management & Control System (EMCS)

The EMCS at Camp Lejeune is an enterprise system that actively receives energy and building condition information from multiple sources and provides load shedding, electric metering, alarming, trending, scheduling, set point adjustment and device status of all supervisory building controllers for maintenance personnel. The EMCS receives real time electrical utility pricing data and automatically manages to Camp Lejeune's energy target. The existing EMCS consists of two servers, 1) Johnson Controls Incorporated (JCI) Metasys Extended Architecture (ADX server), and 2) Niagara FX N4 supervisor (JCI FX web supervisor). Both of the systems communicate over the MCEN and either may be used to fulfill the

requirements of this specification.

1.2.23 Ethernet

A family of local-area-network technologies providing high-speed networking features over various media.

1.2.24 Firmware

Software programmed into read only memory (ROM), flash memory, electrically erasable programmable read only memory (EEPROM), or erasable programmable read only memory (EPROM) chips.

1.2.25 Gateway

Communication hardware and software connecting two or more different protocols, similar to human language translators. The Gateway translates one protocol into equivalent concepts for the other protocol. In BACnet applications, a Gateway has BACnet on one side and non-BACnet protocols on the other side.

1.2.26 Global ID

An identification number assigned to each Supervisory Building Controller. The Global ID includes assigned MSTP Trunk Instance Numbers and a range of BACnet Instance Numbers to be used for the Field Controllers. The Global ID is assigned by Public Works.

1.2.27 Half Router

A device that participates as one partner in a BACnet point-to-point (PTP) connection. Two half-routers in an active PTP connection combine to form a single router.

1.2.28 Hub

A common connection point for devices on a network.

1.2.29 Internet Protocol (IP, TCP/IP, UDP/IP)

A communication method, the most common use is the World Wide Web. At the lowest level, it is based on Internet Protocol (IP), a method for conveying and routing packets of information over various LAN media. Two common protocols using IP are User Datagram Protocol (UDP) and Transmission Control Protocol (TCP). UDP conveys information to well-known "sockets" without confirmation of receipt. TCP establishes "sessions", which have end-to-end confirmation and guaranteed sequence of delivery.

1.2.30 Input/Output (I/O)

Physical inputs and outputs to and from a device, although the term sometimes describes software, or "virtual" I/O. See also "Points".

1.2.31 I/O Expansion Unit

An I/O expansion unit provides additional point capacity to a digital controller.

1.2.32 IP subnet

Internet protocol (IP) identifies individual devices with a 32-bit number divided into four groups from 0 to 255. Devices are often grouped and share some portion of this number. For example, one device has IP address 209.185.47.68 and another device has IP address 209.185.47.82. These two devices share Class C subnet 209.185.47.00

1.2.33 Local-Area Network (LAN)

A communication network that spans a limited geographic area and uses the same basic communication technology throughout.

1.2.34 LonTalk

CEA-709.1-D. A communication protocol developed by Echelon Corp. LonTalk is not permitted.

1.2.35 MAC Address

Media Access Control address. The physical node address that identifies a device on a Local Area Network.

1.2.36 Master-Slave/Token-Passing (MS/TP)

ISO 8802-3. One of the LAN options for BACnet. MSTP uses twisted-pair wiring for relatively low speed and low cost communication (up to 4,000 ft at 76.8K bps).

1.2.37 Native BACnet Device

A device that uses BACnet as its primary, if not only, method of communication with other BACnet devices without intermediary gateways. A system that uses native BACnet devices at all levels is a native BACnet system.

1.2.38 Network

Communication technology for data communications. BACnet approved network types are BACnet over Internet Protocol (IP), Point to Point (PTP) Ethernet, ARCNET, MS/TP, and LonTalk®. In general, networks within the building, all controllers and equipment will be BACnet MS/TP, unless noted otherwise.

1.2.39 Network Number

A site-specific number assigned to each network segment to identify for routing. This network number must be unique throughout the BACnet internetwork.

1.2.40 Object

The concept of organizing BACnet information into standard components with various associated properties. Examples include analog input objects and binary output objects.

1.2.41 Object Identifier

An object property used to identify the object, including object type and instance. Object Identifiers must be unique within a device.

1.2.42 Object Properties

Attributes of an object. Examples include present value and high limit properties of an analog input object. Properties are defined in ASHRAE 135 ; some are optional and some are required. Objects are controlled by reading from and writing to object properties.

1.2.43 Peer-to-Peer

Peer-to-peer refers to devices where any device can initiate and respond to communication with other devices. Peer-to-Peer configurations must be reviewd and approved by Camp Lejeune Public Works Department.

1.2.44 Performance Verification Test (PVT)

The procedure for determining if the installed BAS meets design criteria prior to final acceptance. The PVT is performed after installation, testing, and balancing of mechanical systems. Typically the PVT is performed by the Contractor in the presence of the Government.

1.2.45 PID

Proportional, integral, and derivative control; three parameters used to control modulating equipment to maintain a setpoint. Derivative control is often not required for HVAC systems (leaving "PI" control).

1.2.46 PICS

Protocol Implementation Conformance Statement (PICS), describing the BACnet capabilities of a device. See BACnet, Annex A for the standard format and content of a PICS statement.

1.2.47 Points

Physical and virtual inputs and outputs. See also "Input/Output".

1.2.48 PTP

Point-to-Point protocol connects individual BACnet devices or networks using serial connections like modem-to-modem links.

1.2.49 Repeater

A network component that connects two or more physical segments at the physical layer.

1.2.50 Router

A BACnet router is a component that joins together two or more networks using different LAN technologies. Examples include joining a BACnet Ethernet LAN to a BACnet MS/TP LAN. If a router is connected directly to the MCEN, it must be listed on the approved DIACAP equipment list and must be Marine Corps DADMS listed and approved.

1.2.51 Stand-Alone Control

Refers to devices performing equipment-specific and small system control without communication to other devices or computers for physical I/O, excluding outside air and other common shared conditions. Devices are located near controlled equipment, with physical input and output points limited to 64 or less per device, except for complex individual equipment or systems. Failure of any single device or communications will not cause other network devices to fail. Internal time clocks and onboard scheduling are required to allow for stand-alone control. BACnet "Smart" actuators (B-SA profile) and sensors (B-SS profile) communicating on a network with a parent device are exempt from stand-alone requirements. Provide stand-alone control routines to provide for energy saving sequences such as free cooling. Provide stand-alone control routines that operate without connection to the BACnet/IP and MS/TP networks during a loss of communication.

1.2.52 Supervisory Building Controller

Supervisory Controller that is the main interface for the building control system.

1.3 SUBCONTRACTOR SPECIAL REQUIREMENTS

Perform all work in this section in accordance with the paragraph 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.

1.4 BACnet DIRECT DIGITAL CONTROL SYSTEMS FOR HVAC DESCRIPTION

[a. Remove entire existing system and provide entire new BACnet DDC system(s) including associated equipment and accessories.]

[b. Remove existing and merge new BACnet DDC with existing BACnet DDC system(s) including associated equipment and accessories. Existing DDC system is manufactured by [ ].]

[c. Remove existing and merge new BACnet DDC with existing non-BACnet DDC system(s) including associated equipment and accessories. Existing DDC system is manufactured by [ ].]

d. All new devices are accessible using a Web browser interface and communicate using ASHRAE 135 BACnet communications without the use of gateways, unless gateways are shown on the design drawings and specifically requested by the Government. Where gateways are allowed, they must support ASHRAE 135, including all object properties and read-write services shown on Government approved interoperability schedules. Manufacturer's products, including design, materials, fabrication, assembly, inspection, and testing shall be in accordance with ASHRAE 135, ASME B31.1, and NFPA 70, except where indicated otherwise.

1.4.1 Design Requirements

1.4.1.1 Control System Drawings Title Sheet

Provide a title sheet for the control system drawing set. Include the project title, project location, contract number, the controls contractor preparing the drawings, an index of the control drawings in the set, and a legend of the symbols and abbreviations used throughout the control system drawings. The Title Block of each drawing must include the Drawing revision, i.e. Submittal, Revision 1, Revision 2, As-Built, etc., including the date.

1.4.1.2 List of I/O Points

Also known as a Point Schedule, provide for each input and output point physically connected to a digital controller: point name, point description, point type (Analog Output (AO), Analog Input (AI), Binary Output (BO), Binary Input (BI)), point sensor range, point actuator range, point address, BACnet object, associated BIBBS (where applicable), and point connection terminal number and cable type (18/2, 18/3, etc). Typical schedules for multiple identical equipment are allowed unless otherwise requested in design or contract criteria. All points shall adhere to the Camp Lejeune Standard naming conventions.

1.4.1.3 Control System Components List

Provide a complete list of control system components installed on this project. Include for each controller and device: control system schematic name, control system schematic designation, device description, manufacturer, model, part number, firmware version, serial number, physical location (e.g. Building 4, room 112 overhead), and power requirements (i.e. AC/DC voltage and power draw). For sensors, include point name, sensor range, and operating limits. For valves, include body style, Cv, design flow rate, pressure drop, valve characteristic (linear or equal percentage), and pipe connection size. For actuators, include point name, spring or non-spring return, modulating or two-position action, normal (power fail) position, nominal control signal operating range (0-10 volts DC or 4-20 milliamps), and operating limits.

1.4.1.4 Control System Schematics

Provide control system schematics. Typical schematics for multiple identical equipment are allowed unless otherwise requested in design or contract criteria. Include the following:

a. Location of each input and output device,specify room # for remote devices.

b. Flow diagram for each piece of HVAC equipment

c. Name or symbol for each control system component, such as V-1 for a valve

d. Setpoints, with differential or proportional band values

e. Written sequence of operation for the HVAC equipment

f. Valve and Damper Schedules, with normal (power fail) position

g. Control cabinet general layout, include all devices, point count, cable

type (18/2, 18/3, etc), 24VAC VA power requirement for all devices including those powered from the cabinet.

1.4.1.5 HVAC Equipment Control Ladder Diagrams

Provide HVAC equipment control ladder diagrams. Indicate required electrical interlocks. Ladder diagram schematics shall include 120 VAC and low voltage devices in each panel. Ladder diagram schematics shall also include all field devices (sensors, relays actuators, etc) and any connection point to controlled equipment or devices.

1.4.1.6 Component Wiring Diagrams

Provide a wiring diagram for each type of input device and output device. Indicate how each device is wired and powered; showing typical connections at the digital controller and power supply. Show for all field connected devices such as control relays, motor starters, actuators, sensors, and transmitters.

1.4.1.7 Terminal Strip Diagrams

Provide a diagram of each terminal strip. Indicate the terminal strip location, termination numbers, and associated point names.

1.4.1.8 BACnet Communication Architecture Schematic(Network Riser)

Provide a schematic showing the project's entire BACnet communication network, including Internet Protocol (IP), Media Access Control (MAC), BACnet network, Device ID, field bus address, BBMDs, any devices using BACnet FDR, and Firmware version / Operating System, LAN devices including routers and bridges, gateways, controllers, workstations, and field interface devices. If applicable, show connections to existing networks and include the existing network in the riser diagram. Include surge protection device locations on the riser when the field controller communication trunk is leaving or entering a building.

1.5 SUBMITTALS

Submit detailed and annotated manufacturer's data, drawings, and specification sheets for each item listed, that clearly show compliance with the project specifications.

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Include the following in the project's control system drawing set :

Control System Drawings Title Sheet

List of I/O Points

Control System Components List

Control System Schematics

HVAC Equipment Control Ladder Diagrams

Component Wiring Diagrams

Terminal Strip Diagrams

BACnet Communication Architecture Schematic

Sequence of Operations
Control Panel Layout

SD-03 Product Data

Direct Digital Controllers

Include BACnet PICS for each controller/device type, including smart sensors (B-SS) and smart actuators (B-SA).

BACnet Gateways

Include BACnet and workstation display information; bi-directional communication ability; compliance with interoperability schedule; expansion capacity; handling of alarms, events, scheduling and trend data; and single device capability (not depending on multiple devices for exchanging information from either side of the gateway).

Notebook Computer Software

BACnet Operator Workstation

Include BACnet PICS for Operator Workstation software.

Notebook Computer

Sensors and Input Hardware

Output Hardware

Surge and Transient Protection

Indicators

Duct smoke detectors

Variable Frequency (Motor) Drives

SD-05 Design Data

Performance Verification Testing Plan

SD-06 Test Reports

Performance Verification Testing Report

Bus Waveform Report

SD-07 Certificates

Contractor's Qualifications

Contractor's Training Certifications

SD-10 Operation and Maintenance Data

Comply with requirements for data packages in Section 01 78 23 OPERATION AND MAINTENANCE DATA, except as supplemented and modified in this specification.

BACnet Direct Digital Control Systems, Data Package 4

Controls System Operators Manuals, Data Package 4

VFD Service Manuals, Data Package 4

SD-11 Closeout Submittals

Training Documentation

1.6 QUALITY ASSURANCE

1.6.1 Standard Products

Provide material and equipment that are standard manufacturer's products currently in production and supported by a local service organization.

1.6.2 Delivery, Storage, and Handling

Handle, store, and protect equipment and materials to prevent damage before and during installation according to manufacturer's recommendations, and as approved by the Contracting Officer. Replace damaged or defective items.

1.6.3 Operating Environment

Protect components from humidity and temperature variation, dust, and contaminants. If components are stored before installation, keep them within the manufacturer's limits.

1.6.4 Finish of New Equipment

New equipment finishing shall be factory provided. Manufacturer's standard factory finishing shall be proven to withstand 125 hours in a salt-spray fog test. Equipment located outdoors shall be proven to withstand 500 hours in a salt-spray fog test.

Salt-spray fog test shall be according to ASTM B117, with acceptance criteria as follows: immediately after completion of the test, the finish shall show no signs of degradation or loss of adhesion beyond 3.175 mm 0.125 inch on either side of the scratch mark.

1.6.5 Verification of Dimensions

The contractor shall verify all dimensions in the field, and advise the Contracting Officer of any discrepancy before performing work.

1.6.6 Contractor's Qualifications

Submit documentation certifying the controls Contractor performing the work has completed at least three DDC systems installations of a similar design to this project, and programmed similar sequences of operation for at least two years. Personnel performing the installation, programming, checkout, commissioning and training shall, at a minimum, have obtained all certifications required by the manufacturer for the tasks they are performing. Tasks include any activity required to execute and complete the contracted work. Certifications for each person shall be submitted prior to the beginning of the contracted work. Certifications shall be made available at any time upon the request from Camp Lejeune.

1.6.7 Modification of References

The advisory provisions in ASME B31.1, NFPA 70 and the manufacturer's recommendations are mandatory. Substitute "shall" for "should" wherever it appears and interpret all references to the "authority having jurisdiction" and "owner" to mean the Contracting Officer.

1.6.8 Project Sequence

The control system work for this project shall proceed in the following order:

a. Preparatory meeting for controls work.

b. Submit and receive approval on the Shop Drawings, Product Data, and Certificates specified under the paragraph SUBMITTALS>

c. Submit and receive approval for Performance Verification Testing (PVT) Plan.

d. Perform the control system installation work, including all field check-outs and tuning.

e. Provide support to TAB personnel as specified under the paragraph TEST AND BALANCE SUPPORT.

f. Submit and receive approval of the Controls System Operators Manual specified under the paragraph CONTROLS SYSTEM OPERATORS MANUALS.

g. Perform the Performance Verification Testing.

Submit As-Built Control Drawingson the PVT Report.

i. PVT Report Acceptance test for Season 1.

j. Submit and receive approval on the Training Documentation specified under the paragraph INSTRUCTION TO GOVERNMENT PERSONNEL and VFD Service Support. Submit at least 30 days before training.

k. Deliver the final Controls System Operators Manuals and VFD Service Manuals.

l. Conduct the Phase I Training and VFD on-site/hands-on training.

m. Conduct the Phase II Training.

n. Submit and receive approval of Closeout Submittals.

o. PVT Report Acceptance Test for Season 2.

PART 2 PRODUCTS

2.1 DDC SYSTEM

a. Provide a networked DDC system for stand-alone control in compliance with the latest revision of the ASHRAE 135 BACnet standard. Include all programming, objects, and services required to meet the sequence of control. Provide BACnet MS/TP communications between the DDC system and native BACnet devices furnished with HVAC equipment and plant equipment including boilers, chillers, and variable frequency drives. Devices provided shall be certified in the BACnet Testing Laboratories (BTL) Product Listing and in accordance with ASHRAE 135.1 Method of Test for Conformance to BACnet. Controls provided integral to equipment shall be part of the DDC system and shall fully comply with this specification. Coordinate integration of integral controls into the system as a whole. BACnet over IP is not permitted within the DDC system.

b. Assist the Government in interfacing the new DDC system with the site's existing server and operator workstation and software. Create graphics, scheduling, alarming, and trending.

2.1.1 Supervisory Building Controller (SBC)

ASHRAE 135 building controller that is the main interface for the building control system. Provide either a Johnson Controls Incorporated NAE or NCE; OR a JACE based on the Niagara N4 platform. The JACE (JAVA Application Control Engine) shall be minimally based on a Tridium [8000 with expanded memory] [_____] and embedded "Niagara Workbench or Workplace" software.

Any device implementing the Niagara Framework is a Niagara Framework Supervisory Gateway and must meet these requirements. In addition to the general requirements for all DDC Hardware, Niagara Framework Supervisory Gateway Hardware must:
a. Be direct digital control hardware.
b. Have an unrestricted interoperability license and its Niagara Compatibility Statement (NiCS) must follow the Tridium Open NiCS Specification.
c. Manage communications between a field control network and the Niagara Framework Monitoring and Control Software, and between itself and other Niagara Framework Supervisory Gateways. Niagara Framework Supervisory Gateway Hardware must use Fox protocol for communication with other Niagara Framework Components, regardless of the manufacturer of the other components.
d. Be fully programmable using the Niagara Framework Engineering Tool and must support the following:

(1) Time synchronization, Calendar, and Scheduling using Niagara Scheduling Objects
(2) Alarm generation and routing using the Niagara Alarm Service
(3) Trending using the Niagara History Service and Niagara Trend Log Objects
(4) Integration of field control networks using the Niagara Framework Engineering Tool
(5) Configuration of integrated field control system using the Niagara Framework Engineering Tool when supported by the field control system
e. Meet the following minimum hardware requirements:
(1) Two 10/100/1000 Mbps Ethernet Port(s)
(2) One or more MS/TP ports.
(3) Central Processing Unit of 1000 Mhz or higher.
(4) Embedded operating system.
f. Provide access to field control network data and supervisory functions via web interface and support a minimum of 16 simultaneous users. Note: implementation of this capability may not be required on all projects.
g. Submit a backup of each Niagara Framework Supervisory Gateway. The backup must be sufficient to restore a Niagara Framework Supervisory Gateway to the final as-built condition such that a new Niagara Framework Supervisory Gateway loaded with the backup is indistinguishable in functionality from the original.

2.1.1.1 Niagara Framework Engineering Tool

The Niagara Framework Engineering Tool must be Niagara Workbench or an equivalent Niagara Framework engineering tool software and must:
a. Have an unrestricted interoperability license and its Niagara Compatibility Statement (NiCS) must follow the Tridium Open NiCS Specification.
b. Be capable of performing network configuration for Niagara Framework Supervisory Gateways and Niagara Framework Monitoring and Control Software.
c. Be capable of programming and configuring of Niagara Framework Supervisory Gateways and Niagara Framework Monitoring and Control Software.
d. Be capable of discovery of Niagara Framework Supervisory Gateways and all points mapped into each Niagara Framework Supervisory Gateway and making these points accessible to Niagara Framework Monitoring and Control Software.

2.1.2 EMCS Interface

The Energy Management & Control System (ECMS) at Camp Lejeune is comprised of two separate systems. Both of the systems communicate over the basewide Marine Corps Enterprise Network (MCEN). One uses the Johnson Controls Network Automation Engine (NAE) or Network Control Engine (NCE) to the ADX server. The second system uses a Niagara FX N4 web supervisor with a JACE in the building communicating using Fox protocol. Because of IT security and permissions, only these systems and equipment are permitted as part of the EMCS.

2.1.2.1 Supervisory Building Controller

Provide either a Johnson Controls NAE, NCE, or a JACE. This will serve as both the Supervisory Building Controller and the connection point between the buildings DDC and the EMCS. Provide a five year service license on all Supervisory Controllers. Provide a reserve of 10% of additional points and additional devices on the Supervisory Controller license at the final project acceptance.The contractor shall assign Camp Lejeune Public Works Department as the owner and manager of all licenses including 3rd party drivers.

2.1.2.2 Fortinet Firewall

In addition to the Supervisory controller, provide a Fortinet FortiGate Rugged Series 60D. Manufacturer: Fortinet Model: FGR-60D

2.1.3 Direct Digital Controllers

Direct digital controllers shall be UL 916 rated.

2.1.3.1 I/O Point Limitation

The total number of I/O hardware points used by a single stand-alone digital controller, including I/O expansion units, shall not exceed 64, except for complex individual equipment or systems. Place I/O expansion units in the same cabinet as the digital controller. The field controller must have one spare Configurable Output and one spare Universal Input available per system upon project completion, i.e. AHU, ERU, DOAS, HW System, CHW System and other building primary systems. VAV controllers and programmable thermostats are excluded

2.1.3.2 Environmental Limits

Controllers shall be suitable for, or placed in protective enclosures suitable for the environment (temperature, humidity, dust, and vibration) where they are located.

2.1.3.3 Stand-Alone Controllers

Provide stand-alone direct digital controllers with internal time clocks. Each piece of equipment shall be controlled by a single controller to provide stand-alone control in the event of any building communication failure. All I/O points specified for a piece of equipment shall be integral to its controller and serial connected expansion modules. Provide stable and reliable stand-alone control using default values or other method for values normally read over the network.

2.1.3.4 Internal Clock

Provide internal clocks and scheduling for all Direct Digital Controllers. Provide controllers with BTL listed profiles for all BACnet Building Controllers (B-BC) and BACnet Advanced Application Controllers (B-AAC) using BACnet time synchronization services. This includes but is not limited to VAV Controllers, Fan Coil controllers, Heat Pump controllers and any terminal controllers. BACnet Application specific controllers (B-ASC) will only be accepted for dedicated small exhaust system control such as restroom and mechanical room exhaust fans. Automatically synchronize system clocks daily from an operator-designated controller. The system shall automatically adjust for daylight saving time.

2.1.3.5 Memory

Provide sufficient memory for each controller to support the required control, communication, trends, alarms, and messages. Protect programs residing in memory with EEPROM, flash memory, or by an uninterruptible power source (battery or uninterruptible power supply). The backup power source shall have capacity to maintain the memory during a 72-hour continuous power outage. Rechargeable power sources shall be constantly charged while the controller is operating under normal line power. Batteries shall be replaceable without soldering. Trend and alarm history collected during normal operation shall not be lost during power outages less than 72 hours long.

2.1.3.6 Immunity to Power Fluctuations

Controllers shall operate at 90 percent to 110 percent nominal voltage rating.

2.1.3.7 Transformer

The controller power supply shall be fused or current limiting and rated at 125 percent power consumption. Each transformer must singularly serve the connected load, i.e. do not wire transfomers in parallel on the load side.

2.1.3.8 Wiring Terminations

Use screw terminal wiring terminations for all field-installed controllers. Provide field-removable modular terminal strip or a termination card connected by a ribbon cable for all controllers other than terminal units.

2.1.3.9 Input and Output Interface

Provide hard-wired input and output interface for all controllers as follows:

a. Protection: Shorting an input or output point to itself, to another point, or to ground shall cause no controller damage. Input or output point contact with sources up to 24 volts AC or DC for any duration shall cause no controller damage.

b. Binary Inputs: Binary inputs shall monitor on and off contacts from a "dry" remote device without external power, and external 5-24 VDC voltage inputs.

c. Pulse Accumulation Inputs: Pulse accumulation inputs shall conform to binary input requirements and accumulate pulses at a resolution suitable to the application.

d. Analog Inputs: Analog inputs shall monitor low-voltage (0-10 VDC), current (4-20 mA), or resistance (thermistor or RTD) signals.

e. Binary Outputs: Binary outputs shall send a pulsed 24 VDC low-voltage signal for modulation control, or provide a maintained open-closed position for on-off control. Where appropriate, provide a method to select normally open or normally closed operation.

f. Analog Outputs: Analog outputs shall send modulating 0-10 VDC or 4-20 mA signals to control output devices.

g. Tri-State Outputs: Tri-State outputs shall provide three-point floating control of terminal unit electronic actuators.

2.1.3.10 Digital Controller BACnet Internetwork

Provide intermediate gateways, only when requested by the Government and shown on the contract drawings, to connect existing non-BACnet devices to the BACnet internetwork. Controller and operator interface communication shall conform to ASHRAE 135, BACnet. If a controller becomes non-responsive, the remaining controllers shall continue operating and not be affected by the failed controller.

2.1.3.11 Communications Ports

a. Direct-Connect Interface Ports: Provide at least one extra communication port at each local BACnet network for direct connecting a notebook computer or BACnet hand-held terminal so all network BACnet objects and properties may be viewed and edited by the operator.

b. BACnet routers supporting ARCnet shall also be capable of supporting MS/TP.

2.1.3.12 BACnet Gateways

Provide BACnet communication ports, whenever available as a plant equipment OEM standard option, for DDC integration via a single communication cable. Typical BACnet controlled plant equipment includes, but is not limited to, boilers, chillers, and variable frequency motor drives.

Provide gateways to connect BACnet to legacy systems, existing non-BACnet devices, and existing non-BACnet DDC controlled plant equipment, only when specifically requested and approved by the Government, and shown on the Government approved BACnet Communication Architecture Schematic. Provide with each gateway an interoperability schedule, showing each point or event on the legacy side that the BACnet "client" will read, and each parameter that the BACnet network will write to. Describe this interoperability in terms of BACnet services, or Interoperability Building Blocks (BIBBS), defined in ASHRAE 135 Annex K. Provide two-year minimum warranty for each gateway, including parts and labor.

The following minimum capabilities are required:

a. Gateways shall be able to read and view all readable object properties listed in the interoperability schedule on the non-BACnet network to the BACnet network and vice versa where applicable.

b. Gateways shall be able to write to all writeable object properties listed in the interoperability schedule on the non-BACnet network from the BACnet network and vice versa where applicable.

c. Gateways shall provide single-pass (only one protocol to BACnet without intermediary protocols) translation from the non-BACnet protocol to BACnet and vice versa.

d. Gateways shall meet the requirements of Data Sharing Read Property (DS-RP-B), Data Sharing Write Property (DS-WP-B), Device Management Dynamic Device Binding-B (DM-DDB-B), and Device Management Communication Control (DM-DCC-B) BIBBs, in accordance with ASHRAE 135.

e. Gateways shall include all hardware, software, software licenses, and configuration tools for operator-to-gateway communications. Provide backup programming and parameters on CD media and the ability to modify, download, backup, and restore gateway configuration.

2.1.3.13 Digital Controller Cabinet

Provide each digital controller including gateways, in a factory fabricated locked cabinet enclosure.

Cabinets located indoors shall protect against dust and have a minimum NEMA 1 rating, except where indicated otherwise. Cabinets located outdoors or in damp environments shall protect against all outdoor conditions and have a minimum NEMA 4 rating. Mechanical rooms that contain steam service or equipment including new steam boiler rooms are considered damp environments. Outdoor control panels and controllers must be able to withstand extreme ambient conditions, without malfunction or failure, whether or not the controlled equipment is running. If necessary, provide a thermostatically controlled panel heater in freezing locations, and an internal ventilating fan in locations exposed to direct sunlight. Cabinets shall have a hinged lockable door and an offset removable metal back plate, except controllers integral with terminal units, like those mounted on VAV boxes. Provide like-keyed locks for all hinged panels provided and a set of two keys at each panel, with one key inserted in the lock. All devices must be mounted only to the cabinet backplane with adequate space allowed for serviceability and proper heat dissipation from devices. The Supervisory controller cabinet door position (closed/open) shall be monitored with a door switch and BACnet programmable relay such as the Functional Devices RIBTW2401B-BC. An "open" door status shall initiate an alarm to the EMCS Server.

2.1.3.14 Main Power Switch and Receptacle

Provide each control cabinet with a main external power on/off switch located inside the cabinet. Also provide each cabinet with a separate 120 VAC duplex convenience receptacle.

2.1.4 DDC Software

2.1.4.1 Programming

Provide programming to execute the sequence of operation indicated. Provide all programming and tools to configure and program all controllers. All software shall be licensed to Marine Corps Base, Camp Lejeune Complex for unrestricted use on Camp Lejeune Complex and reproduction for use on Camp Lejeune Complex. Software keys and "dongles" are not permitted. Provide programming routines in simple, easy-to-follow logic with detailed text comments describing what the logic does and how it corresponds to the project's written sequence of operation. All logic programming and control functions shall be closed loop, command and feedback for fault detection and alarming when status != command.

a. Graphic-based programming shall use a library of function blocks made

from pre-programmed code designed for BAS control. Function blocks shall be assembled with interconnecting lines, depicting the control sequence in a flowchart. If providing a computer with device programming tools as part of the project, graphic programs shall be viewable in real time showing present values and logical results from each function block.

b. Menu-based programming shall be done by entering parameters, definitions, conditions, requirements, and constraints.

c. For line-by-line and text-based programming, declare variable types (variable types include but are not limited to the following: local, global, real, and integer) at the beginning of the program. Use descriptive comments frequently to describe the programming.

d. If providing a computer with device programming tools as part of the project, provide a means for detecting program errors and testing software strategies with a simulation tool. Simulation may be inherent within the programming software suite, or provided by physical controllers mounted in a NEMA 1 test enclosure. The test enclosure shall contain one dedicated controller of each type provided under this contract, complete with power supply and relevant accessories.

2.1.4.2 Parameter Modification

All writeable object properties, and all other programming parameters needed to comply with the project specification shall be adjustable for devices at any network level, including those accessible with web-browser communication, and regardless of programming methods used to create the applications.

2.1.4.3 Short Cycling Prevention

Provide setpoint differentials and minimum on/off times to prevent equipment short cycling.

2.1.4.4 Equipment Status Delay

Provide an adjustable delay from when equipment is commanded on or off and when the control program looks to the status input for confirmation.

2.1.4.5 Run Time Accumulation

Use the Elapsed Time Property to provide re-settable run time accumulation for each Binary Output Object connected to mechanical loads greater than 1 HP, electrical loads greater than 10 KW, or wherever else specified.

2.1.4.6 Timed Local Override

Provide an adjustable override time for each push of a timed local override button.

2.1.4.7 Time Synchronization

Provide time synchronization, including adjustments for leap years, daylight saving time, and operator time adjustments.

2.1.4.8 Scheduling

Provide operating schedules as indicated, with equipment assigned to groups. Changing the schedule of a group shall change the operating schedule of all equipment in the group. Groups shall be capable of operator creation, modification, and deletion. Provide capability to view and modify schedules in a seven-day week format. Provide capability to enter holiday and override schedules one full year at a time.

2.1.4.9 Object Property Override

Allow writeable object property values to accept overrides to any valid value. Where specified or required for the sequence of control, the Out-Of-Service property of Objects shall be modifiable using BACnet's write property service. When documented, exceptions to these requirement are allowed for life, machine, and process safeties.

2.1.4.10 Alarms and Events

Alarms and events shall be capable of having programmed time delays and high-low limits. When a web server is connected to the BACnet internetwork, alarms/events shall report to web server as defined by an authorized operator. Otherwise alarms/events shall be stored within a device on the BACnet network until connected to a user interface device and retrieved. Provide alarms/events in agreement with the point schedule, sequence of operation, and the BAS Owner. At a minimum, provide programming to initiate alarms/events any time a piece of equipment fails to operate, a control point is outside normal range or condition shown on schedules, communication to a device is lost, a device has failed, or a controller has lost its memory.

2.1.4.11 Trending

Provide BACnet trending all object present values, set points, and other parameters indicated for trending on project schedules or at the request of Camp Lejeune or commissioning agents. Trends may be associated into groups, and a trend report may be set up for each group. Trends are stored within a device on the BACnet network, with operator selectable trend intervals from 10 seconds up to 60 minutes. The minimum number of consecutive trend values stored at one time shall be 100 per variable. When trend memory is full, the most recent data shall overwrite the oldest data.

The BACnet system shall allow for Change-Of-Value (COV) subscription based trending at user defined thresholds.

The B-BC shall upload trends automatically upon reaching 3/4 of the device buffer limit (via Notification_Threshold property), by operator request, or by time schedule for archiving. Archived and real-time trend data shall be available for viewing numerically and graphically for at the workstation and connected notebook computers.

Additionally, provide daily trend on geothermal well field supply and return temperatures. Allocate sufficient memory to store 24 months data.

2.1.4.12 Device Diagnostics

Each controller shall have diagnostic LEDs for power, communication, and device fault condition. The DDC system shall recognize and report a non-responsive controller.

2.1.4.13 Power Loss

Upon restoration of power, the DDC system shall perform an orderly restart and restoration of control.

2.1.5 Notebook Computer

Provide a notebook computer, complete with the project's installed DDC software, applications database, final archived field controller programs and Supervisory controller database, and graphics to fully troubleshoot and program the project's devices. Provide the notebook computer with ballistic nylon carrying case with shoulder strap with all necessary cables and interface hardware needed for setup and direct communication with the controllers and control system components. Direct communication shall not be through the Supervisory controller.

At a minimum the notebook computer shall include: Common Access Card Reader, Windows based operating system, minimum [2.7 GHz processor with 3 MB Cache, discrete switchable graphics card with minimum 1 GB dedicated memory, 1 Terabyte hard drive, 32 GB DDR3 RAM, 2 USB 3.0 ports, 10/100/1000 network interface card, 802.11 b/g/n WLAN,] 17-inch display, keyboard with numeric keypad, 6-hour battery with charger, internal or external 8X DVD+/-R/RW drive with double layer support with DVD creator software, and Microsoft Office Home and Business bundled software. Provide all original licenses, installation media, documentation, and recovery CDs capable of restoring the original configuration. Provide a means to connect the notebook computer directly to the installed field bus. Provide the manufacturer's 3-year accidental damage protection with 3-day on site response for 2 year warranty with the Government listed as the warranty owner.

2.1.6 Notebook Computer Software

2.1.6.1 Password Protection

System shall support role based access. At a minimum OS administrator, auditor, DDC operator and user roles must be defined. The system must be capable of enforcing role based access by location (e.g., Bob may alter operating parameters for Building 1 but not Building 2. Building 2 is Alice's responsibility).

Workstation shall be capable of DoD Common Access Card (CAC) login in addition to traditional username and password.

The lowest level only allow viewing graphics. The second level allows viewing graphics and changing space temperature setpoints. The third level allows the previous level's capability, plus changing operating schedules. The fourth level allows access to all functions except passwords. The highest level provides all administrator rights and allows full access to all programming, including setting new passwords and access levels. Provide the BAS Owner with the highest level password access. Provide automatic log out if no keyboard or mouse activity is detected after a user-defined time delay.

2.1.6.2 Notebook Computer DDC Software

Provide the workstation software with the manufacturer's installation CDs and licenses. Configure the software according to the DDC system manufacturer's specifications, cybersecurity requirements, and in agreement with BACnet Operator Workstation (B-OWS) device standards found in ASHRAE 135, Annex L.

The workstation software shall permit complete monitoring, modification, archiving, programming and troubleshooting interface with the DDC system including supervisory controller and field controllers.Software shall include, but not limited to, Niagara Workbench, JCI SCT, CCT/PCT or any controls manufacturer Supervisory controller and field controller programming software used to program the system. The operator interface with the software shall be menu-driven with appropriate displays and menu commands to manipulate the DDC system's objects, point data, operating schedules, control routines, system configuration, trends, alarms, messages, graphics, and reports. Trends shall be capable of graphic display in real time, with variables plotted as functions of time. Each alarmed point shall be capable of displaying its alarm history, showing when it went into alarm, if and when it was acknowledged, and when it went out of alarm. The modification of DDC system parameters and object properties shall be accomplished with "fill in the blank" and/or "point and drag" methods. Modifications shall download to the appropriate controllers at the operator's request.

2.1.6.3 Web-Based User Interface (UI) and Graphics

Provide web-based graphics fully compatible with Internet Explorer 9+, Safari, Firefox, and Google Chrome. Web-based user interface shall be browser agnostic and shall not rely on proprietary client side scripting to function.

Graphic displays shall have full-screen resolution when viewed on the workstation and notebook computers. Dynamic data on graphics pages shall refresh within 10 seconds using an Internet connection, or 30 seconds using a dial-up modem connection. Web-based user interface shall not rely on additional third-party browser "plug-in" software like Adobe Flash. Java client side applets may be used if appropriately signed. If Java client side runtimes are used they shall not require deprecated or otherwise unsupported Java runtime environments.

The graphics shall show the present value and object name for each of the project's I/O points on at least one graphic page. Arrange point values and names on the graphic displays in their appropriate physical locations with respect to the floor plan or equipment graphic displayed. Graphics shall allow the operator to monitor current status, view zone and equipment summaries, use point-and-click navigation between graphic pages, and edit setpoints and parameters directly from the screens. Items in alarm shall be displayed using a different color or other obvious visual indicator. Provide graphics with the following:

a. Graphic Types: Provide at least one graphic display for each piece of HVAC equipment, building floor, and controlled zone. Indicate dynamic point values, operating statuses, alarm conditions, and control setpoints on each display. Provide summary pages where appropriate.

(1) Building Elevation: For buildings more than one story, provide an

elevation view of the building with links to each of the building's floor plans. Simulate the building's architecture and include the building number and floor numbers. If possible, use an actual photograph of the building.

(2) Building Floor Plans: Provide a floor plan graphic for each of the building's floors and roof with dynamic display of space temperature and other important data. If used, indicate and provide links to sub-plan areas. If possible, use the project's electronic drawing files for the graphic backgrounds. Provide clear names for important areas, such as "Main Conference Room." Include room names and numbers where applicable. Include features such as stairwells, elevators, and main entrances. Where applicable, include the mechanical room, HVAC equipment, and control component locations, with corresponding links to the equipment graphics.

(3) Sub-plan Areas: Where a building's floor plan is too large to adequately display on the screen, sub-divide the plan into distinct areas, and provide a separate graphic display for each area. Provide same level of detail requested in building floor plan section above.

(4) HVAC Equipment: Provide a graphic display for each piece of HVAC equipment, such as a fan coil unit, VAV terminal, or air handling unit. Equipment shall be represented by a two or three-dimensional drawing. Where multiple pieces of equipment combine to form a system, such as a central chiller plant or central heating plant, provide one graphic to depict the entire plant. Indicate the equipment, piping, ductwork, dampers, and control valves in the installed location. Include labels for equipment, piping, ductwork, dampers, and control valves. Show the direction of air and water flow. Include dynamic display of applicable object data with clear names in appropriate locations.

(5) Sequence of Operation: Provide a graphic screen displaying the written out full sequence of operation for each piece of HVAC equipment. Provide a link to the sequence of operation displays on their respective equipment graphics. Include dynamic real-time data within the text for setpoints and variables.

b. Graphic Title: Provide a prominent, descriptive title on each graphic page.

c. Dynamic Update: When the workstation is on-line, all graphic I/O object values shall update with change-of-value services, or by operator selected discrete intervals.

d. Graphic Linking: Provide forward and backward linking between floor plans, sub-plans, and equipment.

e. Graphic Editing: Provide installed software to create, modify, and delete the DDC graphics. Include the ability to store graphic symbols in a symbol directory and import these symbols into the graphics.

f. Dynamic Point Editing: Provide full editing capability for deleting, adding, and modifying dynamic points on the graphics.

2.2 SENSORS AND INPUT HARDWARE

Coordinate sensor types with the BAS Owner to keep them consistent with existing installations.

2.2.1 Field-Installed Temperature Sensors

Where feasible, provide the same sensor type throughout the project. Avoid using transmitters unless absolutely necessary.

2.2.1.1 Thermistors

Precision thermistors may be used in applications below 200 degrees F. Sensor accuracy over the application range shall be 0.36 degree F or less between 32 to 150 degrees F. Stability error of the thermistor over five years shall not exceed 0.25 degrees F cumulative. A/D conversion resolution error shall be kept to 0.1 degrees F. Total error for a thermistor circuit shall not exceed 0.5 degrees F.

2.2.1.2 Resistance Temperature Detectors (RTDs)

Provide RTD sensors with platinum elements compatible with the digital controllers. Encapsulate sensors in epoxy, series 300 stainless steel, anodized aluminum, or copper. Temperature sensor accuracy shall be 0.1 percent (1 ohm) of expected ohms (10k ohms) at 32 degrees F. Temperature sensor stability error over five years shall not exceed 0.25 degrees F cumulative. Direct connection of RTDs to digital controllers without transmitters is preferred. When RTDs are connected directly, lead resistance error shall be less than 0.25 degrees F. The total error for a RTD circuit shall not exceed 0.5 degrees F.

2.2.1.3 Temperature Sensor Details

a. Room Type: Provide the sensing element components within a decorative protective cover suitable for surrounding decor. [Provide room temperature sensors with timed override button], [setpoint adjustment lever].

b. Duct Probe Type: Ensure the probe is long enough to properly sense the air stream temperature.

c. Duct Averaging Type: Continuous averaging sensors shall be one foot in length for each 4 square feet of duct cross-sectional area, and a minimum length of 6 feet.

d. Pipe Immersion Type: Provide minimum three-inch immersion. Provide each sensor with a corresponding pipe-mounted sensor well, unless indicated otherwise. Sensor wells shall be stainless steel when used in steel piping, and brass when used in copper piping. Provide the sensor well with a heat-sensitive transfer agent between the sensor and the well interior.

e. Outside Air Type: Provide the sensing element on the building's north side with a protective weather shade that positions the sensor approximately 3 inches off the wall surface, does not inhibit free air flow across the sensing element, and protects the sensor from snow, ice, and rain.

2.2.2 Supervisory Controller MCEN Network Homerun

See UFGS 27 10 00 and CLGS 27 10 00

2.2.3 Transmitters

Provide transmitters with 4 to 20 mA or 0 to 10 VDC linear output scaled to the sensed input. Transmitters shall be matched to the respective sensor, factory calibrated, and sealed. Size transmitters for an output near 50 percent of its full-scale range at normal operating conditions. The total transmitter error shall not exceed 0.1 percent at any point across the measured span. Supply voltage shall be 12 to 24 volts AC or DC. Transmitters shall have non-interactive offset and span adjustments. For temperature sensing, transmitter drift shall not exceed 0.03 degrees F a year.

2.2.3.1 Relative Humidity Transmitters

Provide transmitters with an accuracy equal to plus or minus 3 percent from 0 to 90 percent scale, and less than one percent drift per year. Sensing elements shall be the polymer type.

2.2.3.2 Pressure Transmitters

Provide transmitters integral with the pressure transducer.

2.2.4 Current Transducers

Provide current transducers to monitor motor amperage, unless current switches are shown on design drawings or point tables.

2.2.5 Motor Run Status

Unless otherwise noted, provide current switches to indicate run status of pumps and fans. Sensitivity of the switch on belt driven equipment should distinguish between loaded motor and unloaded motor such as a fan with a broken belt.

2.2.6 Pneumatic to Electric Transducers

Pneumatic to electronic transducers shall convert a 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 and linearity shall be 1.0 percent or better.

2.2.7 Air Quality Sensors

Provide power supply for each sensor.

2.2.7.1 CO2 Sensors

Provide photo-acoustic type CO2 sensors with integral transducers and linear output. The devices shall read CO2 concentrations between 0 and 2000 ppm with full scale accuracy of at least plus or minus 100 ppm.

2.2.7.2 Air Quality Sensors

Provide full spectrum air quality sensors using a hot wire element based on the Taguchi principle. The sensor shall monitor a wide range of gaseous volatile organic components common in indoor air contaminants like paint fumes, solvents, cigarette smoke, and vehicle exhaust. The sensor shall automatically compensate for temperature and humidity, have span and calibration potentiometers, operate on 24 VDC power with output of 0-10 VDC, and have a service rating of 32 to 140 degrees F and 5 to 95 percent relative humidity.

2.2.8 Input Switches

2.2.8.1 Timed Local Overrides

Provide buttons or switches to override the DDC occupancy schedule programming for each major building zone during unoccupied periods, and to return HVAC equipment to the occupied mode. This requirement is waived for zones clearly intended for 24 hour continuous operation.

2.2.8.2 Emergency Shut Down Switches (ATFP)

Anti Terrorism Force Protection emergency shut down switches must be two action to prevent accidental initiation, such as a mushroom push button with a cover.

2.2.9 Freeze Protection Thermostats

Provide special purpose thermostats with flexible capillary elements 20 feet minimum length for coil face areas up to 40 square feet. Provide longer elements for larger coils at 1-foot of element for every 4 square feet of coil face area, or provide additional thermostats. Provide switch contacts rated for the respective motor starter's control circuit voltage. Include auxiliary contacts for the switch's status condition. A freezing condition at any 18-inch increment along the sensing element's length shall activate the switch. The thermostat shall be equipped with a manual push-button reset switch so that when tripped, the thermostat requires manual resetting before the HVAC equipment can restart.

2.2.10 Air Flow Measurement Stations

Air flow measurement stations shall have an array of velocity sensing elements and straightening vanes inside a flanged sheet metal casing. The velocity sensing elements shall be the RTD or thermistor type, traversing the ducted air in at least two directions. The air flow pressure drop across the station shall not exceed 0.08 inch water gage at a velocity of 2,000 fpm. The station shall be suitable for air flows up to 5,000 fpm, and a temperature range of 40 to 120 degrees F. The station's measurement accuracy over the range of 125 to 2,500 fpm shall be plus or minus 3 percent of the measured velocity. Station transmitters shall provide a linear, temperature-compensated 4 to 20 mA or 0 to 10 VDC output. The output shall be capable of being accurately converted to a corresponding air flow rate in cubic feet per minute. Transmitters shall be a 2-wire, loop powered device. The output error of the transmitter shall not exceed 0.5 percent of the measurement.

2.2.11 Air Flow Measurement for Terminal Devices

Air flow measurement for terminal devices such as variable air volume

boxes, with or without fan power shall have an array of pressure sensing elements than sense total pressure and static pressure. The flow measurement shall be integral to the device controller and shall be by differential pressure sensor. The air flow shall measure flows down to 300 fpm with an accuracy of 5 percent of reading.

2.2.12 Energy Metering

2.2.12.1 Steam Meters

Steam meters shall be the vortex shedding type, with pressure compensation, a minimum turndown ratio of 10 to 1, and an output signal shall be 4-20 ma, pulsed, or BACnet MS/TP, all compatible with the DDC system.

2.2.12.2 Hot Water Solar Collector Meters

BACnet output or may be a combination of temperature sensors and water flow meter monitored by a DDC controller with the DDC system calculating the BTU transfer. Water flow can be measured by orifice or venturi meter selected for the anticipated system flow rate. Temperature sensors shall be placed in both the supply to and the return from the solar collector array.

2.3 OUTPUT HARDWARE

2.3.1 Control Dampers

Provide factory manufactured [galvanized steel] [aluminum] dampers where indicated. Dampers shall be opposed blade for rectangular applications 10-inches and taller, and single blade for round dampers and rectangular dampers shorter than 10-inches.Control dampers shall comply with SMACNA 1966 except as modified or supplemented by this specification. Published damper leakage rates and respective pressure drops shall have been verified by tests in compliance with AMCA 500-D requirements.

Provide damper assembly frames constructed of0.064 inchminimum thickness [galvanized]steel channels with mitered and welded corners. Damper axles shall be 0.5 inches minimum diameter plated steel rods supported in the damper frame by stainless steel or bronze bearings. Blades mounted vertically shall be supported by thrust bearings.

Dampers shall be rated for not less than 2000 fpm air velocity. The pressure drop through each damper when full-open shall not exceed 0.04 inches water gage at 1000 fpm face velocity. Damper assemblies in ductwork shall be constructed to meet SMACNA Seal Class "A" construction requirements.

Provide the damper operating linkages outside of the air stream, including crank arms, connecting rods, and other hardware that transmits motion from the damper actuators to the dampers, shall be adjustable. Additionally, operating linkages shall be designed and constructed to have a 2 to 1 safety factor when loaded with the maximum required damper operating force. Linkages shall be brass, bronze, galvanized steel, or stainless steel.

Provide access doors or panels in hard ceilings and walls for access to all concealed damper operators and damper locking setscrews.

For field-installed control dampers, a single damper section shall have blades no longer than 48 inches and no higher than 72 inches. The maximum

damper blade width shall be 12 inches. Larger sized dampers shall be built using a combination of sections.

Frames shall be at least 2 inches wide. Flat blades shall have edges folded for rigidity. Blades shall be provided with compressible gasket seals along the full length of the blades to prevent air leakage when closed.

The damper frames shall be provided with jamb seals to minimize air leakage. Seals shall be suitable for an operating temperature range of minus 40 degrees F to 200 degrees F.

The leakage rate of each damper when full-closed shall be no more than 3 cfm per sq. foot of damper face area at 1.0 inches water gage static pressure.

2.3.2 Control Valves

2.3.2.1 Valve Assembly

Valve bodies shall be designed for 125 psig minimum working pressure or 150 percent of the operating pressure, whichever is greater. Valve stems shall be Type 316 stainless steel. Valve leakage ratings shall be 0.01 percent of rated Cv value. Class 125 copper alloy valve bodies and Class 150 steel or stainless steel valves shall meet the requirements of ASME B16.5. Cast iron valve components shall meet the requirements of ASTM A126 Class B or C.

2.3.2.2 Butterfly Valves

Butterfly valves shall be the threaded lug type suitable for dead-end service and for modulation to the fully-closed position, with stainless steel shafts supported by bearings, non-corrosive discs geometrically interlocked with or bolted to the shaft (no pins), and EPDM seats suitable for temperatures from minus 20 degrees F to plus 250 degrees F. Valves shall have a means of manual operation independent of the actuator.

2.3.2.3 Two-Way Valves

Two-way modulating valves shall have an equal percentage characteristic.

2.3.2.4 Three-Way Valves

Three-way valves shall have an equal percentage characteristic.

2.3.2.5 Valves for Chilled Water, Condenser Water, and Glycol Fluid 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 connections. Bodies for valves from 2-1/2 to 3 inches shall have flanged connections.

b. Internal valve trim shall be brass or bronze, except that valve stems shall be stainless steel.

c. Unless indicated otherwise, provide modulating valves sized for 2 psi minimum and 4 psi maximum differential across the valve at the design flow rate.

d. Valves 4 inches and larger shall be butterfly valves, unless indicated otherwise.

2.3.2.6 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 from 2 inches to 3 inches inclusive shall be of brass, bronze, or iron. Bodies for 2 inch valves shall have threaded connections. Bodies for valves from 2-1/2 to 3 inches shall have flanged connections.

b. Internal trim (including seats, seat rings, modulation plugs, valve stems, and springs) of valves controlling water above 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. Valve stems shall be Type 316 stainless steel.

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. Unless indicated otherwise, provide modulating valves sized for 2 psi minimum and 4 psi maximum differential across the valve at the design flow rate.

f. Valves 4 inches and larger shall be butterfly valves, unless indicated otherwise.

2.3.2.7 Valves for High Temperature Hot Water Service

Valves for hot water service 250 Degrees F above:

a. 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).

b. Internal valve trim shall be Type 316 stainless steel.

c. Unless indicated otherwise, provide modulating valves sized for 2 psi minimum and 4 psi maximum differential across the valve at the design flow rate.

2.3.2.8 Valves for Steam Service

The entire body 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 carbon steel. Bodies for valves 4 inches and larger shall be carbon steel. Bodies for 2 inch valves shall have threaded connections. Bodies for valves 2-1/2 inches and larger shall have flanged 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 where indicated otherwise.

Internal valve trim shall be Type 316 stainless steel.

2.3.3 Actuators

Provide direct-drive electric actuators for all control applications, except where indicated otherwise. All actuators shall include a feedback loop for detecting actuator faults. The actuator shall report actual position back to the control system. Binary actuators shall provide open/closed status, at a minimum. Modulating actuators and process shall provide position feedback expressed (directly or through span conversion) as percent open/closed. Actuator status shall be derived from actuator position; however, effect may be used in cases where direct feedback is not practical such as VAV coils and dampers.

Use airflow sensors as a feedback loop for damper actuators. Use differential temperature as a feedback mechanism for VAV coil valve actuation.

2.3.3.1 Electric Actuators

Each actuator shall deliver the torque required for continuous uniform motion and shall have internal end switches to limit the travel, or be capable of withstanding continuous stalling without damage. Actuators shall function properly within 85 to 110 percent of rated line voltage. Provide actuators with hardened steel running shafts and gears of steel or copper alloy. Fiber or reinforced nylon gears may be used for torques less than 16 inch-pounds. Provide two-position actuators of single direction, spring return, or reversing type. Provide modulating actuators capable of stopping at any point in the cycle, and starting in either direction from any point. Actuators shall be equipped with a switch for reversing direction, and a button to disengage the clutch to allow manual adjustments. Provide the actuator with a hand crank for manual adjustments, as applicable. Thermal type actuators may only be used on terminal fan coil units, terminal VAV units, convectors, and unit heaters. Spring return actuators shall be provided on all control dampers and all control valves except terminal fan coil units, terminal VAV units, convectors, and unit heaters; unless indicated otherwise. Each actuator shall have distinct markings indicating the full-open and full-closed position, and the points in-between. Actuators mounted outdoors shall be outdoor rated and not require a weatherproof enclosure.

2.3.4 Output Signal Conversion

2.3.4.1 Electronic-to-Pneumatic Transducers

Electronic to pneumatic transducers shall convert a 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 and linearity shall be 1.0 percent or better. Transducers shall have feedback circuit that converts the pneumatic signal to a proportional 4 to 20 mA or 0 to 10 VDC signal.

2.3.5 Output Switches

2.3.5.1 Control Relays

Field installed and DDC panel relays shall be double pole, double throw, UL listed, with contacts rated for the intended application, indicator light,

and dust proof enclosure. The indicator light shall be lit when the coil is energized and off when coil is not energized. Relays shall be the socket type, plug into a fixed base, and replaceable without tools or removing wiring. Encapsulated "PAM" type relays may be used for terminal control applications.

2.4 ELECTRICAL POWER AND CONTROL WIRING

2.4.1 Transformers

Transformers shall conform to UL 506. For control power other than terminal level equipment, provide a fuse or circuit breaker on the secondary side of each transformer.

2.4.2 Surge and Transient Protection

Provide each control cabinet with surge and transient power protection. Surge protection is not required for small terminal unit controllers such as VAV controllers. Surge and transient protection shall consist of the following devices, installed externally to the controllers.

2.4.2.1 Power Line Surge Protection

Provide surge suppressors on the incoming power at each direct digital controller or grouped terminal controllers and shall be installed externally to the device or devices being protected. Surge suppressors shall be rated in accordance with UL 1449, have a fault indicating light, and conform to the following:

a. The device shall be a transient voltage surge suppressor, hard-wire type individual equipment protector for 120 VAC/1 phase/2 wire plus ground.

b. The device shall react within 5 nanoseconds and automatically reset.

c. The voltage protection threshold, line to neutral, shall be no more than 211 volts.

d. The device shall have an independent secondary stage equal to or greater than the primary stage joule rating.

e. The primary suppression system components shall be pure silicon avalanche diodes.

f. The secondary suppression system components shall be silicon avalanche diodes or metal oxide varistors.

g. The device shall have an indication light to indicate the protection components are functioning.

h. All system functions of the transient suppression system shall be individually fused and not short circuit the AC power line at any time.

i. The device shall have an EMI/RFI noise filter with a minimum attenuation of 13 dB at 10 kHz to 300 MHz.

j. The device shall comply with IEEE C62.41.1 and IEEE C62.41.2, Class "B"

requirements and be tested according to IEEE C62.45.

k. The device shall be capable of operating between minus 20 degrees F and plus 122 degrees F.

2.4.2.2 MS/TP Communication Line Surge Protection

Provide surge and transient protection for DDC controllers and DDC network related devices connected to phone lines, network communication lines, lines from exterior equipment, and lines from other buildings including mechanical buildings in accordance with the following:

a. The device shall provide continuous, non-interrupting protection.

b. The protection shall react within 5 nanoseconds using only solid-state silicon avalanche technology.

c. The device shall be installed at the distance recommended by its manufacturer.

Include the location of the surge protection devices on the control drawing network riser.

2.4.3 Wiring

Provide complete electrical wiring for the DDC System, including wiring to transformer primaries. Run all control wiring in rigid or flexible conduit, metallic tubing, or covered metal raceways, unless noted otherwise. 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 26 20 00, INTERIOR DISTRIBUTION SYSTEM. Run all circuits over 100 volts in conduit, metallic tubing, covered metal raceways, or armored cable. Follow cable manufacturer's recommendations or requirements based on the cable usage, such as outdoors and/or underground.

2.4.3.1 Power Wiring

The following requirements are for field-installed wiring:

a. Wiring for 24 V circuits shall be insulated copper 18 AWG minimum and rated for 300 VAC service.

b. Wiring for 120 V circuits shall be insulated copper 12 AWG minimum and rated for 600 VAC service.

2.4.3.2 Analog Signal and Binary Wiring

Provide in accordance with control manufacturer's recommendations and the following: Field-installed analog signal wiring shall be 18 AWG single or multiple twisted pair. Each cable shall be 100 percent shielded and have a 20 AWG drain wire. Each wire shall have insulation rated for 300 VAC service. Cables shall have an overall aluminum-polyester or tinned-copper cable-shield tape. All binary input and output wiring shall be 18 AWG.

2.4.3.3 MS/TP Communication Bus

a. Provide system manufacturer's recommended or preferred cabling.

b. Follow cable manufacturer's recommendations or requirements based on the cable usage, such as outdoors and/or underground.

c. Splices in communication cable are not allowed. Segments of communication cable between field devices shall be solid lengths with no splices.

2.4.3.4 Conduit

Conduit for controls less than 100 volts shall be colored blue. Junction box cover plates for controls shall be blue. Fittings and boxes do not need to be blue.

2.5 FIRE PROTECTION DEVICES

2.5.1 Duct Smoke Detectors

Provide duct smoke detectors in HVAC ducts in accordance with NFPA 72 and NFPA 90A, except as indicated otherwise. Provide UL listed or FM approved detectors, designed specifically for duct installation.

[Furnish detectors under Section 28 31 76.00 20 INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM and install under this section. Connect new detectors to the building fire alarm panel.
]
[Provide photoelectric type detectors. Detectors shall detect both visible and invisible particles of combustion, and shall not be susceptible to undesired operation by changes to relative humidity. Provide each detector with an approved duct housing mounted exterior to the duct, and an integral perforated sampling tube extending across the width of the duct. The detector housing shall have indicator lamps that light when the detector is powered and when the detector is activated. Each detector shall have an integral test port remote keyed test device. Connect new detectors to the building's existing fire alarm control panel. Provide control and power modules required for the operation of the detectors in their own new control unit. A ground fault, break, or open condition in the electrical circuitry to any detector or its control or power unit shall cause activation of a trouble signal at the building fire alarm panel. Electrical supervision of wiring used exclusively for air-handling unit shutdown is not required, provided a break in the wiring would cause shutdown of the associated unit. Equipment and devices shall be compatible and operable in all respects with, and shall in no way impair the reliability or operational functions of, the existing fire alarm system. The building's existing fire alarm control panel was manufactured by [_____]. Provide descriptive zone labels at the existing fire alarm panel indicating which new air-handling unit detectors they serve and their location. Label zones modified in order to accomplish the work.
]
[Provide photoelectric type detectors. Detectors shall detect both visible and invisible particles of combustion, and shall not be susceptible to undesired operation by changes to relative humidity. Provide each detector with an approved duct housing mounted exterior to the duct, and an integral perforated sampling tube extending across the width of the duct. The detector housing shall have indicator lamps that light when the detector is powered and when the detector is activated. Each detector shall have an

integral test port remote keyed test device. Provide a 115 VAC power supply unit integral with the detector's duct housing. Provide power to the detector from the air-handling unit or air-handling unit controls. Provide the detectors with a remote audio/visual alarm indicator and keyed test device at the location indicated. Activation of a detector shall cause immediate shutdown of the associated air-handling unit and the closing of its dampers and shall activate the remote alarm indicator.]

2.6 INDICATORS

2.6.1 Pressure Gauges for Pneumatic Controls

Provide a pressure gauge at each pneumatic control input and output. Gauges shall have a 2-inch diameter face and a 0 to 30 psi scale with 1 psi graduations.

2.7 PNEUMATIC POWER SUPPLY AND TUBING

2.7.1 Air Compressors

Air compressors for pneumatic control systems shall be the tank-mounted, electric motor driven, air cooled, reciprocating type with integral [duplex motors and compressors][single motor and compressor], tank, controller, [alternator switch,]pressure switch, belt guard[s], pressure relief valve, and automatic moisture drain valve. Compressor piston speeds shall not exceed 450 fpm. Provide compressors with a dry-type combination intake air filter and silencer with baked enamel steel housing. The filter shall be 99 percent efficient at 10 microns. The pressure switch shall start the compressor[s] at 70 psig and stop the compressor[s] at 90 psig. The relief valve shall be set for 10 to 25 psig above the control switch cut-off pressure. Provide compressor capacity suitable for not more than a [33] [50] percent run time, at full system control load. Compressors shall have a maintaining type starter, and shall automatically restart after a power outage. Motors 0.5 hp and larger shall be three-phase.

2.7.1.1 Compressed Air Tank

Provide a steel tank constructed and labeled in agreement with ASME BPVC for 125 psig maximum working pressure. Size the tank for the compressor run time specified above. Provide drain valve and piping routing the drainage to a floor sink or other safe and visible drainage location.

2.7.2 Refrigerated Air Dryers

Provide each air compressor tank with a refrigerant air dryer sized for continuous operation, and capable of reducing the compressed air dew point temperature, at 20 psig output pressure, to 30 degrees F, at an average tank pressure of 80 psig and an ambient air temperature between 55 and 95 degrees F. Provide each dryer with an automatic condensate drain trap with manual override feature. Provide the dryer suction line with a refrigerant pressure gauge. Locate each dryer in the air piping between the tank and the pressure-reducing station.

2.7.3 Compressed Air Discharge Filters

Provide air compressors with a dry type discharge filter, 99 percent efficient at removing oil and solid particles at 0.03 microns, with baked

enamel steel housing and manual drain valve. Provide visual indicator to show when the filter element should be changed.

2.7.4 Air Pressure-Reducing Stations

Provide air compressors with a pressure-reducing valve (PRV) with a field adjustable range of 0 to 50 psig discharge pressure, at an inlet pressure of 70 to 90 psig. Provide a factory-set pressure relief valve downstream of the PRV to relieve over-pressure. Provide a pressure gage upstream of the PRV with range of 0 to 100 psig and downstream of the PRV with range of 0 to 30 psig. For two-pressure control systems, provide an additional PRV and downstream pressure gage.

2.7.5 In-line Filters

Provide a disposable type in-line filter in the incoming pneumatic main at each pneumatic control panel. The filter shall be capable of eliminating 99.99 percent of all liquid or solid contaminants 0.1 micron or larger. Provide the filter with fittings that allow easy removal/replacement.

2.7.6 Pneumatic Tubing

2.7.6.1 Copper Tubing

Provide ASTM B75/B75M or ASTM B88M ASTM B88 rated tubing. Tubing 0.64 mm 0.375 inch outside diameter and larger shall have minimum wall thickness equal to ASTM B88M ASTM B88, Type M. Tubing less than 10 mm 0.375 inch outside diameter shall have minimum wall thickness of 0.64 mm 0.025 inch. Exposed tubing and tubing for working pressures greater than 30 psig shall be hard copper. Fittings shall be ASME B16.18 or ASME B16.22 solder type using ASTM B32 95-5 tin-antimony solder, or ASME B16.26 compression type.

2.7.6.2 Polyethylene Tubing

Polyethylene tubing may only be used in systems with working pressure of 30 psig or less, this includes tubing used for devices such as air filter status, duct pressure and duct pressure safety limits. Provide flame-resistant, multiple polyethylene tubing in flame-resistant protective sheath with mylar barrier, or unsheathed polyethylene tubing in rigid metal, intermediate metal, or electrical metallic tubing conduit for areas where tubing is exposed. Single, unsheathed, flame-resistant polyethylene tubing may be used where concealed in walls or above ceilings and within control panels. Do not provide polyethylene tubing for [systems indicated as critical and] smoke removal systems. Provide compression or brass barbed push-on type fittings. Extruded seamless polyethylene tubing shall conform to the following:

a. Minimum Burst Pressure Requirements: 690 kPA 100 psig at 24 degrees C 75 degrees F to 172 kPa 25 psig at 66 degrees C 150 degrees F.

b. Stress Crack Resistance: ASTM D1693, 200 hours minimum.

c. Tensile Strength (Minimum): ASTM D638, 7583 kPa 1100 psi.

d. Flow Rate (Average): ASTM D1238, 0.30 decigram per minute.

e. Density (Average): ASTM D792, 920 kg/m3 57.5 pounds per cubic feet.

f. Burn rate: ASTM D635

2.8 VARIABLE FREQUENCY (MOTOR) DRIVES

Provide variable frequency drives (VFDs) as indicated. VFDs shall convert 208 or 480 volt (plus or minus 10 percent), three phase, 60 hertz (plus or minus 2Hz), utility grade power to adjustable voltage/frequency, three phase, AC power for stepless motor control from 5 percent to 200 percent of base speed. VFDs shall be UL listed as delivered to the end user. The VFD shall meet the requirements specified in the most current National Electrical Code. Each VFD shall also meet the following:

a. The VFD shall use sine coded Pulse Width Modulation (PWM) technology. PWM calculations shall be performed by the VFD microprocessor.

b. The VFD shall be capable of automatic control by a remote 4-20 mA [0 to 10 VDC] signal, by network command, or manually by the VFD control panel.

2.8.1 VFD Quality Assurance

VFDs shall be the manufacturer's current standard production unit with at least 10 identical units successfully operating in the field.

2.8.2 VFD Service Support

a. Warranty: Provide the VFDs with a minimum 24-month full parts and labor warranty. The warranty shall start when the contract's HVAC system is accepted by the Government. Include warranty documentation, dates, and contact information with the VFD on-site service manuals.

b. VFD Service Manuals: Provide the VFDs with all necessary installation, operation, maintenance, troubleshooting, service, and repair manuals in English including related factory technical bulletins. Provide the documents factory bound, in sturdy 3-ring binders, or hard bound covers. Provide a title sheet on the outside of each binder indicating the project title, project location, installing contractor, contract number, and the VFD manufacturer, address, and telephone number. Each binder shall include a table of contents and tabbed dividers, with all material neatly organized. The documentation provided shall be specifically applicable to this project, shall be annotated to reflect the actual project conditions, and shall provide a complete and concise depiction of the installed work. Provide a storage cabinet on or near the VFD large enough to hold all of the documentation. Have the cabinet's proposed installation site approved in advance by the Contracting Officer. Prominently label the cabinet "VFD OPERATION AND MAINTENANCE MANUALS." Clearly label each manual with the wording "MECHANICAL ROOM COPY - DO NOT REMOVE".

c. Technical Support: Provide the VFDs with manufacturer's technical telephone support in English, readily available during normal working hours, and free of charge for the life of the equipment.

d. Initial Start-Up: Provide the VFDs with factory-trained personnel for the on-site start-up of the HVAC equipment and associated VFD. The personnel shall be competent in the complete start-up, operation, and repair of the particular model VFD installed. The factory start-up

representative shall perform the factory's complete recommended start-up procedures and check-out tests on the VFD. Include a copy of the start-up test documentation with the VFD on-site service manuals.

e. Provide the VFDs with on-site/hands-on training for the user and maintenance personnel. Provide a capable and qualified instructor with minimum two years field experience with the operation and maintenance of similar VFDs. The training shall occur during normal working hours and last not less than 2 hours. Coordinate the training time with the Contracting Officer and the end user. The VFD service manuals shall be used during the training. The contractor shall ensure the manuals are on-site before the start of training. The training shall cover all operational aspects of the VFD.

2.8.3 VFD Features

VFDs shall have the following features:

a. A local 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) Motor RPM.

(4) Phase current.

(5) Fault diagnostics in descriptive text.

(6) All programmed parameters.

(7) Load power.

c. Standard PI loop controller with input terminal for controlled variable and parameter settings.

d. User interface terminals for remote control of VFD speed, speed feedback, and an isolated form C SPDT relay, which energizes on a drive fault condition.

e. An isolated form C SPDT auxiliary relay which energizes on a run command.

f. A metal NEMA 1 enclosure for indoors, NEMA 4 with heater for outdoors.

g. An adjustable carrier frequency with 16 KHz minimum upper limit.

h. A built in DC buss reactor with 3 percent minimum impedance to protect the VFDs DC buss capacitors and rectifier section diodes.

2.8.4 Programmable Parameters

VFDs shall include the following operator programmable parameters:

a. Upper and lower limit frequency.

b. Acceleration and Deceleration rate.

c. Variable torque volts per Hertz curve.

d. Starting voltage level.

e. Starting frequency level.

f. Display speed scaling.

g. Enable/disable auto-restart feature.

h. Enable/disable soft stall feature.

i. Motor overload level.

j. Motor stall level.

k. Jump frequency and hysteresis band.

l. PWM carrier frequency.

2.8.5 Protective Features

VFDs shall have the following protective 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 not exceed the full-load amperage when an overload condition exists at the requested frequency. The VFD will automatically return to the requested frequency when load conditions permit.

c. A separate electronic stall at 110 percent VFD rated current, and a separate hardware trip at 190 percent current.

d. Ground fault protection that protects the output cables and motor from grounds during both starting and continuous running conditions.

e. The ability to restart after the following faults:

(1) Overcurrent (drive or motor).

(2) Power outage.

(3) Phase loss.

(4) Over voltage/Under voltage.

f. The ability shut down if inadvertently started into a rotating load without damaging the VFD or the motor.

g. The ability to keep a log of a minimum of four previous fault conditions, indicating the fault type and time of occurrence in descriptive text.

h. The ability to sustain 110 percent rated current for 60 seconds

i. The ability to shutdown safely or protect against and record the following fault conditions:

(1) Over current (and an indication if the over current was during acceleration, deceleration, or running).

(2) Over current internal to the drive.

(3) Motor overload at start-up.

(4) Over voltage from utility power.

(5) Motor running overload.

(6) Over voltage during deceleration.

(7) VFD over heat.

(8) Load end ground fault.

(9) Abnormal parameters or data in VFD EEPROM.

2.8.6 Minimum Operating Conditions

VFDs shall be designed and constructed to operate within the following service conditions:

a. Ambient Temperature Range, 0 to 120 degrees F.

b. Non-condensing relative humidity to 90 percent.

2.8.7 Additional Features

Provide VFDs with the following additional features:

a. BACnet communication interface port

PART 3 EXECUTION

3.1 INSTALLATION

Perform the installation under the supervision of competent technicians regularly employed in the installation of DDC systems. All material and

equipment shall be installed in accordance with the manufacturer's recommendations for the intended purpose. Maintain a copy of the manufacture's recommendations on the Contruction Site. Use the more stringent methods when manufacturer's recommendations, and plans & specification requirements differ. Use the "Preferred" method when alternative methods are given. The word "should" will be considered to mean "shall". Bring any conflicts between manufacturer's recommendations and plans & specification requirements to the Government's attention. All equipment shall be installed level and plumb.

3.1.1 Pre-Installation Meeting

Prior to starting the installation, meet with the Contracting Officer's Technical Representative (COTR) and the BAS owner to develop a mutual understanding relative to the details of the DDC system requirements. Requirements to be discussed include required submittals, work schedule, and field quality control.

3.1.2 Demolition

Remove and/or demolish all existing controls, cabling, conductors, conduit, controllers, power circuits and cabinets that are no longer needed after new work is installed. Any existing systems to remain, must remain functional and operate properly after all demolition is complete.

3.1.3 BACnet Naming and Addressing

Coordinate with the EMCS Owner and provide unique naming and addressing consistent with existing buildings already loaded on the EMCS server. All DDC controllers shall have a Camp Lejeune unique instance number and all Supervisory Building Controllers shall have a Camp Lejeune unique name. Names are managed by the Government.

a. MAC Address

Every BACnet device shall have an assigned and documented MAC Address unique to its network. For Ethernet networks, document the MAC Address assigned at its creation. For MS/TP networks, assign addresses from 0-127. Do not use the controls manufacturer reserved addresses for field controllers. This is typically 0-3. Also the BACnet Instance ID for MAC Address 127, Trunk 1, is reserved for the Supervisory controller. Supervisory Controller Global ID and instance numbers are to be obtained from Camp Lejeune Public Works Operations to ensure duplicates do not occur. Point of Contact:

Public Works Division/EMCS
1005 Michael Road / Building 1005
MCB Camp Lejeune, NC 28547
(910) 450-7846

For MS/TP, assign from 01 to 127 unless reserved by the manufacturer.

b. Network Numbering

Assign unique numbers to each new network installed on the BACnet internetwork. Provide ability for changing the network number; either

by device switches, network computer, or field operator interface. The BACnet internetwork (all possible connected networks) can contain up to 65,534 possible unique networks.

c. Device Object Identifier Property Number

Assign unique Device "Object_Identifier" property numbers or device instances for each device on the BACnet internetwork. Provide for future modification of the device instance number; either by device switches, network computer, or field interface. Instance numbers must be field assignable. BACnet allows up to 4,194,302 possible unique devices per internetwork.

d. Device Object Name Property Text

Each object on the Camp Lejeune EMCS has a unique point name, which is made up of the object or short name stored in the controller and the equipment identifier, which is stored in the supervisory building controller (SBC). The long point name combines this object name with the name stored in the SBC that describes the controller or location of the object. The device object name property field shall support 32 minimum printable characters. The point name follows the general convention:

Building.Equipment.Object Name

Example: HP512.AHU-3.DA-T. See Attachments one through three for equipment names, object names, object groupings, and area names.

e. Object Name Property Text (Other than Device Objects)

The object name identifies the specific point. Only object names on the approved Camp Lejeune list shall be used. From the example above, the point name is: "DA-T". See Attachment for the approved Camp Lejeune list. The object name property field shall support 32 minimum printable characters.

f. Object Description

The controller shall also store an alpha numeric description of the object name. The controller shall support a minimum of 30 printable characters. From the example above the object description is: " Discharge Air Temperature".

g. List of Attachments

Attachment 1 - Equipment Names
Attachment 2 - Object Names
Attachment 3 - Object Grouping
Attachment 4 - Niagara BAS Alarms Policy
Attachemnt 5 - Trend (History)

3.1.4 Minimum BACnet Object Requirements

a. Use of Standard BACnet Objects in accordance with existing Camp Lejeune Standards

For the following points and parameters, use standard BACnet objects,

where all relevant object properties can be read using BACnet's Read Property Service, and all relevant object properties can be modified using BACnet's Write Property Service:
all device physical inputs and outputs, all set points, all PID tuning parameters, all calculated pressures, flow rates, and consumption values, all alarms, all trends, all schedules, and all equipment and lighting circuit operating status.

b. BACnet Object Description Property

The Object Description property shall support 32 minimum printable characters. For each object, complete the description property field using a brief, narrative, plain English description specific to the object and project application. For example: "HW Pump 1 Proof." Document compliance, length restrictions, and whether the description is writeable in the device PICS.

c. Analog Input, Output, and Value Objects

Support and provide Description and Device_Type text strings matching signal type and engineering units shown on the points list.

d. Binary Input, Output, and Value Objects

Support and provide Inactive_Text and Active_Text property descriptions matching conditions shown on the points list.

e. Calendar Object

For devices with scheduling capability, provide at least one Calendar Object with ten-entry capacity. All operators may view Calendar Objects; authorized operators may make modifications from a workstation. Enable the writeable Date List property and support all calendar entry data types.

f. Schedule Object

Use Schedule Objects for all building system scheduling. All operators may view schedule entries; authorized operators may modify schedules from a workstation.

g. Loop Object or Equal

Use Loop Objects or equivalent BACnet objects in each applicable field device for PID control. Regardless of program method or object used, allow authorized operators to adjust the Update Interval, Setpoint, Proportional Constant, Integral Constant, and Derivative Constant using BACnet read/write services.

h. Setpoints

All setpoints must be BACnet exposed for auto discovery purposes if needed.

3.1.5 Minimum BACnet Service Requirements

a. Command Priorities

Use commandable BACnet objects to control machinery and systems, providing the priority levels listed below. If the sequence of operation requires a different priority, obtain approval from the Contracting Officer.

Priority Level	Application
1	Manual-Life Safety
2	Automatic-Life Safety
3	(User Defined)
4	(User Defined)
5	Critical Equipment Control
6	Minimum On/Off
7	(User Defined)
8	Manual Operator
9	(User Defined)
10	(User Defined)
11	Load Shedding
12	(User Defined)
13	(User Defined)
14	(User Defined)
15	(User Defined)
16	(User Defined)

b. Alarming

(1) Alarm Priorities - Coordinate alarm and event notification with the BAS Owner.

(2) Notification Class - Enable writeable Priority, Ack Required, and Recipient List properties of Notification Class objects.

(3) Event Notification Message Texts - Use condition specific narrative text and numerical references for alarm and event notification.

c. Updating Displayed Property Values

Allow workstations to display property values at discrete polled intervals, or based on receipt of confirmed and unconfirmed Change of Value notifications. The COV increment shall be adjustable by an operator using BACnet services, and polled intervals shall be adjustable at the operator workstation.

3.1.6 Local Area Networks

Obtain Government approval before connecting new networks with existing networks. Network numbers and device instance numbers shall remain unique when joining networks. Do not change existing network addressing without Government approval. See also "BACnet Naming and Addressing".

3.1.7 BACnet Routers and Protocol Gateways

Provide the quantity of BACnet routers necessary for communications shown on the BACnet Communication Architecture schematic. Provide BACnet routers with BACnet Broadcast Message Device (BBMD) capability on each BACnet internetwork communicating across an IP network. Configure BBMD tables to enable unicast forwarding of broadcast messaging across Layer-3 IP subnets.

3.1.8 Plant Controllers

Equipment such as VFD's, chillers, and boilers shall have hardwired enable(start/stop), and status points from the plant controller, VFD's shall also have a hardwired speed command. Additionally, this equipment shall have a BACnet interface for monitoring.

3.1.9 Wiring Criteria

a. Run circuits operating at more than 100 volts in rigid or flexible conduit, metallic tubing, covered metal raceways, or armored cable.

b. Run all control wiring in blue rigid or flexible conduit, blue metallic tubing, or covered metal raceways, unless noted otherwise. All control wiring located inside mechanical rooms shall be in conduit or metallic tubing. All conduit and junction box covers shall be blue in color."

c. Do not run binary control circuit wiring in the same conduit as power wiring over 100 volts. Where analog signal wiring requires conduit, do not run in the same conduit with AC power circuits or control circuits operating at more than 100 volts.

d. Provide circuit and wiring protection required by NFPA 70.

e. Minimum conduit size is 3/4-inch, except 1/2-inch may be used from last junction box to the terminal device. Maximum conduit fill is 40% or the cable manufacturer's recommended amount whichever is less. Provide plastic end sleeves at all conduit terminations to protect wiring from burrs.

f. Do not bury aluminum-sheathed cable or aluminum conduit in concrete.

g. Input/output identification: Permanently label each field-installed wire, cable, and pneumatic tube at each end with descriptive text using a commercial wire marking system. Labels shall fully encircle the wire, cable, or tube. The single line text shall run parallel to the

wire, cable, or tube and shall be repeated so as to be viewable without twirling or twisting the wire. Locate the markers within 2 inches of each termination. Label shall include type of network and destination of cable (ex. BACnet/AHU-1). Match the names and I/O number to the project's point list. Similarly label all power wiring serving control devices, including the word "power" and panel board and circuit number, or transformer location in the label. Number each pneumatic tube every six feet. Label all terminal blocks with alpha/numeric labels. All wiring and the methods shall be in accordance with UL 508A.

h. Permanently display controller wiring diagram for each controller on the inside of the control cabinet door. Diagram shall be neatly lettered and taped or adhered with sticky back label.

i. Conduit identification: All conduits shall be labeled within 36 inches from terminations, boxes, or bends. Labels shall be 3/8 inches black lettering on white background and indicate what system the conduit contains. Label shall be visible and legible from at least three sides with a minimum dimension of 1.9 inches x 4 inches. Conduit that includes power circuits shall be labeled with source panel and circuit, and destination cabinet or equipment.

j. Each terminal device shall have its own terminal conduit run. Device boxes or devices or panels shall not be used as "pass thru" for wiring.

k. Conduit to equipment and devices shall be run tight to walls, and ceilings. Avoid conduit on the floor, i.e. conduit shall not block access to or past equipment. Flex conduit is to be used only when EMT or rigid conduit is not able to satisfy the application such as a transition to a sensor or equipment. Flex conduit shall be limited to a maximum length of 3 ft.

l. For controller power, provide new 120 VAC circuits, with ground if not defined on the electrical drawings. Provide each circuit with a dedicated breaker, and run wiring in its own conduit, separate from any control wiring. Connect the controller's ground wire to the electrical panel ground Conduit grounds are not acceptable.
Include a label on the 120 VAC circuit conduit at each control panel. The label is to include the source panel and circuit identification. The label size shall be a minimum of 1.9 inches by 4 inches, 3/8 inch black lettering on white background.

m. Supervisory Building Controllers (SBC) shall be powered from a dedicated transformer for the SBC only. Each control cabinet shall have a dedicated 24 volt transformer. The 120 VAC power branch circuit shall be dedicated to the DDC control system. Factory provided transformers in equipment must be used as a source of power only for the control devices intended by the equipment manufacturer.

n. Surge Protection: Install surge protection according to manufacturer's instructions. Multiple controllers fed from a common power supply may be protected by a common surge protector, properly sized for the total connected devices.

o. All terminations in panels shall be made at a terminal block if not connected directly to a panel device, ie Field Controller, Supervisory Controller,relays,transmitters, etc. . No wire nuts are allowed in panels,VAV boxes, control panels, relay panels, or any other type of

enclosure shall follow this requirement. High and low voltage wires must not land on the same terminal block unless they are separated and of a different color and/or clearly identified.

p. Grounding: Ground controllers and cabinets to a good earth ground as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Conduit grounding is not acceptable; all grounding shall have a direct path to the building earth ground. Ground sensor drain wire shields at the controller end.

q. The Contractor shall be responsible for correcting all associated MS/TP and SA bus wiring,auxiliary bus wiring, termination, end of line, and ground loop problems.

r. Run wiring in panel enclosures in covered wire track.

s. Control cabinets and wiring boxes must be clean of all debris.

t. Low voltage cable must not be supported directly from "all thread" rod. If cabling/wiring is permitted to be run without conduit/raceway it must be supported using a retaining device such as a bridle ring or J hook, and where appropriate connected to the all thread rod using a standoff device. Openly installed cabling/wiring must be approved by Camp Lejeune Public Works Department.

u. For serviceability, allow a minimum of 2 inches of exposed wire or cable from any termination point, i.e. between Panduit and field controller terminations.

3.1.10 Accessibility

Install all equipment so that parts requiring periodic inspection, operation, maintenance, and repair are readily accessible. Install digital controllers, data ports, and concealed actuators, valves, dampers, and like equipment in locations freely accessible through access doors. Install power surge protection such that it is replacable without removing other components.

3.1.11 Digital Controllers

a. Install as stand alone control devices (see definitions).

b. Locate control cabinets at the locations shown on the drawings. If not shown on the drawings, install in the most accessible space, close to
Controllers must be installed in a manfacturer's required/recommended enclosure for each type of controller.

c. Provide a dedicated analog output to each output device, such as variable frequency driven pump motors in an alternating arrangement.

d. Equipment such as VFD's must have hardwired enable(start/stop), speed command and status points from the controller. Software points are not allowable. Additionally, this equipment shall have a BACnet interface for monitoring

3.1.12 Hand-Off-Auto Switches

Wire safety controls such as smoke detectors, freeze protection thermostats,and emergency shut down switches to protect the equipment during both hand and auto operation.

3.1.13 Emergency Shut Down Switches (ATFP)

Quantity and location as shown on the drawings. Switches must be hardwired such that all fans and dampers that circulate air between rooms, or between inside and outside must shut down/close regardless of equipment HOA switch position. ATFP circuit must be energized to allow equipment to operate; i.e. activation of the emergency shut down switch will de-energize the circuit and open relays at the equipment. Additionally, activation of the switch must signal the DDC system to shut all air moving equipment off/closed and initiate an alarm. Reset of the DDC system must be manual.

3.1.13.1 Safety and Shutdown Circuit Monitoring

All safety or shutdown circuits, or any circuit that can disable a system, shall be monitored by the DDC system as separate inputs for each circuit. This shall include, but is not limited to, Low Temperature Limit, Duct Mounted Smoke Detector, Discharge Air High Pressure Limit, Boiler Emergency Pushbutton, Carbon Monoxide, Gas Detection, ATFP, etc. Supervisory controller alarm reporting shall be configured for each individual circuit alarm.

3.1.14 Temperature Sensors

Install temperature sensors in locations that are accessible and provide a good representation of sensed media. Installations in dead spaces are not acceptable. Calibrate sensors according to manufacturer's instructions. Do not use sensors designed for one application in a different application.

3.1.14.1 Room Temperature Sensors

Mount the sensors on interior walls to sense the average room temperature at the locations indicated. Avoid locations near heat sources such as copy machines or locations by supply air outlet drafts. Mount the center of the sensor 54 inches above the floor to meet ADA requirements.

3.1.14.2 Duct Temperature Sensors

a. Probe Type: Provide a gasket between the sensor housing and the duct wall. Seal the duct penetration air tight. Seal the duct insulation penetration vapor tight.

b. Averaging Type (and coil freeze protection thermostats): Weave the capillary tube sensing element in a serpentine fashion perpendicular to the flow, across the duct or air handler cross-section, using durable non-metal supports. Prevent contact between the capillary and the duct or air handler internals. Provide a duct access door at the sensor location. The access door shall be hinged on the side, factory insulated, have cam type locks, and be as large as the duct will permit, maximum 18 by 18 inches. For sensors inside air handlers, the sensors shall be fully accessible through the air handler's access doors without removing any of the air handler's internals.

3.1.14.3 Immersion Temperature Sensors

Provide thermowells for sensors measuring piping, tank, or pressure vessel temperatures. 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 thermal conductivity material within the well to fully coat the inserted sensor.

3.1.14.4 Outside Air Temperature Sensors

Provide outside air temperature sensors in weatherproof enclosures on the north side of the building, away from exhaust hoods and other areas that may affect the reading. Provide a shield to shade the sensor from direct sunlight.

3.1.15 Energy Meters

Provide and lLocate energy meters as indicated. Connect each meter output to the DDC system, to measure both instantaneous and accumulated energy usage.

3.1.16 Damper Actuators

Where possible, mount actuators outside the air stream in accessible areas.

3.1.17 Pressure Sensors

Locate pressure sensors as indicated.

3.1.18 Pneumatic Tubing

Run tubing concealed in finished and unfinished areas. Run tubing in conduit, such as EMT. For tubing enclosed in concrete, provide rigid metal conduit. Run tubing parallel and perpendicular to building walls. Polyethylene tubing over 3 feet long must be run in conduit such as EMT. Caulking joints is not permitted. Do not run tubing and electrical power conductors or class 1, 2, or 3 cables, in the same conduit. All tubing must be terminated with an appropriate fitting designed for that purpose.

3.1.19 Component Identification Labeling

Using an electronic hand-held label maker with white tape and bold black block lettering, provide an identification label on the exterior of each new control panel, control device, actuator, and sensor. Also provide labels on the exterior of each new control actuator indicating the (full) open and (full) closed positions. For labels located outdoors, use exterior grade label tape, and provide labels on both the inside and outside of the panel door or device cover. Acceptable alternatives are white plastic labels with engraved bold black block lettering permanently attached to the control panel, control device, actuator, and sensor. Have the labels and wording approved by the BAS Owner prior to installation. Devices with field adjustable setpoints, such as Air Filter Status, Duct Pressure Safety Limit, etc., must have the field adjusted setpoint and date included on the label. Components mounted above a ceiling or service hatch

must also have the component identification visible from below. Examples: A VAV controller, or exhaust fan relay, identification would be included on the ceiling grid, or service hatch, in the area of the controller."

3.1.20 Network and Telephone Communication Lines

When telephone lines or network connections by the Government are required, provide the Contracting Officer at least 120 days advance notice of need. Provide one inch conduit and two (2)green Cat 6 cables from the point of connection of the BAS to the point of connection to the MCEN (most likely in the telephone equipment room). Cables must be terminated and tested.

3.2 TEST AND BALANCE SUPPORT

The controls contractor shall coordinate with and provide on-site support to the test and balance (TAB) personnel specified under Section 23 05 93 TESTING, ADJUSTING AND BALANCING or Section 23 05 92 TESTING, ADJUSTING, BALANCING SMALL HEATING/VENTILATING/COOLING SYSTEMS. This support shall include:

a. On-site operation and manipulation of control systems during the testing and balancing.

b. Control setpoint adjustments for balancing all relevant mechanical systems, including VAV boxes.

c. Tuning control loops with setpoints and adjustments determined by TAB personnel.

3.3 INTERFACE WITH EXISTING EMCS

Provide 16 hours of assistance to the Government with interfacing the BAS to the Base wide EMCS. The Government will make the final connection of the BAS to the MCEN. This 16 hours does not include completion or corrections to the installed BAS as defined in the contract documents. This 16 hours is for assisting the interface and for making revisions to the BAS that may be needed outside of the contract requirements. As-Build control drawings must be available for the EMCS operator performing the interacing.

3.4 CONTROLS SYSTEM OPERATORS MANUALS

Provide [two] [three] [four] electronic and printed copies of a Controls System Operators Manual. The manual shall be specific to the project, written to actual project conditions, and provide a complete and concise depiction of the installed work. Provide information in detail to clearly explain all operation requirements for the control system.

Provide with each manual: CDs of the project's control system drawings, control programs, data bases, graphics, and all items listed below. Include gateway back-up data and configuration tools where applicable. Provide CDs in jewel case with printed and dated project-specific labels on both the CD and the case. For text and drawings, use Adobe Acrobat or MS Office file types. When approved by the Government, AutoCAD and Visio files are allowed. Give files descriptive English names and organize in folders.

Provide printed manuals in sturdy 3-ring binders with a title sheet on the outside of each binder indicating the project title, project location, contract number, and the controls contractor name, address, and telephone number. Each binder shall include a table of contents and tabbed dividers, with all material neatly organized. Manuals shall include the following:

a. A copy of the as-built control system (shop) drawings set, with all items specified under the paragraph SUBMITTALS. Indicate all field changes and modifications. As-Built Control Drawings shall be marked "As-Built" on the cover page and in the title block of each page. Revisions must be dated, may be hand or CAD annotated.

b. A copy of the project's mechanical design drawings, including any official modifications and revisions.

c. A copy of the project's approved Product Data submittals provided under the paragraph SUBMITTALS.

d. A copy of the project's approved Performance Verification Testing Plan and Report.

e. A copy of the project's approved final TAB Report.

f. Printouts of all control system programs, including controller setup pages if used. Include plain-English narratives of application programs, flowcharts, and source code.

g. Printouts of all physical input and output object properties, including tuning values, alarm limits, calibration factors, and set points.

h. A table entitled "AC Power Table" listing the electrical power source for each controller. Include the building electrical panel number, panel location, and circuit breaker number.

i. The DDC manufacturer's hardware and software manuals in both print and CD format with printed project-specific labels. Include installation and technical manuals for all controller hardware, operator manuals for all controllers, programming manuals for all controllers, operator manuals for all workstation software, installation and technical manuals for the workstation and notebook, and programming manuals for the workstation and notebook software.

j. A list of qualified control system service organizations for the work provided under this contract. Include their addresses and telephone numbers.

k. A written statement entitled "Technical Support" stating the control system manufacturer or authorized representative will provide toll-free telephone technical support at no additional cost to the Government for a minimum of two years from project acceptance, will be furnished by experienced service technicians, and will be available during normal weekday working hours. Include the toll-free technical support telephone number.

l. A written statement entitled "Software Upgrades" stating software and firmware patches and updates will be provided upon request at no additional cost to the Government for a minimum of two years from

project acceptance. Include a table of all DDC system software and firmware provided under this contract, listing the original release dates, version numbers, part numbers, and serial numbers.

m. Submit any and all updated field controller files, and BACnet Building Controller data base during the acceptance and warranty periods or as a result of a latent defect.

3.4.1 Storage Cabinets

In one project mechanical room, typically near the BACnet Building Controller provide a wall-mounted storage cabinet with hinged doors. In addition to the number of manuals specified above, provide an additional copy of the manuals in thismechanical room storage cabinet. Provide cabinets large enough to hold the entire set of Controls System Operators Manuals, and the HVAC operation and maintenance manuals provided under Division 15 MECHANICAL. Locate cabinets adjacent to DDC control panels where applicable. Have each cabinet's proposed installation site approved in advance by the Contracting Officer and the BAS Owner. Prominently label each cabinet with the wording "OPERATION AND MAINTENANCE MANUALS." Prominently label each binder with the wording "MECHANICAL ROOM COPY - DO NOT REMOVE."

3.5 PERFORMANCE VERIFICATION TESTING (PVT)

3.5.1 General

The PVT shall demonstrate compliance of the control system work with the contract requirements. The PVT shall be performed by the Contractor and may be witnessed by the Government. If the project is phased, provide separate testing for each phase. A Pre-PVT meeting to review the Pre-PVT Checklist is required to coordinate all aspects of the PVT and shall include the Contractor's QA representative, the Contractor's PVT administrator, the Contracting Officer's representative, and the BAS Owner.

3.5.2 Performance Verification Testing Plan

Submit a detailed PVT Plan of the proposed testing for Government approval. Develop the PVT Plan specifically for the control system in this contract. The PVT Plan shall be a clear list of test items arranged in a logical sequence. It shall include each and all sequences of all controllers. Include sequence tested, intended test procedure, required assisted personnel (such as the mechanical contractor), the expected response, and the pass/fail criteria for every component tested. Include pass/fail column for test, and space for comments, signature and date lines for Contractor's PVT administrator and Contractor's QA representative. The PVT plan shall include the prescriptive pre-PVT check list in addition to the Contractor generated controller specific testing sequences. The final part of the PVT Report shall be 72 hour trends. Propose criteria for the trends, ie, change of state, change of value with the trigger value, time in the PVT Plan.

3.5.3 PVT Sample Size

Test all controllers unless otherwise directed. Trends will be reported on all central plant equipment and primary air handling unit controllers, and

25% of terminal controllers such as VAV boxes and fan coil units. Additional trends shall be provided if requested by Camp Lejeune or a commisioning agent.

3.5.4 Pre-Performance Verification Testing Checklist

Submit the following as a part of the PVT Plan and the PVT Report. Each item shall include a column for the Contractor's initial/date. This form may be a general form applicable to all controllers and submitted only once in the PVT Plan. Each controller shall have an individual checklist with controller title and identified in the PVT Report.

a. Verify all mechanical installation work is successfully completed and started up by the appropriate personnel.

b. Verify all required control system components, wiring, and accessories are installed.

c. Verify the installed control system architecture matches approved drawings.

d. Verify all control circuits operate at the proper voltage and are free from grounds or faults.

e. Verify all required surge protection is installed.

f. Verify the A/C Power Table specified in the paragraph CONTROLS SYSTEM OPERATORS MANUALS is accurate.

g. Verify all DDC network communications function properly, including uploading and downloading programming changes.

h. Verify each digital controller’s programming is backed up.

i. Verify all wiring, components, and panels are properly labeled.

j. Verify all required points are programmed into devices.

k. Verify all valve and actuator zero and span adjustments are set properly. List each device and span for that device. label device with span setting and adjustment date.

l. Verify all sensor readings are accurate and calibrated. List each sensor, sensor reading, and measured value. Label device with calibrated value and the calibration date.

m. Verify each control valve and actuator goes to normal position upon loss of power. List each device and normal position.

n. Verify each controller works properly in stand-alone mode by disconnecting the BACnet bus.

3.5.5 Conducting Performance Verification Testing

a. Conduct PVT after approval of the PVT Plan. Notify the Contracting Officer of the planned PVT at least 15 days prior to testing. Provide an estimated time table required to perform the testing. Furnish

personnel, equipment, instrumentation, and supplies necessary to perform all aspects of the PVT. Ensure that testing personnel are regularly employed in the testing and calibration of DDC systems. Using the project's as-built control system (shop) drawings, the project's mechanical design drawings, and the approved PVT Plan, conduct the PVT.

b. During testing, identify any items that do not meet the contract requirements and if time permits, conduct immediate repairs and re-test. Otherwise, deficiencies shall be investigated, corrected, and re-tested later. Document each deficiency and corrective action taken.

c. If re-testing is required, follow the procedures for the initial PVT. The Government may require re-testing of any control system components affected by the original failed test.

3.5.6 Controller Capability and Labeling

Test the following for each controller:

a. Memory: Demonstrate that programmed data, parameters, and trend/ alarm history collected during normal operation is not lost during power failure.

b. Direct Connect Interface: Demonstrate the ability to connect directly to each type of digital controller with a portable electronic device like a notebook computer or PDA. Show that maintenance personnel interface tools perform as specified in the manufacturer's technical literature.

c. Stand Alone Ability: Demonstrate controllers provide stable and reliable stand-alone operation using default values for values normally read over the network.

d. Wiring and AC Power: Demonstrate the ability to disconnect any controller safely from its power source using the AC Power Table. Demonstrate the ability to match wiring labels easily with the control drawings. Demonstrate the ability to locate a controller's location using the BACnet Communication Architecture Schematic and floor plans.

e. Nameplates and Tags: Show the nameplates and tags are accurate and permanently attached to control panel doors, devices, sensors, and actuators.

3.5.7 Workstation and Software Operation

For every user workstation or notebook provided:

a. Show points lists agree with naming conventions.

b. Show that graphics are complete.

c. Show the UPS operates as specified.

3.5.8 BACnet Communications and Interoperability Areas

a. Data Presentation: On each BACnet Operator Workstation, demonstrate

graphic display capabilities.

b. Reading of Any Property: Demonstrate the ability to read and display any used readable object property of any device on the network.

c. Setpoint and Parameter Modifications: Show the ability to modify all setpoints and tuning parameters in the sequence of control or listed on project schedules. Modifications are made with BACnet messages and write services initiated by an operator using workstation graphics, or by completing a field in a menu with instructional text.

d. Peer-to-Peer Data Exchange: Show all BACnet devices are installed and configured to perform BACnet read/write services directly (without the need for operator or workstation intervention), to implement the project sequence of operation, and to share global data.

e. Alarm and Event Management: Show that alarms/events are installed and prioritized according to the BAS Owner. Demonstrate time delays and other logic is set up to avoid nuisance tripping, e.g., no status alarms during unoccupied times or high supply air during cold morning start-up. Show that operators with sufficient privilege can read and write alarm/event parameters for all standard BACnet event types. Show that operators with sufficient privilege can change routing (BACnet notification classes) for each alarm/event including the destination, priority, day of week, time of day, and the type of transition involved (types of transition include but are not limited to the following: TO-OFF NORMAL and TO-NORMAL).

f. Schedule Lists: Show that schedules are configured for start/stop, mode change, occupant overrides, and night setback as defined in the sequence of operations.

g. Schedule Display and Modification: Show the ability to display any schedule with start and stop times for the calendar year. Show that all calendar entries and schedules are modifiable from any connected workstation by an operator with sufficient privilege.

h. Archival Storage of Data: Show that data archiving is handled by the operator workstation/server, and local trend archiving and display is accomplished with BACnet Trend Log objects.

i. Modification of Trend Log Object Parameters: Show that an operator with sufficient privilege can change the logged data points, sampling rate, and trend duration.

j. Device and Network Management: Show the following capabilities:

(1) Display of Device Status Information

(2) Display of BACnet Object Information

(3) Silencing Devices that are Transmitting Erroneous Data

(4) Time Synchronization

(5) Remote Device Reinitialization

(6) Backup and Restore Device Programming and Master Database(s)

(7) Configuration Management of Half-Routers, Routers and BBMDs

3.5.9 Execution of Sequence of Operation

Demonstrate that the HVAC system operates properly through the complete sequence of operation. Use read/write property services to globally read and modify parameters over the internetwork.

3.5.10 Control Loop Stability and Accuracy

For all control loops tested, give the Government trend graphs of the control variable over time, demonstrating that the control loop responds to a 20 percent sudden change of the control variable set point without excessive overshoot and undershoot. If the process does not allow a 20 percent set point change, use the largest change possible. Show that once the new set point is reached, it is stable and maintained. Control loop trend data shall be in real-time with the time between data points 30 seconds or less.

3.5.11 Performance Verification Testing Report

Upon successful completion of the PVT, submit a PVT Report to the Government and prior to the Government taking use and possession of the facility. Do not submit the report until all problems are corrected and successfully re-tested. The report shall include the annotated PVT Plan used during the PVT. Where problems were identified, explain each problem and the corrective action taken. Include a written certification that the installation and testing of the control system is complete and meets all of the contract's requirements.

3.5.12 Bus Waveform Report

Provide printed wave form of the MS/TP bus(es). Use an oscilloscope to test and record the wave form of each bus. This wave form is useful in identifying and troubleshooting bus problems such as inappropriate taps, grounds, end of line terminations and poor connections. Identify each graphic with bus name, location, date and time, and instrument used. Include the resistor sizes needed at each Bus End of Line (EOL). Include a list of the EOL devices.

3.5.13 Performance Verification Testing Acceptance Testing [Season One]

After acceptance of the PVT Report, demonstrate proper and stable operation of the DDC System. During the field acceptance testing, verify, in the presence of the COTR and BAS owner, random selections of sequences reported in the PVT Report. Equipment, controllers, devices, and sequences for field acceptance testing are to be selected by the COTR. As-built control drawings must be for use and verification at acceptance testing. Field acceptance testing includes verification of the PVT for the following equipment groups:

Group 1: All pumps, chillers, boilers, return fans, computer room units, and air handling units (rooftop and central stations).

Group 2: 25 percent of terminals such as VAV and fan coil units.

Group 3: 25 percent of supply fans, and exhaust fans.

If any of the acceptance testing is found to not operate correctly, terminate verification for the given group. Make the necessary corrections and prepare a revised PVT Report. Reschedule acceptance testing of the revised report with the COTR. After the PVT has been accepted, submit the revised controller files and BACnet Building Controller database.

3.5.14 Performance Verification Testing Acceptance Testing Season Two

A minimum of 3 months after initial acceptance of the DDC system and in the opposite season of heating and cooling, demonstrate proper and stable operation of the DDC system. During the field acceptance testing, verify, in the presence of the COTR and BAS owner, random selections of sequences reported in the PCT Report. Equipment, controllers, devices, and sequences for field acceptance testing are to be selected by the COTR. Field acceptance testing includes verification of the PVT for the following equipment groups:

Group 1: All pumps, chillers, boilers, return fans, computer room units, and air handling units (rooftop and central stations).

Group 2: 25 percent of terminals such as VAV and fan coil units.

Group 3: 25 percent of supply fans, and exhaust fans.

If any of the acceptance testing is found to not operate correctly, terminate verification for the given group. Make the necessary corrections and prepare a revised PVT Report. Reschedule acceptance testing of the revised report with the COTR. After the PVT has been accepted, submit the revised controller files and BACnet Building Controller database.

3.6 TRAINING REQUIREMENTS

Provide a qualified instructor (or instructors) with two years minimum field experience with the installation and programming of similar BACnet DDC systems. Orient training to the specific systems installed. Coordinate training times and location[s] with the Contracting Officer and BAS Owner after receiving approval of the training course documentation. Training shall take place at the job site [and][or] a nearby Government-furnished location. A training day shall occur during normal working hours, last no longer than 8 hours and include a one-hour break for lunch and two additional 15-minute breaks. The project's approved Controls System Operators Manual shall be used as the training text. The Contractor shall ensure the manuals are submitted, approved, and available to hand out to the trainees before the start of training.

3.6.1 Training Documentation

Submit training documentation for review 30 days minimum before training. Documentation shall include an agenda for each training day, objectives, a synopses of each lesson, and the instructor's background and qualifications. The training documentation can be submitted at the same time as the project's Controls System Operators Manual.

3.6.2 Phase I Training - Fundamentals

The Phase I training session shall last one day and be conducted in a classroom environment with complete audio-visual aids provided by the contractor. Provide each trainee a printed 8.5 by 11 inch hard-copy of all visual aids used. Upon completion of the Phase I Training, each trainee should fully understand the project's DDC system fundamentals. As-Built control drawings must be used for training. The training session shall include the following:

a. BACnet fundamentals (objects, services, addressing) and how/where they are used on this project

b. This project's list of control system components

c. This project's list of points and objects

d. This project's device and network communication architecture

e. This project's sequences of control, and:

f. Alarm capabilities

g. Trending capabilities

h. Troubleshooting communication errors

i. Troubleshooting hardware errors

3.6.3 Phase II Training - Operation

Provide Phase II Training shortly after completing Phase I Training. The Phase II training session shall last one day and be conducted at the DDC system workstation, at a notebook computer connected to the DDC system in the field, and at other site locations as necessary. Upon completion of the Phase II Training, each trainee should fully understand the project's DDC system operation. The training session shall include the following:

a. A walk-through tour of the mechanical system and the installed DDC components (components include but are not limited to the following: controllers, valves, dampers, surge protection, switches, thermostats, and sensors)

b. A discussion of the components and functions at each DDC panel

c. Logging-in and navigating at each operator interface type

d. Using each operator interface to find, read, and write to specific controllers and objects

e. Modifying and downloading control program changes

f. Modifying setpoints

g. Creating, editing, and viewing trends

h. Creating, editing, and viewing alarms

i. Creating, editing, and viewing operating schedules and schedule objects

j. Backing-up and restoring programming and data bases

k. Modifying graphic text, backgrounds, dynamic data displays, and links to other graphics

l. Creating new graphics and adding new dynamic data displays and links

m. Alarm and Event management

n. Adding and removing network devices

-- End of Section --

Camp Lejeune – Niagara BAS Alarms Policy

January 2020

Camp Lejeune – Public Works Department
Niagara BAS Alarms Policy

Alarms for each given supervisory controller shall be managed by the following Alarm Class definitions:

Default Alarm Class: Non-critical alarms that will remain at the local level and not pushed up to the FX Niagara 4 Server.

Critical Monitoring Alarm Class: The Supervisory controller panel door tamper monitoring switch. This type of alarm will be pushed up to the FX Niagara 4 Server.

Critical Temperature Alarm Class: All critical temperature alarm types related to equipment performance failures and/or high priority zones where temperature and/or occupant comfort is a priority that requires escalated response from Base maintenance. These types of alarms will be pushed up to the FX Niagara 4 Server.

Critical HVAC Alarm Class: All critical AHU, VAV, FCU, WSHP, etc., alarm types such as, but not limited to, Fan Failure, Low Temperature Limit, High/Low Duct Pressure Safety, Smoke Detector, ATFP, etc., that requires escalated response from Base maintenance. These types of alarms will be pushed up to the FX Niagara 4 Server.

Critical Boiler Alarm Class: All critical boiler/heating system alarms defined in the specifications and requiring immediate attention from Base maintenance. These types of alarms will be pushed up to the FX Niagara 4 Server.

Critical Chiller Alarm Class: All critical chiller/chilled water system alarms defined in the specifications and requiring immediate attention from Base maintenance. Theses type of alarms will be pushed up to the FX Niagara 4 Server.

SECTION 23 35 00.00 10

OVERHEAD VEHICLE TAILPIPE EXHAUST REMOVAL SYSTEM(S)
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.

AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL (AMCA)

AMCA 210	(2016) Laboratory Methods of Testing Fans for Aerodynamic Performance Rating

AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE (AHRI)

AHRI Guideline D	(1996) Application and Installation of Central Station Air-Handling Units

AMERICAN BEARING MANUFACTURERS ASSOCIATION (ABMA)

ABMA 11	(2014) Load Ratings and Fatigue Life for Roller Bearings
ABMA 9	(2015) Load Ratings and Fatigue Life for Ball Bearings

AMERICAN WELDING SOCIETY (AWS)

AWS A5.8/A5.8M	(2011; Amendment 2012) Specification for Filler Metals for Brazing and Braze Welding

ASME INTERNATIONAL (ASME)

ASME B16.21	(2011) Nonmetallic Flat Gaskets for Pipe Flanges
ASME BPVC SEC IX	(2010) BPVC Section IX-Welding and Brazing Qualifications

ASTM INTERNATIONAL (ASTM)

ASTM A193/A193M	(2016) Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service and Other Special Purpose Applications
ASTM A307	(2014) Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
ASTM A36/A36M	(2014) Standard Specification for Carbon Structural Steel

ASTM A53/A53M	(2012) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A924/A924M	(2016a) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM B117	(2016) Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM B32	(2008; R 2014) Standard Specification for Solder Metal
ASTM E2016	(2015) Standard Specification for Industrial Woven Wire Cloth

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1	(2016) Motors and Generators

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA 1520	(1999) Round Industrial Duct Construction Standards, 3rd Edition

1.2 SYSTEM DESCRIPTION

Construct, complete and operational, an exhaust system as specified herein. The exhaust system(s) shall provide adequate air exhaust quantities and velocities. All duct shall be properly sized for pressure loss and adequate velocity including locating intakes, ductwork size, layout, equipment and controls. Construction of the exhaust system shall be based on the referenced publications, and other provisions as specified herein. Furnish ductwork offsets, fittings, and any other accessories required, as specified, to provide a complete exhaust system installation and to eliminate interference with other construction. Controls shall be provided as indicated on drawings.

1.3 SUBMITTALS

SD-03 Product Data

Related Submittals
Ductwork Components
Materials and Equipment
Spare Parts
Field Instructions
Final Acceptance Tests
Onsite Training
Exhaust System Specialist

SD-06 Test Reports

Final Acceptance Tests

SD-07 Certificates

Inspection

SD-10 Operation and Maintenance Data

Exhaust System
Operation and Maintenance Manuals

1.4 QUALITY ASSURANCE

1.4.1 Exhaust System Specialist

Submit the name and documentation of certification of the proposed Exhaust System Specialists, no later than 14 days after the Notice to Proceed and prior to the submittal of the exhaust system drawings and hydraulic calculations. The Exhaust System Specialist shall prepare a list of the submittals from the Contract Submittal Register that relate to the successful installation of the exhaust systems(s). Submit the list no later than 7 days after the approval of the Exhaust System Specialist. The related submittals identified on this list shall be accompanied by a letter of approval signed and dated by the Exhaust System Specialist when submitted to the Government. The Exhaust System Specialist shall be regularly engaged in the installation of the type and complexity of system specified in the Contract documents, and shall have served in a similar capacity for at least three systems that have performed in the manner intended for a period of not less than 6 months.

1.5 DELIVERY, STORAGE, AND HANDLING

All equipment delivered and placed in storage shall be housed in a manner to preclude any damage from the weather, humidity and temperature variations, dirt and dust, or other contaminants. Additionally, all ductwork, flexible connections and pipes shall either be capped or plugged until installed.

1.6 EXTRA MATERIALS

Submit spare parts data for each item of equipment and material specified. The data shall include a complete list of parts and supplies, with current unit prices and source of supply, and a list of parts recommended by the manufacturer to be replaced after 1 year and 3 years of service. Include a list of special tools and test equipment required for maintenance and testing of the products supplied.

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

a. Provide materials and equipment which are standard products of a manufacturer regularly engaged in the manufacture of the product and that essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Submit manufacturer's catalog data included with the Exhaust System Drawings for all items specified herein. The data shall be highlighted to show model, size, options, etc., that are intended for consideration. Data shall be adequate to demonstrate compliance with all contract requirements. In addition, a complete equipment list that includes equipment

description, model number and quantity shall be provided.

b. Where an integrated, packaged exhaust system is furnished, all items will be the product of the system manufacturer. System component parts may be by other manufacturers. Equipment shall be supported by a service organization that is capable of responding to service calls within four hours.

c. Asbestos and asbestos-containing products are not acceptable.

2.2 NAMEPLATES

All equipment shall have a nameplate that identifies the manufacturer's name, address, type or style, model or serial number, and catalog number.

2.3 EQUIPMENT GUARDS AND ACCESS

Belts, pulleys, chains, gears, couplings, projecting setscrews, keys, and other rotating parts exposed to personnel contact shall be fully enclosed or guarded according to OSHA requirements. High temperature equipment and piping exposed to contact by personnel or where it creates a potential fire hazard shall be properly guarded or covered with insulation of a type specified.

2.4 DUCTWORK COMPONENTS

2.4.1 General

Duct shall be constructed of galvanized sheets of the minimum gauge thickness for ducts as required in SMACNA 1520. Ducts shall be constructed and sealed in accordance with SMACNA 1520 for a negative pressure of 6 inch water gauge static pressure. Ducts, unless otherwise approved, shall be round with longitudinal lock seam or spiral wound and conform to the dimensions indicated. Ducts shall be straight and smooth on the inside with airtight joints. Where ducts with crimped ends are used to make up joints, the joints shall have crimp and bead. The bead shall provide a rigid stop for the mating open end to seat against.

2.4.2 Fittings

Reducing fittings shall have a minimum of 1 inch increase in diameter per 8 inches in length. Elbows shall have a centerline radius of not less than 1.5 times the diameter. Branches shall stub into mains at main expansion points at an angle of not more than 30 degrees with the centerline of the main duct in the direction of air flow, unless otherwise indicated or approved. Where riser ducts with single or multiple inlets are indicated, the riser duct shall connect into the bottom of the main duct at an angle as specified for branches. Where flexible connections connect to the main duct, the duct branch takeoff or stub shall be braced with approved metal straps or members.

2.4.3 Apparatus Connections

Where sheet metal connections are made to fan suction and discharge, or where ducts of dissimilar metals are connected, an approved noncombustible flexible connection approximately 6 inches wide shall be installed and securely fastened by zinc-coated steel clinch-type draw bands for round ducts. For rectangular ducts the flexible connections locked to metal collars shall be installed using normal duct construction methods.

2.4.4 Duct Test Holes

Test holes with covers shall be provided where indicated, directed, or where necessary in ducts and plenums for using Pitot tubes for taking air measurements to balance the air systems.

2.4.5 Duct Sleeves and Framed Openings

Duct sleeves shall be provided for all round ducts 15 inch diameter or less passing through floors, walls, ceilings, or roofs. Sleeves in non-load bearing walls shall be fabricated of 20 gauge steel sheets conforming to ASTM A924/A924M. Sleeves in load-bearing walls shall be fabricated of standard-weight galvanized steel pipe conforming to ASTM A53/A53M. Round ducts larger than 15 inch diameter and all square and rectangular ducts passing through floors, walls, ceilings, or roofs shall be installed through framed openings. Structural steel members for framed openings shall conform to ASTM A36/A36M. Framed openings shall provide 1 inch clearance between the duct and the opening. Closure collars of galvanized steel not less than 4 inches wide shall be provided on each side of walls or floors where sleeves or framed openings are provided. Collars for round ducts 15 inch diameter or less shall be fabricated from 20 gauge galvanized steel. Collars for round, square or rectangular ducts with minimum dimension over 15 inches shall be fabricated from 18 gauge galvanized steel.

2.5 EXHAUST HOSE SYSTEM

2.5.1 Tailpipe Adapters

Adapters shall be of the tapered-cone type with spring clips or other suitable devices for exhaust pipe attachment. The adapter shall fit 4 inch nominal diameter exhaust pipe.

2.5.2 Flexible Exhaust Hose

Flexible exhaust hose shall be approved heat-resistant wire reinforced glass fiber and silicone tubing. Flexible tubing inside diameter and length shall be as shown. The tubing shall be connected to the bottom of the ductwork. A flanged connection shall be provided where the flexible tubing and overhead ductwork are joined. The flanged connection shall consist of steel flanges not less than 0.078 inch thick, 1/8 inch gasket. The gasket shall be suitable for the system design temperature shown, in accordance with ASME B16.21, full face or self-centering flat ring type. It shall contain aramid fibers bonded with styrene butadiene rubber (SBR) or nitrile butadiene rubber (NBR). The flange shall be sized or designed to suit the hose as approved.

2.6 DAMPERS

Dampers shall be of the type indicated and installed where shown. Dampers shall be of the circular disk type with quadrant locking device or blast gate type. Damper blades shall be not less than 16 gauge thickness of stainless steel. Blast gate dampers shall be two piece construction with adjustable sliding gate and setscrew.

2.7 MATERIALS

Materials shall conform to the following requirements.

2.7.1 Screen

ASTM E2016, type and class as required for the application.

2.7.2 Iron and Steel Sheets

2.7.2.1 Galvanized Iron and Steel

ASTM A924/A924M, Coating Designation G90.

2.7.3 Steel Structural Shapes

ASTM A36/A36M.

2.7.4 Solder Silver

AWS A5.8/A5.8M, brazing alloy; grade to suit application.

2.7.5 Solder

ASTM B32, composition to suit application.

2.7.6 Bolts and Nuts

Bolts and nuts, except as required for high temperature exhaust applications, shall be in accordance with ASTM A307. Bolts and nuts used for exhaust applications where the temperature of the bolt may rise above 400 degrees F or used as flange bolts in corrosion resistant material shall be in accordance with ASTM A193/A193M Class 2. The bolt head shall be marked to identify the manufacturer and the standard with which the bolt complies in accordance with ASTM A307 or ASTM A193/A193M as applicable.

2.8 ELECTRICAL WORK

Electrical motor-driven equipment specified shall be provided complete with motor, motor starter, and controls. Unless otherwise specified, electric equipment, including wiring and motor efficiencies, shall be according to Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Electrical characteristics and enclosure type shall be as shown. Unless otherwise indicated, motors of 1 hp and above shall be high efficiency type. Motor starters shall be provided complete with thermal overload protection and other appurtenances necessary. Each motor shall be according to NEMA MG 1 and shall be of sufficient size to drive the equipment at the specified capacity without exceeding the nameplate rating of the motor. Manual or automatic control and protective or signal devices required for the operation specified, and any control wiring required for controls and devices, but not shown, shall be provided. Where two-speed or variable-speed motors are indicated, solid-state variable-speed controller may be provided to accomplish the same function. Solid-state variable-speed controllers shall be utilized for motors rated 10 hp or less. Adjustable frequency drives shall be used for larger motors.

2.9 AIR MOVING DEVICES

2.9.1 General

Fans shall be tested and rated in accordance with the standards of AMCA 210,

Type "D" Ducted Inlet, Ducted Outlet Configuration.Where V-belt drives are used, such drives shall be designed for not less than 150 percent of the connected driving capacity, and motor sheaves shall be adjustable to provide not less than an overall 20 percent speed variation. Sheaves shall be selected to drive the fan at such speed as to produce the specified capacity when set at the approximate midpoint of the sheave adjustment. Motors for V-belt drives shall be provided with adjustable rails or bases. Fans shall be provided with personnel screens or guards on both suction and supply ends except where ducts or dampers are connected to the fan. Fans and motors shall be provided with vibration isolation supports or mountings. Vibration isolation units shall be standard products with published load ratings, and shall be single rubber-in-shear, neoprene coated fiberglass, double rubber-in-shear springs, or springs under inertia base. Each fan shall be selected to produce the capacity required at the fan total pressure indicated. Standard AMCA arrangements shall be provided unless otherwise indicated and the rotation and discharge shall be as indicated. Fans shall have nonoverloading characteristics. Fan housing shall be constructed with not less than 16 gauge thickness of steel. Fan impellers shall be constructed to meet AMCA Spark Resistance "B" Classification and accurately balanced both statically and dynamically when installed in the assembled fan unit. Impeller and housing in the air stream shall be coated with neoprene, epoxy, phenolic resins, or otherwise be suitable to resist the corrosive gases and temperatures produced. Fans shall be free of objectionable vibration or noise. Certified performance curves indicating that the fan supplied will operate in its most efficient operating range will be provided. In addition, "sound power" ratings shall be furnished with each fan. Fans indicated to be mounted on exterior of building shall be provided with weatherproof covers for the motor drive unit or other weatherproofing as recommended by the manufacturer. Each fan shall be selected to produce the capacity required at the fan total pressure indicated. Weather hoods, flashing, and bird screens shall be provided where indicated.

2.9.2 Fans

Standard AMCA arrangement, rotation, and discharge shall be as indicated. Fans shall be tested and rated according to AMCA 210. Each fan shall be selected to produce the capacity required at the fan static pressure indicated. Fans may be connected to the motors either directly or indirectly with V-belt drive. V-belt drives shall be designed for not less than 15 percent of the connected driving capacity. Motor sheaves shall be variable pitch for 15 hp and below and fixed pitch as defined by AHRI Guideline D. Variable pitch sheaves shall be selected to drive the fan at a speed which will produce the specified capacity when set at the approximate midpoint of the sheave adjustment. When fixed pitch sheaves are furnished, a replaceable sheave shall be provided when needed to achieve system air balance.

2.9.2.1 Protective Devices

Motors for V-belt drives shall be provided with adjustable rails or bases. Removable metal guards shall be provided for all exposed V-belt drives, and speed-test openings shall be provided at the center of all rotating shafts. Fans shall be provided with personnel screens or guards on both suction and supply ends, except that the screens need not be provided, unless otherwise indicated, where ducts are connected to the fan. Fan and motor assemblies shall be provided with vibration-isolation supports or mountings as indicated. Vibration-isolation units shall be

standard products with published loading ratings.

2.9.2.2 Centrifugal Fans

Centrifugal fans shall be fully enclosed, single-width single-inlet, or double-width double-inlet, AMCA Pressure Class I, II, or III as required or indicated for the design system pressure. Impeller wheels shall be rigidly constructed, accurately balanced both statically and dynamically. Fan blades may be forward curved, backward-inclined or airfoil design in wheel sizes up to 30 inches. Fan blades for wheels over 30 inches in diameter shall be backward-inclined or airfoil design. These fans shall be suitable for the temperatures encountered. The fan shaft shall be provided with a heat slinger to dissipate heat buildup along the shaft. An access (service) door to facilitate maintenance shall be supplied with these fans. Bearings shall be sleeve type, self-aligning and self-oiling with oil reservoirs, or precision self-aligning roller or ball-type with accessible grease fittings or permanently lubricated type. Grease fittings shall be connected to tubing and serviceable from a single accessible point. Bearing life shall be L50 rated at not less than 200,000 hours as defined by ABMA 9 and ABMA 11. Fan shafts shall be steel, accurately finished, and shall be provided with key seats and keys for impeller hubs and fan pulleys. Each fan outlet shall be of ample proportions and shall be designed for the attachment of angles and bolts for attaching discharge ducts. Motors, unless otherwise indicated, shall not exceed 1800 rpm and shall have enclosures as indicated. Motor starters shall be magneticacross-the-line type with general-purpose (interior location) or weather-resistant (exterior location) enclosure. Remote manual switch with pilot indicating light shall be provided where indicated.

2.10 FACTORY COATING

Equipment and component items, when fabricated from ferrous metal as defined by ASTM (or similar) standard, shall be factory finished with the manufacturers standard finish except that items located outside of building shall have weather-resistant finishes that will withstand 500 hours exposure to the salt spray test specified in ASTM B117.

PART 3 EXECUTION

3.1 EXAMINATION

After becoming familiar with all details of the work, verify all dimensions in the field, and advise the Contracting Officer of any discrepancy before performing the work.

3.2 INSTALLATION

Work shall be installed as shown and according to the manufacturer's diagrams and recommendations.

3.3 INSPECTION

The Exhaust System Specialist shall (1) Inspect the exhaust system periodically during the installation. (2) Witness the final tests, and sign approval of the test results. (3) Certify in writing that the system has been installed in accordance with the contract requirements. Any discrepancy shall be brought to the attention of the Contracting Officer in writing, no later than three working days after the discrepancy is

discovered.

3.4 EXHAUST SYSTEM INSTALLATION

3.4.1 General Requirements

Welding and brazing shall conform to ASME BPVC SEC IX. Horizontal sections of the main duct shall be installed with the longitudinal lock seam on the top. Slip joints shall be sealed in accordance with SMACNA 1520. Riser duct shall be supported and anchored to the structure as indicated. Main duct shall be attached to the structural members of the building as recommended by SMACNA 1520.

3.4.2 Building Surface Penetrations

Sleeves or framed openings shall be utilized where duct penetrates building surfaces. Penetrations shall be sealed, and fireproofed in accordance with Section 07 84 00 FIRESTOPPING. The space between the sleeve or framed opening and the duct shall be packed with mineral wool or other approved material. Closure collars shall be installed around the duct on both sides of the penetrated surface. Collars shall fit tight against the building surfaces and snugly around the duct.

3.5 ONSITE TRAINING

Submit proposed Onsite Training schedule, at least 14 days prior to the start of related training for the operating staff as designated by the Contracting Officer. The training period shall consist of a total 4 hours of normal working time and shall start after the system is functionally completed but prior to final acceptance tests. The field instructions shall cover all of the items contained in the approved operation and maintenance manuals, as well as demonstrations of routine maintenance operations. Submit 6 manuals listing step-by-step procedures required for system startup, operation, shutdown, and routine maintenance, at least 14 days prior to on-site training. The manuals shall include the manufacturer's name, model number, list of parts and tools that should be kept in stock by the owner for routine maintenance including the name of a local supplier, simplified wiring and controls diagrams, troubleshooting guide, and recommended service organization (including address and telephone number) for each item of equipment. Each service organization submitted shall be capable of providing 4 hour on-site response to a service call on an emergency basis. Notify the Contracting Officer at least 14 days prior to date of proposed conduction of the training course.

3.6 FINAL ACCEPTANCE TESTS

Each exhaust system and inlet shall be balanced to produce the indicated air quantities within 10 percent at the conditions shown. Control devices shall be set to control at the points indicated or directed. Bearings shall be lubricated, and the speed, direction or rotation of each fan shall be checked. The running current of each motor shall be checked. Upon completion, and prior to acceptance of the installation, the exhaust system shall be tested at operating conditions to demonstrate satisfactory functional and operating efficiency.

a. Operating tests shall cover a period of not less than 2 hours for each system, and all tests shall be conducted in the presence of the Contracting Officer. If tests do not demonstrate satisfactory operation of the exhaust system, correct deficiencies and retest.

Provide all instruments, facilities, and labor required to properly conduct the tests. The electricity required for testing will be furnished by the Government.

b. Submit 3 copies of the completed Final Acceptance Tests Reports, no later that 7 days after the completion of the Tests. All items in the Final Acceptance Report shall be signed by the Exhaust System Specialist. Submit proposed diagrams, instructions, and other sheets, concurrent with the Final Acceptance Test Procedures. Framed instructions under glass or in laminated plastic shall be posted where directed, including wiring and control diagrams showing the complete layout of the entire system. 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.

c. Submit proposed procedures for Final Acceptance Tests, no later than 14 days prior to the proposed start of the tests.

d. Submit proposed date and time to begin Final Acceptance Tests, with the Final Acceptance Test Procedures. Notification shall be provided at least 14 days prior to the proposed start of the test.

-- 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.

AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL (AMCA)

AMCA 210	(2007) Laboratory Methods of Testing Fans for Aerodynamic Performance Rating
AMCA 500	(1994) Test Methods for Louvers, Dampers and Shutters

AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE (AHRI)

AHRI 390	(2003); Performance Rating for Single Package Vertical Units
ANSI/AHRI 210/240	(2008; Add 1 2011; Add 2 2012) Performance Rating of Unitary Air-Conditioning & Air-Source Heat Pump Equipment

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z83.20	Gas-fired tubular and low-intensity infrared heaters
ANSI Z83.4/CSA 3.7	(2015) Non-Recirculating Direct Gas-Fired Industrial Air Heaters
ANSI Z97.1	(2009; Errata 2010) Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test

AIR-CONDITIONING AND REFRIGERATION INSTITUTE (ARI)

ARI 410	(1991) Forced-Circulation Air-Cooling and Air-Heating Coils

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 15	(2001) Safety Standard for Mechanical Refrigeration System

ASME INTERNATIONAL (ASME)

ASME B16.3	(1998) Malleable Iron Threaded Fittings
ASME B16.5	(1996; B16.5a) Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24
ASME B16.11	(2001) Forged Fittings, Socket-Welding and Threaded
ASME B16.18	(2001) 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/ANSI B16.39	(1998) Malleable Iron Threaded Pipe Unions
ASME B31.1	(2001) Power Piping
ASME/ANSI B31.5	(2001) Refrigeration Piping and Heat Transfer Components

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 53/A 53M	(1999b) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 106	(1999el) Seamless Carbon Steel Pipe for High-Temperature Service
ASTM A 193/A 193M	(2001b) 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	(2001a) Steel Sheet, Zinc-Coated (Galvanized) by Hot-Dip Process, Lock-Forming Quality
ASTM B 32	(2000) Solder Metal
ASTM B 42	(1998) Seamless Copper Pipe, Standard Sizes
ASTM B 88	(1999el) Seamless Copper Water Tube
ASTM B 280	(1999el) Seamless Copper Tube for Air

	Conditioning and Refrigeration Field Service
ASTM B 306	(1999) Copper Drainage Tube (DWV)
ASTM C 1071	(2000) Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material

ASTM INTERNATIONAL (ASTM)

ASTM A527LFQ	Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Lock-Forming Quality
ASTM A653/A653M	(2015) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM C1036	(2010; E 2012) Standard Specification for Flat Glass

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-58	(1993) Pipe Hangers and Supports - Materials, Design and Manufacture
MSS SP-69	(1996) Pipe Hangers and Supports - Selection and Application

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 33	(2018) Spray Application Using Flammable or Combustible Materials
NFPA 70	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3-4 2014; AMD 4-6 2014) National Electrical Code
NFPA 90A	(2015) Standard for the Installation of Air Conditioning and Ventilating Systems

NATIONAL ROOFING CONTRACTORS ASSOCIATION (NRCA)

NRCA R&W Manual	(2001, 5th Ed) NRCA Roofing and Waterproofing Manual

SHEET METAL & 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 Elec Equip Dir	(2001) Electrical Appliance and Utilization Equipment Directory
UL 181	(1996; Rev Dec 1998) Factory-Made Air Ducts and Air Connectors
UL 508A	(2013; Reprint Jan 2014) Industrial Control Panels

1.2 SYSTEM DESCRIPTION

Provide 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

Equipment layout drawings for:

(1) Paint Spray Booths

SD-03 Product Data

Split-system air-conditioners

Packaged heat pumps

Unit heaters

Exhaust fans

Pipe hangers and supports

Dampers

Diffusers, registers, and grillesOutside air intake louvers

Flexible round ducts

Duct lining

Valves

Pipe and fittings

Energy Recovery Ventilators

Mini-Split Heat Pump Systems

Paint Spray Booths

SD-08 Manufacturer's Instructions

Installation manual

SD-10 Operation and Maintenance Data

Energy Recovery Ventilators, Data Package 3

Split-system air-conditioners, Data Package 3

Packaged heat pumps, Data Package 3

Submit in accordance with Section 01 78 23, "Operation and Maintenance Data."

Air filter inventory

1.3.1 Equipment layout drawings

Submit drawings showing equipment layout including foot print, piping, conduit, control cabinets, door swings, and power disconnects.

1.3.2 Installation Manual

Provide for each item of equipment.

1.3.3 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 any where 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 Mini-Split Heat Pump Systems

Provide units factory assembled, designed, tested, and rated in accordance with ANSI/AHRI 210/240. System shall consist of a slim silhouette, compact, wall mounted indoor fan coil section with wired remote controller and a slim silhouette horizontal discharge outdoor unit which shall be of an inverter driven heat pump design.

a. Outdoor Unit Cabinet: The casing shall be fabricated of galvanized steel, finished with an electrostatically applied, thermally fused acrylic or polyester powder coating in manufacturer's standard color. Assembly hardware shall be cadmium plated. Provide unit with two (2) steel mounting feet, traverse mounted across the cabinet base pan, welded mount, providing four (4) slotted mounting holes. Assembly shall withstand lateral wind gust up to 155 MPH.

b. Outdoor Unit Fan: The unit shall be furnished with a direct drive, high performance propeller type fan. The condenser fan motor shall be a variable speed, direct current (DC) motor and shall have permanently lubricated bearings. Fan speed shall be switch automatically according to the number of operating indoor units and the compressor operating frequency. The fan motor shall be mounted with vibration isolation. The fan shall be provided with a raised guard to prevent contact with moving parts. The outdoor unit shall have horizontal discharge airflow.

c. Outdoor Unit Coil: The outdoor unit coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing. The coil shall be protected with an integral guard. Refrigerant flow from the outdoor unit to the indoor units shall be independently controlled by means of individual electronic linear expansion valves for each indoor unit. Outdoor unit shall be pre-charged with sufficient R-410a refrigerant for up to thirty three (33) feet of refrigerant piping. All refrigerant lines between outdoor and indoor units shall be of annealed, refrigeration grade copper tubing, ARC Type, meeting ASTM B280 requirements, individually insulated in twin-tube, flexible, closed-cell, CFC-free (ozone depletion potential of zero), elastomeric material for the insulation of refrigerant pipes and tubes with thermal conductivity equal to or better than 0.27 BTU-inch/hour per Sq Ft / °F, a water vapor transmission equal to or better than 0.08 Perm-inch and superior fire ratings such that insulation will not contribute significantly to fire and up to 1" thick insulation shall have a Flame-Spread Index of less than 25 and a Smoke-development Index of less than 50 as tested by ASTM E 84. All refrigerant connections between outdoor and indoor units shall be flare type.

d. Outdoor Unit Compressor: The compressor shall be a high performance, hermetic, inverter driven, variable speed, dual rotary type. The compressor motor shall be direct current (DC) type equipped with a factory supplied and installed inverter drive package. The outdoor unit shall be equipped with a suction side refrigerant accumulator. The compressor shall be equipped with an internal thermal overload. The outdoor unit must have the ability to operate over the full capacity range with a maximum height difference of 40 feet and have refrigerant tubing length of 65 feet. The compressor shall be mounted to avoid the transmission of vibration.

e. Outdoor Unit Electrical: The unit electrical power shall be voltage as indicated in schedule. The outdoor unit shall be controlled by the microprocessors located in the indoor unit and in the outdoor unit communicating system status, operation, and instructions digitally over A-Control - a system directing that the indoor unit be powered directly from the outdoor unit using a

3-wire, 14 ga. AWG connection plus ground. The outdoor unit shall be equipped with Pulse Amplitude Modulation (PAM) compressor inverter drive control.

f. Indoor Unit Cabinet: Galvanized steel construction, low profile, concealed mount horizontal ducted fan coil equipped with four corner mounting brackets.

g. Indoor Unit Fan: The indoor unit fan shall be an assembly with a centrifugal blower direct driven by a single motor. The fan shall be statically and dynamically balanced and be powered by a motor with permanently lubricated bearing. The indoor fan shall operate at one of three (3) speeds plus auto-fan mode..

h. Indoor Unit Filter: 1-inch return air filter rack.

i. Indoor Unit Coil: The indoor unit coil shall be of nonferrous construction with smooth plate fins on copper tubing. All tube joints shall be brazed with phoscopper or silver alloy. The coils shall be pressure tested at the factory. A sloped, corrosion resistant condensate pan with drain shall be provided under the coil. An drain pan level switch shall be provided and installed on the condensate pan to prevent condensate from overflowing. Both refrigerant lines to the indoor units shall be fully insulated.

j. Indoor Unit Electrical: The unit electrical power shall be voltage as indicated in schedule. The system shall be equipped with a system directing that the indoor unit be powered directly from the outdoor unit.

k. System Control: Provide indoor unit with a wired remote controller mounted where indicated on plans. The wired remote controller shall be approximately 5" x 5" in size and white in color with a LCD display.

2.1.2 Dehumidifier

Factory assembled, packaged unit with galvanized steel cabinet, centrifugal blower with direct drive motor, integral air-to-air heat exchanger and filter rack with 1.75-inch thick MERV-11 filter. Refrigerant circuit shall include non-ferrous evaporator coil with condensate drain pan and outlet connection, accumulator, rotary compressor, non-ferrous reheat condenser coil, piped fully charged with R410A refrigerant. 115 volt operation with grounded plug/cord set.Control shall be factory matched wall mount wired digital humidity sensor/controller.

2.1.3 Split-System Air-Conditioners

Provide units factory assembled, designed, tested, and rated in accordance with ANSI/AHRI 210/240 for cooling. Outside unit shall include compressor and condenser. Provide guards to protect condenser fins. Units shall be listed in UL Elec Equip Dir. Units shall include blower fan, evaporator coil, filters, and controls. Provide heating section indicated. Insulate interior of inside unit casing with manufacturer's standard insulation.

a. 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. Filter rack shall accept 2 inch thick filters.

b. Safety controls: Provide low refrigerant pressure protection and pressure relief device. Provide compressor motor with thermal and overload protection, 5 minute anti-recycle timer, and start capacitor kit. Provide compressor with electrical crankcase heater and internal high pressure protection. The above safety controls are not required when scroll compressors are provided.

c. Heating section: Provide ARI 410 hot water coil or nonfreeze double tube steam coil as indicated.

d. Space temperature controls: Provide controls under Section 23 09 23.13, "BACnet DIRECT DIGITAL CONTROL SYSTEMS FOR HVAC."

e. Special corrosion protection: Provide condenser coils constructed of copper tubes and plate copper fins or copper tubes and plate aluminum fins with phenolic coating factory applied to entire coil by immersion dipping and baking to 1.5 mil minimum dry film thickness. Rating of units shall be after application of phenolic coating.

2.1.4 Packaged Heat Pumps- Wall Mount Type

Self-contained, vertical, exterior wall mount, through-the-wall heat pump approved and listed by Intertek ETL Listed (ETL US/C), factory assembled, pre-charged, pre-wired, tested and ready to operate.Performance certified in accordance with AHRI 390

a. Cabinet: Single, enclosed, weatherproof casing constructed of 20-gauge galvanized steel with base constructed of 16-gauge galvanized steel. Exterior casing panels bonderized and finished with baked-on exterior polyester enamel paint prior to assembly. The baked-on cured paint finish shall pass the industry rub test with a minimum of 72 rubs MEK (Methyl Ethyl Ketone) or standard rub test of a minimum of 100 rubs using Tolulene. Fully insulate cooling section with 1-inch foil backed fiberglass to prevent sweating and to muffle sounds. Provide factory prepared penings for power connections. Provide access openings appropriate for outside structure to all fan motors and compressor for making repairs and for removing internal components without removing unit from its permanent installation. Fresh air intake and outdoor coil shall be protected from intrusions by metal grating with less than 1/4 inch openings. Provide full-length side mounting brackets integral to the cabinet and bottom mounting bracket.

b. Drain Pan: 20-gauge galvanized steel, bonderized and finished with baked-on exterior polyester enamel paint.

c. Refrigeration System: R-410A (HFC) non-ozone depleting refrigerant, high efficiency scroll or compressor, refrigeration circuit equipped with factory installed high and low pressure controls and liquid line filter dryer. Refrigeration control shall be a factory installed capillary tube. Mount compressor on rubber grommets

d. Condenser Section: Provide slide out configuration incorporating condenser fan, motor and shroud. Factory coat condenser coil with

phenolic coating as specified herein.

e. Indoor Section: Twin forward curve fan wheels with high efficiency ECM motor. Factory coat evaporator coil with phenolic coating as specified herein.

f. Internal Factory Installed Controls: 24VAC type 50VA transformer; solid-state electronic heat pump defrost circuit; electronic heat pump control with thermistor sensor, speed-up terminal for service, and ten-minute defrost override; five-minute time delay circuit to prevent rapid compressor short cycling; low-pressure bypass to prevent nuisance tripping during low temperature start-up.

g. Ventilation Section: Modulating 24 volt motorized outside air damper internally mounted behind the service door.

h. Hot Gas Reheat Dehumdification: Factory installed dehumidification circuit incorporates independent hot gas reheat coil in the supply air stream in addition to the standard evaporator coil. A solid state circuit board shall control the dehumidification function. Electric heat is inhibited during dehumidification mode, although it remains available for additional reheat during certain conditions. Dehumidification cycle is energized on rise in relative humidity above set point with unit operation in cooling mode and two position hot gas valve allowing hot refrigerant gas to pass thru the reheat coil. Dehumidification will be deengergized on calls for cooling or heating during the dehumidification cycle.

Operating Controls:
1) Provide controls in accordance with Section 23 09 23.13.
2) Field mounted sensors:
-Supply air temp temperature sensor.
-Wall-mounted room air temperature sensor with manual adjuster.
-Wall-mounted room air humidity sensor.

2.1.5 Unit Heaters

Provide factory-assembled, propeller or blower type fan unit heaters arranged for horizontal or vertical air discharge as indicated. Each unit shall include hot water coil, fan, electric motor, housing, and air discharge vanes or diffusers. Horizontal discharge type units shall have adjustable deflectors for control of horizontal and vertical airflow. Each unit shall be provided with threaded mounting holes for attaching threaded hanger rods. Fan motor shall be controlled by wall-mounted adjustable thermostat with higher end of scale range factory set at 75 degrees F. Controls shall be automatic of the on-off type.

2.1.6 Infrared Heater

Heaters shall conform to the requirements of ANSI Z83.20 and shall be vented type as indicated. Heaters shall be vented to the outside atmosphere using manufacturer approved venting system. Heater style shall be low-intensity tubular type. Reflector shape shall be manufacturer's standarad parabolic. Heaters shall be provided with space thermostats which control the unit's burner. Thermostats located in the direct radiation pattern shall be covered with a metal shield.

2.1.7 Exhaust Fans

AMCA 210 with AMCA seal. Provide centrifugal type exhaust fans with aluminum housing, fan wheel, and bird screen. Motors shall be completely shielded from the airstream. Provide exhaust opening and gravity closing type automatic backdraft dampers. Provide NRCA R&W Manual roof curb for roof mounted exhaust fans as recommended by fan manufacturer.

2.1.8 Energy Recovery Ventilators

Unit shall include outdoor supply fan, exhaust aire fan, fixed enthalpy energy recovery core, 2-inch thick outdoor air and exhaust air filters, and outdoor and exhaust shut off dampers.

2.1.8.1 Cabinet

Formed single wall insulated metal cabinet, fabricated to permit access to internal components for maintenance. Factory applied polyester urethane paint on 20 gauge G90 galvanized steel. Unit walls and doors shall be insulated with 1 inch, 4 pound density, foil/scrim faced, high density fiberglass board insulation, providing a cleanable surface and eliminating the possibility of exposing the fresh air to glass fibers, and with a minimum R-value of 4.3 (hr-ft2-°F/BTU)

2.1.8.2 Energy Recovery Core

Total enthalpy type, capable of transferring both sensible and latent energy between airstreams. Latent energy transfer shall be accomplished by direct water vapor transfer from one airstream to the other, without exposing transfer media in succeeding cycles directly to the exhaust air and then to the fresh air. No condensate drains shall be allowed. The energy recovery core shall be designed and constructed to permit cleaning and removal for servicing. The energy recovery core shall have a ten year warranty. Performance criteria are to be as specified in AHRI Standard 1060.

2.1.8.3 Blower Section

Supply Air and Exhaust Air: Blower assemblies consist of a ECM motor, and a direct driven backward-inclined blower. Blower assemblies shall be statically and dynamically balanced and designed for continuous operation at maximum rated fan speed and horsepower.

2.1.8.4 Supply and Exhaust Dampers

Motorized AMCA Class I low leakage air isolation dampers shall be factory installed on supply and exhaust.

2.1.8.5 Controls

Factory-installed microprocessor controller and sensors
a. Hardware and software to enable the building automation interface via BACnet MSTP/IP to monitor, control, and display unit status and alarms.
b. Backlit menu-driven display for navigation and control of unit.
c. Integral diagnostics capability.
d. Minimum (10) universal inputs/outputs (AI, DI, AO) and have

(6) six relay outputs (DO)
e. Factory installed temperature and humidity sensors for outside air and return air
f. Factory installed temperature sensors for fresh air and return air.
g. Differtial filter pressure sensor and alarm.
h. Differential pressure for measuring pressure drop across energy recovery core and for determining airflow in both airstreams.
i. Current switches on supply and exhaust fans motors.

2.1.9 Paint Spray Booths

Self-contained packaged paint spray booth conforming to NFPA 33. Electrical panels and wiring third party listed to UL 508A. Furnish equipment layout drawings.

2.1.9.1 Construction

Booth components shall be fabricated from 18 gauge galvanized steel providing a fire rating of 1 hour. The steel shall comply with ASTM A653/A653M requirements, G90 galvanized, 1.25 oz per square foot meeting ASTM A527LFQ requirements.

2.1.9.2 Exhaust Fan

Exhaust fan shall be tube axial type for spray booth applications with non-sparking aluminum blades, belt drive with drive components located outside of air stream as per NFPA 33. Fan shall meet AMCA 210 testing requirements and bear the AMCA rating seal. Exhaust fan shall be sized to provide 100 Linear Feet per minute over the face of the booth.

2.1.9.3 Light Fixtures

Light fixtures shall be UL listed fluorescent or LED 2x4 lay-in type. Fixtures shall be mounted and serviced from the exterior of the booth. The fixtures are separated from the booth by ¼" tempered glass, sealed from the inside to insure a vapor proof seal, as per NFPA 33.

2.1.9.4 Viewing Windows

Viewing windows shall be 1/4" tempered safety glass as required by NFPA 33. Glass used shall meet ANSI Z97.1, Federal Standard 16 CFR 1201, and ASTM C1036requirements.

2.1.9.5 Manometer Draft Gauge

Draft gauge shall be supplied with every booth to comply with OSHA regulations. This gauge monitors condition of exhaust filters and shows at a glance if filters need replacing.

2.1.9.6 Air Valve

Booth shall be shipped with an solenoid air valve solenoid. This valve should be located in the air line entering the booth as per NFPA 33

2.1.9.7 Exhaust Filters

Exhaust media shall be UL listed 15 gram fiberglass arrester material with

95% efficiency.

2.1.9.8 Heated Make-up Air

Direct fired gas heated makeup air unit matched to booth exhaust shall be provided. Unit shall be third party listed to UL 508A and shall work in conjunction with the exhaust fan to provide a pressure balanced booth. Unit shall meet ANSI Z83.4/CSA 3.7 and include timers and interlocks to comply with NFPA 33.

2.1.9.9 Controls

Paint booth controls shall be complete factory furnished ETL listed package. Include switching and control for exhaust and make-up with all required safety devides, timers and interlocks to comply with NFPA 33.

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."

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.

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 Outside Air Intake Louvers

Louvers shall bear AMCA certified ratings program seal for air performance and water penetration in accordance with AMCA 500. Maximum pressure drop shall be 0.1 inch WG, unless indicated otherwise. Louvers shall have maximum water penetration of 0.20 ounce per square foot of free area at free velocity of 800 fpm. Provide aluminum alloy with anodized finish frames and blades assembled with stainless steel screws, including 0.5-inch mesh aluminum screen mounted in extruded aluminum frame.

2.3.6 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.

2.3.7 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.

2.3.8 Duct Lining

Provide for all transfer ductwork. Provide ASTM C 1071 fiberglass duct lining, minimum of one inch thick, with black-pigmented fire-resistant coating on side exposed to airstream. Secure to duct interior with 100 percent coverage of adhesive and with mechanical fastening devices, spaced in accordance with SMACNA HVAC Duct Const Stds. Provide metal nosing at duct lining beginnings and endings.

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. Hot water piping and cold drain piping from drain pans.

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 Steel Piping Systems

Provide steel piping for the following piping systems.

a. Gas piping.b. Hot water piping larger than 4 inches.

2.4.5.1 Steel Pipe

Provide ASTM A 53/A 53M Type E or Type S, or ASTM A 106 steel pipe. Provide Weight Class XS or Schedule No. 80 black steel pipe for threaded end connections.

2.4.5.2 Steel Pipe Fittings

Provide ASME B16.3 or ASME B16.11 threaded fittings, and ASME/ANSI B16.39 threaded unions.

2.4.5.3 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.

2.4.5.4 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 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.

2.4.6.1 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.

2.4.6.2 Refrigerant Valves

ASME/ANSI B31.5, and shall be copper alloy. Provide valves in each system for servicing and for isolating system components in compliance with ASHRAE 15.

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 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.

2.5.2.1 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.

2.5.2.2 Sleeves not in Masonry and Concrete

Provide 26 gage galvanized steel sheet or PVC plastic pipe sleeves.

2.5.3 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.

2.6 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.

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.

3.2 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.

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 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.

3.5 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, ducts, and filters.

3.5.1 Refrigerant Piping

Perform following when field piping connections are provided.

a. Pressure test: Test refrigerant piping to pressures and durations as directed by equipment manufacturer.

b. Evacuation: Perform evacuations as directed by equipment manufacturer.

3.5.2 Air Ducts

Obtain approval before applying insulation.

3.5.3 Equipment

3.5.3.1 Factory Testing

Unit shall be run tested prior to shipment from the factory. Factory run test report shall be provided at the request of the engineer, contractor,or owner.

3.5.3.2 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.

3.5.3.3 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.

3.5.4 Additional Field Testing

Provide testing, adjusting, and balancing (TAB) of ducts, piping, and equipment under Section 23 05 92, "TESTING/ADJUSTING/BALANCING: SMALL HEATING/VENTILATING/COOLING SYSTEMS."

3.5.5 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
EQUPMENT MINIMUM EFFICIENCY REQUIREMENTS
Equipment must meet each rating listed

Equipment Type	Efficiency	Rating Condition
Air to Air Unitary Air Conditioner (Packaged and Split)		
<65 Mbtu/hr	16.5 SEER	
65-135 Mbtu/hr	12.8 EER 11.4 IPLV	
136-240 Mbtu/hr	10.8 EER 11.2 IPLV	
Air to Air Mini-Split Heat Pump (Packaged and Split)		
<65 Mbtu/hr	15.5 SEER 7.7 HSPF	

-- 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.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 709	(2000) 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	(1996) Dictionary of Electrical and Electronics Terms (IEEE)
IEEE C2	(1997) National Electrical Safety Code (IEEE)

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 2011) Enclosures

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3 2014) National Electrical Code

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 480/277 and 208/120 volts secondary, three phase, four wire.

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. Certificates 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. PPSO710D72 or approved equal.

1.10 ELECTRICAL REQUIREMENTS

Electrical installations shall conform to IEEE C2, NFPA 70, and requirements specified herein.

1.10.1 Wiring and Conduit

Provide internal wiring for components of packaged equipment as an integral part of the equipment. Provide power wiring and conduit for field-installed equipment under Section 26 20 00, "Interior Distribution System." Power wiring and conduit shall conform to Section 26 20 00, "Interior Distribution System." Control wiring and conduit shall be provided under, and conform to the requirements of the section specifying the associated equipment.

1.11 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.

1.12 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."

1.13 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.

1.13.1 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.

1.13.1.1 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.

1.13.1.2 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).

1.13.1.3 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.

-- 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.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM B 1	(2001) Hard-Drawn Copper Wire
ASTM B 8	(1999) Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft

INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)

NETA ATS	(1999) Electrical Power Distribution Equipment and Systems

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; Errata 2006; R 2005; Errata 2008) Standard for Controllers, Contactors, and Overload Relays Rated 600 V
NEMA ICS 4	(2000) Industrial Automation Control Products and Systems Section Terminal Blocks
NEMA ICS 6	(1993; R 2011) Enclosures
NEMA KS 1	(2001) Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum)
NEMA ST 20	(1992; R 1997) Dry-Type Transformers for General Applications

NEMA TC 14	(2002) Filament-Wound Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
NEMA TC 2	(1998) 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	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3 2014) National Electrical Code

UNDERWRITERS LABORATORIES (UL)

UL 1	(2000) Flexible Metal Conduit
UL 1010	(1995; R 1999, Bul. 2002) Receptacle-Plug Combinations for Use in Hazardous (Classified) Locations
UL 1242	(2000; R 2001, Bul. 2002) Intermediate Metal Conduit
UL 1449	(1996; R 2002) Transient Voltage Surge Suppressors
UL 1660	(2000; R 2002, Bul. 2002) Liquid-Tight Flexible Nonmetallic Conduit
UL 198C	(1986; R 1998) High-Interrupting-Capacity Fuses, Current-Limiting Types
UL 198E	(1988; R 1988) Class R Fuses
UL 198H	(1988; R 1993) Class T 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 44	(1999; R 2002, Bul. 2002) Thermoset-Insulated Wires and Cables
UL 467	(1993; R 2001) Grounding and Bonding Equipment

UL 486A	(1997; R 2001, Bul. 2002, 2003) Wire Connectors and Soldering Lugs for Use with Copper Conductors
UL 486B	(1997; R 2001, Bul. 2002, 2003) Wire Connectors for Use with Aluminum Conductors
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 5	(1996; R 2001) Surface Metal Raceways and Fittings
UL 50	(1995; R 1999, Bul. 2001) Enclosures for Electrical Equipment
UL 508	(1999; R 2002, Bul. 2003) Industrial Control Equipment
UL 510	(1994; R 1998) Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape
UL 514A	(1996; R 2001, Bul. 2002) Metallic Outlet Boxes
UL 514B	(1997; R 2002, Bul. 2002) Fittings for Cable and Conduit
UL 514C	(1996; R 2002) Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
UL 6	(2000; Bul. 2001, 2002) Rigid Metal Conduit- Steel
UL 651	(1995; R 2002) Schedule 40 and 80 Rigid PVC Conduit
UL 67	(1993; R 2002) Panelboards
UL 797	(2000; Bul. 2002) Electrical Metallic Tubing
UL 83	(1998; R 2001, Bul. 2002) Thermoplastic-Insulated Wires and Cables
UL 869A	(1998; Bul. 2002) Reference Standard for Service Equipment
UL 886	(1994; R 1999, Bul. 2002) Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations
UL 943	(1993; R 2002, Bul. 2002) Ground-Fault

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

Transformers

SD-03 Product Data

Receptacles

Circuit breakers

Switches

Transformers

Motor controllers

Manual motor starters

Surge protective devices

SD-06 Test Reports

600-volt wiring test

Grounding system test

Transformer tests

Ground-fault receptacle test

SD-07 Certificates

Fuses

SD-09 Manufacturer's Field Reports

Transformer factory tests

SD-10 Operation and Maintenance Data

Electrical Systems, Data Package 5

Submit operation and maintenance data in accordance with Section 01 78 00, "Closeout Submittals" and as specified herein.

1.4 QUALITY ASSURANCE

1.4.1 Fuses

Submit coordination data as specified in article entitled, "FUSES" of this section.

1.5 MAINTENANCE

1.5.1 Electrical Systems

Submit operation and maintenance manuals for electrical systems that provide basic data relating to the design, operation, and maintenance of the electrical distribution system for the building. This shall include:

a. Single line diagram of the "as-built" building electrical system.

b. Schematic diagram of electrical control system (other than HVAC, covered elsewhere).

c. Manufacturers' operating and maintenance manuals on active electrical equipment.

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, and EPC-80 in accordance with NEMA TC 2,UL 651 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.

2.2.6.3 Fittings for Use in Hazardous (Classified) Locations

UL 886.

2.2.7 Fittings for Rigid Nonmetallic Conduit

NEMA TC 3, UL 514B.

2.2.8 Liquid-Tight Flexible Nonmetallic Conduit

UL 1660.

2.3 SURFACE RACEWAY

2.3.1 Surface Metal Raceway

UL 5, two-piece painted steel, totally enclosed, snap-cover type. Surface Metal Raceway shall be screwed or bolted to the wall, stick on type is not allowed.

2.4 OUTLET BOXES AND COVERS

UL 514A, cadmium- or zinc-coated, if ferrous metal. UL 514C, if nonmetallic.

2.4.1 Outlet Boxes in Hazardous (Classified) Locations

UL 886.

2.5 CABINETS, JUNCTION BOXES, AND PULL BOXES

Volume greater than 100 cubic inches, UL 50, hot-dip, zinc-coated, if sheet steel.

2.6 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.

2.6.1 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.

2.6.1.1 Equipment Manufacturer Requirements

When manufacturer's equipment requires copper conductors at the terminations or requires copper conductors to be provided between components of equipment, provide copper conductors or splices, splice boxes, and other work required to satisfy manufacturer's requirements.

2.6.1.2 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.

2.6.2 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

b. 480/277 volt, three-phase

(1) Phase A - brown

(2) Phase B - orange

(3) Phase C - yellow

2.6.3 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 or Type XHHW conforming to UL 44, 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.

2.6.4 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.

2.7 SPLICES AND TERMINATION COMPONENTS

UL 486A and UL 486B, as applicable, 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 or UL 486C (twist-on splicing connector). Provide solderless terminal lugs on stranded conductors.

2.8 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. 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."

2.9 SWITCHES

2.9.1 Toggle Switches

NEMA WD 1, UL 20, single pole, double pole, three-way, and four-way, totally enclosed with bodies of thermoplastic and/or thermoset plastic and mounting strap with grounding screw. Handles shall be Grey 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.

2.9.2 Disconnect Switches

NEMA KS 1. Provide heavy duty-type switches where indicated, where switches are rated higher than 240 volts, and for double-throw 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 3R and NEMA 1 enclosure as indicated on drawings per NEMA ICS 6.

2.10 RECEPTACLES

UL 498, hard use, heavy-duty, grounding-type. Ratings and configurations shall be as indicated. Bodies shall be of Grey 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.

2.10.1 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."

2.10.2 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.

2.10.3 Receptacles in Hazardous (Classified) Locations

UL 1010

2.11 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. 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.

2.11.1 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.

2.11.2 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.

2.11.2.1 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.

2.11.2.2 Circuit Breaker With GFCI

UL 943 and NFPA 70. Provide with "push-to-test" button, visible indication of tripped condition, and ability to detect and trip on current imbalance of 6 milliamperes or greater per requirements of UL 943 for Class A GFI devices, for personnel protection.

2.11.2.3 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.

2.12 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 or other circuit protective devices shall be coordinated for proper operation. Submit coordination data for approval. Fuses shall have voltage rating not less than circuit voltage.

2.12.1 Cartridge Fuses, Current Limiting Type (Class R)

UL 198E, Class RK-1 and RK-5 time-delay type. Associated fuseholders shall be Class R only.

2.12.2 Cartridge Fuses, Current Limiting Type (Classes J, L, and CC)

UL 198C, Class J for zero to 600 amperes, Class L for 601 to 6,000 amperes, and Class CC for zero to 30 amperes.

2.12.3 Cartridge Fuses, Current Limiting Type (Class T)

UL 198H, Class T for zero to 1,200 amperes, 300 volts; and zero to 800 amperes, 600 volts.

2.13 TRANSFORMERS

NEMA ST 20, general purpose, dry-type, self-cooled, ventilated . Provide transformers in NEMA 1 enclosure. Transformer shall have 220 degrees C insulation system for transformers 15 kVA and greater, and shall have 180 degrees C insulation for transformers rated 10 kVA and less, with temperature rise not exceeding 115 degrees C under full-rated load in maximum ambient of 40 degrees C. Transformer of 115 degrees C temperature rise shall be capable of carrying continuously 115 percent of nameplate kVA without exceeding insulation rating.

2.14 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. 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. Provide controllers in hazardous locations with classifications as indicated.

2.14.1 Enclosures for Motor Controllers

NEMA ICS 6.

2.14.2 Pushbutton Stations

Provide with "start/stop" momentary contacts having one normally open and one normally closed set of contacts, and red lights to indicate when motor is running. Stations shall be heavy duty, oil-tight design.

2.14.3 Pilot and Indicating Lights

Provide LED cluster lamps.

2.14.4 Terminal Blocks

NEMA ICS 4.

2.15 MANUAL MOTOR STARTERS (MOTOR RATED SWITCHES)

Single, Double and Three pole designed for surface mounting with overload protection .

2.16 TELEPHONE SYSTEM

Provide system of telephone wire-supporting structures, including: conduits with pull wires surface mounted raceway, terminal boxes, outlet and junction boxes andother accessories for telephone outlets. Additional requirements are in Section 27 10 00, "Structured Telecommunications Cabling and Pathway System."

2.16.1 Outlet Boxes for Telephone System

Standard type, as specified herein. Mount flush in finished walls at height specified for outlet receptacles. Outlet boxes for wall-mounted telephones shall be 5 inch square by 2 7/8 in deep; mounted at heightas indicated.

2.16.2 Cover Plates

Modular telephone type with same finish specified for receptacle and switch cover plates.

2.16.3 Conduit Sizing

Conduit for single outlets shall be minimum of 1 1/4 in and for multiple outlets minimum of one inch. Size conduits for telephone risers to telephone cabinets, junction boxes, distribution centers, and telephone service, as indicated.

2.16.4 Backboards

Interior grade plywood, 3/4 in thick, 4 by 8 ft minimum . Plywood shall be fire rated.

2.16.5 Terminal Cabinets

Construct of zinc-coated sheet steel. Cabinets shall be constructed with interior dimensions not less than those indicated. Trim shall be fitted with hinged door and flush catch. Doors shall provide maximum-size openings to the box interiors. Boxes shall be provided with 5/8 in backboard having a two-coat insulating varnish finish. Match trim, hardware, doors, and finishes to lighting panelboards.

2.17 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.

2.18 HAZARDOUS LOCATIONS

Electrical materials, equipment, and devices for installation in hazardous locations, as defined by NFPA 70, shall be specifically approved by Underwriters' Laboratories, Inc., or Factory Mutual for particular "Class," "Division," and "Group" of hazardous locations involved. Boundaries and classifications of hazardous locations shall be as indicated.

2.19 NAMEPLATES

Provide as specified in Section 26 00 00, "Basic Electrical Materials and Methods."

2.20 FIRESTOPPING MATERIALS

Provide firestopping around electrical penetrations in accordance with Section 07 84 00, "Firestopping."

2.21 SURGE PROTECTIVE DEVICES

Provide parallel type surge protective devices which comply with UL 1449 at the service entrance panelboard. 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 . The maximum line to neutral (L-N) Suppressed Voltage Rating (SRV) shall be:

900V for 480Y/277V, three phase system

The minimum MCOV (Maximum Continuous Operating Voltage) rating shall be:

600/320V for 480Y/277V, 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.

2.22 SOURCE QUALITY CONTROL

2.22.1 Transformer Factory Tests

Submittal shall include routine NEMA ST 20 transformer test results on each transformer and also contain the results of NEMA "design" and "prototype" tests that were made on transformers electrically and mechanically equal to those specified.

PART 3 EXECUTION

3.1 INSTALLATION

Electrical installations shall conform to requirements of NFPA 70 and to requirements specified herein.

3.1.1 Hazardous Locations

Work in hazardous locations, as defined by NFPA 70, shall be performed in strict accordance with NFPA 70 for particular "Class," "Division," and "Group" of hazardous locations involved. Provide conduit and cable seals where required by NFPA 70. Conduit shall have tapered threads.

3.1.2 Service Entrance Identification

Service entrance disconnect devices, switches, and enclosures shall be labeled and identified as such.

3.1.2.1 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.

3.1.3 Wiring Methods

Provide insulated conductors installed in rigid steel conduit, or rigid nonmetallic conduit, 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.

3.1.3.1 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 equipment rooms where moving or replacing equipment could physically damage the EMT.

d. Do not use in hazardous areas.

e. Do not use outdoors.

f. Do not use in fire pump rooms.

3.1.3.2 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 hazardous (classified) areas.

(3) Do not use in fire pump rooms.

(4) Do not use in penetrating fire-rated walls or partitions, or fire-rated floors.

(5) Do not use above grade, except where allowed in this section for rising through floor slab or indicated otherwise.

3.1.3.3 Restrictions Applicable to Flexible Conduit

Use only as specified in paragraph entitled "Flexible Connections."

3.1.3.4 Service Entrance Conduit, Underground

PVC, Type-EPC 40, galvanized rigid steel or steel IMC. Underground portion shall be encased in minimum of 3 in of concrete and shall be installed minimum 18 in below slab or grade.

3.1.3.5 Underground Conduit Other Than Service Entrance

Plastic-coated rigid steel; PVC, Type EPC-40.

3.1.4 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.

3.1.4.1 Conduit Installed Under Floor Slabs

Conduit run under floor slab shall be located a minimum of 12 in below the vapor barrier. Seal around conduits at penetrations thru vapor barrier.

3.1.4.2 Conduit Through Floor Slabs

Where conduits rise through floor slabs, curved portion of bends shall not be visible above finished slab.

3.1.4.3 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 partitions of light steel construction, use sheet metal screws. In suspended-ceiling construction, run conduit above ceiling. Do not support conduit by ceiling support system. Conduit and box systems shall be supported independently of both (a) tie wires supporting ceiling grid system, and (b) ceiling grid system into which ceiling panels are placed. 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. Where conduit crosses building expansion joints, provide suitable watertight expansion fitting that maintains conduit electrical continuity by bonding jumpers or other means. For conduits greater than 2 1/2 in inside diameter, provide supports to resist forces of 0.5 times the equipment weight in any direction and 1.5 times the equipment weight in the downward direction.

3.1.4.4 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.

3.1.4.5 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.

3.1.4.6 Telephone and Signal System Conduits

Refer to Section 27 10 00, "Structured Telecommunications Cabling and Pathway System."

3.1.4.7 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.

3.1.4.8 Stub-Ups

Provide conduits stubbed up through concrete floor for connection to free-standing equipment with adjustable top or coupling threaded inside for plugs, set flush with finished floor. Extend conductors to equipment in rigid steel conduit, except that flexible metal conduit may be used 6 in above floor. Where no equipment connections are made, install screwdriver-operated threaded flush plugs in conduit end.

3.1.4.9 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 nonmetallic conduit in wet and damp locations for equipment subject to vibration, noise transmission, movement or motors. Provide separate ground conductor across flexible connections.

3.1.5 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, when surface mounted on interior walls exposed up to 7 ft above floors and walkways, or when installed in hazardous areas and when specifically indicated. Boxes in other locations shall be sheet steel, except that aluminum boxes may be used with aluminum conduit, and nonmetallic boxes may be used with nonmetallic conduit system. 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. Boxes for use in masonry-block or tile walls shall be square-cornered, tile-type, or standard boxes having square-cornered, tile-type covers. 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 wood screws on wood, 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. 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. Where bar hangers are used, attach bar to raceways on opposite sides of box, and support raceway with approved-type fastener maximum 24 in from box. When penetrating reinforced concrete members, avoid cutting reinforcing steel.

3.1.5.1 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. Telephone outlets shall be minimum of 4 in square by 2 1/8 in deep , except for wall mounted telephones.

3.1.5.2 Pull Boxes

Construct of at least minimum size required by NFPA 70 of code-gauge aluminum or galvanized sheet steel, except where cast-metal boxes are required in locations specified herein. Provide boxes with screw-fastened covers. Where several feeders pass through common pull box, tag feeders to indicate clearly electrical characteristics, circuit number, and panel designation.

3.1.6 Mounting Heights

Mount panelboards, enclosed circuit breakers, and disconnecting switches so height of operating handle at its highest position is maximum 78 in above floor. Mount lighting switches and receptacles as indicated. Measure mounting heights of wiring devices and outlets to center of device or outlet. Measure mounting heights of receptacle outlet boxes in the hazardous area to the bottom of the outlet box.

3.1.7 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. Identify control circuit terminations in accordance with Section 23 09 23.13, "BACnet Direct Digital Control Systems for HVAC".

3.1.8 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.

3.1.9 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.

3.1.10 Electrical Penetrations

Seal openings around electrical penetrations through fire resistance-rated walls, partitions, floors, or ceilings in accordance with Section 07 84 00, "Firestopping."

3.1.11 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, telephone system grounds, 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 flanged 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. Make ground connection to driven ground rods on exterior of building. Interconnect all grounding media in or on the structure to provide a common ground potential. This shall include electrical service, telephone system grounds, as well as underground metallic piping systems. Interconnection to the gas line shall be made on the customer's side of the meter. Where ground fault protection is employed, ensure that connection of ground and neutral does not interfere with correct operation of fault protection.

3.1.11.1 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.

3.1.11.2 Telephone Service

Provide main telephone service equipment ground consisting of separate ground wire, No. 6 AWG, in conduit between equipment backboard and readily accessible grounding connection. Equipment end of ground wire shall consist of coiled length at least twice as long as terminal cabinet or backboard height.

3.1.12 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.

3.1.13 Repair of Existing Work

Repair of existing work, demolition, and modification of existing electrical distribution systems shall be performed as follows:

3.1.13.1 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.

3.1.13.2 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.

3.1.13.3 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.

3.1.14 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 Transformer Tests

Perform the standard, not optional, tests in accordance with the Inspection and Test Procedures for transformers, dry type, air-cooled, 600 volt and below; as specified in NETA ATS. Measure primary and secondary voltages for proper tap settings. Tests need not be performed by a recognized independent testing firm or independent electrical consulting firm.

3.2.4 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.

3.2.5 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 00.00 22

INTERIOR LIGHTING
08/12

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 A641/A641M	(2009a) Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
ASTM B117	(2011) Standard Practice for Operating Salt Spray (Fog) Apparatus

GREEN SEAL (GS)

GC-12	(1997) Occupancy Sensors

ILLUMINATING ENGINEERING SOCIETY OF NORTH AMERICA (IESNA)

IESNA HB-10	(2011) IES Lighting Handbook, 10th Edition
IESNA LM-79	(2008) Electrical and Photometric Measurements of Solid-State Lighting Products
IESNA LM-80	(2008) Measuring Lumen Maintenance of LED Light Sources

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 100	(2000; Archived) The Authoritative Dictionary of IEEE Standards Terms
IEEE C2	(2012) National Electrical Safety Code
IEEE C62.41.2	(2002) Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI/IEC 60529	(2004) Degrees of Protection Provided by Enclosures (IP Code)
NEMA ANSLG C78.377	(2008) American National Standard for electric lamps– Specifications for the Chromaticity of Solid State Lighting Products
ANSI C82.77	Harmonic Emission Limits - Related Power

	Quality Requirements for Lighting Equipment
NEMA 250	(2008) Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA ICS 2	(2000; R 2005; Errata 2008) Standard for Controllers, Contactors, and Overload Relays Rated 600 V
NEMA ICS 6	(1993; R 2011) Enclosures

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 101	(2012; Amendment 1 2012) Life Safety Code
NFPA 70	(2011; Errata 2 2012) National Electrical Code

U.S. FEDERAL COMMUNICATIONS COMMISSION (FCC)

FCC Part 15	Radio Frequency Devices (47 CFR 15)

UNDERWRITERS LABORATORIES (UL)

UL 1310	(2005) Standard for Safety Class 2 Power Units - Fifth Edition; Reprint with revisions through and including September 30, 2010
UL 1598	(2008; Reprint Jan 2010) Luminaires
UL 773	(1995; Reprint Mar 2002) Standard for Plug-In, Locking Type Photocontrols for Use with Area Lighting
UL 773A	(2006; Reprint Mar 2011) Standard for Nonindustrial Photoelectric Switches for Lighting Control
UL 8750	(2009) Standard for Safety Light Emitting Diode (LED) Equipment for Use in Lighting Products - First Edition
UL 924	(2006; Reprint Feb 2011) Standard for Emergency Lighting and Power Equipment

1.2 RELATED REQUIREMENTS

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

a. Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, shall be as defined in IEEE 100.

b. Average life is the time after which 50 percent will have failed and 50 percent will have survived under normal conditions.

c. For LED luminaire light sources, "Useful Life" is the operating hours before reaching 70 percent of the initial rated lumen output (L70) with no catastrophic failures under normal operating conditions. This is also known as 70 percent "Rated Lumen Maintenance Life" as defined in IESNA LM-80.

d. Total harmonic distortion (THD) is the root mean square (RMS) of all the harmonic components divided by the total fundamental current.

1.4 SYSTEM DESCRIPTION

1.4.1 Lighting Control System

Provide lighting control system as indicated. Lighting control equipment shall include, if indicated: control modules, power packs, dimming ballasts, occupancy sensors, and light level sensors.

1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. 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-10, as applicable, for the lighting system specified.

SD-01 Preconstruction Submittals

LED Luminaire Warranty

SD-02 Shop Drawings

LED Luminaire drawings

SD-03 Product Data

LED Luminaires

Lighting contactor

Time switch

Photocell

Exit signs

Emergency lighting equipment

Occupancy sensors

SD-06 Test Reports

LED Luminaire - IESNA LM-79 Test Report

LED Light Source - IESNA LM-80 Test Report

Operating test

Submit test results as stated in paragraph entitled "Field Quality Control."

SD-07 Certificates

Luminaire Useful Life Certificate

Submit certification from the manufacturer indicating the expected useful life of the luminaires provided. The useful life shall be directly correlated to the IESNA LM-80 test data, adjusted for the thermal properties of manufacturer's luminaire, and adjusted for local average ambient operating conditions.

SD-10 Operation and Maintenance Data

Lighting Control System, Data Package 5

Submit operation and maintenance data in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA and as specified herein, showing all light fixtures, control modules, control zones, occupancy sensors, power packs, schematic diagrams and all interconnecting control wire, conduit, and associated hardware.

1.6 QUALITY ASSURANCE

1.6.1 Drawing Requirements

1.6.1.1 LED Luminaire Drawings

Include dimensions, accessories, and installation and construction details. Photometric data, including zonal lumen data, average and minimum ratio, and candlepower distribution data shall accompany shop drawings.

1.6.2 LED Luminaire - IESNA LM-79 Test Report

Submit test report on manufacturer's standard production model luminaire. Submittal shall include all photometric and electrical measurements, as well as all other pertinent data outlined under "14.0 Test Report" in IESNA LM-79.

1.6.3 LED Light Source - IESNA LM-80 Test Report

Submit report on manufacturer's standard production LED package, array, or module. Submittal shall include:

a. Testing agency, report number, date, type of equipment, and LED light source being tested.

b. All data required by IESNA LM-80.

1.6.3.1 Test Laboratories

Test laboratories for the IESNA LM-79 and IESNA LM-80 test reports shall

be one of the following:

a. National Voluntary Laboratory Accreditation Program (NVLAP) accredited for solid-state lighting testing as part of the Energy-Efficient Lighting Products laboratory accreditation program.

b. One of the qualified labs listed on the Department of Energy - Energy Efficiency & Renewable Energy, Solid-State Lighting web site.

c. A manufacturer's in-house lab that meets the following criteria:

1. Manufacturer has been regularly engaged in the design and production of high intensity discharge roadway and area luminaires and the manufacturer's lab has been successfully certifying these fixtures for a minimum of 15 years.

2. Annual equipment calibration including photometer calibration in accordance with National Institute of Standards and Technology.

1.6.4 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 Standard Products

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 this section.

1.6.5.1 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 manufacturers' factory or laboratory tests, is furnished.

1.6.5.2 Material and Equipment Manufacturing Date

Products manufactured more than 1 year prior to date of delivery to site shall not be used, unless specified otherwise.

1.7 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.

1.7.1 LED Luminaire Warranty

Provide Luminaire Useful Life Certificate.

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.

a. Provide a written five year on-site replacement warranty for material, fixture finish, and workmanship. On-site replacement includes transportation, removal, and installation of new products.

    1. Finish warranty shall include warranty against failure and against substantial deterioration such as blistering, cracking, peeling, chalking, or fading.

    2. Material warranty shall include:

        (a) All power supply units (drivers).

        (b) Replacement when more than 10 percent of LED sources in any lightbar or subassembly(s) are defective or non-starting.

b. Warranty period must begin on date of beneficial occupancy. Contractor shall provide the Contracting Officer signed warranty certificates prior to final payment.

PART 2 PRODUCTS

2.1 LED LUMINAIRES

UL 1598, ANSI C82.77 and UL 8750. Provide luminaires as indicated in luminaire schedule and plates or details on project plans. Provide luminaires complete with light sources of quantity, type, and wattage indicated. All luminaires of the same type shall be provided by the same manufacturer. Details, shapes, and dimensions are indicative of the general type desired, but are not intended to restrict selection to luminaires of a particular manufacturer. Luminaires of similar designs, light distribution and brightness characteristics, and of equal finish and quality will be acceptable as approved.

2.1.1 General Requirements

a. LED luminaire housings shall be die cast or extruded aluminum.

b. LED luminaires shall be rated for operation within an ambient temperature range of minus 22 degrees F to 122 degrees F.

c. Luminaires shall be UL listed for wet locations per UL 1598 where indicated. Optical compartment for LED luminaires shall be sealed and rated a minimum of IP65 per ANSI/IEC 60529.

d. LED luminaires shall produce a minimum efficacy of 60 lumens per watt driven at a maximum 600 mA, tested per IESNA LM-79. Theoretical models of initial raw LED lumens per watt are not acceptable.

e. Luminaires shall have IES distribution and NEMA field angle classifications as indicated in luminaire schedule on project plans per IESNA HB-10.

f. Housing finish shall be baked-on enamel, anodized, or baked-on powder coat paint. Finish shall be capable of surviving ASTM B117 salt fog environment testing for 2500 hours minimum without blistering or peeling.

g. Luminaires shall be fully assembled and electrically tested prior to shipment from factory.

h. The finish color shall be as indicated in the luminaire schedule or detail on the project plans.

i. Luminaire lenses shall be constructed of clear OR frosted tempered glass or UV-resistant acrylic.

j. Incorporate modular electrical connections, and construct luminaires to allow replacement of all or any part of the optics, heat sinks, power supply units, ballasts, surge suppressors and other electrical components using only a simple tool, such as a manual or cordless electric screwdriver.

k. Luminaires shall have a nameplate bearing the manufacturer's name, address, model number, date of manufacture, and serial number securely affixed in a conspicuous place. The nameplate of the distributing agent will not be acceptable.

l. All factory electrical connections shall be made using crimp, locking, or latching style connectors. Twist-style wire nuts are not acceptable.

2.1.2 LED Light Sources

a. Correlated Color Temperature (CCT) shall be in accordance with NEMA ANSLG C78.377:

Nominal CCT: 3500 degrees K: 3465 plus or minus 245 degrees K

b. Color Rendering Index (CRI) shall be:

Greater than or equal to 80 for 3000 - 3500 degrees K light sources.

c. Color Consistancy:

Manufacturer shall utilize a maximum 4-step MacAdam ellipse binning tolerance for color consistancy of LEDs used in luminaires.

2.1.3 LED Power Supply Units (Drivers)

UL 1310. LED Power Supply Units shall meet the following requirements:

a. Minimum efficiency shall be 85 percent.

b. Drive current per LED shall not exceed 600 mA, plus or minus 10 percent.

c. Shall be rated to operate between ambient temperatures of minus 22 degrees F and 104 degrees F.

d. Shall be designed to operate on the voltage system to which they are connected, typically ranging from 120 V to 480 V nominal.

e. Operating frequency shall be: 50 or 60 Hz.

f. Power Factor (PF) shall be greater than or equal to 0.90.

g. Total Harmonic Distortion (THD) current shall be less than or equal to 20 percent.

h. Shall meet requirements of FCC Part 15 (47 CFR 15), Class B.

i. Shall be RoHS-compliant.

j. Shall be mounted integral to luminaire. Remote mounting of power supply is not allowed.

k. Power supplies in luminaires shall be UL listed with a sound rating of A.

m. Shall be equipped with over-temperature protection circuit that turns light source off until normal operating temperature is achieved.

2.1.4 Surge Protection

Provide surge protection integral to luminaire to meet "C Low" waveforms as defined in IEEE C62.41.2, Scenario 1 Location Category C.

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. Provide with swivel hangers to ensure a plumb installation. Hangers shall be cadmium-plated steel with a swivel-ball tapped for the conduit size indicated. Hangers shall allow fixtures to swing within an angle of 45 degrees. Brace pendants 4 feet or longer to limit swinging. Single-unit suspended fluorescent fixtures shall have twin-stem hangers. Multiple-unit or continuous row fluorescent fixtures shall have a tubing or stem for wiring at one point and a tubing or rod suspension provided for each unit length of chassis, including one at each end. Rods shall be a minimum 0.18 inch diameter.

2.4 SWITCHES

2.4.1 Toggle Switches

Provide toggle switches as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

2.5 LIGHTING CONTACTOR

NEMA ICS 2. Provide a electrically-held lighting contactor housed in a NEMA 1 enclosure conforming to NEMA ICS 6. Contactor shall have 6 poles, configured as normally open (NO). Contacts shall be rated 600 volts, 30 amperes for a resistive load. Coil operating voltage shall be 120 volts. Contactor shall have silver cadmium oxide double-break contacts and shall require no arcing contacts. Provide contactor with hand-off-automatic selector switch.

2.6 TIMESWITCH

Timeswitch shall be an electronic type with a 1 year astronomic programming function that changes on/off settings according to seasonal variations of sunset and sunrise, providing a total of 24 on/off set points. Digital clock display format shall be24 hour type. Provide power outage backup for switch utilizing a lithium battery which provides coverage for a minimum of 7 days. Timeswitch shall provide control to 2 channels or loads. Contacts shall be rated for 30 amps at 120-277 VAC resistive load in a SPST normally open (NO) configuration. Provide switch with manual bypass or remote override control, daylight savings time automatic adjustment,EEPROM memory module and ability for photosensor input.

Timeswitch shall be housed in a surface-mounted, lockable NEMA 1 enclosure constructed of painted steel or plastic polymer conforming to NEMA ICS 6.

2.7 PHOTOCELL

UL 773 or UL 773A. Photocells shall be hermetically sealed,silicon diode light sensor type, rated at 1000 watts, 120/277 volts, 50/60 Hz with single-pole, single-throw contacts. Photocell shall be designed to fail to the ON position. Housing shall be constructed of die cast aluminum, rated to operate within a temperature range of minus 40 to 158 degrees F. Photocell shall have a 1/2 in threaded base for mounting to a junction box or conduit. Provide swivel base type housing. Photocell shall turn on at 1-3 footcandles and turn off at 3 to 15 footcandles. A time delay shall prevent accidental switching from transient light sources. Provide a directional lens in front of the cell to prevent fixed light sources from creating a turnoff condition.

2.8 EXIT SIGNS

UL 924, NFPA 70, and NFPA 101. Exit signs shall be self-powered type. Exit signs shall use no more than 5 watts.

2.8.1 Self-Powered LED Type Exit Signs (Battery Backup)

Provide with automatic power failure device, test switch, pilot light, integral self-testing module 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).

2.9 EMERGENCY LIGHTING EQUIPMENT

UL 924, NFPA 70, and NFPA 101. Provide lamps in wattage indicated.

2.9.1 Emergency Lighting Unit

Provide as indicated. Emergency lighting units shall be rated for 12 volts, except units having no remote-mounted lamps and having no more than two unit-mounted lamps may be rated 6 volts. Provide integral self-testing module.

2.10 SELF-TESTING MODULE

Self-testing module for exit signs and emergency lighting equipment shall perform the following functions:

a. Continuous monitoring of charger operation and battery voltage with visual indication of normal operation and of malfunction.

b. Monthly discharge cycling of battery with monitoring of transfer circuit function, battery capacity and emergency lamp operation with visual indication of malfunction. The battery capacity test may be conducted by using a synthetic load.

c. Manual test switch to simulate a discharge test cycle.

d. Module shall have low voltage battery disconnect (LVD) and brown-out protection circuit.

2.11 OCCUPANCY SENSORS

UL listed. Comply with GC-12. Occupancy sensors and power packs shall be designed to operate on the voltage indicated. Sensors and power packs shall have circuitry that only allows load switching at or near zero current crossing of supply voltage. Occupancy sensor mounting as indicated. Sensor shall have an LED occupant detection indicator. Sensor shall have adjustable sensitivity and adjustable delayed-off time range of 5 minutes to 15 minutes. Wall mounted sensors shall match the color of adjacent wall plates as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM, ceiling mounted sensors shall be white. Ceiling mounted sensors shall have 360 degree coverage unless otherwise indicated.

c. altrasonic/Infrared Combination Sensor

2.12 SUPPORT HANGERS FOR LIGHTING FIXTURES IN SUSPENDED CEILINGS

2.12.1 Wires

ASTM A641/A641M, galvanized regular coating, soft temper, 0.1055 inches in diameter (12 gage).

2.13 EQUIPMENT IDENTIFICATION

2.13.1 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.

2.13.2 Labels

Provide labeled luminaires in accordance with UL 1598 requirements. All luminaires shall be clearly marked for operation of specific light sources and ballasts according to proper lamp type. The following lamp characteristics shall be noted in the format "Use Only _____":

a. Light source tube diameter code (e.g. T-4, T-5, T-8), tube quantity configuration (e.g. twin, quad, triple), base type (e.g. G24q-2, GX 24 q-4), and nominal wattage for fluorescent and compact fluorescent luminaires.

c. Start type (e.g. programmed-start, rapid-start, instant-start) for fluorescent and compact fluorescent luminaires.

e. Correlated color temperature (CCT) and color rendering index (CRI) for all luminaires.

All markings related to lamp type shall be clear and located to be readily visible to service personnel, but unseen from normal viewing angles when lamps are in place. Ballasts shall have clear markings indicating multi-level outputs and indicate proper terminals for the various outputs.

2.14 FACTORY APPLIED FINISH

Electrical equipment shall have factory-applied painting systems which shall, as a minimum, meet the requirements of NEMA 250 corrosion-resistance test.

PART 3 EXECUTION

3.1 INSTALLATION

Electrical installations shall conform to IEEE C2, NFPA 70, and to the requirements specified herein.

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.

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.

3.1.3 Suspended Fixtures

Suspended fixtures shall be provided with 45 degree swivel hangers so that they hang plumb and shall be located with no obstructions within the 45 degree range in all directions. The stem, canopy and fixture shall be capable of 45 degree swing. Pendants, or chains 4 feet or longer excluding fixture shall be braced to prevent swaying using three cables at 120 degree separation. Fixture finishes shall be free of scratches, nicks, dents, and warps, and shall match the color and gloss specified. Pendants shall be finished to match fixtures. Aircraft cable shall be stainless steel. Canopies shall be finished to match the ceiling and shall be low profile unless otherwise shown. Maximum distance between suspension points shall be 10 feet or as recommended by the manufacturer, whichever is less.

3.1.4 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.

3.1.5 Photocell Switch Aiming

Aim switch according to manufacturer's recommendations.

3.1.6 Occupancy Sensor

Provide quantity of sensor units indicated as a minimum. Provide additional units to give full coverage over controlled area. Full coverage shall provide hand and arm motion detection for office and administration type areas and walking motion for industrial areas, warehouses, storage rooms and hallways. Locate the sensor(s) as indicated and in accordance with the manufacturer's recommendations to maximize energy savings and to avoid nuisance activation and deactivation due to sudden temperature or airflow changes and usage.

3.2 FIELD APPLIED PAINTING

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 Section 09 90 00 PAINTS AND COATINGS.

3.3 FIELD QUALITY CONTROL

Upon completion of installation, verify that equipment is properly installed, connected, and adjusted. Conduct an operating test to show that equipment operates in accordance with requirements of this section.

-- End of Section --

SECTION 27 10 00

BUILDING TELECOMMUNICATIONS CABLING SYSTEM
02/15

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 D709	(2013) Laminated Thermosetting Materials

ELECTRONIC COMPONENTS ASSOCIATION (ECA)

ECA EIA/ECA 310	(2005) Cabinets, Racks, Panels, and Associated Equipment

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 100	(2000; Archived) The Authoritative Dictionary of IEEE Standards Terms

INSULATED CABLE ENGINEERS ASSOCIATION (ICEA)

ICEA S-83-596	(2011) Indoor Optical Fiber Cables
ICEA S-90-661	(2012) Category 3, 5, & 5e Individually Unshielded Twisted Pair Indoor Cables for Use in General Purpose and LAN Communications Wiring Systems Technical Requirements

NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION (NECA)

NECA/BICSI 568	(2006) Standard for Installing Building Telecommunications Cabling

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI/NEMA WC 66	(2013) Performance Standard for Category 6 and Category 7 100 Ohm Shielded and Unshielded Twisted Pairs

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3 2014) National Electrical Code

TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA)

TIA-1152	(2009) Requirements for Field Test

	Instruments and Measurements for Balanced Twisted-Pair Cabling
TIA-455-21	(1988a; R 2012) FOTP-21 - Mating Durability of Fiber Optic Interconnecting Devices
TIA-492AAAA	(2009b) 62.5-um Core Diameter/125-um Cladding Diameter Class 1a Graded-Index Multimode Optical Fibers
TIA-526-14	(2010b) OFSTP-14A Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant
TIA-526-7	(2002; R 2008) OFSTP-7 Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant
TIA-568-C.0	(2009; Add 1 2010; Add 2 2012) Generic Telecommunications Cabling for Customer Premises
TIA-568-C.1	(2009; Add 2 2011; Add 1 2012) Commercial Building Telecommunications Cabling Standard
TIA-568-C.2	(2009; Errata 2010) Balanced Twisted-Pair Telecommunications Cabling and Components Standards
TIA-568-C.3	(2008; Add 1 2011) Optical Fiber Cabling Components Standard
TIA-569	(2012c; Addendum 1 2013; Errata 2013) Commercial Building Standard for Telecommunications Pathways and Spaces
TIA-570	(2012c) Residential Telecommunications Infrastructure Standard
TIA-606	(2012b) Administration Standard for the Telecommunications Infrastructure
TIA-607	(2011b) Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises
TIA/EIA-598	(2005c) Optical Fiber Cable Color Coding
TIA/EIA-604-2	(2004b; R 2014) FOCIS 2 Fiber Optic Connector Intermateability Standard

U.S. FEDERAL COMMUNICATIONS COMMISSION (FCC)

FCC Part 68	Connection of Terminal Equipment to the Telephone Network (47 CFR 68)

UNDERWRITERS LABORATORIES (UL)

UL 1286	(2008; Reprint Sep 2013) Office Furnishings
UL 1666	(2007; Reprint Jun 2012) Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts
UL 1863	(2004; Reprint Nov 2012) Communication Circuit Accessories
UL 444	(2008; Reprint Apr 2010) Communications Cables
UL 467	(2007) Grounding and Bonding Equipment
UL 50	(2007; Reprint Apr 2012) Enclosures for Electrical Equipment, Non-environmental Considerations
UL 514C	(2014) Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
UL 969	(1995; Reprint Nov 2008) Standard for Marking and Labeling Systems

1.2 RELATED REQUIREMENTS

Section 01 33 00 SUBMITTAL PROCEDURES; Section QUALITY CONTROL; Section 26 00 00, BASIC ELECTRICAL MATERIALS AND METHODS; and Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM; apply to this section with additions and modifications specified herein.

Contact Camp Lejeune Base Telephone for special requirements on classified service, unofficial service, under slab cabling, using water block, and any item not covered in this document.

Buildings with Special Network Requirements such as Secured Internet Protocol, Classified networks, American Warrior Network, Charter cable, MCCS.org, Boingo, and Naval Blue Network may require additional guidance outside this specification. Secured areas or secured networks in non-secured areas may require Protected Distribution System which is also outside this specification. Classified networks may require shielded twisted pair and has separation requirements outside this specification. In these cases contact Telecommunications Support Division G-6 MCIEAST-MCB CAMLEJ for guidance at (910) 451-9439 or (910) 451-4760.

Contact AHJ for special requirements on classified service, unofficial service, under slab cabling, using water block, and any item not covered in this document.

1.3 DEFINITIONS

Unless otherwise specified or indicated, electrical and electronics terms used in this specification shall be as defined in TIA-568-C.1, TIA-568-C.2, TIA-568-C.3, TIA-569, TIA-606 and IEEE 100 and herein.

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 fire rated plywood backboard. Depending upon local site conditions, the MDF and BDF may be the same space.

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 or lockable terminal cabinet, cable supports, and fire rated plywood backboard. 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 crossconnections within telecommunications rooms. Shall be connected to MDF with both fiber and copper. Secure Internet Protocol (SIPR) vault or cabinet is considered an IDF.

1.3.4 Communications Room

An enclosed space for communications equipment, terminations, and crossconnect wiring for horizontal cabling.

1.3.5 Campus Distributor (CD)

A distributor from which the campus backbone cabling emanates. (International expression for main cross-connect (MC) also known as central office or Area Distribution Node.)

1.3.6 Building Distributor (BD)

A distributor in which the building backbone (customer owned outside plant) cables terminate and at which connections to the campus backbone cables may be made. (International expression for intermediate cross-connect (IC).)

1.3.7 Floor Distributor (FD)

A distributor used to connect horizontal cable and cabling subsystems or equipment. (International expression for horizontal cross-connect (HC).)

1.3.8 Entrance Facility (EF) (can be same as communications room)

An entrance to the building for both private and public network service cables (including wireless) including the entrance point at the building wall and continuing to the communications room.

1.3.9 Equipment Room (ER) (can be same as communications room)

An environmentally controlled 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.

1.3.10 Open Cable

Cabling that is not run enclosed in a raceway as defined by NFPA 70. This refers to cabling that is "open" to the space in which the cable has been installed and is therefore exposed to the environmental conditions associated with that space, such as wire basket tray, cable tray, J-hooks, D-rings,or bridal rings.

1.3.11 Open Office

A floor space division provided by furniture, moveable partitions, or other means instead of by building walls, normally over 100 square feet.

1.3.12 Pathway

A physical infrastructure utilized for the placement and routing of communications cabling.

1.4 SYSTEM DESCRIPTION

The building telecommunications cabling and pathway system shall include permanently installed backbone and horizontal cabling, horizontal and backbone pathways, service entrance facilities, work area pathways, telecommunications outlet assemblies, conduit, raceway, and hardware for splicing, terminating, and interconnecting cabling necessary to transport telephone data, and other communications systems (including LAN A/V, intercom, PA, CATV, CCTV, and WiFi) between equipment items in a building. The horizontal system shall be wired in a star topology from the communications work area to the floor distributor/IDF or building distributor/MDF or campus distributor or communications room at the center or hub of the star. The backbone cabling and pathway system includes intrabuilding and interbuilding interconnecting cabling, pathway, and terminal hardware. The intrabuilding backbone provides connectivity from the floor distributors to the building distributors or to the campus distributor and from the building distributors to the campus distributor as required. The backbone system shall be wired in a star topology with the campus distributor (Area Distribution Node) at the center or hub of the star. Provide telecommunications pathway systems referenced herein as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. The telecommunications contractor must coordinate with MCB CL Base Telephone concerning access to and configuration of telecommunications spaces. The telecommunications contractor may be required to coordinate work effort within the telecommunications spaces with MCB CL Base Telephone.

1.5 SUBMITTALS

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

SD-02 Shop Drawings

Telecommunications drawings

Telecommunications Space Drawings

In addition to Section 01 33 00 SUBMITTAL PROCEDURES, provide shop drawings in accordance with paragraph SHOP DRAWINGS.

SD-03 Product Data

Communications cabling (backbone and horizontal)

Patch panels

Telecommunications outlet/connector assemblies

Equipment support frame

Connector blocks

Building Protector Assemblies

Submittals shall include the manufacturer's name, trade name, place of manufacture, and catalog model or number. Include performance and characteristic curves. 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 in Section 01 33 00 SUBMITTAL PROCEDURES.

SD-06 Test Reports

Communications cabling testing

SD-07 Certificates

Communications Contractor Qualifications

Key Personnel Qualifications

Manufacturer Qualifications

Test plan

SD-09 Manufacturer's Field Reports

Factory reel tests

SD-10 Operation and Maintenance Data

Communications cabling and pathway system Data Package 5

SD-11 Closeout Submittals

Record Documentation

1.5.1 ADDITIONAL SUBMITTAL REQUIREMENTS

All submittals of material, equipment and design must be approved by the Telecommunications Support Division (TSD) prior to installing any telecommunications wiring and equipment.

1.6 QUALITY ASSURANCE

1.6.1 Shop Drawings

In exception to Section 01 33 00 SUBMITTAL PROCEDURES, submitted plan drawings shall be a minimum of 11 by 17 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. 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 Drawings

Provide registered communications distribution designer (RCDD) approved, drawings in accordance with TIA-606. The identifier for each termination and cable shall appear on the drawings. Drawings shall depict final communications installed wiring system infrastructure in accordance with TIA-606. The drawings should provide details required to prove that the distribution system shall properly support connectivity from the EF communications and ER communications, CD's, BD's, and FD's to the communications work area outlets. Provide a plastic laminated schematic of the as-installed communications cable system showing cabling, CD's, BD's, FD's, and the EF and ER for communications keyed to floor plans by room number. Mount the laminated schematic in the EF communications space as directed by the Contracting Officer. The following drawings shall be provided as a minimum:

a. T1 - Layout of complete building per floor - Building Area/Serving Zone Boundaries, Backbone Systems, and Horizontal Pathways. Layout of complete building per floor. The drawing indicates location of building areas, serving zones, vertical backbone diagrams, communications rooms, access points, pathways, grounding system, and other systems that need to be viewed from the complete building perspective.

b. T2 - Serving Zones/Building Area Drawings - Drop Locations and Cable Identification (ID'S). Shows a building area or serving zone. These drawings show drop locations, communications rooms, access points and detail call outs for common equipment rooms and other congested areas.

c. T4 - Typical Detail Drawings - Faceplate Labeling, Firestopping, Americans with Disabilities Act (ADA), Safety, Department of Transportation (DOT). Detailed drawings of symbols and typicals such as faceplate labeling, faceplate types, faceplate population installation procedures, detail racking, and raceways.

1.6.1.2 Telecommunications Space Drawings

Provide T3 drawings in accordance with TIA-606 that include telecommunications rooms 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 incoming cable stub or connector blocks, building protector assembly, outgoing 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.

1.6.2 Communications Contractor Qualifications

Work under this section shall be performed by and the equipment shall be provided by the approved communications contractor and key personnel. Qualifications shall be provided for: the communications system contractor, the communications system installer, and the supervisor (if different from the installer). A minimum of 30 days prior to installation, submit documentation of the experience of the communications contractor and of the key personnel.

1.6.2.1 Communications Contractor

The communications contractor shall be a firm which is regularly and professionally engaged in the business of the applications, installation, and testing of the specified communications systems and equipment. The communications contractor shall demonstrate experience in providing successful communications systems within the past 3 years of similar scope and size. Submit documentation for a minimum of three and a maximum of five successful communication system installations for the communications contractor. Also IAW Section on QC Specialists; a Telecommunications Systems QC Specialists may be required on site, full time with 10 years minimum experience in telecom installation and experience, specialist shall be very familiar with Division 27, 28, 33 concerning communications systems work and installation.

1.6.2.2 Key Personnel

Provide key personnel who are regularly and professionally engaged in the business of the application, installation and testing of the specified communications 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 communications systems within the past 3 years.

Supervisors and installers assigned to the installation of this system or any of its components shall be Building Industry Consulting Services International (BICSI) Registered Cabling Installers, Technician Level. Submit documentation of current BICSI certification for each of the key personnel.

In lieu of BICSI certification, supervisors and installers assigned to the installation of this system or any of its components shall have a minimum of 3 years experience in the installation of the specified copper and fiber optic cable and components. They 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 communication 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 communications system proposed for this solicitation. Include specific experience in installing and testing communications systems and provide the names and locations of at least two project installations successfully completed using optical fiber and copper communications cabling systems. All of the existing communications 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 communications contractor, or have a commitment to the communications contractor to work on this project. All key persons shall be employed by the communications contractor at the date of issuance of this solicitation, or if not, have a commitment to the communications 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 communications system. Key personnel shall function in the same roles in this contract, as they functioned in the offered successful experience. Any substitutions for the communications 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 TIA-568-C.1, TIA-568-C.2 and TIA-568-C.3.

1.6.3 Test Plan

Provide a complete and detailed test plan for the communications cabling system including a complete list of test equipment for the components and accessories for each cable type specified, 60 days prior to the proposed test date. Include procedures for certification, validation, sample report, and testing.

1.6.4 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 Standard Products

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 this section.

1.6.5.1 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 manufacturers' factory or laboratory tests, is furnished.

1.6.5.2 Material and Equipment Manufacturing Date

Products manufactured more than 1 year prior to date of delivery to site shall not be used, unless specified otherwise.

1.7 DELIVERY AND STORAGE

Provide protection from weather, moisture, extreme heat and cold, dirt, dust, and other contaminants for communications cabling and equipment placed in storage.

1.8 ENVIRONMENTAL REQUIREMENTS

Connecting hardware shall be rated for operation under ambient conditions of 32 to 140 degrees F and in the range of 0 to 95 percent relative humidity, noncondensing.

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.

1.10 MAINTENANCE

1.10.1 Operation and Maintenance Manuals

Commercial off the shelf manuals shall be furnished for operation, installation, configuration, and maintenance of products provided as a part of the communications 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 not later than 2 months prior to the date of beneficial occupancy. In addition to requirements of Data Package 5, include the requirements of paragraphs TELECOMMUNICATIONS DRAWINGS, TELECOMMUNICATIONS SPACE DRAWINGS, and RECORD DOCUMENTATION. Ensure that these drawings and documents depict the as-built configuration.

1.10.2 Record Documentation

Provide T5 drawings including documentation on cables and termination

hardware in accordance with TIA-606. T5 drawings shall include schedules to show information for cut-overs and cable plant management, patch panel layouts and cover plate assignments, cross-connect information and connecting terminal layout as a minimum. T5 drawings shall be provided in hard copy and soft copy (PDF) and AutoCAD 2012 format on CD/CDRW. Provide the following T5 drawing documentation as a minimum:

a. Cables - A record of installed cable shall be provided in accordance with TIA-606. The cable records shall include 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 TIA-606. Include manufacture date of cable with submittal.

b. Termination Hardware - A record of installed patch panels, cross-connect points, distribution frames, terminating block arrangements and type, and outlets shall be provided in accordance with TIA-606. Documentation shall include the required data fields as a minimum in accordance with TIA-606.

PART 2 PRODUCTS

2.1 COMPONENTS

Components shall be UL or third party certified. Where equipment or materials are specified to conform to industry and technical society reference standards of the organizations, submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance. 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. Provide a complete system of telecommunications cabling and pathway components using star topology. Provide support structures and pathways, complete with outlets, cables, connecting hardware and telecommunications cabinets/racks. Cabling and interconnecting hardware and components for telecommunications systems shall be UL listed or third party independent testing laboratory certified, and shall comply with NFPA 70 and conform to the requirements specified herein.

2.2 COMMUNICATIONS PATHWAY

Provide telecommunications pathways in accordance with TIA-569 and as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Provide system furniture pathways in accordance with UL 1286.

2.2.1 Pathways Aboard Camp Lejeune Greater Area, Including MCAS New River

Pathway shall be conduit, cable tray, or access flooring. Under floor duct and wire way shall not be used. Cantilever-type center hung tray or Poke-Thru devices shall not be used. J-hooks/ D-rings / bridal rings and other open face type cable pathways are not authorized except in minor renovations or to continue like existing system. Provide grounding and bonding as required by TIA J-STD-607-A. Cable tray wiring shall comply with NFPA 70. All conduits entering the communications room should be grouped and consolidated, conduits can be “Home Run” or stubbed to cable tray, all shall have bonding bushing / plastic insert, and shall extend

down from the ceiling 3 to 4 inches to ladder rack or onto the backboard, and will be bonded to the TMGB or TGB by a minimum number 6 green sheathed stranded conductors. All penetrations will be sealed in accordance with code (fire-stopping). A minimum of two 3 inch conduits overhead will be installed between the main communications room and other communication rooms (IDFs).

2.2.2 Work area Pathways

Comply with TIA-569, except minimum 1 1/4 inch diameter conduit will be used. System furniture pathways shall comply with UL 1286. Horizontal cabling for open offices shall comply with TIA TSB-75. In system furniture that blocks access to or is distant from the communications wall outlets: each system furniture desk/cubical shall be equipped with system furniture communications outlets that are plugged into the communications wall outlets. All ports should be extended into the furniture.

2.2.3 Pull Boxes

Construct of galvanized sheet steel with screw-fastened covers. Minimum size of boxes shall be not less than 5 inches wide by 5 inches in length by 2 7/8 inches deep for individual 1 1/4 inch diameter conduit; minimum size of boxes shall be not less than 12"W x 48"L x 5"D for 3" conduit, 15"W x 60"L x 8"D for 4" conduit per TIA-569. 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 sides of pull boxes as in a pull through, do not turn or change direction in pull boxes. Provide pull boxes in straight lengths of conduit. Electrical pull points, LC, LB, condo lets are not authorized.

2.3 COMMUNICATIONS OUTLET BOXES

Communications outlet boxes should be placed in all work areas and any area that can be converted to work areas; so any furniture package configuration will have a connection along the wall with a 6’ base cord. Good practice is 6” to the left or right of the out side edge of electrical outlet box in workable office areas or any area that could be converted into workable office area such as a large storage closet; also any conference room should have one floor and one ceiling box. Boxes shall be standard type 5 inches square by 2 7/8 inches deep for CAT6 with 1 1/4 inch diameter side knock-outs, with a single gang plaster ring. Mount flush in finished walls at height indicated by drawings. Outlet boxes for wall-mounted telephones shall be 2 by 4 by 2 1/8 inches deep with 1 CAT6 cable terminated in a standard CAT6 wall phone plate; mounted at ADA required height. Outlet boxes for work counter area shall be mounted at a height 48 inches above finished floor. Outlet boxes installed for CCTV and CATV should also contain 2 CAT 6 cables. Outlet boxes installed in floor for classrooms or open spaces shall be communications floor boxes large enough to support a surge of users with proper cable protection and ports that are not parallel to the floor. Floor boxes and under slab cabling should not be used on the first floor 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 open office spaces.

2.4 COMMUNICATIONS CABLING

Cabling shall be UL listed for the application and shall comply with

TIA-568-C.0, TIA-568-C.1, TIA-568-C.2, TIA-568-C.3 and NFPA 70. Provide a labeling system in accordance with the manufacture and local AHJ guidance for cabling as required by TIA-606 and UL 969. Confirm labeling is compatible with Base Telephone requirements. Ship cable on reels or in boxes bearing manufacture date for for unshielded/shielded twisted pair (UTP/STP) in accordance with ICEA S-90-661 and optical fiber cables in accordance with ICEA S-83-596 for all cable used on this project. Cabling manufactured more than 12 months prior to date of installation shall not be used.

2.4.1 Backbone Cabling

2.4.1.1 Backbone Copper

Copper backbone cable shall be solid conductor, 24 AWG, 100 ohm, 25 to 100-pair, Category 3, UTP, in accordance with ICEA S-90-661, TIA-568-C.1, TIA-568-C.2 and UL 444, formed into 25 pair binder groups covered with a gray thermoplastic jacket and overall metallic shield if required for additional protection. A minimum of two conductor twists per foot is required. Cable shall be imprinted with manufacturers name or identifier, flammability rating, gauge of conductor, transmission performance rating (category designation) at regular length marking intervals in accordance with ICEA S-90-661 . Sufficient pair count CAT 3/5 riser (25, 50, 100, 200..) and two 4 pair 24 AWG Category 6 riser (CMR) rated cable will be installed between the MDF and each of the IDF's. Provide plenum (CMP), riser (CMR), or general purpose (CM or CMG)communications rated cabling in accordance with NFPA 70. Voice riser shall be terminated on suitable insulation displacement contact cross connect blocks and two CAT6 in the patch panels last position. Substitution of a higher rated cable shall be permitted in accordance with NFPA 70. Any backbone copper run in under slab conduit shall be rated for outdoor use in accordance with AHJ and have lightning protection at both ends.

2.4.1.2 Backbone Optical Fiber

Provide in accordance with ICEA S-83-596, TIA-568-C.3, UL 1666 and NFPA 70. Cable shall be imprinted with fiber count, fiber type and aggregate length at regular intervals not to exceed 40 inches.

Provide the number of strands indicated, (but not less than 12 strands of each single and multi modebetween the main telecommunication room and each of the other communication rooms or secure racks), of single-mode(OS1), tight buffered fiber optic cable.

Provide the number of strands indicated, (but not less than 12 strands between the main communication room and each of the other communications rooms and secure racks), of tight buffered fiber optic multimode, 62.5/125-um diameter(OM1) cable, conforming to TIA-492AAAA.

Provide plenum (OFNP), riser (OFNR), or general purpose (OFN or OFNG) rated non-conductive, fiber optic cable in accordance with NFPA 70. Substitution of a higher rated cable shall be permitted in accordance with NFPA 70. The cable cordage jacket, fiber, unit, and group color shall be in accordance with TIA/EIA-598.

2.4.2 Horizontal Cabling

Provide horizontal cable in compliance with NFPA 70 and performance

characteristics in accordance with TIA-568-C.1.

2.4.2.1 Horizontal Copper

Provide a minimum of four horizontal copper cables to each work area outlet (faceplate), UTP, 100 ohm in accordance with TIA-568-C.2, UL 444, ANSI/NEMA WC 66, ICEA S-90-661 . Provide four each individually twisted pair, minimum size 24 AWG conductors, Category 6 or 6A, with a green thermoplastic jacket. Cable shall be imprinted with manufacturers name or identifier, flammability rating, gauge of conductor, transmission performance rating (category designation) and length marking at regular intervals in accordance with ICEA S-90-661. Provide plenum (CMP), riser (CMR), or general purpose (CM or CMG) communications rated cabling in accordance with NFPA 70. Substitution of a higher rated cable shall be permitted in accordance with NFPA 70. Cables installed in conduit within and under slabs are not recommend but can be used if approved by local AHJ and shall be UL listed and labeled for wet locations in accordance with NFPA 70. **Contact AHJ for special requirements on classified service, unofficial service, under slab cabling, using water block, and any item not covered in this document.**

2.4.2.2 Horizontal Optical Fiber

Provide optical fiber horizontal cable in accordance with ICEA S-83-596and TIA-568-C.3. Cable shall be tight buffered, multimode, 62.5.125-um diameter, OM1, single-mode, 8/125-um diameter, OS1. Cable shall be imprinted with manufacturer, flammability rating and fiber count at regular intervals not to exceed 40 inches.

Provide plenum (OFNP), riser (OFNR), or general purpose (OFN or OFNG) rated non-conductive, fiber optic cable in accordance with NFPA 70. Substitution of a higher rated cable shall be permitted in accordance with NFPA 70.Cables installed in conduit within and under slabs be UL listed and labeled for wet locations in accordance with NFPA 70. The cable jacket shall be of single jacket construction with color coding of cordage jacket, fiber, unit, and group in accordance with TIA/EIA-598.

2.4.3 Work Area Cabling

2.4.3.1 Work Area Copper

Provide work area copper cable in accordance with TIA-568-C.2, with a green thermoplastic jacket.

Communications CAT6 twisted pair shall have a minimum of 6 inch slack cable loosely coiled into the communications outlet boxes. Minimum manufacturer's bend radius for each type of cable shall not be exceeded. All communications work area outlet boxes should have 4 cables to a double gang box (no rough in or future use allowed).

2.4.3.2 Work Area Optical Fiber

Provide optical work area cable in accordance with TIA-568-C.3.

2.5 TELECOMMUNICATIONS SPACES

Provide connecting hardware and termination equipment in the

communications entrance facility and communication equipment rooms to facilitate installation as shown on design drawings for terminating and cross-connecting permanent cabling. Space shall be a minimum 8' x 10' unless a local waiver is provided by the AHJ (authority having jurisdiction) which is the Telecommunications Support Division (TSD) aboard Camp Lejeune. Communications room could be much larger depending on building size, usable square footage served, and customer requirements. Communications rooms shall be centrally located unless multiple rooms are used. Access to Rooms shall be from a common area such as a hallway / open office door shall swing out. Additional/ Multiple communications 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 communications outlet, including slack and vertical distance, exceeds 295 feet. Multiple communications rooms and IDFs shall be connected by a minimum of two 3 inch conduits overhead. The minimum clear height in the room shall be 2.4 m (8 ft) without obstructions. The height between the finished floor and the lowest point of the ceiling should be a minimum of 3 m (10 ft) to accommodate overhead pathways. The flooring shall be sealed concrete to reduce dust and static electricity; no carpet or tile. Two separate dedicated 20 amp electrical outlet will be installed for each communications equipment rack needed. Dedicated outlets and conduits shall be installed on the longest farthest wall from the door, same wall as the communications backboard. There should not be an electrical panel within the communications room unless it serves only the room. The room requires a lockable door keyed or key padded to restrict access to MCIEAST-MCB G-6 personnel only. Room shall not have any windows or skylights. At least one wall, where the point of presence is, should be covered with fire rated plywood backboard for mounting equipment; additional boards may be needed for mounting additional equipment. Light, as measured within the communications room, should be a minimum of 500 lx (50 foot-candles). Lighting design should seek to minimize shadows within the telecommunications room (minimum two light fixtures). Equipment not related to the support of the communications room (e.g., piping, ductwork, pneumatic tubing) shall not be installed in, pass through, or enter the telecommunications room. Provide telecommunications interconnecting hardware color coding in accordance with TIA-606.

2.5.1 Backboards

Provide void-free, interior grade A-C plywood 3/4 inch thick 4 by 8 feet as indicated. Backboards shall be fire rated by manufacturing process. Fire stamp shall be clearly visible. Backboards shall be provided on a minimum of two adjacentwalls in the telecommunication spaces.

2.5.2 Equipment Support Frame

Provide in accordance with ECA EIA/ECA 310 and UL 50. Steel construction shall be treated to resist corrosion.

a. Bracket, wall mounted, (for buildings with very low jack/pair count and no secured electronic equipment requirement), 8 gauge aluminum. Provide hinged bracket compatible with 19 inches panel mounting and must be in a secured communications room.

b. Racks, wall or floor mounted modular type, 16 gauge steel construction, minimum, treated to resist corrosion. Provide rack with vertical and horizontal cable management channels, top and bottom cable troughs, grounding lug and a surge protected power strip with 6 duplex 20 amp receptacles. Racks shall be enough to support all

telephone / data equipment required plus 25 percent spare and shall have a maximum of 7’ height. Rack shall be compatible with 19 inches panel mounting and must be in a secured communications room. Recommend SIEMON’s RS3-07-S or equivalent approved by AHJ.

c. Cabinets, freestanding modular type, 16 gauge steel or 11 gauge aluminum construction , minimum, treated to resist corrosion. Cabinet shall have removable and lockable side panels, front and rear doors, and have adjustable feet for leveling. All cabinets shall be keyed to current TSD key and large enough to support all telephone / data equipment required in the building plus 25% for future expansion. Recommend CPI or equivalent approved by AHJ. Dedicated electrical outlets should be installed within the cabinet. A backboard for mounting equipment is still needed when a cabinet is installed. Cabinet shall be vented in the roof and rear door. Cabinet shall have cable access in the roof and base and be compatible with 19 inches panel mounting. Provide cabinet with grounding bar, mounted 550 CFM fan with filter and a surge protected power strip with 6 duplex 20 amp receptacles.

d. Cabinets, wall-mounted modular type, 16 gauge steel or 11 gauge aluminum construction, minimum, treated to resist corrosion. Cabinet shall have lockable front and rear doors, louvered side panels, 250 CFM mounted fan, ground lug, and top and bottom cable access. Cabinets shall be no smaller than 24"W X 48"H X 30"D shall be keyed to current TSD key and large enough to support all telephone / data equipment required in the building plus 25% for future expansion. Recommend CPI or equivalent approved by AHJ. Dedicated electrical outlets should be installed within the cabinet. A backboard for mounting equipment is still needed when a cabinet is installed. Cabinet shall be compatible with 19 inches panel mounting. All cabinets shall be keyed alike. A surge protected power strip with 6 duplex 20 amp receptacles shall be provided within the cabinet.

2.5.3 Connector Blocks

Provide insulation displacement connector (IDC) Type 110 for Category 6 systems. Provide blocks for the number of horizontal and backbone cables terminated on the block plus 25 percent spare. For Camp Lejeune greater area; Recommend Krone blocks' 6652-1-880-10 or equivalent approved by AHJ, for Category 5 and higher systems. Provide blocks for the number of backbone cables terminated on the block plus 25 percent spare. Also provide sufficient blocks for cross connects for all IDFs. Blocks shall be mounted on an 89D style bracket on rack or in cabinet.

2.5.4 Building Protector Assemblies

Building protector assembly are required on all OSP cables and shall have 710 type connector blocks for connection to the exterior cable at full capacity. M150-66 type IDC for connection to the voice cross connect blocks. 110 type IDC is not approved. For Central office a R399 type central office protector shall be used.

2.5.5 Cable Guides

Provide cable guides specifically manufactured for the purpose of routing cables, wires and patch cords horizontally and vertically on 19 inches equipment racks, cabinets, and telecommunications backboards. Cable guides of ring or bracket type devices mounted on rack, cabinet, panels,

and backboard for horizontal cable management and individually mounted for vertical cable management. Mount cable guides with screws and/or nuts and lock washers, cable guides are not to be used outside of the communications room.

2.5.6 Patch Panels

Provide ports for the number of horizontal and backbone cables terminated on the panel plus 25 percent spare. Provide pre-connectorized ST type optical fiber and CAT 6 copper patch cords for patch panels. Provide patch cords, as complete assemblies, with matching connectors as specified. Provide fiber optic patch cables with crossover orientation in accordance with TIA-568-C.3. Patch cords shall meet minimum performance requirements specified in TIA-568-C.1, TIA-568-C.2 and TIA-568-C.3 for cables, cable length and hardware specified.

2.5.6.1 Modular to 110 Block Patch Panel

Provide in accordance with TIA-568-C.1 and TIA-568-C.2. Panels shall be third party verified and shall comply with EIA/TIACategory 6/6A requirements. Panel shall be constructed of 0.09 inches minimum aluminum and shall be cabinet/ rack mounted and compatible with an ECA EIA/ECA 310 19 inches equipment rack. Panel shall provide 48 non-keyed, 8-pin dualmodular (8P8C) ports, wired to T568A. Patch panels shall terminate the building cabling on Type 110 IDCs and shall utilize a printed circuit board interface. C6-C6-Recommend Siemon's CT Couplers, CT-F-XX or equivalent approved by AHJ. The rear of each panel shall have incoming cable strain-relief and routing guides; DO NOT USE ZIP TIES. Panels shall have each port factory numbered and be equipped with laminated plastic nameplates above each port.

2.5.6.2 Fiber Optic Patch Panel

Provide panel for maintenance and cross-connecting of optical fiber cables. Panel shall be constructed of 16 or 18 gauge steel or 11 gauge aluminum minimum and shall be cabinet/ rack mounted and compatible with a ECA EIA/ECA 310 19 inches equipment rack. Each panel shall provide multimode / single-mode adapters as required in SC format in accordance with TIA/EIA-604-2 with metallic alignment sleeves. Provide dust cover for unused adapters. The rear of each panel shall have a cable management tray a minimum of 8 inches 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.

2.5.7 Optical Fiber Distribution Panel

Cabinet/ Rack mounted optical fiber distribution panel (OFDP) shall be constructed in accordance with ECA EIA/ECA 310 utilizing 16 or 18 gauge steel or 11 gauge aluminum minimum. Panel shall be divided into two sections, distribution and user. Distribution section shall have strain relief, routing guides, splice tray and shall be lockable, user section shall have a cover for patch cord protection. Each panel shall provide multimode and single-mode adapters as required. Provide adapters as SC with metallic is the standard for Camp Lejeune alignment sleeves. Provide dust covers for adapters. Provide patch cords as specified in the paragraph PATCH PANELS.

2.6 TELECOMMUNICATIONS OUTLET/CONNECTOR ASSEMBLIES

2.6.1 Outlet/Connector Copper

Outlet/connectors shall comply with FCC Part 68, TIA-568-C.1, and TIA-568-C.2. UTP outlet/connectors shall be UL 1863 listed, non-keyed, 8-pin modular, dual molded 8P8C, constructed of high impact rated thermoplastic housing and shall be third party verified and shall comply with TIA-568-C.2 Category 6 requirements. Recommend SIEMON's CT couplers, CT-F-C6-C6-xx or **equivalent approved by AHJ**, of indicated color (normally ivory or white at work area and black in communications room) should match electrical face plate color and type. Outlet/connectors provided for UTP cabling shall meet or exceed the requirements for the cable provided. Outlet/connectors shall be terminated using a Type 110 IDC PC board connector, color-coded for both T568A and T568B wiring. Each outlet/connector shall be wired T568A. UTP outlet/connectors shall comply with TIA-568-C.2 for 750 mating cycles. UTP outlet/connectors installed in outdoor or marine environments shall be jell-filled type containing an anti-corrosive, memory retaining compound.

2.6.2 Optical Fiber Adapters(Couplers)

Provide optical fiber adapters suitable for SC in accordance with TIA/EIA-604-2 with metallic alignment sleeves as indicated. Provide dust cover for adapters. Optical fiber adapters shall comply with TIA-455-21 for 500 mating cycles.

2.6.3 Optical Fiber Connectors

Provide in accordance with TIA-455-21. Optical fiber connectors shall be SC in accordance with TIA/EIA-604-2 with metallic ferrule, epoxy less crimp style compatible with 62.5/125 multimode and 8/125 single-mode fiber. The connectors shall provide a maximum attenuation of 0.3 dB at 850/ 1300 and 1310/ 1550 nm with less than a 0.2 dB change after 500 mating cycles.

2.6.4 Cover Plates

Telecommunications cover plates shall comply with UL 514C, and TIA-568-C.1, TIA-568-C.2, TIA-568-C.3; flush or oversized design constructed of high impact thermoplastic material ivory, white in color to match color of receptacle switch cover plates specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM, color may be different for classified networks Red and Grey. Provide labeling in accordance with the paragraph LABELING in this section. Additionally, it shall be labeled as to its function with a blue computer icon on all even ports and a red phone icon on all the odd ports.

2.7 MULTI-USER TELECOMMUNICATIONS OUTLET ASSEMBLY (MUTOA)

Provide MUTOA(s) in accordance with TIA-568-C.1.

2.8 TERMINAL CABINETS

Construct of zinc-coated sheet steel, 36 by 24 by 6 inches deep, as indicated. Trim shall be fitted with hinged door and locking latch. Doors shall be maximum size openings to box interiors. Boxes shall be provided with 5/8 inch backboard with two-coat varnish finish. Match trim, hardware, doors, and finishes with panelboards. Provide label and

identification systems for telecommunications wiring and components consistent with TIA-606.

2.9 GROUNDING AND BONDING PRODUCTS

Provide in accordance with UL 467, TIA-607, and NFPA 70. Components shall be identified as required by TIA-606. Provide ground rods, bonding conductors, and grounding busbars as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. The preferred ground for the Telephone Main Grounding Bus (TMGB) bar will be to the Main electrical Distribution Panel (MDP) bus bar and building steel. In most cases; a #6 AWG bonding conductor is recommended for telecommunications. All grounding and bonding conductors within the Telecommunications room will be green sheathed copper conductor, stranded, and labeled as suitable for use as such and tagged "DO NOT REMOVE". All grounding and bonding conductors running out of or side of the Telecommunications room should be protected in conduit or attached to the outside of the cable tray and sized according to references. The minimum size of the TMGB shall be no smaller than 4" by 10" by 1/4 inch thick; bus bar should be factory made and factory drilled -not fabricated or drilled onsite. All bonding and grounding terminations shall be irreversible and secured with a double hole crimp termination. Do not exceed minimum bend radius on bonding and grounding conductors.

2.10 FIRESTOPPING MATERIAL

Provide as specified in Section 07 84 00 FIRESTOPPING.

2.11 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.

2.12 FIELD FABRICATED NAMEPLATES

ASTM D709. Provide laminated plastic nameplates for each equipment enclosure, relay, switch, and device; as specified 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 inches 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 inches high normal block style.

2.13 TESTS, INSPECTIONS, AND VERIFICATIONS

2.13.1 Factory Reel Tests

Provide documentation of the testing and verification actions taken by manufacturer to confirm compliance with TIA-568-C.1, TIA-568-C.2, TIA-568-C.3, TIA-526-7 for single mode optical fiber, and TIA-526-14 for multimode optical fiber cables.

PART 3 EXECUTION

3.1 INSTALLATION

Install communications cabling and pathway systems, including the

horizontal and backbone cable, pathway systems, communications outlet/connector assemblies, and associated hardware in accordance with NECA/BICSI 568, TIA-568-C.1, TIA-568-C.2, TIA-568-C.3, TIA-569, NFPA 70, manufacture instructions, current industry best practices, and UL standards as applicable. Provide cabling in a star topology network. Provide residential cabling in a star wiring architecture from the distribution device as required by TIA-570. Pathways and outlet boxes shall be installed as specified in this document and Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Standard type 5" x 5" x 2 7/8" square box with a single gang plaster ring shall be used except in concrete or concrete masonry units where a standard 4" and 11/16" square or a floor box will be used. Mount flush in finished walls at height indicated by drawings. Depth of boxes shall be large enough to allow manufacturer's recommended conductor bend radii normally 2 7/8". Install communications cabling with copper media in accordance with the following criteria to avoid potential electromagnetic interference between power and communications equipment. The interference ceiling shall not exceed 3.0 volts per meter measured over the usable bandwidth of the communications cabling (normal minimum clearance distances of 4 feet from motors, generators, frequency converters, transformers, x-ray equipment or uninterrupted power system, 300 mm (12 in) from power conduits and cable systems, 125 mm (5 inches) from fluorescent or high frequency lighting system fixtures. Cabling shall be run with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.

3.1.1 Cabling

Install UTP/STP, and optical fiber telecommunications cabling system as detailed in TIA-568-C.1, TIA-568-C.2, TIA-568-C.3, and TIA-570 for residential cabling. 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 6 UTP cables more than ½" (12 mm) from the point of termination to maintain cable geometry. Provide service loop on each end of the cable, minimum 10' (3 meters) in the telecommunications room, 6" (150mm) in or close to the work area outlet 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 25 pounds 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 hook and loop fasteners are allowed on Category 6 / 6A cable and optical fiber cable. DO NOT USE ZIP TIES. For UTP cable, bend radii shall not be less than four times the cable diameter. Cables shall be terminated; no cable shall contain unterminated elements (See NEC abandoned cabling). Cables shall not be spliced. Label cabling in accordance with paragraph LABELING in this section.

3.1.1.1 Open Cable

Use only where specifically indicated on plans for use in cable trays, or below raised floors. Install in accordance with TIA-568-C.1, TIA-568-C.2, and TIA-568-C.3. Do not exceed cable pull tensions recommended by the manufacturer. Copper cable not in a wire way or pathway shall be suspended a minimum of 8 inches above ceilings by cable supports no greater than 60 inches apart. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items. Placement of cable parallel to power conductors shall be avoided,

if possible; a minimum separation of 12 inches shall be maintained when such placement cannot be avoided.

Plenum cable shall be used where open cables are routed through plenum areas. Cable routed exposed under raised floors shall be plenum rated. Plenum cables shall comply with flammability plenum requirements of NFPA 70. Install cabling after the flooring system has been installed in raised floor areas. Cable 6 feet long shall be neatly coiled not less than 12 inches in diameter below each feed point in raised floor areas.

3.1.1.2 Backbone Cable

a. Copper Backbone Cable. Install intrabuilding backbone copper cable, in minimum 2-way 3 inch conduit or larger indicated pathways, between the campus distributor, located in the communications entrance facility or room, the building distributors and the floor distributors located in communications rooms and communications equipment rooms as indicated on drawings.

b. Optical fiber Backbone Cable. Install intrabuilding backbone optical fiber in indicated pathways (normal in in one of multiple interducts installed in conduit so as to maximize pathways). Do not exceed manufacturer's recommended bending radii and pull tension. Prepare cable for pulling by cutting outer jacket 10 inches leaving strength members exposed for approximately 10 inches. Twist strength members together and attach to pulling eye. Vertical cable support intervals shall be in accordance with manufacturer's recommendations.

3.1.1.3 Horizontal Cabling

Install horizontal cabling as indicated in the spec and on drawings Do not untwist Category 6 UTP cables more than one half inch from the point of termination to maintain cable geometry. Provide slack cable in the form of a figure eight or large service loop on each end of the cable (prevent inductance caused by small coils), 10 feet in the telecommunications room, and 6 inches in the work area outlet.

3.1.2 Pathway Installations

Provide in accordance with TIA-569 and NFPA 70, except that 1 1/4 inch diameter conduit from cable tray or telecommunication room backboard to each work area outlet is required. Provide building pathway as specified in the spec and Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

Conceal conduit within finished walls, ceilings, and floors (not in wet areas). Keep conduit minimum 12 inches away from parallel runs of electrical power equipment, flues, steam, light ballast, 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 as if exposed. Install no more than two 90 degree bends for a single horizontal cable run. All bends/turns in conduits will be in straight runs of conduit; a pull box shall be installed after every 180 degrees of bends or 100’; in no case will a turn be made within a pull box. The minimum size for a pull box for a single 1¼” conduit will be 5" long by 5" wide by 2 7/8" deep, and for a 3” conduit 30”W x 54”L x9”D. All conduits should contain a bushing at the end to protect the cable from damage and required bonding. Pull points, LC, LB, condo lets, and consolidation points are not authorized.

Under floor cabling, under floor duct, and conduit under floor slabs should be avoided in the Camp Lejeune Greater area due to wet area close to coastal waters.

3.1.3 Service Entrance Conduit, Overhead

Provide service entrance overhead as specified in this spec and Section 26 20 00 INTERIOR DISTRIBUTION SYSTEMS.

Ensure entrance fitting or weather head is sized to ensure min bend radius for largest cable is maintained.

3.1.4 Service Entrance Conduit, Underground

Provide service entrance underground as specified in this spec and Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

Underground portion shall be encased in minimum of 3 inches of concrete extending from the building entrance to OSP demarcation point and shall be a minimum of 18 inches below slab or grade. Location of entrance conduit in communications room should be to the left of the longest furthest wall from the door.

3.1.5 Cable Tray Installation

Install cable tray as specified in this spec and Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Only CMP and OFNP type cable shall be installed in a plenum.

A continuous stranded bonding conductor shall be run on the outside along the tray tapped to each section to ensure bonding. Remove all sharps from cable tray and pathways. Ensure bonding is on the pathway so as not to obstruct horizontal cabling.

3.1.6 Work Area Outlets

3.1.6.1 Terminations

Terminate UTP cable in accordance with TIA-568-C.1, TIA-568-C.2 and wiring configuration as specified. Terminate fiber optic cables in accordance with TIA-568-C.3

All work areas will contain a minimum of two communications face plates. Any work area larger than 80 sq feet will require additional face plates to service any work location in the room within 6 feet of a faceplate. This also applies to any area that could be converted to work space in the future. Recommend a communications outlet box 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 a storage closet; All work area face plates will contain four category 6 jacks terminated with T568A configuration unless otherwise approved by AHJ.

3.1.6.2 Cover Plates

As a minimum, each outlet/connector shall be labeled as to its function and a unique number to identify cable link in accordance with the paragraph LABELING in this section. (For secured networks contact AHJ as shielded twisted pair and color coded face plates may be necessary).

3.1.6.3 Cables

Unshielded/shielded twisted pair and fiber optic cables shall have a minimum of 6 inches of slack cable loosely coiled into the communications outlet boxes or in cable tray as close as possible to outlet box. Minimum manufacturer's bend radius for each type of cable shall not be exceeded.

3.1.6.4 Pull Cords

Pull cords shall be installed in conduit serving communications outlets that do not have cable installed (this is not normal as all outlets should be cabled).

3.1.6.5 Multi-User Telecommunications Outlet Assembly (MUTOA)

Run horizontal cable in the ceiling and terminate each cable on a MUTOA in each individual zone. MUTOAs shall not be located in ceiling spaces, or any obstructed area. MUTOAs shall not be installed in furniture unless that unit of furniture is permanently secured to the building structure. MUTOAs shall be located in an open work area so that each furniture cluster is served by at least one MUTOA. The MUTOA shall be limited to serving a maximum of six work areas. Maximum work area cable length requirements shall also be taken into account. MUTOAs must be labeled to include the maximum length of work area cables. MUTOA labeling is in addition to the labeling described in TIA-606, or other applicable cabling administration standards. Work area cables extending from the MUTOA to the work area device must also be uniquely identified and labeled.

3.1.7 Communications Space Termination

Install termination hardware required for Category 6 and optical fiber system. An manufacture approved insulation displacement tool shall be used for terminating copper cable to insulation displacement connectors.

3.1.7.1 Connector Blocks

Connector blocks shall be cabinet/rack mounted, as approved by the AHJ, in orderly rows and columns. Adequate vertical and horizontal wire routing areas shall be provided between groups of blocks. Install in accordance with industry standard wire routing guides in accordance with TIA-569.

3.1.7.2 Patch Panels

Patch panels shall be mounted in equipment cabinets/racks with sufficient ports to accommodate the installed cable plant plus 25 percent spares.

a. Copper cable entering a patch panel shall be secured to the panel with hook and loop ties and as recommended by the manufacturer to prevent movement of the cable.

b. Fiber Optic Patch Panel. Fiber optic cable loop shall be 3 feet in length provided as recommended by the manufacturer. The outer jacket of each cable entering a patch panel shall be secured to the panel to prevent movement of the fibers within the panel, using clamps or brackets specifically manufactured for that purpose.

3.1.7.3 Equipment Support Frames

Install in accordance with TIA-569:

a. Bracket, wall mounted. Mount bracket to plywood backboard in accordance with manufacturer's recommendations. Mount so height of highest panel does not exceed 78 inches above floor. Mount so there is sufficient space remaining on backboard to mount lightning protection, bonding, and cable managers or install additional backboards.

b. Racks, floor mounted modular type. Permanently anchor rack to the floor in accordance with manufacturer's recommendations. Install sections of ladder rack anchored to telephone rack/ cabinet and at least two walls.

c. Cabinets, freestanding modular type. Permanently anchor to the floor in accordance with manufacturer's recommendations. When cabinets are connected together, remove adjoining side panels for cable routing between cabinets. Mount rack mounted fan in cabinet. Install sections of ladder rack anchored to telephone rack/ cabinet and at least two walls.

d. Cabinets, wall-mounted modular type. Mount cabinet to plywood backboard in accordance with manufacturer's recommendations. Mount cabinet so height of highest panel does not exceed 78 inches above floor. Mount so there is sufficient space remaining on backboard to mount lightning protection, bonding, and cable managers or install additional backboards.

3.1.8 Electrical Penetrations

Seal openings around electrical penetrations through fire resistance-rated wall, partitions, floors, or ceilings as specified in Section 07 84 00 FIRESTOPPING.

3.1.9 Grounding and Bonding

Provide in accordance with TIA-607, NFPA 70 and as specified in this spec and Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM except only two hole compression lugs will be accepted.

3.2 LABELING

3.2.1 Labels

Provide labeling in accordance with TIA-606 except jacks will be numbered in a logical, sequential, clockwise numbering system from 1 to X with a closet designator. Example would be 145 C 146, would be the 145th & 146th jacks from the C comm. room. All labels shall be numbered with manufacture's labeling system (not fabricated) and be equipped with laminated plastic cover. All terminations that are not to work area outlets should be in the last patch panel locations and labeled accordingly i.e. DDC, FACP, Elevator, Wall phones, or Wireless access points.

3.2.2 Cable

Cables shall be labeled using color labels on both ends with identifiers

in accordance with TIA-606.

3.2.3 Termination Hardware

Workstation outlets and patch panel connections shall be labeled using manufacturing labeling system, color coded labels with identifiers in accordance with this spec and TIA-606. Coordinate with Base Telephone.

3.3 FIELD APPLIED PAINTING

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 Section 09 90 00 PAINTS AND COATINGS.

3.3.1 Painting Backboards

Camp Lejeune no longer paints backboards as fire rated plywood is available manufactured fire retardant backboard shall be used, so as not to increase flame spread and smoke density and must be appropriately labeled. Label and fire rating stamp must be visible.

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 TESTING

3.5.1 Communications Cabling Testing

Perform communications cabling inspection, verification, and performance tests in accordance with TIA-568-C.1, TIA-568-C.2, TIA-568-C.3 and AHJ local. Test equipment shall conform to TIA-1152. Perform optical fiber field inspection tests via attenuation measurements on factory reels and provide results along with manufacturer certification for factory reel tests. Remove failed cable reels from project site upon attenuation test failure.

3.5.1.1 Inspection

Visually inspect all communications cabling jacket materials for UL or third party certification markings. Inspect cabling terminations in communications rooms and at workstations to confirm color code for T568A pin assignments, and inspect cabling connections to confirm compliance with TIA-568-C.1, TIA-568-C.2, TIA-568-C.3, and TIA-570 for residential cabling. Visually confirm Category 6, marking of outlets, cover plates, outlet/connectors, cable physical damage, and patch panels.

3.5.1.2 Verification Tests

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 all terminations are complete but prior to being cross-connected.

For multimode optical fiber, perform optical fiber end-to-end attenuation tests in accordance with TIA-568-C.3 and TIA-526-14 using Method A with power meter and light source for optical fiber validate / troubleshoot failures with Method B. For single-mode optical fiber of sufficient distance (normally OSP), perform optical fiber end-to-end attenuation tests in accordance with TIA-568-C.3 and TIA-526-7 using Method B, OTDR for single-mode optical fiber. Perform verification acceptance tests.

3.5.1.3 Performance Tests

Provide summary in .pdf (hard and soft copy) detailed tester results in test format .flw (soft copy only), and fiber power meter/OTDR reports (summary hard copy and detailed soft copy). All Test reports should have a building or project number on it. The final QC and certification of installation will be performed by TSD after the contractor has provided passing and acceptable results on all test and as-built drawings showing all telecommunications outlets and their numbers to include any empty conduit or ports coiled in overhead for future use and all building automated system ports such as DDC, Elevator, FACP, or WAPs. Test results that are a marginal may not be accepted. Also fiber tests that pass the link budget but exceed tolerance on any connector or splice are considered a failure. All discrepancies need to be repaired and retested.

Perform testing for each outlet and MUTOA as follows:

a. Perform Category 6 link tests in accordance with TIA-568-C.1 and TIA-568-C.2. Tests shall include wire map, length, insertion loss, NEXT, PSNEXT, ELFEXT, PSELFEXT, return loss, propagation delay, and delay skew.

. Optical fiber Links. Perform optical fiber end-to-end link tests in accordance with TIA-568-C.3.

3.5.1.4 Final Verification Tests

Perform verification tests for all copper and optical fiber systems after the complete communications cabling and workstation outlet/connectors are installed.

a. Voice Tests. These tests assume that dial tone service has been installed (normally only done for FACP, Elevator, or emergency phones). 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.

b. Data Tests. These tests assume the Information Technology Staff has a network installed and are available to assist with testing (normally this is only done for VTC, CCTV). Connect to the network interface device at the demarcation point. Log onto the network to ensure proper connection to the network.

-- End of Section --

SECTION 28 31 49

CARBON MONOXIDE DETECTORS
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.

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2017; ERTA 1-2 2017; TIA 17-1; TIA 17-2; TIA 17-3; TIA 17-4; TIA 17-5; TIA 17-6; TIA 17-7; TIA 17-8; TIA 17-9; TIA 17-10; TIA 17-11; TIA 17-12; TIA 17-13; TIA 17-14) National Electrical Code

UNDERWRITERS LABORATORIES (UL)

UL 2034	(2017) UL Standard for Safety Single and Multiple Station Carbon Monoxide Alarms

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Carbon monoxide detector

SD-06 Test Reports

Carbon monoxide detector test

SD-10 Operation and Maintenance Data

Carbon monoxide detector; Data Package 1

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

PART 2 PRODUCTS

2.1 CARBON MONOXIDE DETECTOR

UL 2034, Single station detector surface mounted. Operational requirements shall be as follows:

a. Electrical: 24 volt DC

b. Environmental: 32 degrees to 120 degrees F.

c. Alarm and Indicator: Red LED for visual and 85 db at 10 ft for audible alarm. Malfunction indicator light shall be yellow or amber LED. Power on indicator light shall be white or green for 120 Volt AC powered units, while operating on AC power.

d. Alarm reset/silence button: Provide a manually operated alarm reset and silence button. Pressing the button shall silence the alarm, and reset the detector. Alarm shall resound within 6 minutes if CO level remains at or above 70 ppm.

e. Battery removal flag: Provide a warning flag that will be exposed while the battery is removed, and hidden while the battery is installed.

2.2 CONDUIT, BOXES, AND FITTINGS

Specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

2.3 WIRES AND CABLES

Specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Electrical work

Electrical installation shall conform to the requirements of Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM and NFPA 70.

3.1.2 Carbon Monoxide Detector

Install detectors in accordance with the manufacturer's instructions. Provide detector in locations as indicated.

3.1.3 Grounding and Bonding

Equipment grounding and bonding shall be in accordance with UL 2034 and NFPA 70.

3.2 FIELD QUALITY CONTROL

Provide test equipment and personnel and submit written copies of the test results. Notify Contracting Officer 15 working days prior to the test.

3.2.1 Carbon Monoxide Detector Test

Contractor shall show by demonstration in service that the detectors are in good condition and properly performing the intended function. Test shall be in accordance with UL 2034 requirements specified in paragraph entitled "Normal Operation Test" and the manufacturer's test procedure .

-- End of Section --

SECTION 28 31 76

INTERIOR FIRE ALARM AND FUTURE MASS NOTIFICATION SYSTEM
08/11

PART 1 GENERAL

1.1 RELATED SECTIONS

Section 26 00 00 BASIC ELECTRICAL MATERIALS AND METHODS, applies to this section, with the additions and modifications specified herein. In addition, refer to the following sections for related work and coordination:

Section 21 13 13.00 10 WET PIPE SPRINKLER SYSTEM, FIRE PROTECTION

Section 28 31 49 CARBON MONOXIDE DETECTORS

Section 07 84 00 FIRESTOPPING for additional work related to firestopping.

1.2 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.

ACOUSTICAL SOCIETY OF AMERICA (ASA)

ASA S3.2	(2009; R2014) Method for Measuring the Intelligibility of Speech Over Communication Systems (ASA 85)

FM GLOBAL (FM)

FM APP GUIDE	(updated on-line) Approval Guide http://www.approvalguide.com/

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C62.41.1	(2002; R 2008) Guide on the Surges Environment in Low-Voltage (1000 V and Less) AC Power Circuits
IEEE C62.41.2	(2002) Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits

INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC)

IEC 60268-16	(2003; R4.0) Sound System Equipment - Part 16: Objective Rating Of Speech Intelligibility By Speech Transmission Index

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 7240-16	(2007) Fire Detection And Alarm Systems — Part 16: Sound System Control And Indicating Equipment
ISO 7240-19	(2007) Fire Detection and Alarm Systems — Part 19: Design, Installation, Commissioning and Service of Sound Systems for Emergency Purposes

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 170	(2018) Standard for Fire Safety and Emergency Symbols
NFPA 70	(2017; ERTA 1-2 2017; TIA 17-1; TIA 17-2; TIA 17-3; TIA 17-4; TIA 17-5; TIA 17-6; TIA 17-7; TIA 17-8; TIA 17-9; TIA 17-10; TIA 17-11; TIA 17-12; TIA 17-13; TIA 17-14) National Electrical Code
NFPA 72	(2016) National Fire Alarm and Signaling Code
NFPA 90A	(2018) Standard for the Installation of Air Conditioning and Ventilating Systems
NFPA 720	(2015) Standard for the Installation of Carbon Monoxide (CO) Detection and Warning Equipment

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-601-02	(2010) Operations and Maintenance: Inspection, Testing, and Maintenance of Fire Protection Systems

UNDERWRITERS LABORATORIES (UL)

UL 1480	(2016; Reprint Sep 2017) Standard for Speakers for Fire Alarm, Emergency, and Commercial and Professional Use
UL 1638	(2016; Reprint Sep 2017) Visual Signaling Appliances - Private Mode Emergency and General Utility Signaling
UL 1971	(2002; Reprint Oct 2008) Signaling Devices for the Hearing Impaired
UL 2017	(2008; Reprint Jan 2016) General-Purpose Signaling Devices and Systems
UL 268	(2016; Reprint Jul 2016) Smoke Detectors for Fire Alarm Systems
UL 464	(2016; Reprint Sep 2017) Standard for Audible Signal Appliances

UL 864	(2014) Standard for Control Units and Accessories for Fire Alarm Systems
UL Electrical Constructn	(2012) Electrical Construction Equipment Directory
UL Fire Prot Dir	(Current) Fire Protection Equipment Directory

1.3 DEFINITIONS

Wherever mentioned in this specification or on the drawings, the equipment, devices, and functions shall be defined as follows:

a. Interface Device: An addressable device that interconnects hard wired systems or devices to an analog/addressable system.

b. Remote Fire Alarm and Mass Notification Control Unit: A control panel, electronically remote from the fire alarm and mass notification control panel, that receives inputs from automatic and manual fire alarm devices; may supply power to detection devices and interface devices; may provide transfer of power to the notification appliances; may provide transfer of condition to relays or devices connected to the control unit; and reports to and receives signals from the fire alarm control panel.

c. Fire Alarm Control Unit and Mass Notification Autonomous Control Unit(FMCP): A master control panel having the features of a fire alarm control unit and mass notification control unit are interconnected. The panel has central processing, memory, input and output terminals, and LCD, LED Display units.

d. Terminal Cabinet: A steel cabinet with locking, hinge-mounted door that terminal strips are securely mounted.

1.4 SYSTEM DESCRIPTION

1.4.1 Scope

a. This work includes demolition of the existing fire alarm system, completion of design and installation of a new fire alarm system to be readily upgradeable to interface with a future individual building mass notification system as described herein and on the contract drawings for Building AS4135. Include in the system 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 system complete and ready for fire alarm operation.

b. Provide equipment, materials, installation, workmanship, inspection, and testing in strict accordance with the required and advisory provisions of NFPA 72, ISO 7240-16, IEC 60268-16, except as modified herein. The system layout on the drawings show the intent of coverage and are shown in suggested locations. Submit 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. Final quantity, system layout, and coordination are the responsibility of the Contractor.

1.4.2 Technical Data and Computer Software

Technical data and computer software (meaning technical data that relates to computer software) that are specifically identified in this project, and may be defined/required in other specifications, shall be delivered, strictly in accordance with the CONTRACT CLAUSES. Identify data delivered 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:

a. Identification of programmable portions of system equipment and capabilities.

b. Description of system revision and expansion capabilities and methods of implementation detailing both equipment and software requirements.

c. Provision of operational software data on all modes of programmable portions of the fire alarm and detection system.

d. Description of Fire Alarm and Mass Notification Control Panel equipment operation.

e. Description of auxiliary and remote equipment operations.

f. Library of application software.

g. Operation and maintenance manuals.

1.4.3 Keys

Keys and locks for equipment shall be identical. Provide not less than six keys of each type required. Master all keys and locks to a single key as required by the local AHJ.

1.5 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Nameplates
Wiring Diagrams
System Layout
System Operation
Notification Appliances
Amplifiers

SD-03 Product Data

Technical Data And Computer Software
Fire Alarm Control Unit and Mass Notification Control Unit (FMCP)
Terminal cabinets
Manual stations
Transmitters (including housing)
Batteries
Battery chargers
Smoke sensors
Duct smoke detectors
Notification appliances
Addressable interface devices
Amplifiers
Tone generators
Digitalized voice generators
Carbon Monoxide Detectors
Digital alarm communicator transmitter (DACT)

SD-05 Design Data

Battery power
Battery chargers

SD-06 Test Reports

Field Quality Control
Testing Procedures
Smoke sensor testing procedures

SD-07 Certificates

Installer
Formal Inspection and Tests
Final Testing

SD-09 Manufacturer's Field Reports

System Operation
Fire Alarm/Mass Notification System

SD-10 Operation and Maintenance Data

Operation and Maintenance (O&M) Instructions
Instruction of Government Employees

SD-11 Closeout Submittals

As-Built Drawings

1.6 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. The supervising equipment is existing and consists of a Sur-Gard System III Digital Alarm Communicator Receiver which receives signals via contact ID protocol.

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.

c. Devices and equipment for fire alarm service shall be listed by UL Fire Prot Dir or approved by FM APP GUIDE.

1.6.1 Qualifications

1.6.1.1 Design Services

Installations requiring completion of installation drawings and specification or modifications of fire detection, fire alarm, or 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 a registered professional engineer (P.E.) in fire protection engineering.

1.6.1.2 Supervisor

NICET Fire Alarm Technicians to perform the installation of the system. A NICET Level 4 Fire Alarm Technician shall supervise the installation of the fire alarm system/mass notification system. A Fire Alarm Technician with a minimum of 8 years of experience shall perform/supervise the installation of the fire alarm/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.

1.6.1.3 Technician

Fire Alarm Technicians with a minimum of four years of experience utilized to install and terminate fire alarm 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.

1.6.1.4 Installer

NICET Level II technician to assist in the installation of fire alarm/mass notification devices, cabinets and panels. An electrician shall be allowed to install wire, cable, conduit and backboxes for the fire alarm/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.

1.6.1.5 Test Personnel

Fire Alarm Technicians with a minimum of eight years of experience (NICET Level III)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.

1.6.1.6 Manufacturer's Representative

The fire alarm and mass notification equipment manufacturer's representative shall be present for the connection of wiring to the control panel. The Manufacturer's Representative shall be an employee of the manufacturer with necessary technical training (NICET Level III,)on the system being installed.

1.6.1.7 Manufacturer

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.

1.6.2 Regulatory Requirements

1.6.2.1 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 APP GUIDE. Where the terms "listed" or "approved" appear in this specification, they shall mean listed in UL Fire Prot Dir or FM APP GUIDE. 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.

1.6.2.2 Fire Alarm/Mass Notification System

Furnish equipment that is compatible and is UL listed, FM approved, or listed by a nationally recognized testing laboratory for the intended use. All listings by testing laboratories shall be from an existing ANSI or UL published standard. Submit a unique identifier for each device, including the control panel and initiating and indicating devices, 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. Include the NFPA 72 Record of Completion and NFPA 72 Inspection and Testing Form, with the appropriate test reports.

1.6.2.3 Fire Alarm Testing Services or Laboratories

Construct fire alarm and fire detection equipment in accordance with UL Fire Prot Dir, UL Electrical Constructn, or FM APP GUIDE.

1.7 DELIVERY, STORAGE, AND HANDLING

Protect equipment delivered and placed in storage from the weather, humidity, and temperature variation, dirt and dust, and other contaminants.

1.8 OPERATION AND MAINTENANCE (O&M) INSTRUCTIONS

Submit 6 copies of the Operation and Maintenance Instructions, indexed and in booklet form. 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. 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. All data (devices, testing frequencies, etc.) shall comply with UFC 3-601-02.

1.9 EXTRA MATERIALS

1.9.1 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.

1.9.2 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.

1.9.3 Spare Parts

Furnish the following spare parts and accessories:

a. Four fuses for each fused circuit

b. One of each type of notification appliance in the system (e.g. speaker, FA/MNS strobe, etc.)

c. One of each type of initiating device included in the system (e.g.

smoke detector, carbon monoxide detector, manual station, etc.)

1.9.4 Parts List

Furnish a list, in duplicate, of all other parts and accessories which the manufacturer of the system recommends to be stocked for maintenance.

1.9.5 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.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

Submit annotated catalog data as required in the paragraph SUBMITTAL, 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. Also provide UL or FM listing cards for equipment provided.

2.1.1 Standard Products

Provide materials, equipment, and devices that have been tested by a nationally recognized testing laboratory, such as UL or FM Approvals, LLC (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.

2.1.2 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. In addition, provide a nameplate with the manufacturer and model number permanently affixed to the front of the FACP that is visible without opening the enclosure. Major components include, but are not limited to, the following:

a. FMCPs

b. Automatic transmitter

c. Terminal Cabinet

Furnish nameplate illustrations and data 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.

2.2 GENERAL PRODUCT REQUIREMENT

All fire alarm 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 2017 shall be done in a laboratory listed configuration, if the software programming features cannot provide a listed interface control. If a field modification is needed, such as adding equipment like relays, the manufacturer of the panels being same or different brand the manufacturer shall provide the proposed configuration to the installing contractor for review and confirmation by the installing contractor. As part of the submittal documents, provide this information.

2.3 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, NFPA 720, UL 864, 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 control panel is reset and restored to normal. The system may be placed in the alarm mode by local microphones or remotely from authorized locations/users.

Submit 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. Submit a complete description of the system operation in matrix format on the drawings. Submit a complete list of device addresses and corresponding messages.

2.3.1 Alarm Initiating Devices and Notification Appliances (Visual, Voice, Textural)

a. Connect alarm initiating devices to signal line circuits (SLC) Class "B" and installed in accordance with NFPA 72.

b. Connect alarm notification appliances and speakers to notification appliance circuits (NAC) Class "B".

c. The system shall operate in the alarm mode upon actuation of any alarm initiating device or a future mass notification signal. The system shall remain in the alarm mode until initiating device(s) or future mass notification signal is/are reset and the control panel is manually reset and restored to normal. Audible, and visual appliances and systems shall comply with NFPA 72 and as specified herein. Fire alarm system/mass notification system components requiring power, except for the control panel power supply, shall operate on 24 Volts dc.

2.3.2 Functions and Operating Features

The system shall provide the following functions and operating features:

a. The FMCP 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 signaling line circuits for the network.

c. Provide notification appliance circuits. The visual alarm notification appliances shall have the flash rates synchronized as required by NFPA 72.

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 program capability via switches in a locked portion of the FMCP to bypass the automatic notification appliance circuits, and fire reporting system or features. Operation of this programming shall indicate this action on the FMCP display.

g. Provide alarm verification capability for smoke sensors. Alarm verification shall initially be set for 20 seconds.

h. Alarm, supervisory, and/or trouble signals shall be automatically transmitted to the supervising station.

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. Where the fire alarm/mass notification system is responsible for initiating an action in another emergency control device or system, such as an HVAC system , the addressable fire alarm relay shall be in the vicinity of the emergency control device.

n. An alarm signal shall automatically initiate the following functions:

(1) Transmission of an alarm signal to the supervising station.

(2) Visual indication of the device operated on the control panel (FMCP), and sound the audible alarm at the respective panel.

(3) Continuous actuation of all alarm notification appliances.

(4) Recording of the event via electronically in the history log of the fire control system unit.

(5) Operation of a duct smoke sensor shall shut down the appropriate air handler in accordance with NFPA 90A in addition to other requirements of this paragraph and as allowed by NFPA 72.

(6) Operation of a sprinkler waterflow switch shall operate the local sprinkler alarm bell and activate audible and visual fire alarm devices in addition to other requirements of this paragraph.

o. A supervisory signal shall automatically initiate the following functions:

(1) Visual indication of the device operated on the FMCP, and sound the audible alarm at the respective panel.

(2) Transmission of a supervisory signal to the supervising station.

(3) Recording of the event electronically in the history log of the control unit.

p. A trouble condition shall automatically initiate the following functions:

(1) Visual indication of the system trouble on the FMCP, and sound the audible alarm at the respective panel.

(2) Transmission of a trouble signal to the supervising station.

(3) Recording of the event in the history log of the control unit.

q. The maximum permissible elapsed time between the actuation of an initiating device and its indication at the FACP is 10 seconds.

r. The maximum elapsed time between the occurrence of the trouble condition and its indication at the FACP is 200 seconds.

2.4 SYSTEM MONITORING

2.4.1 Valves

Each valve affecting the proper operation of a fire protection system, including automatic sprinkler control valves, sprinkler service entrance valve, 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. Provide each tamper switch with a separate address.

2.5 FUTURE MASS NOTIFICATION SYSTEM FUNCTIONS

2.5.1 Notification Appliance Network

The audible notification appliance network consists of speakers located to provide intelligible instructions at areas as indicated. The future Mass Notification System announcements shall take priority over all other audible announcements of the system including the output of the fire alarm system in a normal or alarm state. When a future mass notification

announcement is activated during a fire alarm, all fire alarm system functions shall continue in an alarm state except for the output signals of the fire alarm audible and visual notification appliances.

2.5.2 Strobes

Provide strobes to alert hearing-impaired occupants. Fire Alarm strobes are to be utilized as MNS strobes.

2.5.3 Wide Area MNS

The Wide Area MNS system (if available) in the area of the building shall not be activated by the in-building MNS.

2.5.4 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.

2.5.5 Installation-Wide Control

If an installation-wide control system for mass notification exists on the base, the autonomous control unit shall communicate with the central control unit of the installation-wide system. The autonomous control unit shall receive commands/messages from the central control unit and provide status information.

2.6 OVERVOLTAGE AND SURGE PROTECTION

2.6.1 Signaling Line Circuit Surge Protection

For systems having circuits located outdoors, communications equipment shall be protected against surges induced on any signaling line circuit and shall comply with the applicable requirements of IEEE C62.41.1 and IEEE C62.41.2. Cables and conductors, that serve as communications links, shall have surge protection circuits installed at each end that meet the following waveform(s):

a. A 10 microsecond by 1000 microsecond waveform with a peak voltage of 1500 volts and a peak current of 60 amperes.

b. An 8 microsecond by 20 microsecond waveform with a peak voltage of 1000 volts and a peak current of 500 amperes. Protection shall be provided at the equipment. Additional triple electrode gas surge protectors, rated for the application, shall be installed on each wireline circuit within 3 feet of the building cable entrance. Fuses shall not be used for surge protection.

2.6.2 Sensor Wiring Surge Protection

Digital and analog inputs and outputs shall be protected against surges induced by sensor wiring installed outdoors and as shown. The inputs and outputs shall be tested with the following waveforms:

a. A 10 by 1000 microsecond waveform with a peak voltage of 1500 volts and a peak current of 60 amperes.

b. An 8 by 20 microsecond waveform with a peak voltage of 1000 volts and a peak current of 500 amperes. Fuses shall not be used for surge protection.

2.7 ADDRESSABLE INTERFACE DEVICES

The initiating device being monitored shall be configured as a Class "B" initiating device circuits. The system shall be capable of defining any module as an alarm module and report alarm trouble, loss of polling, or as a supervisory module, and reporting supervisory short, supervisory open or loss of polling such as waterflow switches, valve supervisory switches, etc. The module shall be UL or FM listed as compatible with the control panel. The monitor module shall provide address setting means compatible with the control panel's SLC supervision and store an internal identifying code. Monitor module shall contain an integral LED that flashes each time the monitor module is polled and is visible through the device cover plate. Pull stations with a monitor module in a common backbox are not required to have an LED.

2.8 ADDRESSABLE CONTROL MODULE

The control module shall be capable of operating as a relay (dry contact form C) for interfacing the control panel with other systems. The module shall be UL or FM listed as compatible with the control panel. The indicating device or the external load being controlled shall be configured as a Class "B" notification appliance circuits. The system shall be capable of supervising, audible, visual and dry contact circuits. The control module shall have both an input and output address. The supervision shall detect a short on the supervised circuit and shall prevent power from being applied to the circuit. The control model shall provide address setting means compatible with the control panel's SLC supervision and store an internal identifying code. The control module shall contain an integral LED that flashes each time the control module is polled and is visible through the device cover plate. Control Modules shall be located in environmental areas that reflect the conditions to which they were listed.

2.9 SMOKE SENSORS

2.9.1 Duct Smoke Detectors

Provide detectors installed in ducts of the ionization or photoelectric type and listed by UL or FM for duct installation. Control and power modules required for operation shall be integral with the main control panel. Detectors and associated modules shall be compatible with the main control panel and shall be suitable for use in a supervised circuit. Detector circuits shall be of the 4-wire type whereby the detector operating power is transmitted over conductors separate from the initiating circuit. Malfunction of the electrical circuits to the detector or its control or power modules shall cause operation of the system trouble signals. Provide a separate, fused power circuit for each smoke detection initiating circuit (zone). Failure of the power circuit shall be indicated as a trouble condition on the corresponding initiating circuit. Provide duct detectors in accordance with NFPA 90A. Provide duct detectors with an approved duct housing, mounted exterior to the

duct, with perforated sampling tubes extending across the width of the duct. Activation of duct detectors shall cause shutdown of the associated air handling unit, annunciation at the control panel, and tripping of the master box and sounding of building evacuation alarms. Each detector shall have a visible indicator lamp that shall flash when the detector is in the normal standby mode and shall glow continuously when the detector is activated. Provide remote indicator lamp for each detector. Permanently label remote indicator with description or number of associated air handling unit(s). Provide each detector with a remote test switch. Mount switch not more than 6 feet above finish floor. Permanently label test switch with description or number of associated air handling unit(s).

2.9.2 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.)

2.9.2 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. In addition to the NFPA 72 requirements, smoke detector sensitivity shall be tested during the preliminary tests.

2.10 CARBON MONOXIDE DETECTORS

Building has a gas fired boiler in mechanical room: See Section 28 31 49 Carbon Monoxide Detectors. Additional gas-fired heaters will be in the shop work areas.

2.11 ELECTRIC POWER

2.11.1 Primary Power

Power shall be 120 VAC service for the FMCP from the AC service to the building in accordance with NFPA 72.

2.12 SECONDARY 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.

2.12.1 Batteries

Provide sealed gel cell (valve-regulated lead acid) batteries as the source for emergency power to the FMCP. 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.

2.12.1.1 Capacity

Battery size shall be of 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 60 minutes.

Fire alarm transmitter shall be provided with standby battery capacity with sufficient power to operate the transmitter for at least 72 hours with alarm transmitting capabilities during that period.

2.12.1.2 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. Include ampere-hour requirements for each system component and each panel component, and compliance with UL 864.

(2) Provide complete battery calculations for both the alarm, alert, and supervisory power requirements. Submit ampere-hour requirements for each system component 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.

2.12.2 Battery Chargers

Provide a solid state, fully automatic, variable charging rate battery charger. The charger shall be capable of providing 120 percent of the connected system load and shall maintain the batteries at full charge. In the event the batteries are fully discharged (20.4 Volts dc), the charger shall recharge the batteries back to 95 percent of full charge within 48 hours after a single discharge cycle as described in paragraph CAPACITY above. 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.

2.13 FIRE ALARM CONTROL UNIT AND MASS NOTIFICATION CONTROL UNIT (FMCP)

Provide a complete control panel fully enclosed in a lockable steel cabinet 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 cabinets shall match exactly.

a. 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.

b. Visual indication of alarm, supervisory, or trouble initiation on the fire alarm control panel shall be by liquid crystal display or similar means. The LCD text display size shall meet the requirements of Chapter 24 of NFPA 72. At least two lines of information with a minimum of 20 characters per line displayed. The total number of characters shall be 80 minimum. Text shall be no less than the height requirements in Table 18.9.4.7 of NFPA 72 and color/contrast requirements of 18.9.4 of NFPA 72.

c. The future mass notification control unit shall have the capability of temporarily deactivate the fire alarm audible notification appliances while delivering voice messages.

d. Provide secure operator console for initiating recorded messages, strobes and displays; and for delivering live voice messages. Provide capacity for at least eight 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.

2.13.1 Cabinet

Install control panel components in cabinets 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 1 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.

2.13.2 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 resistors, if any, on screw terminals in the FACP. Circuits operating at 24 VDC shall not operate at less than the UL listed voltage at the sensor or appliance connected. Circuits operating at any other voltage shall not have a voltage drop exceeding 10 percent of nominal voltage.

2.13.3 Silencing Switches

2.13.3.1 Alarm Silencing Switch

Provide an alarm silencing switch at the FMCP that shall silence the audible and visual. This switch shall be overridden upon activation of a subsequent alarm.

2.13.3.2 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.

2.13.4 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 FMCP after the initiating device or devices have been restored to normal.

2.13.5 Audible Notification System

The Audible 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 eight distinct sounds for tone signaling, and the incorporation of a voice module for delivery of prerecorded messages. Audible appliances shall produce a temporal code 3 tone for three cycles followed by a voice message that is repeated until the control panel is reset or silenced. Automatic messages shall be broadcast through speakers throughout the building/facility. A live voice message shall override the automatic audible output through use of a microphone input at the control panel.

a. When using the microphone, live messages shall be broadcast throughout the building. The system shall be capable of operating all speakers at the same time. 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 code 3 temporal tone to take over all functions assigned to the failed unit in the event an alarm is activated.

b. The future Mass Notification functions shall override the manual or automatic fire alarm notification or Public Address (PA) functions. Other fire alarm functions including transmission of a signal(s) to the fire department shall remain operational. The system shall have the capability of utilizing LOC with redundant controls of the notification system control panel. 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. 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.

c. Speaker placement/installation shall ensure that a CIS value greater than the required minimum value is provided in each area where building occupants typically are found as indicated on the drawings. The minimum required value is 0.7 CIS.

2.13.5.1 Outputs and Operational Modules

All outputs and operational modules shall be fully supervised with on-board diagnostics and trouble reporting circuits. Provide form "C" contacts for system alarm and trouble conditions. Provide circuits 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.

2.13.5.2 Mass Notification

a. Mass Notification functions shall take precedence over all other function performed by the Audible Notification System. Messages shall utilize a female voice and shall be similar to the following:

(1) 1000 Hz tones (as required in 18.4.2.1 of NFPA 72)

(2) "May I have your attention. May I have your attention. An fire emergency has been reported in the building. Please leave the building by the nearest exit." (Provide a 2 second pause.) "May I have your attention, (repeat the message)."

(3) "May I have your attention. May I have your attention. A carbon monoxide emergency has been reported in the building. Please leave the building by the nearest exit." (Provide a 2 second pause.) (repeat the message)

b. Include Coordinate ALL installation specific message voice messages with the Contracting officer.

2.13.6 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.

2.13.7 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.

2.13.8 Input/Output Modifications

The FMCP 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 FMCP.

2.13.9 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.

2.13.10 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 FMCP. 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.

2.13.11 Walk Test

The FACP shall have a walk test feature. When using this feature, operation of initiating devices shall result in limited system outputs, so

that the notification appliances operate for only a few seconds and the event is indicated in the history of the panel, but no other outputs occur.

2.13.12 History Logging

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.

2.14 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 remote FMCP, terminal cabinet, or in the FMCP. Submit 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.

2.14.1 Operation

The system shall automatically operate and control all building speakers.

2.14.2 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.

2.14.3 Inputs

Equip each system with separate inputs for 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.

2.14.4 Tone Generators

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 generators shall produce a code 3 temporal tone and a code 4 temporal tone. The tone shall be constantly repeated until interrupted by either the digitalized voice message, the microphone input, or the alarm silence mode as specified. 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.

2.14.5 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 in the system, and other actions for trouble conditions as specified.

2.15 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 at 48 inches. Stations shall have a separate screw terminal for each conductor.

2.16 NOTIFICATION APPLIANCES

2.16.1 Fire Alarm/Mass Notification Speakers

Audible appliances shall conform to the applicable requirements of UL 464. Appliances shall be connected into notification appliance circuits. Surface mounted audible appliances shall be painted red or white. Recessed audible appliances shall be installed with a grill that is painted red or 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 70.7 VRMs and 25 VRMs, by means of selectable tap settings. Tap settings shall include taps of 1/8, 1/4, 1/2, 1, and 2 watt. Speakers shall incorporate a high efficiency speaker for maximum output at minimum power across a frequency range of 150 Hz to 10,000 Hz, 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 unit. All inputs shall be polarized for compatibility with standard reverse polarity supervision of circuit wiring via the FMCP.

b. Provide speaker mounting plates constructed of cold rolled steel having a minimum thickness of 16 gauge or molded high impact plastic 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.

c. Speakers shall utilize screw terminals for termination of all field wiring.

2.16.2 Visual Notification Appliances

Visual notification appliances shall conform to the applicable requirements of UL 1971 and conform to the Architectural Barriers Act (ABA). Colored lens, such as amber, 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 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 15 candela (actual

output after derating for tinted lens) based on the UL 1971 test. Strobe shall be surface or semi-flush mounted. Where more than two appliances are located in the same room or corridor or field of view, provide synchronized operation. Devices shall use screw terminals for all field wiring.

2.17 ENVIRONMENTAL ENCLOSURES OR GUARDS

Environmental enclosures shall be provided to permit Fire Alarm or Mass Notification components to be used in areas that exceed the environmental limits of the listing. The enclosure shall be listed for the device or appliance as either a manufactured part number or as a listed compatible accessory for the UL category that the component is currently listed. Guards required to deter mechanical damage shall be either a listed manufactured part or a listed accessory for the category of the initiating device or notification appliance.

2.18 AUTOMATIC FIRE TRANSMITTERS

2.18.1 Digital Alarm Communicator Transmitter (DACT)

Provide a print reporting DACT that is compatible with the existing supervising station fire alarm system and is programmed to report by points to the Sur-Gard System III Digital Alarm Communicator Receiver at the supervising station. 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.

a. Operation: Each transmitter shall operate from 120-volt ac power. In the event of 120-volt ac power loss, the transmitter shall automatically switch to battery operation. Switchover shall be accomplished with no interruption of protective service, and shall automatically transmit a trouble message. Upon restoration of ac power, transfer back to normal ac power supply shall also be automatic.

b. Battery Power: Transmitter standby battery capacity shall provide sufficient power to operate the transmitter in a normal standby status for a minimum of 72 hours and be capable of transmitting alarms during that period.

c. Transmitter housing shall be NEMA Type 1. The housing shall contain a lock that is keyed identical to the fire alarm system for the building.

2.18.2 Signals to Be Transmitted to the Base Receiving Station

The following signals shall be sent to the base receiving station:

a. Sprinkler water flow

b. Manual pull stations

c. Smoke detectors

d. Carbon Monoxide Detector

e. Sprinkler valve supervision

2.19 WIRING

Provide wiring materials under this section as specified in Section 26 20 00INTERIOR DISTRIBUTION SYSTEM with the additions and modifications specified herein. All fire alarm cables are to be installed in metallic conduit.

2.19.1 Alarm Wiring

The SLC wiring shall be solid copper cable in accordance with the manufacturers requirements. Copper signaling line circuits and initiating device circuit field wiring shall be No. 16 AWG size twisted solid conductors at a minimum. Visual notification appliance circuit conductors, that contain audible alarm appliances, shall be solid copper No. 16 AWG size conductors at a minimum. Speaker circuits shall be copper No. 16 AWG size twisted 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 the UL listed voltages for the sensors and/or appliances. Power wiring, operating at 120 VAC minimum, shall be a minimum No. 12 AWG solid copper having similar insulation. Acceptable power-limited cables are FPL, FPLR or FPLP as appropriate with red colored covering. Nonpower-limited cables shall comply with NFPA 70.

PART 3 EXECUTION

3.1 INSTALLATION OF FIRE ALARM INITIATING DEVICES AND NOTIFICATION APPLIANCES

3.1.1 FMCP

Locate the 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 FMCP.

3.1.2 Manual Stations:

Locate manual stations as required by NFPA 72 and as 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.

3.1.3 Notification Appliance Devices

Locate notification appliance devices as required by NFPA 72 and to provided intended coverage as indicated on contract drawings. Mount assemblies on walls as required by NFPA 72 and to meet the intelligibility requirements. Ceiling mounted speakers shall conform to NFPA 72.

3.1.4 Smoke and Carbon Monoxide Detectors

Locate sensors as required by NFPA 72 and their listings and as indicated on a 4 inch mounting box. Locate smoke and CO sensors on the ceiling. Smoke sensors are permitted to be on the wall no lower than 12 inches from the ceiling with no minimum distance from the ceiling. Install smoke

sensors no closer than 5 feet from air handling supply outlets. Install carbon monoxide detectors no closer than 10 feet from fuel fire appliances.

3.1.5 Water Flow Detectors and Tamper Switches

Connect to water flow detectors and tamper switches.

3.2 SYSTEM FIELD WIRING

3.2.1 Wiring within Cabinets, Enclosures, and Boxes

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 screw-type terminal blocks. Mark each terminal in accordance with the wiring diagrams of the system. The use of wire nuts or similar devices is prohibited. Conform wiring to NFPA 70.

Indicate the following in the wiring diagrams.

a. 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.

b. 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.

3.2.2 Terminal Cabinets

Provide a terminal cabinet at the base of any circuit riser, on each floor at each riser, and where indicated on the drawings. Terminal size shall be appropriate for the size of the wiring to be connected. Conductor terminations shall be labeled and a drawing containing conductors, their labels, their circuits, and their interconnection shall be permanently mounted in the terminal cabinet. Minimum size is 8 inches by 8 inches. Only screw-type terminals are permitted.

3.2.3 Alarm Wiring

Voltages shall not be mixed in any junction box, housing, or device, except those containing power supplies and control relays. Provide all wiring in electrical metallic conduit.

3.2.4 Conductor Terminations

Labeling of conductors at terminal blocks in terminal cabinets and FMCP, 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 and FMCP 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.

3.3 DISCONNECTION AND REMOVAL OF EXISTING SYSTEM

Once the new system is completed, tested, and accepted by the Government, it shall be placed in service and connected to the station fire alarm system.

a. After acceptance of the new system by the Contracting Officer, remove existing equipment not connected to the new system if not reused, remove unused exposed conduit, and restore damaged surfaces. Remove the material from the site and dispose.

b. Disconnect and remove the existing fire alarm and smoke detection systems where indicated and elsewhere in the specification.

c. Control panels and fire alarm devices and appliances disconnected and removed shall be turned over to the Contracting Officer.

d. Properly dispose of fire alarm outlet and junction boxes, wiring, conduit, supports, and other such items.

3.4 CONNECTION OF NEW SYSTEM

The following new system connections shall be made during the last phase of construction, at the beginning of the preliminary tests. New system connections shall include:

a. Connection of new system transmitter to existing base fire reporting system.

Once these connections are made, system shall be left energized and new audio/visual devices deactivated. Report immediately to the Contracting Officer, coordination and field problems resulting from the connection of the above components.

3.5 FIRESTOPPING

Provide firestopping for holes at conduit penetrations through floor slabs, fire rated walls, partitions with fire rated doors, corridor walls, and vertical service shafts in accordance with Section 07 84 00 FIRESTOPPING.

3.6 PAINTING

Paint exposed electrical, fire alarm conduit, and surface metal raceway to match adjacent finishes in exposed areas. Paint junction boxes red in unfinished areas and conduits and surface metal raceways shall be painted with a 1-inch wide red band every 10 feet in unfinished areas. Painting shall comply with Section 09 90 00 PAINTS AND COATINGS. Paint all fire alarm junction boxes and covers red in unfinished areas (i.e.above ceilings, mechanical rooms, etc). In finished areas, conduit and junction boxes can be painted to match the room finish, the inside cover of the junction box must be identified as “Fire Alarm” and the conduit must have painted red bands 3/4-inch wide at 10 foot centers and at each side of a floor, wall, or ceiling penetration.

3.7 FIELD QUALITY CONTROL

3.7.1 Testing Procedures

Submit 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 30 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; similar to the form in NFPA 72) and shall be used for the preliminary testing and the acceptance testing. The test data forms shall record the test results and shall:

a. Identify the NFPA Class of all Initiating Device Circuits (IDC), Notification Appliance Circuits (NAC), Voice Notification System Circuits (NAC Audio), and Signaling Line Circuits (SLC).

b. 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.

c. 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.

d. Identify all test equipment and personnel required to perform each test (including equipment necessary for testing smoke detectors using real smoke).

e. 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.

3.7.2 Tests Stages

3.7.2.1 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.

3.7.2.2 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.

3.7.2.3 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. Furnish instruments and personnel required for the tests. A final acceptance test will not be scheduled until the following are provided at the job site:

a. The systems manufacturer's technical representative

b. Marked-up red line drawings of the system as actually installed

c. Megger test results

d. Loop resistance test results

e. Complete program printout including input/output addresses

The final tests will 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.

3.7.2.4 System Acceptance

Following acceptance of the system, as-built drawings and O&M manuals shall be delivered to the Contracting Officer for review and acceptance. Submit six sets of detailed as-built drawings. 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.

a. Furnish one set of CD or DVD discs containing software back-up and CAD based drawings in latest version of AutoCAD and DXF format of as-built drawings and schematics.

b. Include complete wiring diagrams showing connections between devices and equipment, both factory and field wired.

c. Include a riser diagram and drawings showing the as-built location of devices and equipment.

3.7.3 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. Megger Tests: After wiring has been installed, and prior to making any connections to panels or devices, wiring shall be megger tested for insulation resistance, grounds, and/or shorts. Conductors with

300 volt rated insulation shall be tested at a minimum of 250 VDC. Conductors with 600 volt rated insulation shall be tested at a minimum of 500 VDC. The tests shall be witnessed by the Contracting Officer and test results recorded for use at the final acceptance test.

b. 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.

c. 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.

d. Verify that the control unit is in the normal condition as detailed in the manufacturer's O&M manual.

e. Test each initiating device and notification appliance 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 except that, for item 12(e) (Supervision) in Table 14.4.2.2, disconnect at least 20 percent of devices. If there is a failure at these devices, then supervision shall be tested at each device.

f. Test the system for specified functions in accordance with the contract drawings and specifications and the manufacturer's O&M manual.

g. 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.

h. Determine that the system is operable under trouble conditions as specified.

i. Visually inspect wiring.

j. Test the battery charger and batteries.

k. 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.

l. Verify that red-line drawings are accurate.

m. Measure the current in circuits to ensure there is the calculated spare capacity for the circuits.

n. Measure voltage readings for circuits to ensure that voltage drop is not excessive.

o. 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 or the use of canned smoke which is permitted.

p. Measure the voltage drop at the most remote appliance (based on wire

length) on each notification appliance circuit.

3.7.3.1 Intelligibility Tests

Intelligibility testing of the System shall be accomplished in accordance with NFPA 72 for Voice Evacuation Systems, IEC 60268-16, and ASA S3.2. Following are the specific requirements for intelligibility tests:

a. Intelligibility Requirements: Verify intelligibility by measurement after installation.

b. Ensure that a CIS value greater than the required minimum value is provided in each area where building occupants typically could be found. The minimum required value for CIS is 0.7.

c. Areas of the building provided with hard wall and ceiling surfaces (such as metal or concrete) that are found to cause excessive sound reflections may be permitted to have a CIS score less than the minimum required value if approved by the DOD installation, and if building occupants in these areas can determine that a voice signal is being broadcast and they must walk no more than 33 feet to find a location with at least the minimum required CIS value within the same area.

d. Areas of the building where occupants are not expected to be normally present are permitted to have a CIS score less than the minimum required value if personnel can determine that a voice signal is being broadcast and they must walk no more than 50 feet to a location with at least the minimum required CIS value within the same area.

e. Take measurements near the head level applicable for most personnel in the space under normal conditions (e.g., standing, sitting, sleeping, as appropriate).

f. The distance the occupant must walk to the location meeting the minimum required CIS value shall be measured on the floor or other walking surface as follows:

(1) Along the centerline of the natural path of travel, starting from any point subject to occupancy with less than the minimum required CIS value.

(2) Curving around any corners or obstructions, with a 12 inches clearance there from.

(3) Terminating directly below the location where the minimum required CIS value has been obtained.

Use commercially available test instrumentation to measure intelligibility as specified by ISO 7240-19 and ISO 7240-16 as applicable. Use the mean value of at least three readings to compute the intelligibility score at each test location.

3.8 INSTRUCTION OF GOVERNMENT EMPLOYEES

3.8.1 Instructor

Include in the project the services of an instructor, who has 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 system. 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. Submit the instructors information and qualifications including the training history.

3.8.2 Required Instruction Time

Provide 6 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.

3.8.2.1 Technical Training

Equipment manufacturer or a factory representative shall provide 1 days of on site Training shall allow for classroom instruction as well as individual hands on programming, troubleshooting and diagnostics exercises. Training shall occur within 2 months of system acceptance.

3.9 Technical Data and Computer Software

Provide, in manual format, lesson plans, operating instructions, maintenance procedures, and training data 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. Any proprietary equipment and proprietary software needed by technicians to implement future changes to fire alarm system shall be provided as part of the contract. Maintenance software required and provided as part of the contract shall not be required and provided as part of this contract shall not require any type of annual license agreement or annual cost to continue use of the software or any updates. The software that is provided will continue to operate during the entire lifetime of the installed equipment without any additional cost to the government.

-- End of Section --

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		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 &	1.2														
			Acceptance of Military Real															
			Property															
		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														
			Complete Submittal Package	1.6.1														
		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	1.7.1.4														
			SD-06 Test Reports															
			Reports	1.14														
			Accident Reports	1.14.1														
			Monthly Exposure Reports	1.14.3														
			Regulatory Citations and	1.14.4														
			Violations															

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		01 35 29	Crane Reports	1.14.5															
			SD-07 Certificates																
			Confined Space Entry Permit	1.11															
			Certificate of Compliance	1.14.6															
			Third Party Certification of	1.14.7															
			Barge-Mounted Mobile Cranes																
		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	1.4.2															
			waste																
			Environmental training	1.2															
			documentation																
			Permit to transport hazardous	1.4.3															
			waste																
			Hazardous waste certification	1.4.4															
			Annual Report of Products	2.1															
			Containing Recovered Materials																

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		01 78 00	SD-10 Operation and Maintenance															
			Data															
			Equipment/product warranty list	1.4.1														
			SD-11 Closeout Submittals															
			As-built drawings	1.2.1														
			Record of materials	1.2.2														
			Maximo requirements	1.3														
			Complete Submittal Package	1.6														
			Equipment/product warranty tag	1.4.2														
		01 78 23	SD-10 Operation and Maintenance															
			Data															
			O&M Database	1.4														
			Training Plan	3.1.1														
			Training Outline	3.1.3														
			Training Content	3.1.2														
			SD-11 Closeout Submittals															
			Training Video Recording	3.1.4														
			Validation of Training Completion	3.1.6														
		01 78 30.00 22	SD-11 Closeout Submittals															
			GIS Data Deliverables	1.3.7														
		02 41 00	SD-01 Preconstruction Submittals															
			Demolition Plan	1.2.1														
			Existing Conditions	1.9														
			SD-07 Certificates															
			Notification	1.6														
		02 84 16	SD-07 Certificates															

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		02 84 16	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	3.5.3.1															
		03 30 04	SD-03 Product Data																
			Air-Entraining Admixture	2.1.3.1															
			Water-Reducing or Retarding Admixture	2.1.3.3															
			Curing Materials	2.1.9															
			Reinforcing Steel	2.1.5															
			Expansion Joint Filler Strips, Premolded	2.1.6															
			SD-06 Test Reports																
			Aggregates	2.1.2															
			Concrete Mixture Proportions	1.3.2															
			SD-07 Certificates																
			Cementitious Materials	2.1.1															
			Aggregates	2.1.2															
		05 40 00	SD-02 Shop Drawings																

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		05 40 00	Framing Components	1.6.1															
			SD-03 Product Data																
			studs,joists	2.1															
			SD-07 Certificates																
			Welds	3.1.1															
		06 10 00	SD-02 Shop Drawings																
			Structural glued laminated	2.2.3															
			Fabricated structural members	1.8.1															
			Modifications of structural	1.8.2															
			members																
			Nailing Strips	2.5.3.1															
			SD-03 Product Data																
			Underlayment	2.4															
			Engineered wood products	2.1.1															
			Structural-use	1.4.4															
			SD-05 Design Data																
			Modifications of structural	1.8.2															
			members																
			SD-06 Test Reports																
			Preservative-treated	1.4.5															
			SD-07 Certificates																
			Certificates of grade	1.8.3															
			Preservative treatment	1.7															
		06 20 00	SD-02 Shop Drawings																
			Detail Drawings	1.3															
			SD-04 Samples																

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		06 20 00	Fascias and Trim	2.3														
			SD-07 Certificates															
			Certificates of grade	1.4														
			Certificates of compliance	1.4														
		07 42 13	SD-01 Preconstruction Submittals															
			Qualification of Manufacturer	1.5.3														
			Qualification of Installation	1.5.4														
			Contractor															
			Qualification of Welders	1.5.4.1														
			Warranty	1.8														
			SD-02 Shop Drawings															
			Installation Drawings	1.5.1.1														
			SD-03 Product Data															
			Wall Panels	2.2.1														
			Factory Color Finish	2.2.2														
			Closure Materials	1.5.5														
			Pressure Sensitive Tape	2.5.4.4														
			Sealants and Caulking	2.5.4.1														
			Galvanizing Repair Paint	1.5.3.1														
			Enamel Repair Paint	1.5.3.1														
			Accessories	1.5.5														
			Accessories	2.5														
			SD-04 Samples															
			Wall Panels	2.2.1														
			Fasteners	1.5.3.1														
			Metal Closure Strips	2.5.3														

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		07 42 13	Color chart	2.2.2.5															
			SD-05 Design Data																
			Wind load design analysis	1.5.1.2															
			SD-06 Test Reports																
			Leakage Tests	3.7.2															
			Wind Load Tests	1.3.2															
			Coating	2.2.2.6															
			Chalking	2.2.2.6															
			Seismic Tests	1.3.2															
			SD-07 Certificates																
			Coil Stock	1.5.3.1															
			Fasteners	1.5.3.1															
			Galvanizing Repair Paint	1.5.3.1															
			Enamel Repair Paint	1.5.3.1															
			SD-08 Manufacturer’s Instructions																
			Installation	3.3															
			SD-09 Manufacturer’s Field																
			Reports																
			Manufacturer's Field Reports	3.8.1															
			SD-11 Closeout Submittals																
			Warranty	1.8															
			Maintenance Instructions	1.5.6															
			20 year 'No Dollar Limit' warranty	1.8.1															
			for labor and material																
		07 84 00	SD-02 Shop Drawings																
			Firestopping System	2.1															

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		07 84 00	SD-03 Product Data																
			Firestopping Materials	2.2															
			SD-06 Test Reports																
			Inspection	3.3															
			SD-07 Certificates																
			Inspector Qualifications	1.5.2															
			Firestopping Materials	2.2															
			Installer Qualifications	1.5.1															
		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	2.2															
			Doors	2.2															
			Frames	2.5															
			Frames	2.5															
			Accessories	2.3															
			Weatherstripping	2.7															
			SD-03 Product Data																
			Doors	2.2															
			Frames	2.5															
			Accessories	2.3															

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		08 11 13	Weatherstripping	2.7															
		08 21 00	SD-02 Shop Drawings																
			Doors	2.1															
			SD-03 Product Data																
			Doors	2.1															
			Accessories	2.2															
			Water-resistant sealer	2.3.7															
			warranty	1.4															
			Fire resistance rating	2.1.2															
			SD-04 Samples																
			Doors	2.1															
			Door finish color	2.3.6.2															
			SD-06 Test Reports																
			Split resistance	2.4															
			Cycle-slam	2.4															
			Hinge loading resistance	2.4															
		08 33 23	SD-02 Shop Drawings																
			Overhead Coiling Doors	2.1															
			Counterbalancing Mechanism	1.6															
			Counterbalancing Mechanism	2.3															
			Manual Door Operators	1.6															
			Manual Door Operators	2.4															
			Bottom Bar	2.1.3															
			Guides	1.5															
			Mounting Brackets	2.3.1															
			Overhead Drum	2.1.8															

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		08 33 23	Hood	1.6															
			Painting	1.6															
			Installation Drawings	1.5															
			SD-03 Product Data																
			Overhead Coiling Doors	2.1															
			Hardware	2.2															
			Counterbalancing Mechanism	1.6															
			Counterbalancing Mechanism	2.3															
			Manual Door Operators	1.6															
			Manual Door Operators	2.4															
			ELECTRIC DOOR OPERATORS	2.5															
			Fire-Rated Door Assembly	2.6															
			SD-05 Design Data																
			Overhead Coiling Doors	2.1															
			Hardware	2.2															
			Counterbalancing Mechanism	1.6															
			Counterbalancing Mechanism	2.3															
			Manual Door Operators	1.6															
			Manual Door Operators	2.4															
			Fire-Rated Door	1.2															
			SD-10 Operation and Maintenance																
			Data																
			Operation and Maintenance	1.5															
			Manuals																
			Overhead Coiling Door	1.6															
			Assemblies																

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		08 33 23	Materials	1.6															
			Devices	1.6															
			Procedures	1.6															
			Manufacture's Brochures	1.6															
			Parts Lists	1.6															
			Cleaning	3.3.2															
		08 39 54	SD-02 Shop Drawings																
			Installation	3.1															
			SD-03 Product Data																
			Door Description	1.2															
			Design Requirements	1.2.1															
			Manufacturer's Field Service	3.3															
			SD-06 Test Reports																
			Tests	3.2															
			Tests, Inspections, and	2.6															
			Verifications																
			Fire Rating Test and Inspection	2.6.6															
			Prototype Static Test	2.6.1															
			Prototype Blast Test	2.6.2															
			SD-07 Certificates																
			Materials	2.1															
			Fire-Rated Door Assemblies	2.6.6															
			Thermal Insulation	2.4.3															
			Sound Rating Test	2.6.5															
			SD-10 Operation and Maintenance																
			Data																

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		08 39 54	Door Description	1.2														
		08 51 13	SD-02 Shop Drawings															
			Windows	2.1														
			Fabrication Drawings	1.9														
			SD-03 Product Data															
			Windows	2.1														
			Hardware	2.2.8.1														
			Fasteners	2.2.3														
			Window performance	1.10														
			THERMAL-BARRIER WINDOWS	2.3														
			MULLIONS	2.4														
			Screens	2.2.10														
			Weatherstripping	2.2.2														
			Accessories	2.2.8														
			Adhesives	2.2.4														
			Thermal performance	1.10.4														
			SD-04 Samples															
			Window Sample	1.4.2.2														
			Finish Sample	1.4.2.1														
			SD-05 Design Data															
			Structural calculations for	2.1														
			deflection															
			Design Analysis	1.4.3														
			SD-06 Test Reports															
			Minimum condensation	1.4.4														
			resistance factor															

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		08 51 13	SD-10 Operation and Maintenance															
			Data															
			Windows	2.1														
		08 71 00	SD-02 Shop Drawings															
			Hardware schedule	1.3														
			Keying system	2.4.7														
			SD-03 Product Data															
			Hardware items	2.4														
			SD-08 Manufacturer’s Instructions															
			Installation	3.1														
			SD-10 Operation and Maintenance															
			Data															
			Hardware Schedule	1.3														
			SD-11 Closeout Submittals															
			Key Bitting	1.4														
		08 81 00	SD-04 Samples															
			Insulating Glass	1.6.1														
			Plastic Sheet	3.2.6														
			Glazing Compound	2.3.2														
			Tape	2.3.6														
			Sealant	2.3.3.1														
			SD-07 Certificates															
			Insulating Glass	1.6.1														
			SD-08 Manufacturer’s Instructions															
			Setting and sealing materials	2.3														
			Glass setting	3.2														

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		09 29 00	SD-03 Product Data															
			Cementitious backer units	2.1.3														
			Water-Resistant Gypsum Backing Board	2.1.2														
			Accessories	2.1.7														
			Gypsum Board	2.1.1														
			Joint Treatment Materials	2.1.4														
			SD-07 Certificates															
			Asbestos Free Materials	2.1														
			SD-08 Manufacturer’s Instructions															
			Material Safety Data Sheets	2.1														
			SD-10 Operation and Maintenance Data															
			Waste Management	3.7														
		09 30 00	SD-02 Shop Drawings															
			Detail Drawings	1.4														
			SD-03 Product Data															
			Tile	2.1														
			Setting-Bed	2.2														
			Mortar, Grout, and Adhesive	2.4														
			SD-04 Samples															
			Tile	2.1														
			Marble Thresholds	2.5														
			Grout	2.4														
			SD-07 Certificates															
			Tile	2.1														

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		09 30 00	Mortar, Grout, and Adhesive	2.4															
			SD-11 Closeout Submittals																
			Tile	2.1															
			Reinforcing Wire Fabric	2.2.5															
		09 51 00	SD-02 Shop Drawings																
			Approved Detail Drawings	1.2															
			SD-04 Samples																
			Acoustical Units	2.1															
			Acoustic Ceiling Tiles	2.1.1															
			SD-06 Test Reports																
			Ceiling Attenuation Class and	1.2.1															
			Test																
			SD-07 Certificates																
			Acoustical Units	2.1															
			Acoustic Ceiling Tiles	2.1.1															
		09 67 23.13	SD-02 Shop Drawings																
			Installation Drawings	1.3															
			SD-03 Product Data																
			Manufacturer's Catalog Data	1.3.1															
			Epoxy Undercoat	1.3.2															
			Urethane Mortar	1.3.1															
			Urethane Mortar	1.3.2															
			Flakes	1.3.1															
			Urethane Sealer	1.3.2															
			SD-04 Samples																

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		09 67 23.13	Hardboard Mounted Epoxy	1.4.2															
			Flooring																
			SD-05 Design Data																
			Physical Properties	2.1.1															
			Design Mix Data	1.3.2															
			Urethane Mortar	1.3.1															
			Urethane Mortar	1.3.2															
			SD-06 Test Reports																
			Records of Inspection	1.4															
			SD-07 Certificates																
			Listing of Product Installations	1.4.1															
			Referenced Standards	1.4															
			Certificates																
			Warranty	3.6															
		09 90 00	SD-02 Shop Drawings																
			Piping identification	3.10															
			stencil	3.10															
			SD-03 Product Data																
			Coating	2.1															
			Manufacturer's Technical Data	2.1															
			Sheets																
			SD-04 Samples																
			Color	1.10															
			SD-07 Certificates																
			Applicator's qualifications	1.3															
			Qualification Testing	1.4.1.2															

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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	1.7.2															
			Data Sheets																
			SD-10 Operation and Maintenance																
			Data																
			Coatings:	2.1															
		10 21 13	SD-02 Shop Drawings																
			Installation Drawings	3.2															
			SD-03 Product Data																
			Cleaning and Maintenance	1.2															
			Instructions																
			Colors And Finishes	2.6															
			Solid Phenolic Panels	2.1.1															
			Anchoring Devices and Fasteners	2.1.2															
			Hardware and Fittings	2.1.4															
			Brackets	2.1.3															
			Door Hardware	2.1.5															
			Toilet Enclosures	2.2.1															
			Urinal Screens	2.2.2															
			SD-04 Samples																
			Colors and Finishes	2.6															
			Hardware and Fittings	2.1.4															
			Anchoring Devices and Fasteners	2.1.2															
			SD-07 Certificates																

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		10 21 13	Warranty	1.6															
			SD-10 Operation and Maintenance																
			Data																
			Waste Management Plan	3.6															
			Plastic Identification	1.2.1															
			SD-11 Closeout Submittals																
			Toilet Enclosures	2.2.1															
			Urinal Screens	2.2.2															
		10 28 13	SD-03 Product Data																
			Finishes	2.1.2															
			Accessory Items	2.2															
			SD-04 Samples																
			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 50 20	SD-02 Shop Drawings																
			Types	2.1															

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		10 50 20	Location	1.3															
			Installation	3.1															
			Numbering system	3.2															
			SD-03 Product Data																
			Material	2.2															
			Assembly	3.1															
			SD-04 Samples																
			Colors	1.4.1															
			Colors	2.2.3															
		10 52 20	SD-03 Product Data																
			Fire extinguishers	2.1															
			Fire extinguisher cabinets	2.2															
		21 13 13.00 10	SD-02 Shop Drawings																
			Shop Drawings	1.4.3															
			As-Built Drawings	3.8															
			SD-03 Product Data																
			Fire Protection Related Submittals	1.4.1															
			Materials and Equipment	2.3															
			Spare Parts	1.6															
			Preliminary Tests	3.7															
			Final Acceptance Test	3.8															
			Onsite Training	3.9															
			Fire Protection Specialist	1.4.1															
			Sprinkler System Installer	1.4.2															
			SD-05 Design Data																

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		21 13 13.00 10	Sway Bracing	1.4.3															
			Hydraulic Calculations	1.2.1.3															
			SD-06 Test Reports																
			Preliminary Test Report	3.7															
			Final Acceptance Test Report	3.8															
			SD-07 Certificates																
			Inspection by Fire Protection	3.3															
			Specialist																
			SD-10 Operation and Maintenance																
			Data																
			Operating and Maintenance	3.9															
			Manuals																
		21 13 17.00 10	SD-02 Shop Drawings																
			Shop Drawings	1.4.3															
			As-Built Drawings	3.8															
			SD-03 Product Data																
			List of Submittals	1.4.1															
			Materials and Equipment	2.1															
			Spare Parts	1.6															
			Fire Protection Specialist	1.4.1															
			Installer Qualifications	1.4.2															
			Onsite Training	3.9															
			SD-05 Design Data																
			Sway Bracing	3.4.1															
			Hydraulic Calculations	1.2.1.2															
			SD-06 Test Reports																

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		21 13 17.00 10	Preliminary Tests	3.7															
			Final Acceptance Test	3.8															
			SD-07 Certificates																
			Inspection by Fire Protection	3.3															
			Specialist																
			SD-10 Operation and Maintenance																
			Data																
			Operating and Maintenance	3.9															
			Instructions																
		22 00 00	SD-03 Product Data																
			Fixtures	2.4															
			Flush valve water closets	2.4.1															
			Flush valve urinals	2.4.2															
			Wall hung lavatories	2.4.4															
			Drinking-water coolers	2.4.5															
			Shower Faucets	2.5.2															
			SD-06 Test Reports																
			Tests, Flushing and Disinfection	3.5															
			SD-10 Operation and Maintenance																
			Data																
			Plumbing System	3.5.1															
		22 15 14.00 40	SD-03 Product Data																
			Equipment and Performance	2.1.1															
			Data																
			Aboveground Piping Materials	2.3.1															
			Piping Specialties	2.2.1															

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		22 15 14.00 40	Supporting Elements	2.4.2															
			Air Compressors	2.2.2															
			Valves	2.2.3															
			Accessories	3.1.1.1															
			Miscellaneous Materials	2.4.1															
			SD-07 Certificates																
			Aboveground Piping Materials	2.3.1															
			Supporting Elements	2.4.2															
			Valves	2.2.3															
			Miscellaneous Materials	2.4.1															
			SD-10 Operation and Maintenance																
			Data																
			Operation and Maintenance	3.4															
			Manuals																
		23 05 92	SD-06 Test Reports																
			TAB Report	1.4.1															
		23 07 00	SD-03 Product Data																
			Piping insulation	2.1															
			Piping insulation finishes	2.1.7															
			Heating, ventilating, and air	2.2															
			conditioning systems insulation																
			Duct insulation finishes	2.2.5															
			Accessory materials	2.4															
			Adhesives, sealants, and coating	2.3															
			compounds																
		23 09 23.13	SD-02 Shop Drawings																

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		23 09 23.13	Control System Drawings Title Sheet	1.4.1.1															
			List of I/O Points	1.4.1.2															
			Control System Components List	1.4.1.3															
			Control System Schematics	1.4.1.4															
			HVAC Equipment Electrical Ladder Diagrams	1.4.1.5															
			Component Wiring Diagrams	1.4.1.6															
			Terminal Strip Diagrams	1.4.1.7															
			BACnet Communication Architecture Schematic	1.4.1.8															
			SD-03 Product Data																
			Direct Digital Controllers	2.1.3															
			BACnet Gateways	2.1.3.12															
			Notebook Computer Software	2.1.6															
			Notebook Computer	2.1.5															
			Sensors and Input Hardware	2.2															
			Output Hardware	2.3															
			Surge and Transient Protection	2.4.2															
			SD-05 Design Data																
			Performance Verification Testing Plan	3.5.2															
			Pre-Performance Verification Testing Checklist	3.5.4															
			SD-06 Test Reports																

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		23 09 23.13	Performance Verification Testing	3.5.11															
			Report																
			SD-07 Certificates																
			Contractor's Qualifications	1.6.6															
			SD-09 Manufacturer’s Field																
			Reports																
			Pre-PVT Checklist	3.5.1															
			SD-10 Operation and Maintenance																
			Data																
			BACnet Direct Digital Control	1.4															
			Systems																
			Controls System Operators	3.4															
			Manuals																
			SD-11 Closeout Submittals																
			Training Documentation	3.6.1															
		23 35 00.00 10	SD-03 Product Data																
			Related Submittals	1.4.1															
			Ductwork Components	2.4															
			Materials and Equipment	2.1															
			Spare Parts	1.6															
			Field Instructions	3.5															
			Final Acceptance Tests	3.6															
			Onsite Training	3.5															
			Exhaust System Specialist	1.4.1															
			SD-06 Test Reports																
			Final Acceptance Tests	3.6															

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Interior/Exterior Repairs Ground Support Equipment Shop AS4135

CONTRACTOR

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SURVEY REPORT FOR ASBESTOS AND LEAD-BASED PAINT

Prepared For:

TALLEY & SMITH ARCHITECTURE, INC.

409 EAST MARION STREET

SHELBY, NORTH CAROLINA 28150

Regarding:

DELIVERY ORDER NO. 0019 - PROJECT 17-B-0080

INTERIOR/EXTERIOR REPAIRS GROUND SUPPORT EQUIPMENT SHOP, BLDG. AS4135

MARINE CORPS AIR STATION – NEW RIVER

JACKSONVILLE, NORTH CAROLINA

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ISSUE DATE: JUNE 26, 2018

ACES PROJECT: 2018-02-021

SURVEY REPORT
FOR ASBESTOS AND LEAD-BASED PAINT

Prepared for:

TALLEY & SMITH ARCHITECTURE, INC.
409 EAST MARION STREET
SHELBY, NORTH CAROLINA 28150

Regarding:

DELIVERY ORDER NO. 0019 – PROJECT 17-B-0080
INTERIOR/EXTERIOR REPAIRS GROUND SUPPORT EQUIPMENT SHOP, BLDG. AS4135
MARINE CORPS AIR STATION – NEW RIVER
JACKSONVILLE, NORTH CAROLINA

ACES Project No.: 2018-02-021

June 26, 2018

Prepared by:

DeWitt Whitten, CHMM, REM, CES, REPA, CESCO
General Manager
NC Licensed Asbestos Inspector #10706
NC Licensed LBP Risk Assessor #120118

Reviewed by:

Robert L. Smith, AIA, LEED AP
Managing Partner

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SURVEY REPORT
FOR ASBESTOS AND LEAD-BASED PAINT

INTERIOR/EXTERIOR REPAIRS GROUND SUPPORT EQUIPMENT SHOP, BLDG. AS4135

MARINE CORPS AIR STATION – NEW RIVER

JACKSONVILLE, NORTH CAROLINA

1.0 INTRODUCTION

As authorized by Talley & Smith Architecture, Inc. on February 22, 2018, personnel of Allied Consulting and Environmental Services, LLC (ACES) performed a non-invasive survey for suspect asbestos containing materials (ACM) and a limited lead-based paint (LBP) survey for building AS4135 at the Marine Corps Air Station – New River in Jacksonville, North Carolina on February 22, 2018. The surveys were conducted for the purpose of identifying asbestos containing materials and lead-based painted materials that may be impacted by the proposed renovation of the Building AS 4135.

2.0 GENERAL BACKGROUND INFORMATION

2.1 Asbestos

The term "asbestos" refers to a group of naturally-occurring, fibrous minerals that are commercially mined throughout the world, primarily in Canada, Russia, and South Africa. Asbestos has been used in hundreds of products. Collectively, these products are referred to as asbestos-containing materials (ACMs). Asbestos gained wide use because it is plentiful, readily available, low in cost, and because of its unique properties – fire resistance, high tensile strength, resistance, and insulating characteristics.

As an insulator, asbestos received wide spread use for thermal insulation and condensation control. Asbestos is added to a variety of building materials to enhance strength. It is found in concrete and concrete-like products. Asbestos cement products are used as siding and roofing shingles, wallboard, as corrugated or flat sheets for roofing and partition walls, and as piping. Asbestos has also been added to asphalt, vinyl, and other materials to make products like roofing cements, felts and shingles, exterior siding materials, floor tiles, joint compounds, and mastics/adhesives. Asbestos also proved valuable as a component of acoustical plaster. This material was troweled-on or sprayed-on to ceilings or walls. As a decorative product, asbestos was frequently used to texture ceilings, walls, and other painted surfaces. Asbestos is still mined commercially and used in many common products, including brake shoes, roofing materials, and flooring products. It is important to realize that commercially available products containing asbestos can still be purchased. It is a common misconception that asbestos is no longer used.

The three most commonly encountered types of asbestos are sometimes referred to by their predominant color. Chrysotile (white) is by far the most frequently used asbestos mineral, constituting approximately 95% of all commercial and industrial applications. Chrysotile fibers

are long and flexible and can be spun or woven into cloth. Amosite (brown) and crocidolite (blue) are used in approximately 4-5% of asbestos-containing products.

The U.S. Environmental Protection Agency promulgated the National Emission Standards for Hazardous Air Pollutants (NESHAP) [40 CFR Part 61], which addresses the application, removal, and disposal of asbestos-containing materials (ACM). Under NESHAP, the following categories are defined for asbestos-containing materials:

Friable - When dry, can be crumbled, pulverized, or reduced to powder by hand pressure.

Nonfriable - When dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.

Category I Nonfriable ACM - Packings, gaskets, resilient floor coverings, and asphalt roofing products containing more than 1% asbestos.

Category II Nonfriable ACM – Any material excluding Category I Nonfriable ACM containing more than 1% asbestos.

Regulated Asbestos Containing Material (RACM) – RACM include one of the following:

1) Friable ACM
2) Category I Nonfriable ACM that has become friable.
3) Category I Nonfriable ACM that will be or has been subjected to sanding, grinding, cutting, or abrading.
4) Category II Nonfriable ACM that has a high probability of becoming, or has become, friable by the forces expected to act on the material in the course of demolition or renovation operations.

Under NESHAP, the following actions are required:

1) Prior to the commencement of demolition or renovation activities, the building owner must inspect the affected facility or part of the facility where the demolition or renovation activities will occur for the presence of asbestos.
2) Remove all RACM from the facility before any activity begins that would break up, dislodge, or similarly disturb the material or preclude access for subsequent removal.
3) RACM need not be removed if:
    a) It is Category I nonfriable ACM that is not in poor condition.
    b) It is on a facility component that is encased in concrete or other similar material and is adequately wet whenever exposed.
    c) It was not accessible for testing and was therefore not discovered until after demolition began and because of the demolition the material cannot be safely removed.

d) It is Category II non-friable ACM and the probability is low that the material will become crumbled, pulverized, or reduced to powder during demolition.

The Occupational Safety and Health Administration (OSHA) has established three sets of regulatory standards pertaining to asbestos exposure:

29 CFR 1910.1001	General Industry
29 CFR 1926.1101	Construction Industry
29 CFR 1910.134	Respiratory Protection

The construction industry standard covers activities involving asbestos demolition, removal, alteration, repair, maintenance, installation, cleanup, transportation, disposal, and storage. The general industry standard covers other activities where asbestos exposure is possible. Addressed under the OSHA standards are building owner / employer responsibilities regarding the identification of identified or presumed asbestos containing materials (PACM), notification to tenants / employees of the presence of asbestos, employee training, and work procedures.

2.2 Lead-based Paint

Lead-based paint is paint containing lead, a heavy metal, which is used as pigment. Lead chromate ($PbCrO_4$ - "chrome yellow") and lead carbonate($PbCO_3$ - "white lead") are the most common lead compounds used as pigments. Lead is also added to paint to speed drying, increase durability, retain a fresh appearance, and resist moisture that causes corrosion. Paint with significant lead content is still used in industry and by the military. For example, leaded paint is sometimes used to paint roadway markings and parking lot lines.

Although lead improves paint performance, it is a dangerous substance. It is especially damaging to children under age six whose bodies are still developing. Lead causes nervous system damage, hearing loss, stunted growth, and delayed development. It can cause kidney damage and affects every organ system of the body. It also is dangerous to adults, and can cause reproductive problems for both men and women. One myth related to lead-based paint is that the most common cause of poisoning was eating leaded paint chips. In fact, the most common pathway of childhood lead exposure is through ingestion of lead dust through normal hand-to-mouth contact during which children swallow lead dust dislodged from deteriorated paint or lead dust generated during remodeling or painting. Lead dust from remodeling or deteriorated paint lands on the floor near where children play and can ingest it.

Paint containing more than 0.06% (600 ppm) lead was banned for residential use in the United States in 1978 by the U.S. Consumer Product Safety Commission (16 Code of Federal Regulations CFR 1303). The U.S. Government defines "lead-based paint" as any "paint, surface coating that contains lead equal to or exceeding one milligram per square centimeter (1.0 mg/cm^2) or 0.5% by weight." These definitions are used to enforce regulations that apply to certain activities conducted in housing constructed prior to 1978, such as abatement, or the permanent elimination of a "lead-based paint hazard." Construction activities that involve LBP are addressed OSHA in 29 CFR 1926.62 (Lead in Construction).

2.3 Project Scope

The scope of this survey included the interior and exterior of Building AS 4135 as designated on drawings furnished by Talley & Smith Architecture, Inc., the proposed scope of work provided to ACES, and as discussed in our conversation on February 22, 2018. It is our understanding that the building will be renovated in the near future.

3.0 METHODOLOGY

3.1 Asbestos

For this project, a visual, non-invasive survey and sampling for suspect asbestos containing materials (ACM) was conducted at the above referenced building. ACES personnel submitted a total of eight (8) bulk samples of suspect ACM that may be impacted by the planned renovation project. Samples were collected by a NC Licensed Asbestos Inspector (DeWitt Whitten - #10706) and submitted to a NVLAP Accredited Asbestos Laboratory (EMSL in Charlotte, NC). Samples were analyzed using Polarized Light Microscopy (PLM) by EPA Method 600/R-93/116. Due to some materials consisting of more than one layer, a total of ten (10) samples were analyzed by the laboratory. Samples included the following materials: lay-in ceiling tile and three types of floor tile and associated mastic. Please refer to the Sample Location Plan (Figure No. 1) and the Chain of Custody sheets in Appendices 1 and 2, respectively, for the approximate sample locations and the specific materials sampled.

During the survey, ACES personnel also reviewed a previously prepared report for Building AS 4135 provided by personnel of the Camp Lejeune Marine Corps' Environmental Protection office. The report was dated August 4, 2017 (print date). For the purpose of this report, the materials listed in the report are considered presumed asbestos containing materials. These materials are discussed further in Section 4.3 of this report. A copy of the provided report prepared by others is presented in Appendix 3.

3.2 Lead-based Paint

A North Carolina Lead-based Paint Risk Assessor (Mr. DeWitt Whitten, Risk Assessor #120118) performed a limited lead-based paint (LBP) survey of the interior and exterior painted surfaces at eighty (80) locations at the building. Please refer to the Sample Location Plan (Figure No. 2) and the XRF Field Data Sheets in Appendices 1 and 4, respectively, for the approximate test locations and the specific materials sampled. The testing was conducted using a INNOV-X Portable X-ray Fluorescence (XRF) Analyzer to screen surface coatings that may contain lead. The sampling for lead-based paint was not a comprehensive surface by surface testing of the paint (*e.g.* a HUD level survey), but consisted of testing representative painted surfaces for the presence of LBP. Surfaces tested included exterior and interior walls, exterior and interior doors and door frames, and columns.

4.0 FINDINGS AND RECOMMENDATIONS

4.1 Non-asbestos Containing Materials

Ten (10) of the ten (10) samples analyzed by EMSL did not contain asbestos (i.e. greater than one percent asbestos).

4.2 Asbestos Containing Materials & Presumed Asbestos Containing Materials (PACM)

Asbestos was not detected in the ten (10) samples analyzed by EMSL. Asbestos reports prepared by others indicated that neither friable nor non-friable ACM are present in the building.

4.3 Lead-based Paint

The results of the testing (Appendix 3) indicated that lead-based paint was not present at the eighty (80) locations surveyed with Building AS 4135.

4.4 Recommendations - ACM & Presumed ACM

Asbestos containing materials (ACM) or Presumed ACM (PACM) were not identified in the building.

4.5 Recommendations - Lead-based Paint

Lead-based paint (LBP), i.e. paint that contains lead equal to or exceeding one milligram per square centimeter (1.0 mg/cm^2), was not identified at the eighty (80) locations on the painted surfaces tested at the building.

Lead was identified on other painted surfaces but the concentration did not meet the definition of LBP. For painted surfaces where LBP was not present but lead was present and would be impacted by the renovation activities, the necessary protection for the potential exposure to lead that may be present should be addressed as outlined in applicable Occupational Safety and Health Administration (OSHA) regulatory standards.

All waste materials from the renovations should be collected and disposed of in accordance with applicable state and federal regulations, the project specifications, and the “Marine Corps Base (MCB) Camp Lejeune Contractor Environmental Guidelines”.

5.0 LIMITATIONS

This report has been prepared for the exclusive use of Talley & Smith Architecture, Inc. and their agents with regard to Building AS 4135 located at the Marine Corps Air Station – New River in Jacksonville, North Carolina. This report has been prepared in accordance with generally accepted environmental practices. No other warranty, expressed or implied, is made. Our observations are based upon conditions readily visible at the time of our site visit. We have not verified the completeness or accuracy of the information provided by others.

Materials identified as presumed ACM should be considered to contain asbestos or additional sampling and analysis should be performed to confirm or deny the presence of asbestos.

During the site visit, accessible areas were visually surveyed for the presence of suspect asbestos containing materials (ACM) and lead-based paints (LBP). Inaccessible areas, such as above ceilings or behind walls may have not been surveyed; therefore, all ACM and/or LBP may not have been identified. Areas inspected were those designated by the scope of services. As with any similar survey of this nature, actual conditions exist only at the precise locations from which bulk samples were collected and/or LBP samples measured. Certain inferences are based on the results of this sampling and related testing to form a professional opinion of conditions in areas beyond those from which the samples were collected. No other warranty, expressed or implied, is made.

Under this scope of services, ACES assumes no responsibility regarding response actions (e.g. O&M Plan, encapsulation, abatement, removal, worker notification, etc.) initiated as a result of these findings. It is important to note that the Building Owner has a number of responsibilities and obligations as found under 40 CFR 745 (also known as Title X) including notification and/or disclosure of all information concerning LBP to workers and buyers. ACES assumes no liability for the duties and responsibilities of the Building Owner with respect to compliance with these regulations. Compliance with regulations and response actions are the sole responsibility of the Building Owner and should be conducted in accordance with local, state and/or federal requirements, and should be performed by appropriately qualified and licensed personnel, as warranted.

ACES, by virtue of providing the services described in this report, does not assume the responsibility of the person(s) in charge of the site, or otherwise undertake responsibility for reporting to any local, state, or federal public agencies any conditions at the site that may present a potential danger to public health, safety, or the environment. It is the client's responsibility to notify the appropriate local, state, or federal public agencies as required by law, or otherwise to disclose, in a timely manner, any information that may be necessary to prevent any danger to public health, safety, or the environment. The contents of this report should not be construed in any way as a recommendation to purchase, sell, or further develop the project site.

APPENDIX 1

FIGURES

LEGEND

Sample ID # — CT-2: Approximate Sample Location - Asbestos Not Detected

Sample ID # — FT-2: Approximate Sample Location - Asbestos Detected

PROJ. NUM.: 2018 - 02 - 021

DATE: June 17, 2018

SAMPLE LOCATION PLAN

ALLIED CONSULTING & ENVIRONMENTAL SERVICES
SHELBY, NORTH CAROLINA
P.O. BOX 2426 (28151-2426) 704-600-6255
409 E. MARION ST. (28150) FAX 704-482-5596

DELIVERY ORDER 0018
INT./EXT. REPAIRS, GRND SUPPORT BLDG., AS4135
MARINE CORPS AIR STATION - NEW RIVER
JACKSONVILLE, NORTH CAROLINA

FIGURE
1

PROJ. NUM.: 2018 - 02 - 021
DATE: June 17, 2018

SAMPLE LOCATION PLAN

ALLIED CONSULTING & ENVIRONMENTAL SERVICES
SHELBY, NORTH CAROLINA
P.O. BOX 2426 (28151-2426) 704-600-6255
409 E. MARION ST. (28150) FAX 704-482-5596

DELIVERY ORDER 0018
INT./EXT. REPAIRS, GRND SUPPORT BLDG., AS4135
MARINE CORPS AIR STATION - NEW RIVER
JACKSONVILLE, NORTH CAROLINA

FIGURE
2

APPENDIX 2

ASBESTOS ANALYTICAL RESULTS

CHAIN OF CUSTODY

EMSL Analytical, Inc.

10801 Southern Loop Blvd Pineville, NC 28134

Tel/Fax: (704) 525-2205 / (704) 525-2382

http://www.EMSL.com / charlottelab@emsl.com

EMSL Order:	411801471
Customer ID:	ALLC25
Customer PO:	
Project ID:	

Attention:	Dewitt Whitten	**Phone:**	(704) 232-0152
	Allied Consulting & Environmental Svs	**Fax:**	
	P.O. Box 2426	**Received Date:**	02/24/2018 9:00 AM
	Shelby, NC 28151	**Analysis Date:**	03/01/2018 - 03/02/2018
		Collected Date:	02/22/2018
Project:	AS4135/ 2018-02-021		

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
CT-1 *411801471-0001*	1st Deck - Lay-In Ceiling Tile (Type 1)	Gray/White Fibrous Heterogeneous	60% Cellulose 10% Min. Wool	15% Perlite 15% Non-fibrous (Other)	None Detected
CT-2 *411801471-0002*	1st Deck - Lay-In Ceiling Tile (Type 1)	Gray/White Fibrous Homogeneous	60% Cellulose 8% Min. Wool	10% Perlite 22% Non-fibrous (Other)	None Detected
CT-3 *411801471-0003*	1st Deck - Lay-In Ceiling Tile (Type 2)	Gray/White Fibrous Heterogeneous	60% Cellulose 8% Min. Wool	15% Perlite 17% Non-fibrous (Other)	None Detected
CT-4 *411801471-0004*	1st Deck - Lay-In Ceiling Tile (Type 2)	Gray/White Fibrous Homogeneous	60% Cellulose 10% Min. Wool	10% Perlite 20% Non-fibrous (Other)	None Detected
CT-5 *411801471-0005*	2nd Deck - Lay-In Ceiling Tile	Gray/White Fibrous Heterogeneous	60% Cellulose 8% Min. Wool	15% Perlite 17% Non-fibrous (Other)	None Detected
CT-6 *411801471-0006*	2nd Deck - Lay-In Ceiling Tile	Gray/White Fibrous Homogeneous	60% Cellulose 8% Min. Wool	10% Perlite 22% Non-fibrous (Other)	None Detected
FT-1-Floor Tile *411801471-0007*	12x12 Floor Tile	Gray Non-Fibrous Homogeneous		40% Ca Carbonate 60% Non-fibrous (Other)	None Detected
FT-1-Mastic *411801471-0007A*	12x12 Floor Tile	Tan Non-Fibrous Homogeneous	<1% Cellulose	5% Ca Carbonate 95% Non-fibrous (Other)	None Detected
FT-2-Floor Tile *411801471-0008*	12x12 Floor Tile	Gray Non-Fibrous Homogeneous	1% Cellulose	40% Ca Carbonate 59% Non-fibrous (Other)	None Detected
FT-2-Mastic *411801471-0008A*	12x12 Floor Tile	Tan Non-Fibrous Homogeneous	<1% Cellulose	100% Non-fibrous (Other)	None Detected

Analyst(s)

Eric Loomis (5)

Lacy Searcy (5)

Lee Plumley, Laboratory Manager
or Other Approved Signatory

Initial report from: 03/02/2018 17:04:35

OrderID: 411801471

411801471

EMSL ANALYTICAL INC.

Asbestos Lab Services Chain of Custody

EMSL Order Number *(Lab Use Only)*: ~~411800454~~ MH

Charlotte, NC
376 Crompton Street
Charlotte, NC 28273
PHONE: (704) 525-2205
FAX: (704) 525 2382

Company: Allied Consulting & Environmental Services, LLC	EMSL-Bill to: ☑ Same ☐ Different If Bill to is Different note instructions in Comments** *Third Party Billing requires written authorization from third party*
Street: P. O. Box 2426	
City/State/Zip: Shelby, NC 28151	
Report To (Name): DeWitt Whitten	Fax: 7044825596
Telephone: 7042320152	Email Address: dewitt@aces-env.com
Project Name/Number: AS 4135 / 2018-02-021	
Please Provide Results: Email / Purchase Order:	State Samples Taken: NC

Turnaround Time (TAT) Options* – Please Check

☐ 3 Hour ☐ 6 Hour ☐ 24 Hour ☐ 48 Hour ☐ 72 Hour ☐ 96 Hour ☒ 1 Week ☐ 2 Week

*For TEM Air 3 hr through 6 hr, please call ahead to schedule. *There is a premium charge for 3 Hour TEM AHERA or EPA Level II TAT. You will be asked to sign an authorization form for this service. Analysis completed in accordance with EMSL's Terms and Conditions located in the Analytical Price Guide.

PCM - Air ☐ Check if samples are from NY
- ☐ NIOSH 7400
- ☐ w/ OSHA 8hr. TWA

PLM - Bulk (reporting limit)
- ☒ PLM EPA 600/R-93/116 (<1%)
- ☐ PLM EPA NOB (<1%)

Point Count
- ☐ 400 (<0.25%) ☐ 1000 (<0.1%)

Point Count w/Gravimetric
- ☐ 400 (<0.25%) ☐ 1000 (<0.1%)
- ☐ NYS 198.1 (friable in NY)
- ☐ NYS 198.6 NOB (non-friable-NY)
- ☐ NIOSH 9002 (<1%)

TEM – Air ☐ 4-4.5hr TAT (AHERA only)
- ☐ AHERA 40 CFR, Part 763
- ☐ NIOSH 7402
- ☐ EPA Level II
- ☐ ISO 10312

TEM - Bulk
- ☐ TEM EPA NOB
- ☐ NYS NOB 198.4 (non-friable-NY)
- ☐ Chatfield SOP
- ☐ TEM Mass Analysis-EPA 600 sec. 2.5

TEM – Water: EPA 100.2
- Fibers >10µm ☐ Waste ☐ Drinking
- All Fiber Sizes ☐ Waste ☐ Drinking

TEM - Dust
- ☐ Microvac - ASTM D 5755
- ☐ Wipe - ASTM D6480
- ☐ Carpet Sonication (EPA 600/J-93/167)

Soil/Rock/Vermiculite
- ☐ PLM CARB 435 - A (0.25% sensitivity)
- ☐ PLM CARB 435 - B (0.1% sensitivity)
- ☐ TEM CARB 435 - B (0.1% sensitivity)
- ☐ TEM CARB 435 - C (0.01% sensitivity)
- ☐ EPA Protocol (Semi-Quantitative)
- ☐ EPA Protocol (Quantitative)

Other:
- ☐

☐ Check For Positive Stop – Clearly Identify Homogenous Group

Filter Pore Size (Air Samples): ☐ 0.8µm ☐ 0.45µm

Samplers Name: DeWitt Whitten Samplers Signature: DeWitt Whitten

Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
~~RC-1,2,3~~ CT-1,2	1st Deck - Lay-in Ceiling Tile (Type 1)		22 Feb 18 AM
CT-3,4	1st Deck - Lay-in Ceiling Tile (Type 2)		"
CT-5,6	2nd Deck Lay-in Ceiling Tile		"
FT-1,2	12x12 Floor Tile		"

Client Sample # (s): see above Total # of Samples: 8

Relinquished (Client): DeWitt Whitten Date: 24 Feb 2018 Time: 0833

Received (Lab): MH Date: 2-24-18 Time: 0900 0113

Comments/Special Instructions:

APPENDIX 3

ASBESTOS REPORT BY OTHERS

SURVEY FINDINGS — Building: AS4135

Friable ACM identified

DESCRIPTION	LOCATION	Date	Quantity

No friable ACM records found in database

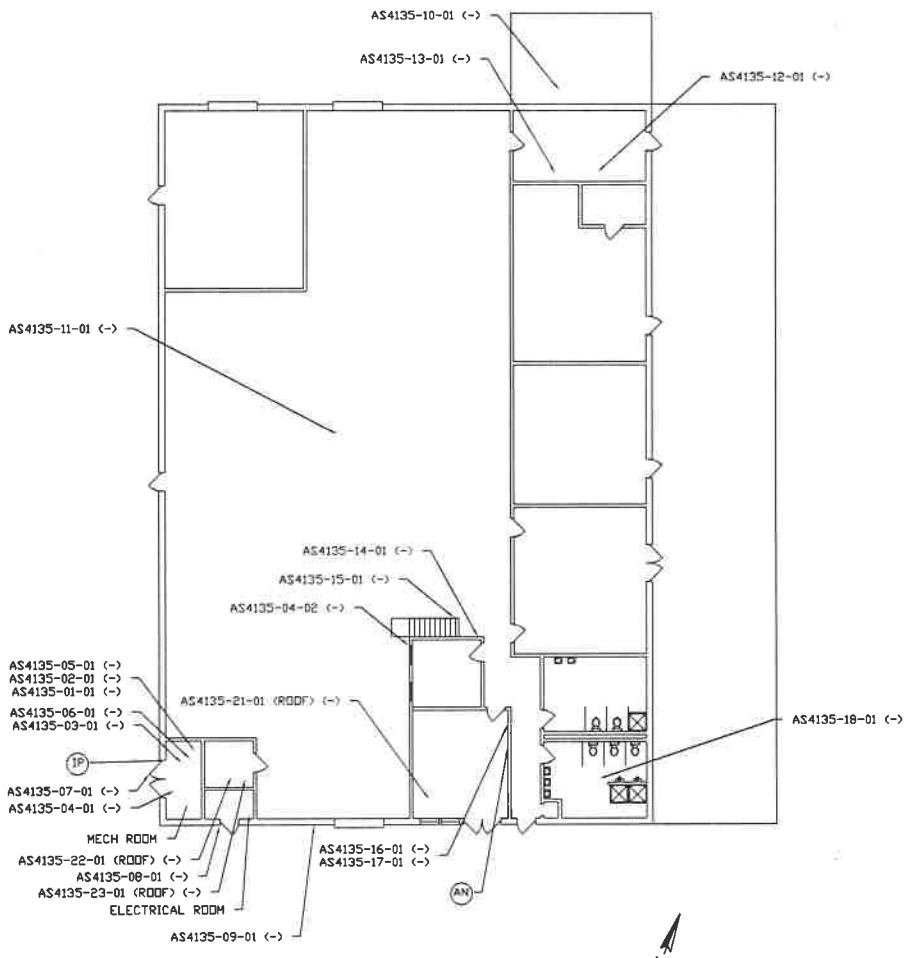
Non-friable ACM identified

DESCRIPTION	LOCATION	Date	Quantity

No non friable ACM records found in database

Tested Non ACM or REMOVED Materials

DESCRIPTION	LOCATION	Date	Quantity
CONCRETE EXPANSION JOINT MATERIAL	INTERIOR SLAB FLOOR	1/11/2007	
LABORATORY COUNTER TOP	BATTERY ROOM	1/11/2007	
ROOF FLASHING/SEALER MATERIAL	ROOF	1/11/2007	
12" BROWN FLOOR TILE AND MASTIC	OFFICE	1/11/2007	
MISCELLANEOUS SEALANT	OFFICE	1/11/2007	
2'x2' CEILING TILE,	OFFICE	1/11/2007	
MISCELLANEOUS SEALANT	MEN'S HEAD	1/11/2007	
12" GRAY FLOOR TILE AND ADHESIVE	OFFICE	1/11/2007	
CONCRETE EXPANSION JOINT MATERIAL	EXTERIOR OF BLDG	1/11/2007	
CONCRETE SURFACING MATERIAL	OFFICE	1/11/2007	
LABORATORY COUNTER TOP	BATTERY ROOM	1/11/2007	
CONCRETE EXPANSION JOINT MATERIAL	EXTERIOR OF BLDG	1/11/2007	
MISCELLANEOUS SEALANT	@ REAR BLDG STEAMLINES	1/11/2007	
ROOFING SEALANT, BLACK	ROOF VENT	1/11/2007	
ROOFING SEALANT, GRAY	ROOF VENT	1/11/2007	
DUCT SEALANT, GRAY	CLASSROOM	1/11/2007	
FIRE DOOR	MECH ROOM DOORS	1/11/2007	
GASKET MATERIAL	MECH ROOM	1/11/2007	
GASKET MATERIAL	MECH ROOM	1/11/2007	
PIPE INSULATION SEALANT	MECH ROOM	1/11/2007	
GASKET MATERIAL	MECH ROOM	1/11/2007	
INTERIOR CAULKING,	MECH ROOM	1/11/2007	



NO ACM IDENTIFIED
BUILDING AS4135
FIRST FLOOR

5' 0 5' 10'

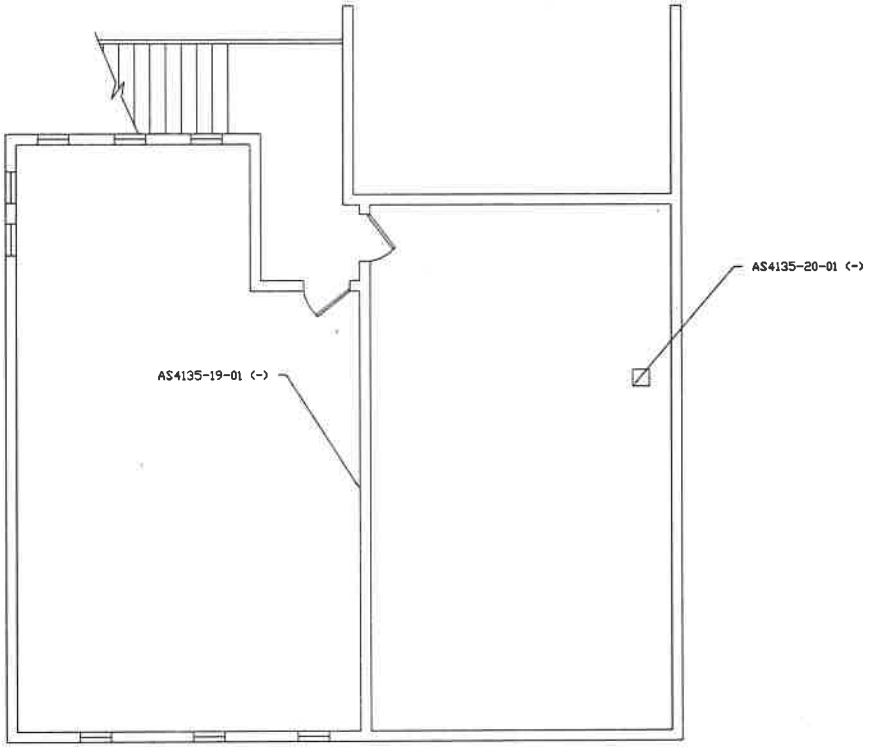
SAMPLE LEGEND ID

BUILDING ID — ASBESTOS SAMPLE IDENTIFICATION
####-01-01 (+,-)
POSITIVE (+) OR NEGATIVE (-) FOR THE PRESENCE OF ASBESTOS
HOMOGENOUS AREA #

REVISIONS

MCB CAMP LEJEUNE

CY05 ASBESTOS INSPECTION 2005
AS4135-01
USMC CAMP LEJEUNE, NC



NO ACM IDENTIFIED
BUILDING AS4135
SECOND FLOOR

5' 0 5' 10'

ASBESTOS SAMPLE ID

BUILDING ASBESTOS SAMPLE IDENTIFICATION

####-01-01 (+)

POSITIVE (+) OR NEGATIVE (-) FOR THE PRESENCE OF ASBESTOS

HOMOGENOUS AREA #

REVISIONS

MCB CAMP LEJEUNE

CY05 ASBESTOS INSPECTION 2005
AS4135-02
USMC CAMP LEJEUNE, NC

APPENDIX 4

XRF FIELD DATA SHEETS

XRF LBP TESTING DATA SHEET								
PROJECT NAME/ADDRESS/UNIT NO. BLDG AS-4135, White Street; MCAS – New River			**PROJECT NO.** 2018 – 02 – 021			**DATE** 22 Feb 2018		
XRF MODEL/SERIAL NO. INNOVX LBP 4000 #11916			**INSPECTOR NAME/NO.** DeWitt Whitten, NCRA 220118			**SIGNATURE**		
SAMPLE #	**SUBSTRATE[1]**	**COMPONENT**	**COLOR[2]**	**TEST LOCATION**	**LEVEL**	**XRF READING**	**UNITS[3]**	**CLASSIFICATION[4]**
4	M	Door frame	Y	See Figure 2	1st	0.00	mg/cm^2	N
5	M	Door	B	See Figure 2	1st	0.00	mg/cm^2	N
6	M	Window frame	Y	See Figure 2	1st	0.00	mg/cm^2	N
7	M	Wall	B	See Figure 2	1st	0.00	mg/cm^2	N
8	M	Column	Y	See Figure 2	1st	0.00	mg/cm^2	N
9	CMU	Wall	R	See Figure 2	1st	0.00	mg/cm^2	N
10	CMU	Wall	B	See Figure 2	1st	0.00	mg/cm^2	N
11	M	Door frame	Y	See Figure 2	1st	0.00	mg/cm^2	N
12	M	Door	B	See Figure 2	1st	0.00	mg/cm^2	N
13	CMU	Wall	B	See Figure 2	1st	0.00	mg/cm^2	N
14	M	Door frame	Gr	See Figure 2	1st	0.00	mg/cm^2	N
15	M	Door	Gr	See Figure 2	1st	0.04	mg/cm^2	N
16	M	Column	OW	See Figure 2	1st	0.00	mg/cm^2	N
17	CMU	Wall	OW	See Figure 2	1st	0.00	mg/cm^2	N
18	M	Wall	Gr	See Figure 2	1st	0.00	mg/cm^2	N
19	M	Column	Gr	See Figure 2	1st	0.00	mg/cm^2	N
20	CMU	Wall	OW	See Figure 2	1st	0.00	mg/cm^2	N
21	CMU	Wall	W	See Figure 2	1st	0.00	mg/cm^2	N
22	CMU	Wall	W	See Figure 2	1st	0.00	mg/cm^2	N
23	CMU	Wall	W	See Figure 2	1st	0.00	mg/cm^2	N

1) M – metal
W – wood
DW – drywall
B – Brick
C – Concrete
CMU – Concrete Masonry Unit
P – Plaster

2) W- White
B – Blue
Y – Yellow
Bk – Black
Gr – Gray
O – Orange
Pr – Purple
R – Red
G – Green
T – Tan
Br – Brown
OW – Off-white
P - Pink
C – Clear

3) mg/cm2 – milligrams/square centimeter

4) N – Negative
P – Positive

XRF LBP TESTING DATA SHEET								
PROJECT NAME/ADDRESS/UNIT NO. BLDG AS-4135, White Street; MCAS – New River			**PROJECT NO.** 2018 – 02 – 021			**DATE** 22 Feb 2018		
XRF MODEL/SERIAL NO. INNOVX LBP 4000 #11916			**INSPECTOR NAME/NO.** DeWitt Whitten, NCRA 220118			**SIGNATURE**		
SAMPLE #	**SUBSTRATE[1]**	**COMPONENT**	**COLOR[2]**	**TEST LOCATION**	**LEVEL**	**XRF READING**	**UNITS[3]**	**CLASSIFICATION[4]**
24	M	Column	Gr	See Figure 2	1st	0.00	mg/cm^2	N
25	CMU	Wall	OW	See Figure 2	1st	0.00	mg/cm^2	N
26	CMU	Wall	Gr	See Figure 2	1st	0.00	mg/cm^2	N
27	CMU	wall	Gr	See Figure 2	1st	0.00	mg/cm^2	N
28	CMU	Wall	Gr	See Figure 2	1st	0.00	mg/cm^2	N
30	CMU	Wall	R	See Figure 2	1st	0.00	mg/cm^2	N
31	M	Stair frame	R	See Figure 2	1st	0.04	mg/cm^2	N
32	M	Stair railing	R	See Figure 2	1st	0.05	mg/cm^2	N
33	M	Overhead door	B	See Figure 2	1st	0.07	mg/cm^2	N
34	M	Overhead door frame	B	See Figure 2	1st	0.01	mg/cm^2	N
35	M	Bollard	Y	See Figure 2	1st	0.01	mg/cm^2	N
36	M	Column	B	See Figure 2	1st	0.00	mg/cm^2	N
37	M	Framing	B	See Figure 2	1st	0.00	mg/cm^2	N
38	M	Door frame	Gr	See Figure 2	1st	0.00	mg/cm^2	N
39	M	Door	Gr	See Figure 2	1st	0.07	mg/cm^2	N
40	M	Wall	OW	See Figure 2	1st	0.00	mg/cm^2	N
41	M	Horizontal framing	B	See Figure 2	1st	0.00	mg/cm^2	N
42	C	Striping (on floor)	Y	See Figure 2	1st	0.07	mg/cm^2	N
43	C	Striping (on floor)	R	See Figure 2	1st	0.00	mg/cm^2	N
44	CMU	Wall	Gr	See Figure 2	1st	0.00	mg/cm^2	N

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P - Pink
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3) mg/cm2 – milligrams/square centimeter

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XRF LBP TESTING DATA SHEET								
PROJECT NAME/ADDRESS/UNIT NO. BLDG AS-4135, White Street; MCAS – New River			**PROJECT NO.** 2018 – 02 – 021			**DATE** 22 Feb 2018		
XRF MODEL/SERIAL NO. INNOVX LBP 4000 #11916			**INSPECTOR NAME/NO.** DeWitt Whitten, NCRA 220118			**SIGNATURE**		
SAMPLE #	**SUBSTRATE[1]**	**COMPONENT**	**COLOR[2]**	**TEST LOCATION**	**LEVEL**	**XRF READING**	**UNITS[3]**	**CLASSIFICATION[4]**
45	CMU	Wall	Gr	See Figure 2	1st	0.00	mg/cm^2	N
46	M	Bollard	Y	See Figure 2	1st	0.21	mg/cm^2	N
47	M	Door frame	B	See Figure 2	1st	0.00	mg/cm^2	N
48	M	Column	B	See Figure 2	1st	0.00	mg/cm^2	N
49	M	Wall	OW	See Figure 2	1st	0.00	mg/cm^2	N
50	CMU	Wall	Gr	See Figure 2	1st	0.00	mg/cm^2	N
51	CMU	Wall	Pink	See Figure 2	1st	0.00	mg/cm^2	N
52	CMU	Wall	Gr	See Figure 2	1st	0.00	mg/cm^2	N
53	M	Wall	Pink	See Figure 2	1st	0.00	mg/cm^2	N
54	M	Column	Pink	See Figure 2	1st	0.00	mg/cm^2	N
55	M	Wall	OW	See Figure 2	1st	0.00	mg/cm^2	N
56	M	Horizontal bracing	B	See Figure 2	1st	0.00	mg/cm^2	N
57	CMU	Wall	Gr	See Figure 2	1st	0.00	mg/cm^2	N
58	CMU	Wall	Gr	See Figure 2	1st	0.00	mg/cm^2	N
59	M	Door frame	R	See Figure 2	1st	0.13	mg/cm^2	N
60	CMU	Wall	Gr	See Figure 2	1st	0.00	mg/cm^2	N
61	M	Wall	OW	See Figure 2	1st	0.01	mg/cm^2	N
62	CMU	Overhead door	B	See Figure 2	1st	0.05	mg/cm^2	N
63	CMU	Overhead door frame	B	See Figure 2	1st	0.01	mg/cm^2	N
64	M	Standpipe	Y	See Figure 2	1st	0.01	mg/cm^2	N

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XRF LBP TESTING DATA SHEET								
PROJECT NAME/ADDRESS/UNIT NO. BLDG AS-4135, White Street; MCAS – New River			**PROJECT NO.** 2018 – 02 – 021			**DATE** 22 Feb 2018		
XRF MODEL/SERIAL NO. INNOVX LBP 4000 #11916			**INSPECTOR NAME/NO.** DeWitt Whitten, NCRA 220118			**SIGNATURE**		
SAMPLE #	**SUBSTRATE[1]**	**COMPONENT**	**COLOR[2]**	**TEST LOCATION**	**LEVEL**	**XRF READING**	**UNITS[3]**	**CLASSIFICATION[4]**
65	M	Wall	B	See Figure 2	1st	0.00	mg/cm^2	N
66	M	Door	B	See Figure 2	1st	0.00	mg/cm^2	N
67	M	Door frame	b	See Figure 2	1st	0.00	mg/cm^2	N
68	M	Bollard	Y	See Figure 2	1st	0.41	mg/cm^2	N
69	M	Door	B	See Figure 2	1st	0.00	mg/cm^2	N
70	M	Door frame	B	See Figure 2	1st	0.00	mg/cm^2	N
71	M	Wall	B	See Figure 2	1st	0.00	mg/cm^2	N
72	M	Bollard	Y	See Figure 2	1st	0.06	mg/cm^2	N
73	M	Overhead door	B	See Figure 2	1st	0.21	mg/cm^2	N
74	M	Overhead door frame	B	See Figure 2	1st	0.00	mg/cm^2	N
75	M	Wall	B	See Figure 2	1st	0.00	mg/cm^2	N
76	M	Column	b	See Figure 2	1st	0.00	mg/cm^2	N
77	M	Bollard	Y	See Figure 2	1st	0.27	mg/cm^2	N
78	M	Overhead door	B	See Figure 2	1st	0.06	mg/cm^2	N
79	M	Overhead door frame	B	See Figure 2	1st	0.00	mg/cm^2	N
80	M	Wall	B	See Figure 2	1st	0.00	mg/cm^2	N
81	M	Column	B	See Figure 2	1st	0.00	mg/cm^2	N
82	M	Column	B	See Figure 2	1st	0.00	mg/cm^2	N
83	M	Bollard	Y	See Figure 2	1st	0.14	mg/cm^2	N
84	M	Railing	R	See Figure 2	1st	0.06	mg/cm^2	N

1) M – metal
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CMU – Concrete Masonry Unit
P – Plaster

2) W- White
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Bk – Black
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3) mg/cm2 – milligrams/square centimeter

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XRF LBP TESTING DATA SHEET								
PROJECT NAME/ADDRESS/UNIT NO. BLDG AS-4135, White Street; MCAS – New River			**PROJECT NO.** 2018 – 02 – 021			**DATE** 22 Feb 2018		
XRF MODEL/SERIAL NO. INNOVX LBP 4000 #11916			**INSPECTOR NAME/NO.** DeWitt Whitten, NCRA 220118			**SIGNATURE**		
SAMPLE #	**SUBSTRATE[1]**	**COMPONENT**	**COLOR[2]**	**TEST LOCATION**	**LEVEL**	**XRF READING**	**UNITS[3]**	**CLASSIFICATION[4]**
85	M	Railing	R	See Figure 2	1st	0.06	mg/cm^2	N

1) M – metal
W – wood
DW – drywall
B – Brick
C – Concrete
CMU – Concrete Masonry Unit
P – Plaster

2) W- White
B – Blue
Y – Yellow
Bk – Black
Gr – Gray
O – Orange
Pr – Purple
R – Red
G – Green
T – Tan
Br – Brown
OW – Off-white
P - Pink
C – Clear

3) mg/cm2 – milligrams/square centimeter

4) N – Negative
P – Positive

March 2016

Marine Corps Base (MCB)
Camp Lejeune Contractor Environmental Guide

Prepared For:

Marine Corps Installations East-Marine Corps Base Camp Lejeune

Version Number 3

Michael Baker INTERNATIONAL

75 YEARS

Prepared By:
Michael Baker International, Inc.

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RECORD OF CHANGES

Date	Description of Changes	Page #	Name/Initials

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CERTIFICATION PAGE

I certify that I have read, understood, and accept this document and all attachments, and that all those within my party working on a job site within Marine Corps Base Camp Lejeune and/or Marine Corps Air Station New River will comply with the environmental policies and regulations herein. I am aware that there are penalties for not complying with this Guide.

_____

Signature

_____

Date

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LIST OF ACRONYMS AND ABBREVIATIONS

ACM	Asbestos-Containing Material
AHERA	Asbestos Hazard and Emergency Response Act
AHPA	Archaeological and Historic Preservation Act
ARPA	Archeological Resource Protection Act
ASHARA	Asbestos School Hazard Abatement Reauthorization Act
ASD	Accumulation Start Date
ASO	Air Station Order
BMP	Best Management Practice
BO	Base Order
C&D	Construction and Demolition
CAA	Clean Air Act
CAMA	Coastal Area Management Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability
CETEP	Comprehensive Environmental Training and Education Program
CFC	Chlorofluorocarbon
CFR	Code of Federal Regulations
CG	Commanding General
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
DHHS	Department of Health and Human Services
DLADS	Defense Logistics Agency Disposition Services
DM	Decision Memorandum

DMM	Discarded Military Munitions
DoD	Department of Defense
DoN	Department of Navy
DOT	Department of Transportation
DRMS	Defense Reutilization and Marketing Service
EA	Environmental Assessment
EAD	Environmental Affairs Department
ECON	Environmental Conservation Branch
EISA	Energy Independence and Security Act
EHS	Extremely Hazardous Substances
ELLAP	Environmental Lead Laboratory Accreditation Program
EMD	Environmental Management Division
EMS	Environmental Management System
EO	Executive Order
EOD	Explosives and Ordnance Disposal
EPA	Environmental Protection Agency
EPR	Extended Producer Responsibility
EPCRA	Emergency Planning and Community Right-to-Know Act
EPEAT	Electronic Product Environmental Assessment Tool
FAR	Federal Acquisition Regulation
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FSC	Facilities Support Contracts
FWS	Fish and Wildlife Service
GIS	Geographic Information System
GP	Green Procurement
HAP	Hazardous Air Pollutants

HCFC	Hydrochlorofluorocarbon
HCS	Hazard Communication Standard
HHCU	Health Hazards Control Unit (North Carolina)
HM	Hazardous Material
HMTA	Hazardous Materials Transportation Act
HQMC	Headquarters Marine Corps
HQW	High Quality Water
HVAC	Heating, Ventilation, and Air Conditioning
HW	Hazardous Waste
HWMP	Hazardous Waste Management Plan
IGI&S	Installation Geospatial Information & Services
INRMP	Integrated Natural Resources Management Plan
IRP	Installation Restoration Program
LBP	Lead-Based Paint
LDA	Land-Disturbing Activities
LQG	Large Quantity Generator
MAG	Marine Aircraft Group
MCAS	Marine Corps Air Station
MCB	Marine Corps Base
MCM	Minimum Control Measure
MCIEAST	Marine Corps Installations East
MCO	Marine Corps Order
MEC	Munitions and Explosives of Concern
MEF	Marine Expeditionary Force
MRF	Materials Recovery Facility
MS4	Municipal Separate Storm Sewer Systems
MSW	Municipal Solid Waste
NAPL	Non-Aqueous Phase Liquid

NC	North Carolina
NCAC	North Carolina Administrative Code
NCDAQ	North Carolina Department of Air Quality
NCDCM	North Carolina Division of Coastal Management
NCDEQ	North Carolina Department of Environmental Quality
NCDFR	North Carolina Division of Forest Resources
NCDMS	North Carolina Division of Mitigation Services
NCDWR	North Carolina Division of Water Resources
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NHPA	National Historic Preservation Act
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRC	National Response Center
NRHP	National Register of Historic Places
ODS	Ozone-Depleting Substance
OPA	Oil Pollution Act
ORW	Outstanding Resource Water
OSHA	Occupational Safety and Health Administration
OWS	Oil-Water Separator
P2	Pollution Prevention
PACM	Presumed Asbestos-Containing Material
PCB	Polychlorinated biphenyl
POC	Point of Contact
POL	Petroleum, Oil, and Lubricant
PPA	Pollution Prevention Act
ppm	Parts Per Million

PPV	Public-Private Venture
PWD	Public Works Division
QRP	Qualified Recycling Program
RACM	Regulated Asbestos-Containing Material
RCRA	Resource Conservation and Recovery Act
RCRS	Resource Conservation and Recovery Section
ROICC	Resident Officer in Charge of Construction
RRP	Renovation, Repair, and Painting
SAA	Satellite Accumulation Area
SARA	Superfund Amendments & Reauthorization Act
SDS	Safety Data Sheet
SHPO	State Historic Preservation Officer
SPCC	Spill Prevention Control and Countermeasures
SSPP	Strategic Sustainability Performance Plan
SWDA	Solid Waste Disposal Act
SWPPP	Stormwater Pollution Prevention Plan (Also referred to as SPPP in NC)
T&P	Treatment and Processing
TCLP	Toxic Characteristic Leaching Procedure
TSD	Treatment, Storage, and Disposal
TSI	Thermal System Insulation
ULCP	Unit Level Contingency Plan
USC	United States Code
USACE	United States Army Corps of Engineers
USMC	United States Marine Corps
UW	Universal Waste

UXO	Unexploded Ordnance
XRF	X-Ray Fluorescence

CONTRACTOR'S PHONE DIRECTORY

In the event of an emergency, refer to the emergency numbers below. All non-emergency contractor inquiries regarding the operations at Marine Corps Base (MCB) Camp Lejeune and Marine Corps Air Station New River should be directed to the Resident Officer in Charge of Construction (ROICC) or Contract Representative. The ROICC or Contract Representative will either directly contact or refer contractors to the appropriate Division or Organization.

Emergency and Important Non-Emergency Numbers

Fire and Emergency Services Division	911
Ambulance	911
Hearing Impaired	(910) 451-4444
CHEMTREC (Emergency 24-hour/Outside MCB Camp Lejeune)	(800) 424-9300
Hazardous Chemical Spill	911
Military Police	911
National Response Center (Outside MCB Camp Lejeune)	(202) 372-2428
Toll Free	(800) 424-8802
Provost Marshall Office	911

Marine Corps Base Camp Lejeune

Operator/ Directory Assistance	(910) 451-1113
Confined Space Program Manager	(910) 451-5725
Environmental Management Division	(910) 451-5003
-Environmental Compliance Branch	(910) 451-5837

Asbestos Management
Resource Conservation and Recovery Section
(910) 451-1482
Hazardous Material Consolidation Site/Free Issue
.....(910) 451-1482
Recycling Center, Building 982.....(910) 451-4214
-Environmental Conservation Branch.....(910) 451-5063
Fish & Wildlife
Forestry Management
NEPA
Conservation Law Enforcement
.....(910) 451-2196/5226
-Environmental Quality Branch.....(910) 451-5068
Air Quality
Underground Storage Tanks
Water Quality
Explosives and Ordnance Disposal.....(910) 451-0558
Public Works Division.....(910) 451-5307
-Construction Project Managers.....(910) 451-2583
-Contracts Branch.....(910) 451-2582
-Officer In Charge of Construction (Main)..(910) 451-2581
-Public Works Base Utility Director.....(910) 451-5024
Water Line Break/Wastewater Line Break.....(910) 451-7190 (x225)
-Public Works Solid Waste Division/Landfill
.....(910) 451-2946
Range Control.....(910) 451-3064
Regional Geospatial Information & Services (Installation Manager).....(910) 451-8915
Safety Department.....(910) 451-5725

Marine Corps Air Station New River

Confined Space Program.....(910) 449-4964
Consolidated Hazardous Material Reutilization and
Inventory Management Program.....(910) 449-4531/4533
Environmental Affairs Department
(Director).....(910) 449-5441
-Environmental Affairs Department (Environmental
Manager).....(910) 449-5442
-Environmental Affairs Department (GIS
Manager).....(910) 449-6144
-Environmental Affairs Department (Hazardous
Waste).....(910) 449-5997
-Conservation Law Enforcement.....(910) 449-0108
Explosives Safety Officer.....(910) 449-5443
Military Police (Non-Emergency).....(910) 449-4248/4249
Public Works Division.....(910) 449-6506
-Officer In Charge of Construction.....(910) 449-5587
Safety Department.....(910) 449-4527

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1.0 CONTRACTOR ENVIRONMENTAL GUIDE OVERVIEW

Environmental protection is an integral part of the Marine Corps mission in order to protect public health, preserve environmental quality, comply with regulatory requirements, and develop and strengthen relationships between the Marine Corps community and external stakeholders. The purpose of the MCB Camp Lejeune Contractor Environmental Guide is to assist contractors working aboard Marine Corps Installations East's (MCIEAST's) Marine Corps Base (MCB) Camp Lejeune and Marine Corps Air Station (MCAS) New River in maintaining the mission by complying with Federal and State environmental laws and regulations, as well as the United States Marine Corps (USMC) and installation environmental policies. This guide is written in accordance with Marine Corps Order (MCO) P5090.2A and designed to answer many of the environmental questions that arise, as well as to provide pertinent information on environmental topics and training requirements.

This document should be used only as a *guide* to the environmental issues contractors may face while working aboard MCB Camp Lejeune and MCAS New River.

NOTE: This document should be used only as a guide to the environmental issues contractors may face while working

aboard MCB Camp Lejeune and MCAS New River. It is expected that contractors will work closely with the Environmental Management Division (EMD) at MCB Camp Lejeune, the Environmental Affairs Department (EAD) at MCAS New River, and Contract Representatives regarding environmental management issues, concerns, and/or questions. Should the need arise, this guide provides contractors with EMD, EAD, and emergency response points of contact (POCs). All initial inquiries should be directed to the Resident Officer in Charge of Construction (ROICC) or Contract Representative, who will either direct the contractor or contact the appropriate environmental office if additional clarification regarding an environmental issue is necessary.

Contact the ROICC or Contract Representative with any questions.

NOTE: It is very important to note that this guide is designed to provide requirements specific to MCB Camp Lejeune-issued contracts. It is the contractor's responsibility to know and comply with all Federal, State, and local regulations. MCB Camp Lejeune 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 or certification as per contract requirements. All required environmental training should be completed ***prior*** to working at MCIEAST installations.

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 required.

1.1. KEY DEFINITIONS AND CONCEPTS

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

1.1.1. Key Definitions

- **Environment.** Surroundings, to include all surface water, groundwater, drinking water supply, land surface or subsurface area, or ambient air within the United States or under the jurisdiction of the United States, including manmade structures, indoor air environments, natural resources, and archeological and cultural resources.
- **Environmental Management Division.** MCB Camp Lejeune's division responsible for environmental issues and compliance at MCB Camp Lejeune.
- **Environmental Affairs Department.** MCAS New River's department responsible for environmental issues and compliance at MCAS New River.
- **Environmental Management System (EMS).** A systematic approach for integrating environmental

considerations and accountability into day-to-day decisionmaking and long-term planning processes across all missions, practices, and functions. The EMS institutionalizes processes for continual environmental improvement and reducing risks to mission through ongoing planning, review, and preventive or corrective action.

1.1.2. Key Concepts

- **Environmental Requirement.** A defined standard pertaining to environmental compliance, pollution prevention (P2), or natural/cultural resources, subject to uniform application. Environmental requirements may be in the form of a law, regulation, Executive Order (EO), policy, ordinance, permit, Base Order (BO), or other form that prescribes a standard.
- **Executive Order.** Legally binding orders given by the President, as head of the Executive Branch, to direct Federal agencies and officials in their execution of congressionally established laws or policies.
- **MCB Camp Lejeune.** Throughout this document, MCB Camp Lejeune includes all MCB Camp Lejeune real property and contracts for work performed at MCAS New River and all outlying fields associated with MCB Camp Lejeune.
- **Marine Corps Order.** A directive of continuing authority or information, meant to be a permanent reference and requiring continuing action, issued by Headquarters Marine Corps (HQMC). In accordance

with MCO 5215.1K (10 May 2007), all MCOs shall, where applicable: establish, describe, or change existing policy, programs and major activities, and organizations; define missions; assign responsibilities; issue procedural guidance; and be written in standardized format.

- **Resident Officer In Charge of Construction.** The ROICC administers construction contracts and is the contractor's first line of contact with the government.
- **Regulatory Requirements.** Government (including Federal, State, and local) environmental regulations implemented by environmental statutes. Federal regulations often establish minimum standards for State and local governments' implementing programs.
- **Statutory Requirements.** Federal environmental statutes are laws that generally require compliance by U.S. Department of Defense (DoD) installations.

1.2. INSTALLATION BACKGROUND

MCB Camp Lejeune was established in 1941 in Onslow County, along the southern coast of North Carolina (NC). MCB Camp Lejeune is just south of MCAS New River. MCB Camp Lejeune takes advantage of 156,000 acres and 11 miles of beach capable of supporting amphibious operations, 32 gun positions, 48 tactical landing zones, three state-of-the-art training facilities, and 80 live fire ranges for its training mission.

The primary function of MCB Camp Lejeune is national defense, providing a home installation for the II Marine Expeditionary Force (MEF), 2nd Marine Division, 2nd Force Service Support Group, and other combat units and support commands. MCB Camp Lejeune's mission is to maintain combat-ready units for expeditionary deployment. MCB Camp Lejeune maintains and utilizes supply warehouses, maintenance shops, hazardous material storage, nonhazardous and hazardous waste storage, bulk fuel storage and transfer facilities, fleet parking, housing areas, recreational areas, two golf courses, and a marina.

MCAS New River is the principal USMC helicopter operating location on the East Coast and supports aircrew training in the H-53 helicopter. It is also the evaluation and prospective bed-down site for the V-22 Osprey. The mission of MCAS New River is to provide the necessary support for its Marine Aircraft Group (MAG) tenant units, MAG-26 and MAG-29.

1.2.1. Environmental Management Division and Environmental Affairs Department

MCB Camp Lejeune's EMD, within the Installation and Environment Department, is responsible for all natural resource and environmental matters aboard the installation. EMD works closely with MCB Camp Lejeune personnel, educating and training them to comply with environmental laws while accomplishing the military mission.

The EAD at MCAS New River works closely with the EMD on environmental compliance and protection matters. Due to

various joint operations, MCB Camp Lejeune and MCAS New River participate together in one EMS. See Figure 1-1 and Figure 1-2 for organization charts of EMD and EAD.

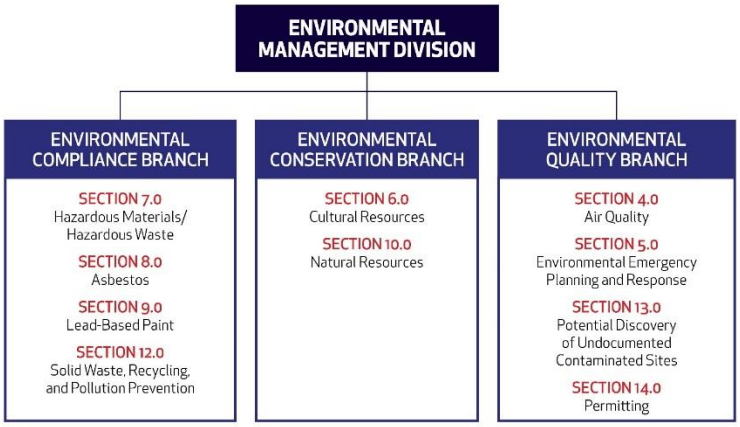

Figure 1-1. Environmental Management Division (MCB Camp Lejeune) Organization Chart

Figure 1-2. Environmental Affairs Department (MCAS New River)
Organization Chart

1.2.2. Expectations

Contractors aboard the installation, which are committed to strict compliance with environmental laws and regulations,

assist MCB Camp Lejeune in providing the best possible training facilities for today's Marines and Sailors, while honoring our environmental responsibilities and objectives. Violation of environmental laws may result in severe civil or criminal penalties and fines.

1.3. OVERVIEW OF REQUIREMENTS

Contractors operating aboard MCB Lejeune and MCAS New River must be aware of and adhere to all applicable environmental regulations and requirements, which include but may not be limited to the following:

- **EO 12088, Federal Compliance with Pollution Control Standards (October 13, 1978).** Requires all facilities owned by or leased to or by the military to be designed, operated, and maintained in compliance with all applicable environmental standards. Military and civilian personnel must cooperate with Federal, State, and local environmental protection agencies and comply with applicable standards and criteria issued by these agencies to the extent permitted by law.
- **EO 13423, Strengthening Federal Environmental, Energy, and Transportation Management.** Requires Federal agencies to comply with applicable Federal, State, local, and host nation environmental laws and regulations. Additionally, requirements include more widespread use of EMSs as the framework for sustainability management.

- **EO 13514, Federal Leadership in Environmental, Energy, and Economic Performance.** Requires Federal agencies to meet various sustainability goals, to include the reduction of greenhouse gas emissions. Applicable provisions for meeting these goals are to be included in acquisition and service contracts.
- **MCO P5090.2A, Environmental Compliance and Protection Manual (26 August 2013).** USMC policies and responsibilities for compliance with environmental statutes and regulations, as well as the management of USMC environmental programs.

1.3.1. Contractor Environmental Guide

This guide consists of the following information:

- MCB Camp Lejeune Contractor Environmental Guide
  - EMS overview and requirements
  - Environmental program-specific requirements
- MCB Camp Lejeune General EMS and Environmental Awareness Training for Contractors and Vendors
- Signature Page

Prior to beginning work onsite, or within 30 days of beginning work onsite, all contractors and their employees performing work aboard MCB Camp Lejeune must review these materials and complete EMS and General Environmental Awareness training.

Prior to beginning work onsite, or within 30 days of beginning work onsite, all contractors and their employees performing work aboard MCB Camp Lejeune must review these materials and complete EMS and General Environmental Awareness training. This guide summarizes the EMS and environmental programs at MCB Camp Lejeune, as well as 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 EMD/EAD when environmental concerns or issues arise.

1.3.2. Environmental and EMS Training

In accordance with Department of Defense (DoD) instructions and MCOs, EMD has implemented a Comprehensive Environmental Training and Education Program (CETEP). The goal of the 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.

All contractors are required to receive both EMS and general environmental awareness training at the level necessary for their job function.

In addition to CETEP requirements, MCB Camp Lejeune has implemented an installation-wide EMS. 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 are required to receive both EMS and general environmental awareness training at the level necessary for their job function. This guide satisfies these training requirements (See the Appendix).

As such, contractors working aboard MCB Camp Lejeune will do the following:

- Conduct 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.

- Complete EMS and general environmental awareness training, and be aware of and understand the MCB Camp Lejeune Environmental Policy.
- Contact their ROICC or Contract Representative immediately regarding environmental and/or EMS issues.

Prior to beginning work onsite or within 30 days, all contractors must sign and date the signature page and return it to the installation Contract Representative. Anyone who works on a contract at any point during the contract period must receive this information and training.

1.4. POINTS OF CONTACT

EMD Branches and phone numbers are found in the Contractor's Phone Directory on pages xv and xvi of this Guide. All initial inquiries regarding an environmental issue should be directed to the ROICC or Contract Representative, who will either directly contact or refer the contractor to the appropriate environmental office if additional clarification is necessary. In the case of a spill or environmental emergency, immediately dial 911. Additional emergency response procedures are provided in Section 5.0 of this Guide.

Table 1-1. Contacts in Case of a Spill

For spills of:	Call:	Follow-up:
Hazardous waste	**911**	Spill Report
Unknown materials	**911**	Spill Report
Material on a permeable surface	**911**	Spill Report
Any amount of a POL or Hazardous Material	**911**	Spill Report
Material that reaches stormwater inlets or waterways	**911**	
Nonhazardous waste	(910) 451-1482	911

1.5. OVERVIEW MAP

Figure 1-3 provides an overview map that displays the locations of installation facilities discussed throughout this Guide.

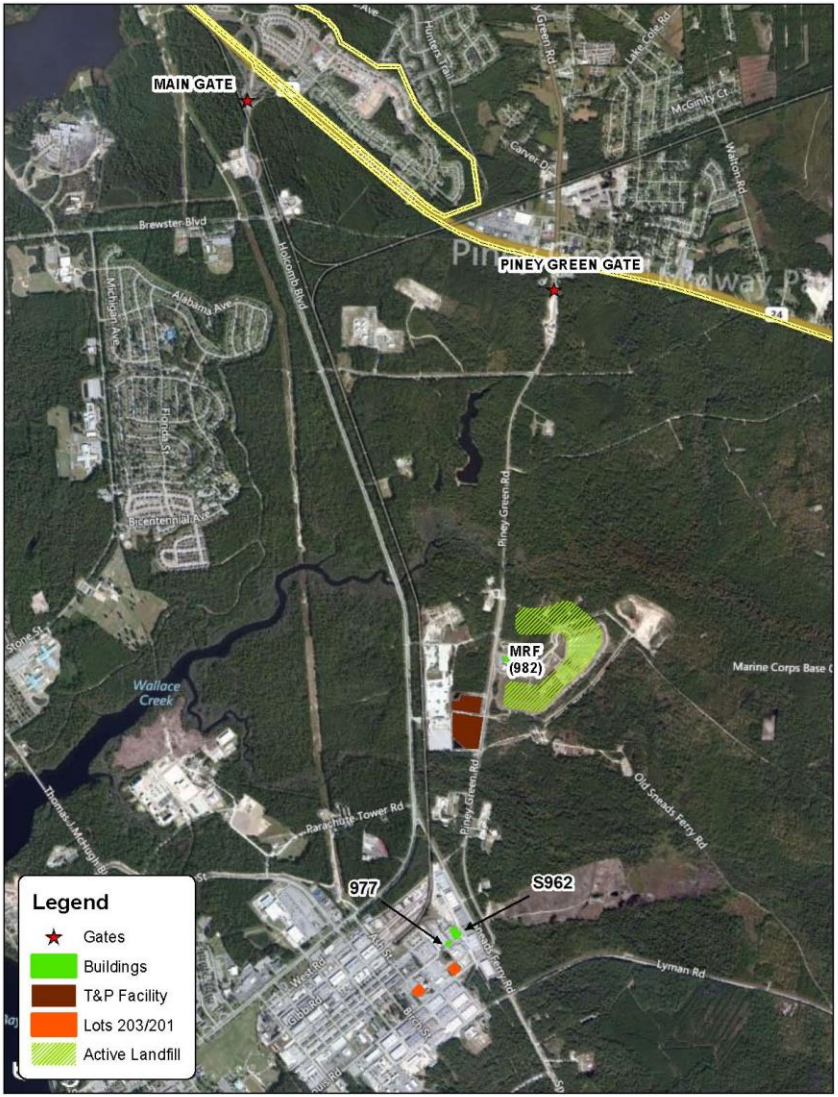

Figure 1-3. Overview Map

2.0 ENVIRONMENTAL MANAGEMENT SYSTEM

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

MCB Camp Lejeune and MCAS New River jointly operate an EMS, which provides a systematic way of continually implementing environmental requirements and evaluating performance. The EMS is founded on the principles of MCB Camp Lejeune's Environmental Policy, which is endorsed by the Commanding General (CG). Three key principles of the Environmental Policy are to:

- Comply with relevant environmental laws and regulations;
- Prevent pollution; and
- Continually improve the EMS.

The EMS promotes sustained mission readiness through actively identifying and implementing opportunities for efficient resource use. The USMC implements EMS at all levels to continually improve environmental compliance programs and meet evolving EOs and DoD requirements for mission sustainability. 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 DEFINITION AND CONCEPTS

The following key definitions and concepts are associated with an EMS. Please consult the ROICC or Contract Representative with any questions about these definitions or concepts.

Please consult the ROICC or Contract Representative with any questions.

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 an organization's activities, products, or services that may 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, beneficial or adverse, 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 MCB Camp Lejeune or MCAS New River, in the surrounding community, within the ecosystem, or beyond, that may be impacted by the operation of practices.

- **Practice.** A unit process that supports a military mission and may 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 the assignment of more specific responsibilities is left to the owning organizations.
- **Requirement.** Legislation, regulation, or policy issued by any Executive, Federal, State, local, DoD, Department of Navy (DoN), or USMC authority that addresses environmental considerations and requires action.

2.1.2. Key Concepts

- **Environmental Management System.** A systematic approach for integrating environmental considerations and accountability into day-to-day decisionmaking and long-term planning processes across all missions, activities, and functions. The EMS institutionalizes processes for continual environmental improvement and for reducing risks to mission through ongoing planning, review, and preventive or corrective action.

- **Environmental Policy.** Public commitment by senior leaders to the management of the installation's environmental affairs, including environmental compliance, pollution prevention, natural/cultural resource management, cleanup, risk to mission, and continual improvement of the EMS.
- **Plan, Do, Check, Act.** Four-step model by which the EMS carries out change – **Plan:** establish objectives and processes; **Do:** implement and execute the plan; **Check:** study and analyze the results; **Act:** take action based on what you learned.

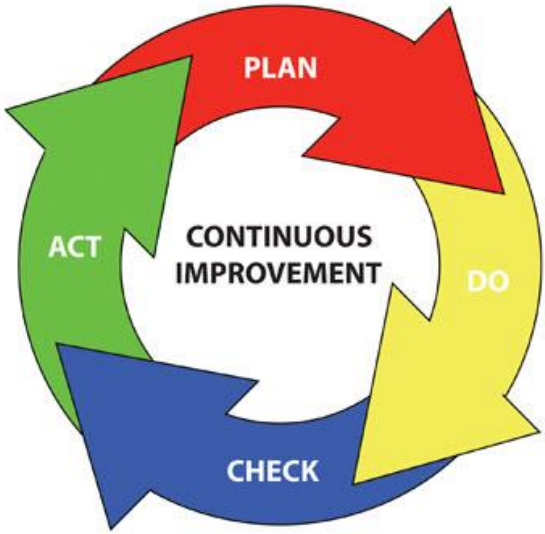

Figure 2-1. Plan, Do, Check, Act Cycle

2.2. OVERVIEW OF REQUIREMENTS

Contractors operating aboard MCB Camp Lejeune and MCAS New River must be aware of and adhere to all applicable regulations and requirements concerning EMS, which include but may not be limited to the following:

- **EO 13148, Greening the Government Through Leadership in Environmental Management.** Mandates that environmental management considerations must be an integral component of Federal Government policies, operations, planning, and management, with the primary goal for each agency to promote the sustainable management of Federal facility lands through the implementation of cost-effective, environmentally sound practices, and programs to reduce adverse impacts to the natural environment.
- **EO 13423, Strengthening Federal Environmental, Energy, and Transportation Management.** Establishes the EMS as the primary management approach for addressing environmental aspects, including energy and transportation aspects, and as the reporting mechanism for communicating progress on meeting performance goals.
- **EO 13514, Leadership in Environmental, Energy, and Economic Performance.** Requires continuing implementation of formal EMSs at all appropriate organizational levels to support the sustainability performance requirements of the Order.

2.3. ENVIRONMENTAL MANAGEMENT SYSTEM

An EMS is a systematic way to identify and eliminate or minimize the installation's environmental risk-to-mission. MCB Camp Lejeune's EMS identifies practices and their aspects as a starting point for prioritizing environmental management initiatives. Each installation practice, such as construction/renovation/demolition, equipment operation/maintenance/disposal, landscaping, or pesticide/herbicide management and application, has one or more environmental aspects. Figure 2-2 illustrates the simplified potential interactions of one practice, construction/renovation/demolition, with the environment.

Figure 2-2. Potential Interactions of Construction and Demolition Activities with the Environment

2.4. EMS RESPONSIBILITIES

Contractors are expected to understand that the practices they support on the installation may interact with and have the potential to impact the environment. Therefore, it is expected that contractors will do the following:

Contractors are expected to understand that the activities performed on the installation may interact with the environment and have the potential to impact the environment.

- Review the Contractor Environmental Guide.
- Be aware of the Environmental Policy (Attachment 2-1).
- Conduct practices in a way that avoids and/or minimizes impacts to the environment by complying with all applicable Federal, State, and local environmental regulations and BOs.
- Be familiar with spill response 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 sections of this Contractor Environmental Guide are categorized based on the type of environmental requirements routinely encountered by contractors at MCB Camp Lejeune. The following matrix is derived from MCB Camp Lejeune's EMS Working Group sessions and relates the contents of this guide to the practices aboard MCB Camp Lejeune. It is provided to assist contractors in narrowing down specific requirements that may apply to onsite activities.

Table 2-1. Practices Identified Under MCB Camp Lejeune's EMS

MCB Camp Lejeune 2015 Practices	Env. Emergency Response/ Spill Response, Section 5.0	HM/HW, Section 7.0	Potential Discovery of Undocumented Contaminated Sites, Section 13.0	Asbestos, Section 8.0	Lead-Based Paint, Section 9.0	Stormwater, Section 11.0	Solid Waste, Recycling, and P2, Section 12.0	Training, Section 3.0	Cultural Resources, Section 6.0	Permitting, Section 14.0	Air Quality, Section 4.0	Natural Resources, Section 10.0
Battery management	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				
Boat operation/ maintenance		●									●	
Boat, ramp, dock cleaning						●						
Boiler operation		●									●	
Building operation/ maintenance/ repair		●		●			●					
Channel dredging						●						
Chlorination		●									●	
Composting						●	●					
Construction/demo/ renovation				●	●	●	●		●			
Cooling tower operation and maintenance		●										
De-greasing		●									●	
Drinking water management		●										
Engine operation and maintenance		●									●	
Equipment operation/ maintenance/disposal		●		●			●					
Erosion/ runoff control						●						●
Fish stocking												

MCB Camp Lejeune 2015 Practices	Env. Emergency Response/ Spill Response, Section 5.0	HM/HW, Section 7.0	Potential Discovery of Undocumented Contaminated Sites, Section 13.0	Asbestos, Section 8.0	Lead-Based Paint, Section 9.0	Stormwater, Section 11.0	Solid Waste, Recycling, and P2, Section 12.0	Training, Section 3.0	Cultural Resources, Section 6.0	Permitting, Section 14.0	Air Quality, Section 4.0	Natural Resources, Section 10.0
Fueling and fuel mgt./ storage	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			●	
Grease traps							●					
Habitat management		●									●	●
HCP operation		●										
HM storage		●				●					●	
HM transportation		●									●	
HW disposal offsite transport		●					●					
HW satellite accumulation area		●									●	
HW storage (<90 days)		●										
HW transportation		●		●	●						●	
Land clearing						●	●		●			●
Landfill gas energy recovery system												
Landscaping		●				●						
Laundry		●										
Live fire range operation		●				●					●	●
Livestock operation						●	●					
Metal working		●					●				●	
Non-destructive inspection		●										
ODS/ halon management		●									●	
Packaging/unpack-aging							●					

MCB Camp Lejeune 2015 Practices	Env. Emergency Response/ Spill Response, Section 5.0	HM/HW, Section 7.0	Potential Discovery of Undocumented Contaminated Sites, Section 13.0	Asbestos, Section 8.0	Lead-Based Paint, Section 9.0	Stormwater, Section 11.0	Solid Waste, Recycling, and P2, Section 12.0	Training, Section 3.0	Cultural Resources, Section 6.0	Permitting, Section 14.0	Air Quality, Section 4.0	Natural Resources, Section 10.0
Paint booth	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			●	
Paint gun cleaning		●									●	
Paint removal		●			●		●				●	
Painting		●					●				●	
Parts replacement		●		●			●					
Pesticide/herbicide mgt. and application		●				●						
Polishing		●					●				●	
Pumping station/ force main		●										
Range residue clearance		●				●	●					
Recreational facilities operation		●					●					
Road construction and maintenance						●	●		●	●	●	●
Rock-crushing operations							●				●	
Roofing kettle		●										
Sewers												
Sidewalk and road deicing		●				●						
Soil excavation/grading						●			●			●
Solid waste collection/transportation							●				●	
Storage tank management		●					●				●	

MCB Camp Lejeune 2015 Practices	Env. Emergency Response/ Spill Response, Section 5.0	HM/HW, Section 7.0	Potential Discovery of Undocumented Contaminated Sites, Section 13.0	Asbestos, Section 8.0	Lead-Based Paint, Section 9.0	Stormwater, Section 11.0	Solid Waste, Recycling, and P2, Section 12.0	Training, Section 3.0	Cultural Resources, Section 6.0	Permitting, Section 14.0	Air Quality, Section 4.0	Natural Resources, Section 10.0
Stormwater collection/ conveyance	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				
Surface washing												
Swimming pool operation and maintenance		●										
Timber management												●
Universal waste storage/ collection		●										
Urban wildlife management							●					●
UXO/EOD operations		●									●	
Vehicle maintenance		●					●				●	
Vehicle parking						●						
Wash rack						●						

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Attachment 2-1

MCB Camp Lejeune's Environmental Policy Statement

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COMMANDING GENERAL'S ENVIRONMENTAL POLICY STATEMENT

The protection and enhancement of our natural environment is a valuable tool in sustaining the training and support mission of Marine Corps Installations East-Marine Corps Base Camp Lejeune (MCIEAST-MCB CAMLEJ). As MCIEAST-MCB CAMLEJ prepares for the increasing demands on facilities, training areas, ranges, and quality-of-life services that support the readiness of our forces, we are committed to protecting human health, conserving natural and cultural resources, and complying with regulatory requirements.

The MCIEAST-MCB CAMLEJ Environmental Management System (EMS) promotes sustained mission readiness through actively identifying and implementing solutions and opportunities for efficient resource use. Through the EMS, MCIEAST-MCB CAMLEJ will continually assess daily operations in order to identify and implement improvements to its practices that will ensure compliance with governing regulations and meet the sustainability objectives of Executive Orders 13514 and 13423. In this endeavor, MCIEAST-MCB CAMLEJ will:

- Continue proactive compliance with all environmental laws, regulations, and U. S. Marine Corps policies.
- Integrate natural and cultural resource management with the military mission whenever practical.
- Incorporate sound environmental practices into all of our operations and business decisions.
- Implement pollution prevention initiatives, waste diversion, recycling, and waste minimization programs.
- Assess and remediate contaminated sites aboard the Base that are the result of past disposal practices or spills and leaks of hazardous materials.
- Implement energy efficiency and water conservation management projects.
- Procure sustainable products, including biobased, environmentally preferable, energy efficient, water efficient, and recycled–content products.
- Collaborate with local communities and regulatory agencies to enhance stewardship of the environment, create goodwill and build trust.
- Educate our Marines, Sailors, and Civilian Marines about their responsibility to protect our natural environment, stressing the important role each individual plays in an effective EMS.

Join me in applying these environmental management principles to protect and enhance our natural environment, while strengthening the combat readiness of our forces and the quality-of-life services to our warriors and their families.

R. F. CASTELLVI
Brigadier General, U.S. Marine Corps
Commanding General
Marine Corps Installations East-Marine Corps Base Camp Lejeune

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3.0 TRAINING

To minimize the environmental impact of MCB Camp Lejeune operations, all contractors are required to receive both EMS and general environmental awareness training at the level necessary for their job function.

The contractor is responsible for ensuring that every employee completes a program of classroom instruction or on-the-job training that teaches the employee to perform his or her duties in compliance with Federal, State, and local regulatory requirements.

To minimize the environmental impact of MCB Camp Lejeune operations, all civilian and military personnel, including contractors, are required to receive both EMS and general environmental awareness training at the level necessary for their job function. Use of the Contractor Environmental Guide satisfies these training requirements. A training presentation is provided in the Appendix.

NOTE: The contractor is responsible for knowing and complying with Federal, State, and local regulations. MCB Camp Lejeune 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 training as per contract requirements. Required training should be completed ***prior*** to working at MCB Camp Lejeune.

3.1. KEY DEFINITIONS AND CONCEPTS

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

Please consult the ROICC or Contract Representative with any questions or concerns about the information in this section.

3.1.1. Key Definitions

- **Explicitly Required Training.** Training expressly required by specific laws, regulations, or policies that apply due to the nature of work assignments, job functions, and/or specific licensing or certification requirements mandated by environmental laws, regulations, or policies.
- **Implicitly Required Training.** Instruction/information that is not expressly required by laws, regulations, or policies, but that may be reasonably inferred as being required to maintain compliance or is determined through EMS to reduce overall environmental risk.

3.1.2. Key Concepts

- **Comprehensive Environmental Training and Education Program (CETEP).** The USMC training program designed to ensure that high-quality, efficient, and effective environmental training, education, and information are provided at all levels of the USMC.
- **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.** All contractors are required to receive EMS training at the level necessary for their job function.
- **General Environmental Awareness Training.** Instruction designed to ensure that MCB Camp Lejeune and MCAS New River personnel become familiar with the installation environmental policies and programs for regulatory compliance, natural resource conservation, P2, and environmental protection. General EMS and Environmental Awareness Training for contractors and vendors is required for all MCB Camp Lejeune contractors. The training presentation is included as an Appendix to this document.

3.1.3. Environmental Management System

Training is potentially applicable to all EMS practices conducted aboard MCB Camp Lejeune.

3.2. OVERVIEW OF REQUIREMENTS

Contractors operating aboard MCB Lejeune and MCAS New River must be aware of and adhere to all applicable regulations and requirements concerning training, which include but may not be limited to the following:

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

3.3. TRAINING REQUIREMENTS

3.3.1. General Environmental Awareness

In accordance with DoD instructions and MCO, the EMD at MCB Camp Lejeune has implemented a 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. Prior to or within 30 days of beginning work onsite, all contractors and their employees performing work aboard

Prior to or within 30 days of beginning work onsite, all contractors are required to receive both EMS and general environmental awareness training.

MCB Camp Lejeune must receive general environmental awareness training.

3.3.2. Environmental Management System

In addition to CETEP requirements, MCB Camp Lejeune has implemented an installation-wide EMS per EO 13423, *Strengthening Federal Environmental, Energy, and Transportation Management*, and DoD and USMC 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.

Prior to or within 30 days of beginning work onsite, all contractors and their employees performing work aboard MCB Camp Lejeune must receive EMS training.

3.3.3. Recordkeeping

Upon completion of the training materials included in the Appendix of the Contractor Environmental Guide, each employee must sign the Training Roster. The Contracting Representative must maintain these records in the contract file.

All training records, including other applicable environmental training, must be maintained onsite for review.

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4.0 AIR QUALITY

The Air Quality Program is responsible for ensuring that the installation complies with all applicable Federal, State, and local air quality regulations. The ROICC or Contract Representative will provide a copy of BO 5090.6A, Air Quality Management, which has additional information.

4.1. 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 the ROICC or Contract Representative, who will contact the appropriate environmental office if additional clarification is necessary.

Please consult the ROICC or Contract Representative with any questions or concerns about the information in this section.

4.1.1. Key Definitions

- **Criteria Pollutants.** Pollutants that the U.S. Environmental Protection Agency (EPA) Administrator has determined will cause or contribute to air pollution, that may reasonably be anticipated to endanger public health and welfare, and for which air quality criteria have been established (i.e., sulfur dioxide, nitrogen oxides,

ground-level ozone, carbon monoxide, lead, and particulate matter).

- **Dust-Causing Activity.** Any activity that has the potential to generate an excess level of dust, including but not limited to construction and demolition (C&D), blasting and sanding, construction of haul roads, land clearing, or fallow fields.
- **Hazardous Air Pollutants.** Air pollutants, as identified within 42 United States Code (USC) 7412, that cause or may cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental and ecological effects.
- **Ozone-Depleting Substance.** Chemicals, such as certain refrigerants, that cause depletion of the stratospheric ozone layer—primarily chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs) and their blends.
- **Particulate Matter.** A criteria air pollutant that includes dust, soot, and other small materials that are released into and transported by air.
- **Title V Operating Permit.** Permit issued under the Clean Air Act (CAA) Amendments of 1990 for all major sources of air pollution. All emission sources at the installation must be listed on the permit.

4.1.2. Key Concepts

- **Emission Sources.** Before beginning any emitting activity, please have the ROICC or Contract

Representative contact EMD to determine whether any permitting, monitoring, reporting, testing, and/or recordkeeping requirements apply.

- **Permitted Sources.** Ensure that construction/authorization permits are in place prior to beginning construction and/or prior to the arrival onsite of new or additional emission sources (emergency generators, paint booths, etc.).

4.1.3. Environmental Management System

Contractor activities associated with air quality include the following:

- Boat operation/maintenance
- Boiler operation
- Chlorination
- Degreasing
- Engine operation and maintenance
- Fueling and fuel management/storage
- Hazardous material (HM) storage/transportation
- Hazardous waste (HW) satellite accumulation area/HW transportation
- Live fire range operations
- Metal working
- Ozone-depleting substance (ODS)/halon management

- Paint booth operations/paint gun cleaning/paint removal
- Polishing
- Road construction and maintenance
- Rock-crushing operations
- Solid waste collection/transportation
- Storage tank management
- Unexploded ordnance (UXO)/explosives and ordnance disposal (EOD) operations
- Vehicle maintenance

The potential impacts of these activities on the environment include degradation of air quality, degradation of quality of life, and depletion of nonrenewable resources.

4.2. OVERVIEW OF REQUIREMENTS

Contractors operating aboard the installation must be aware of and adhere to all applicable regulations and requirements regarding air quality, which include but may not be limited to:

- **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 Operating Permit.** Operating permit required for any major stationary source that emits or

has the potential to emit 100 tons per year or more of any criteria air pollutant and outlines the requirements to address and ensure air quality compliance.

- **BO 5090.6A, 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 5090, Open Burning of Vegetative Debris.** Outlines procedures for conducting open burning in accordance with State regulations and installation procedures.
- **North Carolina Department of Air Quality (NCDAQ) Rules.** Outlines all State-specific air quality rules, control requirements, procedures for permits, and approvals contained in 15A North Carolina Administrative Code (NCAC) 02D, 02H, and 02Q applicable to North Carolina entities.

4.3. PERMIT REQUIREMENTS

The installation has a single permit, the CAA Title V Construction and Operating Permit, which includes all stationary air emission sources at the facility; therefore, all permit application submittals to the NCDAQ must be coordinated through the EMD. The NCDAQ will review and process the application and 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:

A permit is required for the construction of any emission source. Timely submittal of the permit application is necessary to ensure the permit is available before commencing construction.

- Boilers
- Generators
- Engine test stands
- Surface coating/painting operations
- Paint removal (chemical and mechanical), abrasive blasting, or other surface preparation activities
- Fuel storage and fuel dispensing
- Grinding
- Woodworking
- Welding
- ODS/refrigerant recovery and recycling operations (industrial chillers, refrigerators, air conditioning compressors, cleaning agents, etc.)
- Bulk chemical and flammable materials storage

4.4. ADDITIONAL ACTIVITIES OF CONCERN

Contact the ROICC or Contract Representative for additional information regarding activities that do not

necessarily require modification to the Title V permit, but that must be coordinated with or tracked by EMD or the NCDAQ. Examples of these activities include, but are not limited to, the following:

- **Use, Maintenance, and Management of Refrigerants and other ODS.** Includes installation, recovery, replacement, conversion, or service of refrigerant-containing equipment (chillers, refrigerators, air conditioning condensers, etc.). All contractors will use Best Management Practices (BMPs) during refrigerant management activities. All Heating, Ventilation, and Air Conditioning (HVAC) technicians will maintain their appropriate State-specific licenses and present them to the ROICC or Contract Representative upon request.
- **Emergency Generators.** Includes the installation and temporary use of emergency generators during electrical failures and construction activities. All contractors will coordinate with the ROICC or Contract Representative to determine if the intended generator may be exempted or must be temporarily permitted for the intended use.
- **Open Burning (e.g., right-of-way clearing, storm debris burning).** Open burning activities aboard MCB Camp Lejeune and MCAS New River must coordinated through EMD and the Fire Department. Open burning activities are only permissible for land clearing and right-of-way maintenance when the following conditions are met:

- The wind direction at the time the burning is initiated is away from any public transport roads within 250 feet so they are not affected by smoke, ash, or other air pollutants from the burning.
- The location of the burning is at least 500 feet from any dwelling, group of dwellings, commercial or institutional establishment, or other occupied structure not located on the property on which the burning is conducted, unless an air curtain burner is used. If an air curtain burner is used, the regional office supervisor may grant exceptions to the setback requirements.
- Heavy oils, asphaltic materials (e.g., shingles and other roofing materials), items containing natural or synthetic rubber, or any materials other than vegetative plant growth are not burned.
- Initial burning must begin between 0800 and 1800. After 1800, no material may be added to the fire until 0800 the following day.
- No fires may be started, and no vegetation may be added to existing fires, when the North Carolina Division of Forest Resources has banned burning for that area.
- Burners that have the potential to burn more than 8,100 tons per year may be subject to Title V air quality permitting requirements.

Situations that require a regulatory exemption evaluation by the NCDAQ Regional Office

Supervisor are coordinated through EMD's Environmental Quality Branch Air Quality Program Manager. The ROICC or Contract Representative will address any additional questions or provide a copy of Base Bulletin 5090, which contains a summary of the installation's open burning requirements.

The four designated sites at MCB Camp Lejeune that are permitted for storing and/or burning storm debris are in the following areas: Mainside at the borrow pit near the Piney Green landfill, Courthouse Bay, Camp Johnson, and Camp Geiger. Only storm debris may be accumulated at these sites. EMD must notify the NCDAQ if the installation intends to burn the storm debris at one of these sites. Contact the 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.

  Before the training exercise, an accredited North Carolina Asbestos Inspector must inspect any structure to be burned to ensure that it is free from asbestos. Turn in the completed form to EMD for submittal to NCDAQ and the Division of Public Health, Health Hazards Control Unit. Contact the

ROICC or Contract Representative for additional information.

- **Dust-causing activities (e.g., concrete and 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. Applicable wet suppression may be required during temporary concrete-crushing operations during C&D activities.
- **Noise Management.** USMC commands engaged in any activity resulting in noise emissions must comply with Federal, State, interstate, and local requirements for the control and management of environmental noise to minimize disruption to the local community. To the maximum extent practicable, personnel should limit the use of power tools, machinery, construction equipment, and other noisy devices to normal working hour

5.0 ENVIRONMENTAL EMERGENCY PLANNING AND RESPONSE

Environmental emergency planning and response can reduce injuries, protect employees, reduce asset losses, minimize downtime, and minimize environmental impacts of uncontrolled releases of pollutants to air, land, and water. The purpose of emergency planning is to prepare for, mitigate, respond to, and recover from environmental emergencies while minimizing any potential impacts to human health and the environment. Contractors operating aboard MCB Camp Lejeune must be aware of and adhere to all environmental emergency response procedures and notification requirements to minimize detrimental effects from inadvertent releases.

Procedures relating to emergencies caused by unforeseen site conditions are addressed in Section 5.0of this guide. If an environmental emergency is identified, contact 911 immediately. Additional inquiries should be directed to the ROICC or Contract Representative.

Please consult the ROICC or Contract Representative with any questions or concerns about the information in this section.

5.1. 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 the ROICC or Contract Representative, who will contact the appropriate environmental office if additional clarification is necessary.

5.1.1. Key Definitions

- **Berm.** A mound used to prevent the spread of a contaminant.
- **Discharge.** Any spilling, leaking, pumping, pouring, emitting, emptying, or dumping not explicitly permitted.
- **Navigable waters.** The waters of the United States and territorial seas, including waters that have been or may be used for commerce, waters subject to tidal flow, interstate waters and wetlands, and all other waters (intrastate lakes, rivers, streams, intermittent streams, flats, wetlands, sloughs, prairies, wet meadows, natural ponds, tributaries, etc.).
- **Petroleum, Oil, and Lubricant (POL).** A broad term that includes all petroleum and associated products or oil of any kind or in any form, including, but not limited to, petroleum, fuel oil, vegetable oil, animal oil, sludge, oil refuse, and oil mixed with wastes.
- **Release.** Pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment (including the abandonment or discarding of barrels, containers, and other closed receptacles) of any hazardous

chemical, hazardous substance, or extremely hazardous substance (EHS). Releases may be aboveground, belowground, or to water.

- **Spill Event.** The reportable discharge of oil into or upon the navigable waters of the United States or adjoining shorelines in harmful quantities, as defined by the Code of Federal Regulations (CFR) in 40 CFR 110.

5.1.2. Key Concepts

- **Environmental Emergency Response Contacts.** The following table identifies the emergency contact information for various spill scenarios. In addition to these emergency response contacts, the ROICC or Contract Representative should be notified immediately after an incident.

Table 5-1. Environmental Emergency Response Contacts

For spills of:	Call:	Follow-up:
Hazardous waste	**911**	Spill Report
Unknown materials	**911**	Spill Report
Material on a permeable surface	**911**	Spill Report

For spills of:	Call:	Follow-up:
Any amount of a POL or Hazardous Material	**911**	Spill Report
Material that reaches stormwater inlets or waterways	**911**	
Nonhazardous waste	(910) 451-1482	911

- Contractors have containment and cleanup responsibilities following a spill, and there may be additional follow-up reporting or requirements. Contact the ROICC or Contract Representative for additional guidance.

5.1.3. Environmental Management System

Environmental planning and response are potentially applicable to all EMS practices conducted aboard MCB Camp Lejeune.

5.2. 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 emergency response

and spill response procedures, which include but may not be limited to the following:

- **Clean Air Act of 1970, Section 112r** Mandates the prevention and control of air emissions and specifies emergency planning where the potential exists for accidental 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. The CWA establishes that there should be no discharges of oil or hazardous substances into or upon the navigable waters of the United States or adjoining shorelines, which may affect natural resources under the management of the United States.
- **Comprehensive Environmental Response, Compensation, and Liability (CERCLA) Act of 1980.** Authorizes a Federal response to any release or threatened release of a hazardous substance into the environment. This act defines hazardous substances by reference to substances that are listed or designated under other environmental statutes.
- **Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986, Section 304.** Establishes requirements for reporting a release to ensure a quick response by local emergency responders. Notification requirements apply to two chemical lists: the CERCLA Hazardous Substance list and the EHS list. The "List of Lists" provides a comprehensive identification of hazardous

substances and EHSs. In addition, facilities may be required to submit a list of their hazardous materials inventory maintained onsite or Safety Data Sheets (SDS) to response personnel.

- **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. The OPA requires contingency planning for "worst case" discharges and demonstrated response capabilities through planning, equipment, training, and exercises.
- **Resource Conservation and Recovery Act (RCRA) of 1976.** Protects human health and the environment from the hazards associated with hazardous waste handling, generation, transportation, treatment, storage, and disposal. Subtitle C of the RCRA requires owners and operators of hazardous waste facilities to develop comprehensive management plans that address spill prevention and cleanup.

5.3. SPILL NOTIFICATION

5.3.1. POL/Hazardous Materials Spill Notification Procedures

In accordance with MCB Camp Lejeune notification requirements, any discharge of oil or hazardous materials must be immediately reported to the MCB Camp Lejeune Fire Department at 911.

MCB Camp Lejeune maintains a Spill Prevention, Control, and Countermeasures (SPCC) Plan that establishes procedures to prevent oil spills and documents existing oil spill prevention structures, procedures, and equipment. The Installation SPCC Plan provides general information for any type of response actions needed for spills aboard MCB Camp Lejeune. Contractors engaged in the handling and transfer of POL or hazardous materials must develop a Unit-Level Contingency Plan (ULCP) that addresses the spill response for their specific sites and potential spill types. This ULCP must be maintained onsite, and all personnel working within that site must be made aware of its location and use.

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

In the event of a spill, contact the ROICC or Contract Representative (after contacting emergency responders) to obtain a spill report form. Return the completed spill report form to EMD (fax to (910) 451-3471) and to the ROICC or Contract Representative. A copy of the spill report form is included as Attachment 5-1. The following information must be provided when reporting a spill:

- 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, even if all of the required information is not immediately available.

5.3.2. Wastewater Spill and Water Line Break Notification

Contractors operating aboard MCB Camp Lejeune and MCAS New River must be aware of water and wastewater utilities in their specific work/project area.

Wastewater Spills

In the event of a wastewater spill, report the incident to the Public Works Base Utilities at (910) 451-7190 (x225). In addition, report the incident immediately to the ROICC or Contract Representative. The following information must be provided:

- Name and phone number
- Location of spill (building number, street address)
- Type and amount of spilled material
- Source of the spill
- Action being taken, if any, to control the spill
- Estimated time of spill

Water Line Breaks

In the event of a water line break, report the incident to the Public Works Base Utilities at (910) 451-7190 (x225). In addition, report the incident immediately to the ROICC or Contract Representative. The following information must be provided:

- Name and phone number
- Location of spill (building number, street address)
- Reason for the break
- Estimated time of the break

5.4. FOLLOW-UP

If surface run-off is contaminated, the contractor will, under the advisement of the Fire Department 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. Notify the Resource Conservation and Recovery Section (RCRS) at (910) 451-1482); the RCRS 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 12.0 and 7.0 of this guide for disposal requirements.

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Attachment 5-1

Spill Reporting Form

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MARINE CORPS INSALLATIONS EAST
MARINE CORPS BASE CAMP LEJEUNE
UNIT LEVEL SPILL FORM

Spill Date: Spill Time:

RESPONDERS

Response Initiator: Major Command:

Phone Number: Unit Name:

Fire Department Response: Responder Name:

EMD Respond? Responder Name:

GPS Coordinates: X: Y:

SPILL IDENTIFICATION

Spilled Substance: State:

Source (Vehicle, drum, etc.): Building:

Estimated Amount:

Cause of Spill:

Containment/Clean-up Action Taken:

Parties Performing Spill Clean-up/Removal (EMD Turn-in Date):

Additional Assistance Required:

REPORT CERTIFICATION

Printed Name/Rank: Signature:

E-mail: Date:

All releases must be reported to the Base Fire Department by calling 911. The Environmental Management Division can be reached by calling (910) 451-1482. Units are required to maintain a copy of all completed spill forms, preferably in their ESOP Binder.

MCIEAST-MCB CAMLEJ/G-F/EMD/5090.9/18 (2/13) PREVIOUS EDITIONS ARE OBSOLETE ADOBE 9.0

Enclosure (4)

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6.0 CULTURAL RESOURCES

MCB Camp Lejeune enjoys a rich history, and remnants of our past may be found throughout the real properties that make up the installation. All personnel at MCB Camp Lejeune are responsible for ensuring the cultural resources entrusted to the USMC care remain intact and available for future generations. Contractors are responsible for notifying the ROICC or Contract Representative immediately if they encounter suspected archaeological sites, artifacts, or human remains.

6.1. 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 the ROICC or Contract Representative, who will contact the appropriate environmental office if additional clarification is necessary.

Please consult the ROICC or Contract Representative with any questions or concerns about the information in this section.

6.1.1. Key Definitions

- **Archaeological Resource.** Defined by the Archaeological Resources Protection Act (ARPA) as any material remains of past 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 pottery, basketry, bottles, weapons, weapon projectiles, tools, structures or portions of structures, pit houses, rock paintings, rock carvings, intaglios, graves, human skeletal materials/remains, or any portion or piece of any of the foregoing items or structures. Non-fossilized and fossilized paleontological specimens, or any portion or piece thereof, are not considered archaeological resources unless found in an archaeological context. (According to the National Historic Preservation Act (NHPA) of 1966, some historic properties built within the past 50 years can achieve significance if they are of exceptional importance [National Register Criteria Consideration G].)

- **Cultural Resource.** A generic term for the collective evidence of the past activities and accomplishments of people, including buildings, structures, districts, sites, features, and objects of significance in history, architecture, archaeology, engineering, or culture, per MCO P5090.2A.

- **Effect.** Any condition of a project that may cause a change in the quality of the historic, architectural, archaeological, or cultural character of a property that qualifies it for listing in the National Register of Historic Places (NRHP). A project is considered to have an effect on a historic or cultural property when any aspect of the project changes the integrity of the

location, design, setting, materials, workmanship, feeling, or association of the property that contributes to its significance.

- **Historic Property.** Any prehistoric or historic district, site, building, structure, or object significant in U.S. history, architecture, archaeology, engineering, or culture and included, or eligible for listing in, the NRHP, per the NHPA and MCO P5090.2A.
- **State Historic Preservation Officer.** The person designated to administer the State Historic Preservation Program, including identifying and nominating eligible properties to the NRHP and administering applications for listing historic properties in the NRHP.

6.1.2. Key Concepts

- **Notification.** Contractors must notify the ROICC or Contract Representative if they encounter any cultural resources.
- **Policy.** DoD policy is to preserve significant historic and archaeological resources.

6.1.3. Environmental Management System

Contractor practices associated with cultural resources include the following:

- Construction/demolition/renovation
- Land clearing

- Road construction and maintenance
- Soil excavation/grading

The potential impacts of these activities on the environment include damage, destruction, alteration, theft, or demolition of historic properties.

6.2. 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 MCB Lejeune and MCAS New River must be aware of and adhere to all applicable regulations and requirements regarding cultural resources, which include but may not be limited to the following:

- **BO 5090.8A.** Sets forth regulations and establishes responsibilities associated with management of archaeological and historic resources aboard MCB Camp Lejeune.
- **Archaeological and Historic Preservation Act (AHPA) of 1974 (16 USC 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.

- **Archeological Resources Protection Act of 1979 (16 USC 470 et seq.)** Requires Federal land managers to issue permits for the excavation or removal of artifacts from lands under their jurisdiction. The ARPA 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, theft, or defacement of an archaeological site or artifacts 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.
- **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 USC 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 USC 4321 et seq.).** States that it is Federal government policy to preserve important historic, cultural, and natural aspects of our national heritage

and requires the consideration of environmental concerns during project planning and execution.

- **National Historic Preservation Act of 1966 (16 USC 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 State historic preservation offices and the Advisory Council on Historic Preservation. Section 110 of NHPA 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.
- **Title 36 CFR Part 65, National Historic Landmarks Program.** Identifies and designates National Historic Landmarks, and encourages the long-range preservation of nationally significant properties that illustrate or commemorate the history and prehistory of the United States.

6.3. PROCEDURES

All contractors are expected to follow these procedures:

- Notify the ROICC or Contract Representative immediately concerning any encounter with suspected archaeological sites, artifacts, human remains, or any other suspected cultural resources during contractor activities.
- Stop work in the immediate area of the discovery until directed by the Contract Representative to resume work.

Notify the ROICC or Contract Representative immediately concerning any encounter with suspected archaeological sites, artifacts, or human remains during contractor activities.

Be particularly aware of surroundings when working in a designated historic area. The Camp Lejeune Installation Geospatial Information & Services Office of the Geospatial Services Division can provide resource mapping of known cultural resource areas for all planners, project managers, contractors, and others, through formal request. The ROICC or Contract Representative will assist with making arrangements to request access for Geographic Information System mapping.

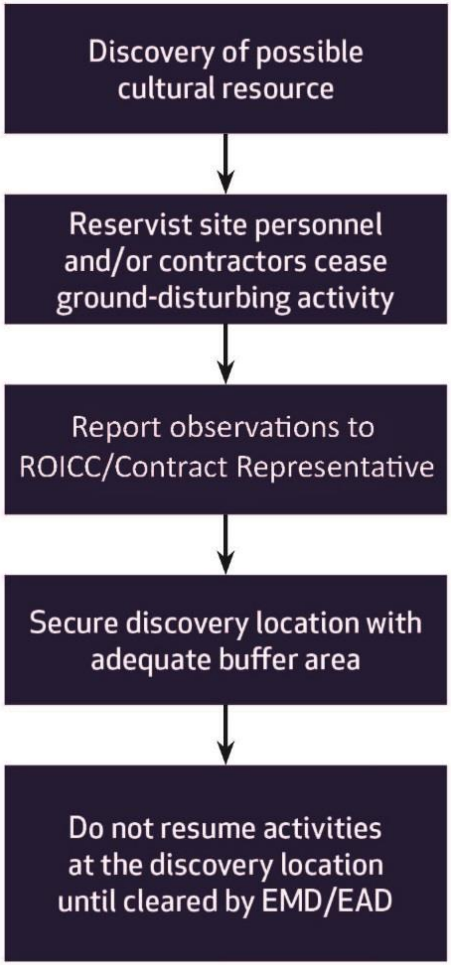

Figure 6-1. Possible Cultural Resource Discovery Flow Chart

7.0 HAZARDOUS MATERIALS/HAZARDOUS WASTE MANAGEMENT

All persons on a USMC installation are subject to compliance with Federal, State, and local regulations and permit conditions addressing the proper management of hazardous materials and waste. Mishandling these wastes and materials may result in violation notices, fines, and/or penalties. The EPA regulates hazardous wastes through the RCRA, which provides specific regulatory definitions for hazardous waste and its management. The RCRA governs all hazardous waste from the point of generation to ultimate disposal, including hazardous waste generated by contractors aboard MCB Camp Lejeune and MCAS New River. Hazardous materials, including those used by contractors aboard the installation, are also regulated by the EPCRA. Additionally, the North Carolina Department of Environmental Quality (NCDEQ) has issued more stringent rules and regulations governing hazardous materials and hazardous waste management that also apply to contractors.

7.1. KEY DEFINITIONS AND CONCEPTS

The following key definitions and concepts are associated with hazardous materials (HM), hazardous wastes (HW), and their management. If you have any questions or concerns about the information in this section,

Direct questions or concerns about the information in this section to the ROICC or Contract Representative.

please consult the ROICC or Contract Representative, who will contact the appropriate environmental office if additional clarification is necessary.

7.1.1. Key Definitions

- **90-day Accumulation Area.** These areas are used to store HW temporarily until it is either manifested and shipped off site for disposal or transferred to a permitted storage facility. HW may be accumulated for up to 90 days in these areas. MCB Camp Lejeune's 90-day accumulation facility is located on Michael Road.
- **Generator.** Any person whose activity or process produces HW or whose activity or process subjects HW to regulation.
- **Hazardous Material.** A chemical compound, or a 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.** Any discarded material (including solid, liquid, or gas) or combination of discarded materials which, due to quantity, concentration, or physical, chemical, or infectious characteristics may:
    - Cause or significantly contribute to an increase in mortality or cause a 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, disposed of, or otherwise managed.

- **Manifest.** A document that allows all parties involved in HW management (e.g., generators, transporters, disposal facilities, EPA, State agencies) to track the movement of HW from the point of generation to the point of ultimate treatment, storage, or disposal. All HW manifests for waste generated aboard MCB Camp Lejeune must be reviewed and released by personnel from the Resource Conservation and Recovery Section, EMD, who can be contacted at (910) 451-1482.

- **Non–RCRA-Regulated Waste.** Waste that is not regulated or is exempt from regulation under RCRA HW requirements but has other regulatory requirements for proper management.

- **Satellite Accumulation Area (SAA).** Designated areas at or near the point of generation, where HW is accumulated. Generators may accumulate up to 55 gallons of HW or one quart of acute HW at a satellite area for an indefinite amount of time. When 55 gallons of HW (or 1 quart of acute HW) are exceeded, the generator must date the container and transfer it to an approved 90-day site or long-term HW storage facility within 72 hours. 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 acute HW. In accordance with installation policy, HW in an SAA should not be stored longer than 365 days, even if the container is not full.

- **Safety Data Sheet (SDS).** A document that provides information about (1) chemical properties, environmental hazards, and health hazards; and (2) protective measures, along with safety precautions, for handling, storing, and transporting hazardous chemical products. The Hazard Communication Standard (HCS), 29 CFR 1910.1200(g), was revised in 2012 to mandate the use of a single Globally Harmonized System of Classification and Labelling of Chemicals (GHS) by manufacturers, distributors and importers to communicate information on chemical-related hazards. The information contained in the SDS is standardized in a 16-section format. Employers must ensure that the SDSs for all hazardous chemicals in the workplace are readily accessible to employees.

- **Treatment.** Any method, technique, or process designed to change the physical, chemical, or biological character or composition of any HW to neutralize the waste; or to recover energy or material resources from the waste; or to render such waste nonhazardous or less hazardous, safer to transport, store, or dispose of, or amenable for recovery or storage, or reduction in volume.

- **Treatment, Storage, and Disposal (TSD) Facilities.** TSD facilities conduct HW treatment,

storage, or disposal operations and require an RCRA part B permit for final approval to operate. The part B permit is maintained to accurately identify the most current operations at the TSD facility. MCB Camp Lejeune does not have a TSD facility.

- **Universal Waste (UW).** UW regulations streamline HW 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 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, it is managed as a separate category of material.

7.1.2 Key Concepts

- **HW Management.** The systematic control of the collection, source separation, storage, transportation, processing, treatment, recovery, and disposal of HW. In addition, HW Management includes processes to

reduce the HW's effect on the environment and to recover resources from it.

- **HW Minimization.** The USMC policy is to reduce the quantity of HW disposed of by source reduction, recycling, treatment, and disposal. The highest priorities are reducing HW generation, and recycling. The goal of the USMC is to achieve continuous reduction of HW generation through P2 initiatives, BMPs, and use of the best available demonstrated technology.
- **National Fire Protection Association.** The U.S. trade association that creates and maintains private, copyrighted standards and codes, including the diamond hazard label in Figure 7-1, which is used by emergency personnel to quickly and easily identify the risks posed by hazardous materials.

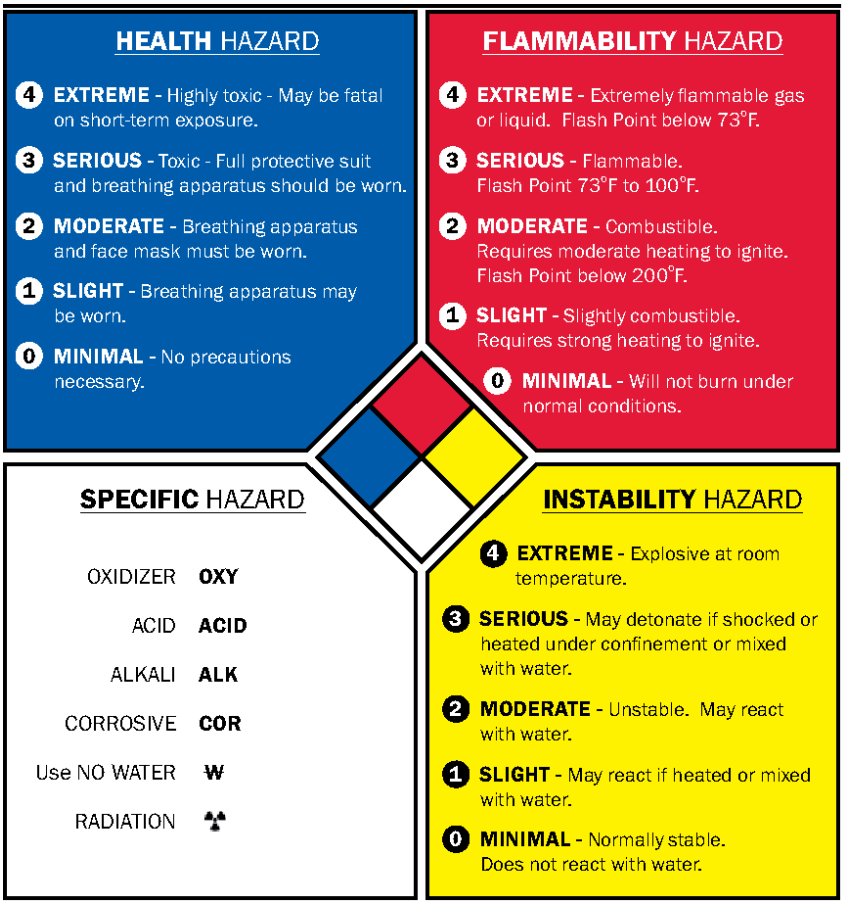

Figure 7-1. Diamond Hazard Label

7.1.3 Environmental Management System

Contractor practices associated with HM and HW management include, but are not limited to, the following:

Battery management

Boat operation/ maintenance

Boiler operation

Building operation/ maintenance/repair

Chlorination

Cooling tower operation and maintenance

Construction/renovation/ demolition

Degreasing

Drinking water management

Engine operation and maintenance

Equipment operation/ maintenance/disposal

Fueling and fuel management/storage

Habitat management

HCP operation

HM storage

HM transportation

HW disposal offsite transport

HW satellite accumulation area

HW storage (<90 days)

HW transportation

Laboratory

Landscaping

Laundry

Live fire range operations

Metal working

Non-destructive inspection

ODS/halon management

Paint gun cleaning

Paint removal

Painting

Parts replacement

Pesticide/herbicide management and application

Polishing

Pumping station/force main

Range residue clearance

Recreational facilities operation

Roofing kettle

Sidewalk and road deicing

Storage tank management

Swimming pool operation and maintenance

Universal waste storage/collection

UXO/EOD operations

Vehicle maintenance

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

7.2. 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 HM and HW, which include but may not be limited to the following:

- **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 HM and HW under environmental permits and authorizations.
- **Emergency Planning and Community Right-to-Know Act.** Establishes requirements regarding emergency planning and the reporting of hazardous chemical storage and use.
- **Hazardous Material Transportation Act (HMTA) of 1975.** The principal Federal law regulating the transportation of HM. Established to mitigate the risks to health, property, and the environment inherent in the transportation of HM in intrastate, interstate, and foreign commerce. The HMTA is administered by the U.S. Department of Transportation (DOT) and regulates the shipping, marking, labeling, placarding, and recordkeeping requirements for HM, including HW and military munitions.

- **Resource Conservation and Recovery Act of 1976.** Establishes standards for HW generators as necessary to protect human health and the environment by instituting statutory standards for generators and transporters of HW that will ensure the following: proper recordkeeping and reporting; use of a manifest system; use of appropriate labels and containers; containerization and accumulation time; and proper management of TSD facilities. In addition, it gives the EPA and State agencies authority to access facility premises and all records regarding HW management.
- **40 CFR Subchapter I (Parts 260–299), Solid Wastes.** Federal regulations promulgated under the 1976 RCRA that regulate HW management, generators, transporters, and owners or operators of TSD facilities. North Carolina has adopted the Federal HW rules by reference.

Because the installation is designated as a Large Quantity Generator (LQG) of HW, all HW generated aboard MCB Camp Lejeune must meet the regulatory requirements of this generator designation. An LQG may maintain three types of HW accumulation/storage areas: satellite, 90-day, and permitted. Typically, HW is accumulated at an SAA and later transferred to a 90-day or permitted storage area.

Both MCB Camp Lejeune and MCAS New River maintain Hazardous Waste Management Plans (HWMPs) that outline the specific requirements for managing HM and HW. The HWMP identifies and provides guidance to implement all regulatory HW management activities and is available to all

personnel who accumulate, generate, transport (including on-installation transportation), treat, store, or dispose of HW.

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

Contractors are responsible for the management of all HM and the ultimate disposition of any HW generated aboard MCB Camp Lejeune during a contract performance period. The ROICC or Contract Representative will contact Environmental personnel, who will provide additional guidance and oversight to verify compliance with applicable Federal, State, and local laws governing the generation, handling, and disposal of HM, HW, UW, used oil, petroleum-contaminated materials, RCRA-regulated HW, and non–RCRA-regulated waste.

Depending on the type of project, contractors may be required to submit a site-specific HWMP to the ROICC or the Contract Representative prior to beginning work. Additionally, the Contracting Officer may require a Contractor Hazardous Material Inventory Log and corresponding SDSs for all materials to be used during the execution of the contract. EMD/EAD will use the SDSs to help contractors establish their Hazardous Material Storage and SAAs.

7.3. HAZARDOUS MATERIALS REQUIREMENTS

If a project uses HM:

- Reduce/reuse/recycle when possible; meet contract requirements for recycling.
- Segregate incompatible materials. Consult the SDS or material manufacturers with questions about a material's compatibility. Some examples of incompatible materials likely to be used by contractors are:

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

  - *Corrosives* (e.g., batteries, stripping and cleaning compounds containing acids or bases) *and Flammables* (e.g., fuels, oils, paints, and adhesives)
  - *Corrosives and Oxidizers* (e.g., peroxide, perchlorates, sodium hypochlorite/bleach, or calcium hypochlorite)
  - *Oxidizers and Flammables*
- All compatible materials should be segregated and stored within designated storage lockers or cabinets (i.e., flammable materials should be stored in designated flammable storage lockers or cabinets, and corrosives should be stored in designated corrosives storage lockers or cabinets).

- Do not store large quantities of materials. Keep on hand only what can be used.
- Maintain an inventory of all HM maintained onsite, with adequate controls in place to prevent unauthorized access.
- Do not dump any HM into floor drains, sinks, oil-water separators (OWSs), or storm drains, or onto the ground.

Stop work immediately if a project unearths a hazardous material (such as MEC/DMM/UXO) and report the situation to the ROICC or Contract Representative.

- Store containers that hold 55 gallons or more (including in-use electrical generators and portable equipment) in proper secondary containment. Permanent secondary containment must be inspected weekly, temporary secondary containment must be inspected daily; all inspections and drainage of stormwater from secondary containment must be documented.
- Maintain SDSs and appropriate spill control/cleanup materials onsite at all times.
- Provide HM storage and usage information for regulatory reporting to the appropriate environmental office upon request.
- Stop work immediately if a project unearths any unknown HM (e.g., munitions and explosives of

concern [MEC], discarded military munitions [DMM], or unexploded ordnance [UXO]), and immediately report the situation to the ROICC or Contract Representative.

- Do not leave HM (or HW) onsite once the contract is completed. Remove it from the installation or make arrangements through the ROICC or Contract Representative to contact RCRS or EAD for turn-in procedures upon completion of the contract.

7.4. UNIVERSAL WASTE REQUIREMENTS

The NCDEQ allows thermostats, obsolete agricultural pesticides, lamps, and certain types of batteries to be managed as UW. UW has less stringent requirements for storage, transport, and collection, but it must still comply with full HW requirements for final recycling, treatment, or disposal. Federal UW requirements are outlined in 40 CFR 273. Contact the ROICC or Contract Representative regarding any additional direction or questions on the handling of UW.

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

- Words: UNIVERSAL WASTE.
- Content: Noun name found on the specific Hazardous Waste Profile Sheet (DRMS Form 1930), which is 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 as soon as the UW item is placed in 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.).

Contractors who need UW accumulation areas should contact the ROICC or Contract Representative, who will contact RCRS or EAD personnel to help contractors establish an accumulation area for UW. Key points for this process:

- The containers must be under the control of the contractor generating the waste and must be closed at all times except when waste is being adding.
- Per installation policy, UW containers/areas must be inspected weekly using the *Weekly Hazardous Waste (HW) Site Inspection Form*, included as Attachment 7-1 and Attachment 7-2. Written records noting discrepancies and corrective actions must be maintained onsite for 3 years. Copies of inspection reports should be provided to the ROICC or Contract Representative.
- When the ASD reaches 1 year, or when the container is full, the waste generator has 72 hours (3 days) to arrange for the transportation of the UW to an RCRA

Part B permitted storage area. Contact the ROICC or Contract Representative to coordinate the removal of the UW when the container is full or the contract is finished.

7.5. HAZARDOUS WASTE REQUIREMENTS

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

The appropriate environmental office must be notified before any HW is generated on projects managed by the ROICC or the Facilities Support Contracts (FSC). Have the ROICC or Contract Representative contact RCRS or EAD with questions regarding whether or not a waste meets the definition of HW. Installation personnel must approve all regulated waste and HW storage locations.

If a project generates HW:

- Minimize generation through waste minimization and P2 techniques.
- Have the ROICC or Contract Representative contact RCRS or EAD with questions regarding how to manage the waste. Do not mix waste types (e.g., used oil rags and solvent rags).
- Have the ROICC or Contract Representative contact RCRS or EAD for turn-in procedures as wastes are

generated, to determine if waste can be disposed of on the installation.

- Do not dump any HW into floor drains, sinks, OWSs, or storm drains, or onto the ground. Do not place HW into general/municipal trash dumpsters.
- Ensure that HW drums are properly labeled and lids are secured (wrench tight).
- Ensure that SAAs are managed properly and storage limits are not exceeded; have the ROICC or Contract Representative consult RCRS or EAD prior to creating a new SAA.

7.5.1. Storage

All HW must be properly containerized, stored, and labeled at the time the waste is first generated. HW must be stored in containers that meet applicable DOT specifications. HW labels, as required by the EPA and the NCDEQ, 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.
- ASD: For HW accumulated in an SAA, the ASD will be affixed once the container is filled or at the 1-year anniversary, whichever comes first.
- Number of Containers: Reflects the total number of containers (e. g., 1 of 1, etc.).

Any HW generated by contractors must be stored in an SAA. Contractors who need an SAA should contact the ROICC or Contract Representative, who will contact RCRS or EAD personnel to help the contractor establish each SAA. A summary of procedures follows:

- The HW generator may accumulate as much as 55 gallons of a specific HW stream (or up to one quart of acute HW) 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 waste is being added.
- HW containers must be inspected weekly using the *Weekly Hazardous Waste (HW) Site Inspection Form*, included as Attachment 7-1 and Attachment 7-2. Written records noting discrepancies and corrective actions must be maintained for a period of 3 years. Copies of inspection reports should be provided to the ROICC or Contract Representative.
- The generating contractor must monitor the level of waste in the SAA container and contact the ROICC or Contract Representative to coordinate disposal or determine if the contractor can turn in the HW to RCRS or EAD before the container is full. If the SAA container becomes full, the generating contractor has 72 hours (3 days) to arrange for the transport of the HW to an RCRA Part B permitted

storage area. Storage of HW in an SAA should not exceed 365 days, even if the container is not full.

7.5.2. Manifesting and Disposal

All disposal of HW generated by contractors must be coordinated with the installation. HW and UW generated aboard MCB Camp Lejeune and MCAS New River must be transported off the installation by a permitted HW transporter and must include a *Uniform Hazardous Waste Manifest* form (EPA Form 8700-22) or an equivalent approved manifest. The following procedures must be followed for disposal of HW:

- Use the MCB Camp Lejeune or MCAS New River EPA identification number for disposal of all contractor-generated HW.
- HW may only be transported by authorized personnel or permitted companies. Prior to transportation offsite, the HW generator must ensure that all DOT requirements for labeling, marking, placarding, and containerizing are met. The HW generator must also ensure that the transporter has obtained the installation's EPA identification number for the transportation of HW and that an appropriate waste manifest accompanies each shipment.

Only personnel from EMD who have been designated in writing by the MCB Camp Lejeune Commanding General can sign the hazardous waste manifest.

- The HW manifest can only be signed by personnel from the installation who have been designated in writing by the CG. The ROICC or Contract Representative should contact RCRS or EAD about manifesting regulated and non-regulated wastes offsite. Under **NO** circumstances can a contractor, ROICC, or Contract Representative sign a HW manifest or use another EPA identification number for wastes generated at the installation.
- All HW must be submitted to a permitted TSD facility. HW generators must certify that the facility receiving the waste employs the most practical and current treatment, storage, or disposal methods for minimizing present and future threats to human health and the environment.

7.6. NON–RCRA-REGULATED WASTE REQUIREMENTS

Non-RCRA-regulated wastes include used oil (when recycled), non-terne (tin and lead alloy) plated oil filters (not mixed with listed waste), CFC refrigerants (from totally enclosed equipment), certain wastes containing Polychlorinated Biphenyl (PCB), asbestos, and batteries not managed as UW.

7.6.1. Used Oil and Oil Filters

Used motor oil itself is *not* regulated as HW 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 HW. Used oil must be collected in

drums or another approved container marked "Used Oil." If the used oil storage container has a volume of 55 gallons or more, it must be stored in secondary containment.

- 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.

Terne plated oil filters contain an alloy of tin and lead. They are considered a hazardous waste due to their lead content and are typically located on industrial and heavy duty vehicles and equipment. All other used oil filters are not regulated as HW in North Carolina, as long as they are not mixed with listed HW. 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.
- Any incidental spillage that occurs must be cleaned up with a dry sweep, rags, or "absorbent matting."
- 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.
- Coordinate with the ROICC or Contract Representative to determine if the drained used oil filters can be given to RCRS or EAD.

7.6.2. Used Antifreeze

Antifreeze is composed of regulated chemicals, including ethylene glycol and propylene glycol, and during typical use may become contaminated with traces of fuel or metal particles (i.e., lead, cadmium, or chromium). It may also become HW if it has been mixed with other wastes, such as gasoline or solvents. Additional characterization may be required to determine whether or not used antifreeze is HW. Used antifreeze that is not recycled may be regulated as HW if the results from the Toxic Characteristics Leaching Procedure (TCLP) indicate metal contents that meet or exceed RCRA thresholds.

The State of North Carolina does not regulate used antifreeze as HW, as long as it is recycled by reuse, distillation, filtration, or ion exchange. Used antifreeze must be stored in closed containers on an impermeable concrete surface with adequate spill controls (secondary containment, appropriate stocked spill kits, etc.). Contact the ROICC or Contract Representative to determine if used antifreeze can be given to RCRS or EAD.

7.6.3. Petroleum-Contaminated Wipes and 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 and to protect them from the weather.
- Do not throw these non-regulated waste items into solid waste dumpsters or garbage cans.
- Contact the ROICC or Contract Representative to determine if petroleum-contaminated wipes and oily rags can be given to RCRS or EAD.

7.6.4. Used Electronic Equipment

Used electronic equipment may contain lead solder or PCB oils (e.g., light ballast). Turn in these items as they are generated. Have the ROICC or Contract Representative contact RCRS or EAD for proper handling and/or turn-in procedures.

7.6.5. 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 the ROICC or Contract Representative contact RCRS or EAD for proper handling and/or turn-in procedures.

Attachment 7-1

Weekly Hazardous Waste (HW) Site Inspection Form MCB Camp Lejeune

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MCB Camp Lejeune Weekly Hazardous Waste (HW) Site Inspection
Universal Waste (UW)/Satellite Accumulation Area (SAA)

Building Number/location of HW Site: _____
Unit Evaluated: _____
Evaluation Date: _____/_____/_____
Evaluation By (Site Manager): _____
Evaluation Time: _____

QUESTION	**YES**	**NO**	**Location of Discrepancy *and* Proposed Corrective Action**
1. Is housekeeping maintained in acceptable manner?			
2. Is any HW present at the site?			
3. Are HW containers properly marked?			
4. Are HW containers in serviceable condition?			
5. Are container bungs, caps, and openings properly secured?			
6. Is a 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?			

QUESTION	**YES**	**NO**	**Location of Discrepancy *and* Proposed Corrective Action**
10. Does the site have emergency communication system or two-man rule in effect? If the two-man rule is implemented, is a sign posted with the legend "**Two-Man Rule in Effect**"?			
11. Are properly charged fire extinguishers, as well as eye wash stations, present and inspected at least monthly?			
12. Is the post indicator valve in good operating condition and secured in the closed position, and are there any structural defects such as cracked concrete?			
13. Is the proper spill response equipment readily available?			
14. Is the site designated and 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 HWs properly segregated and stored in the designated site?			
16. Are any hazardous materials being stored in the Satellite Accumulation Area or < 90-day storage site?			

Attachment 7-2

Weekly Hazardous Waste (HW) Site Inspection Form
MCAS New River

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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 no one is 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?			

Question	**Yes**	**No**	**Corrective Actions or N/A**
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 in prior to the 90th day after the ASD?			
14. Are adequate spill response supplies readily available for use in case of spill or leakage?			
15. Is there a means of emergency communication between storage facilities and working spaces?			
16. Is the SAA site or 90-Day Site in a good state of police?			

NAVOSHENVTRACEN COMPATIBILITY CHART

HMUG GROUP	HCC see note 2	GROUP NAME	EXAMPLES	INCOMPATIBLE MATERIALS	EXAMPLES	REACTION IF MIXED
1	C1, C2, C4, C5	ACIDS	Battery Acid Paint Removers De-Rust Spray	FLAMMABLES/ COMBUSTIBLES ALKALIS/BASES/CAUSTICS OXIDIZERS (HMUG Groups 2, 3, 4, 6, 7, 8, 10, 11, 12, 13, 14, 15, 17, 18, 19, 20, 22)	Degreasers, Carbon Removers, Anti-Fogging Compounds	HEAT Gas Generation VIOLENT REACTION
2	P1 to P7, P9, T4, V3, V6	ADHESIVES	Epoxies Isocyanates Diethylenetriamine	ACIDS ALKALIS/BASES/CAUSTICS OXIDIZERS (HMUG Group 1, 3, 18)		HEAT FIRE HAZARD
3	B1, B2	ALKALIES BASES/ CAUSTICS	Ammonia Sodium Hydroxide Cleaners	ACIDS/OXIDIZERS FLAMMABLES/COMBUSTIBLES (HMUG Group 1, 2, 6, 8, 9, 10, 11, 14, 17, 18, 19, 20, 22)	Battery acid, Paint Removers, De-Rust Sprays, Paints, Solvents	HEAT Gas Generation VIOLENT REACTION
4	C1-C6, B1-B3, P2 to P7, T4, T6, V3-V4	CLEANING COMPOUNDS	Degreasers Carbon Removers Antifogging Compounds	DETERGENTS/SOAPS OXIDIZERS (HMUG Group 1, 7, 18)	Calcium Hypochlorite, Sodium Nitrite, Hydrogen Peroxide	HEAT FIRE HAZARD
5	G1 to G6	COMPRESSED GASES	Acetylene, Propane, Nitrogen, Argon, Helium, Oxygen	HEAT SOURCES Consult paragraph C23 for specific handling and storage guidance (HMUG Groups 8, 9, 10, 11, 12, 13, 18, 19)		FIRE HAZARD EXPLOSION HAZARD
6	F2 to F5, T5, V2, V5, V8	CORROSION PREVENTIVE COMPOUNDS	Corrosion Inhibitors Chemical Conversion Compounds	ACIDS/BASES OXIDIZERS IGNITION SOURCES (HMUG Group 1, 3, 18, 20)		FIRE HAZARD
7	B5	DETERGENTS/ SOAPS	Trisodium Phosphate Scouring Powders Disinfectants	ACID-CONTAINING COMPOUNDS (HMUG Groups 1, 4, 18)	Battery Acid, Paint Removers De-Rust Sprays	VIOLENT REACTION HEAT
8	F6, V4, V7	GREASES	Lithium Grease Silicone Molybdenum	OXIDIZERS ALKALIS/BASES/CAUSTICS (HMUG Group 3, 5, 18)		FIRE HAZARD HEAT
9	T6, V4, V6, V7	HYDRAULIC FLUIDS	Petroleum-Based Synthetic Fire-Resistant	CORROSIVES, OXIDIZERS (HMUG Group 1, 3, 5, 18)		VIOLENT REACTION
10	F2 to F4, T4, T6, V2-V8	INSPECTION PENETRANTS	Petroleum-Based Dyes	CORROSIVES, OXIDIZERS (HMUG Group 1, 3, 5, 18)	Battery Acid Caustic Soda Chlorine laundry bleach Calcium Hypochlorite Hydrogen Peroxide OSA Canisters Paint Removers	
11	F4, T5, V2, V3, V4, V6	LUBRICANTS/ OILS	General Purpose, Gear, Turbine, Weapons			EXPLOSION HAZARD
12	F2 to F6, P1, T3, T4, T6, V3-V8	PAINT MATERIALS	Primers, Enamels, Undercoats, Lacquers, Varnishes, Non-Skid, Thinners	ACIDS, OXIDIZERS (HMUG Group 1, 5, 18)		HEAT FIRE HAZARD
13	C1-C6, B1-B3, D1	PHOTO CHEMICALS	Developers, Stopbath, Toners, Bleaches, Replenishers	ACIDS HEAVY METALS (HMUG Group 1, 18, 20)		HEAT FIRE HAZARD
14	F4	POLISH/WAX COMPOUNDS	Buffing Compounds Metal Polishes General Purpose Waxes	CORROSIVES OXIDIZERS (HMUG Group 1, 3, 18)		HEAT, FIRE HAZARD VIOLENT REACTION
15	F2 to F6, T3, T4, T6, V1-V8	SOLVENTS	Methyl Ethyl Ketone (MEK) Toluene, Xylene Acetone	CORROSIVES OXIDIZERS BATTERIES (HMUG Group 1, 5, 18, 21, 22)	Battery Acid Calcium Hypochlorite Sodium Nitrite Sodium Hydroxide	HEAT FIRE HAZARD
16	T6, T7, Z1	THERMAL INSULATION	Asbestos Fiberglass Glass Wool	MATERIAL IS NOT REACTIVE KEEP DRY		NO REACTION
17	C1-C6, B1-B3, D1	WATER TEST/ TREATMENT CHEMICALS	Nitric Acid Mercuric Nitrate Caustic Soda	CORROSIVES OXIDIZERS HEAVY METALS (HMUG Group 1, 3, 18, 20, 21)		HEAT VIOLENT REACTION
18	D1 to D6	OXIDIZERS	Calcium Hypochlorite Laundry Bleach OSA Canisters	PETROLEUM BASED MATERIALS FUELS, SOLVENTS, CORROSIVES, HEAT (HMUG Groups 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 17, 18, 20, 21, 22)		FIRE HAZARD VIOLENT REACTION EXPLOSION HAZARD TOXIC GAS GENERATION
19	F1 to F4, V4, V5, V6	FUELS	JP4, JP5 Gasoline Diesel Fuel	CORROSIVES OXIDIZERS (HMUG Group 1, 3, 5, 18)	Battery Acid Calcium Hypochlorite Sodium Nitrite Sodium Hydroxide	FIRE HAZARD TOXIC GAS GENERATION
20	T6, V1, Z2	HEAVY METALS	Mercury Lead Beryllium	CORROSIVES OXIDIZERS WATER TREATMENT/PHOTO CHEMICALS (HMUG Group 1, 3, 6, 13, 17, 18, 20)		VIOLENT REACTION GENERATION OF TOXIC AND FLAMMABLE GAS
21	Z4 to Z7	BATTERIES	Lead-Acid Dry-Cell Alkaline	SOLVENTS HEAVY METALS OXIDIZERS (HMUG Groups 15, 17, 18, 20)	Xylene Toluene Alcohol	HEAT VIOLENT REACTION TOXIC GAS GENERATION
22	T2 to T8	PESTICIDES	Insecticides, Fungicides Rodenticides Fumigants	CORROSIVES OXIDIZERS (HMUG Group 1, 3, 15, 18)		TOXIC GAS GENERATION TOXIC

1. This chart is to be used as a ***GUIDE ONLY!***
2. Compare the desired HMUG Group/HCC in the left column with the Incompatible Material(s) of that Group in the center column on the same row. Mixing of the HMUG Group/HCC with the Incompatible Material(s) may result in the reaction(s) listed in the right column.
3. Not all applicable HCCs are listed; only the most frequently encountered HCCs (except N1) are listed.

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8.0 ASBESTOS

Asbestos was widely used in many products (especially building parts) prior to 1990 for its fire resistance, strength, and affordability. However, exposure to friable asbestos can lead to lung diseases including cancer. Contractors working aboard the installation must follow all Federal, State, and local regulations/specifications for the proper notification, removal, disposal, and management of all asbestos-containing materials (ACM) associated with demolition and renovation projects.

8.1. KEY DEFINITIONS AND CONCEPTS

Please consult the ROICC or Contract Representative with any questions or concerns about the information in this section.

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 the ROICC or Contract Representative, who will contact the appropriate EMD program if additional clarification is necessary.

8.1.1. Key Definitions

- **Abatement.** Work performed to repair, maintain, remove, isolate, or encapsulate ACM.
- **Asbestos.** Asbestos is the generic term for a group of naturally occurring fibrous silicate minerals, including those that typically exhibit high tensile

strength, flexibility, and resistance to thermal, chemical, and electrical conditions. Asbestos was commonly used in installed products such as roofing shingles, floor tiles, cement pipe and sheeting, roofing felts, insulation, ceiling tiles, fire-resistant drywall, and acoustical products.

- **Asbestos-Containing Material.** Any material containing more than 1 percent asbestos, per 29 CFR 1926.1101.
- **Category I Non-friable ACM.** Asbestos-containing packings, gaskets, resilient floor covering, and asphalt roofing products containing more than 1 percent asbestos, per 40 CFR 61, Subpart M.
- **Category II Non-friable ACM.** Any material, excluding Category I non-friable ACM, containing more than 1 percent asbestos that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure, per 40 CFR 61, Subpart M.
- **Demolition.** The wrecking or removal of any load-bearing walls or structure with any related handling operations.
- **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 non-friable), per 40 CFR 763.
- **Glove Bag.** A sealed compartment with attached inner gloves that is used for handling ACM. Glove bags provide a small work area enclosure typically used for small-scale asbestos stripping operations.

- **Presumed Asbestos-Containing Material (PACM).** Thermal system insulation (TSI) and surfacing material found in buildings constructed no later than 1980, per 29 CFR 1926.1101.
- **Regulated Asbestos-Containing Material (RACM).** Includes friable ACM, Category I non-friable ACM that has become friable, Category I non-friable ACM that has been sanded, ground, cut, etc., and Category II non-friable ACM that has a high probability of becoming crumbled, pulverized, or reduced to powder during demolition or renovation, per 40 CFR 61, Subpart M.
- **Removal.** Stripping, chipping, sanding, sawing, drilling, scraping, sucking, and other methods of separating material from its installed location in a building.
- **Renovation.** Altering a facility or its components in any way, including stripping or removal of RACM, per 40 CFR 61, Subpart M.

8.1.2. Key Concepts

- **Demolition Notification.** North Carolina law requires notification for all demolition, 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 Contract Representative to coordinate the disposal through the MCB Camp Lejeune Sanitary

Landfill. Asbestos waste is only accepted on Mondays through Thursdays from 0700 to 1000.

- **Removal Requirements.** Permits for asbestos removal or demolition must be obtained when the ACM present exceeds 260 linear feet, 160 square feet, or 35 cubic feet. Additionally, proper work practice procedures must be followed during demolition or renovation operations.
- **Renovation Notification.** If ACM is present within a structure, North Carolina law requires notification of renovation 10 working days prior to starting renovation.

8.1.3. Environmental Management System

Contractor practices associated with asbestos management include the following:

- Building operation/maintenance/repair
- Construction/demolition/renovation
- Equipment operation/maintenance/disposal
- HW transportation
- Parts replacement

The potential impacts of these activities on the environment include soil contamination, degradation of water quality and air quality, and the potential exposure of installation occupants.

8.2. OVERVIEW OF REQUIREMENTS

Contractors operating aboard the installation must be aware of and adhere to all applicable regulations and requirements regarding ACM, which include but may not be limited to the following:

- **Asbestos General Standard, 29 CFR 1910.1001 – Asbestos.** Applies to all occupational exposures to asbestos in all industries covered by the Occupational Safety and Health Administration (OSHA).
- **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 ACM.
- **Asbestos School Hazard Abatement Reauthorization Act, 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 40 CFR 61 – Subpart M – National Emission Standard for Asbestos.** Includes standards for asbestos demolition, renovation, and disposal, and administrative requirements.
- **Naval Facilities Engineering Service Center, Facilities Management Guide for Asbestos and Lead.** Summarizes asbestos and lead requirements

that routinely affect facilities operations, to protect workers, building occupants, and the environment.

- **Naval Facilities Guide Specifications and Engineering Control of Asbestos Materials.** Covers the requirements for safety procedures and requirements for the demolition, removal, encapsulation, enclosure, repair, and disposal of ACM.
- **North Carolina Asbestos Hazard Management Program, NC General Statutes, Chapter 130A, Article 19; 10A NCAC 41C.0601–.0608 and .0611.** Incorporates 40 CFR 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 in the construction, demolition, alteration, repair, maintenance, or renovation of structures that contain asbestos.

8.3. RESPONSIBILITIES BEFORE A DEMOLITION OR RENOVATION PROJECT

Prior to starting a demolition or renovation project, contractors must:

- Determine whether ACM, PACM, and/or RACM are present in the buildings involved in the project.
- Complete the necessary notifications to the State of North Carolina and obtain any necessary permits for the removal of ACM, PACM, and/or RACM.
- Understand what actions to take if ACM, PACM, and/or RACM are unexpectedly encountered during project execution.
- Remove all non-friable and friable ACM in accordance with all Federal, State, and local regulations, prior to demolition activities.
- Know how to properly dispose of ACM, and provide any waste disposal manifests generated for disposal.

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.

8.3.1. Identification of ACM and PACM

Form DHHS 3768 *must* be posted onsite during all permitted projects.

Contract documents will identify the presence of known ACM, PACM, and RACM. Contact the ROICC or Contract Representative with questions regarding the presence of these materials as identified in the contract documents. An inspection conducted by a Health Hazards

Control Unit (HHCU)-licensed asbestos inspector may be necessary to confirm the location and quantities of any ACM, PACM, and/or RACM and determine if any previously unidentified materials are present.

8.3.2. Notification

To maintain accurate files and records, the ROICC or Contract Representative is required to notify the 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 HHCU 10 working days before demolition activities, regardless of whether asbestos is present.

The North Carolina Department of Health and Human Services (DHHS) Form 3768, *Asbestos Permit Application and Notification for Demolition and Renovation,* must be submitted to the North Carolina HHCU 10 working days in advance of demolition activities, regardless of whether asbestos is present. This form must be posted onsite during the entire duration of the project. Have the ROICC or Contract Representative contact the Asbestos Program Manager with questions or concerns about requirements for notification of demolition or renovation.

8.3.3. Removal

Any ACM, PACM, and/or RACM present 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.

8.3.4. Training

North Carolina regulations require that all persons who perform asbestos management activities in the State of North Carolina must be accredited by the North Carolina HHCU under the appropriate accreditation category (i.e., Building Inspector, Project Supervisor, and/or Abatement Worker). Training documentation should be available upon request.

8.4. RESPONSIBILITIES DURING A DEMOLITION OR RENOVATION PROJECT

North Carolina regulations require that DHHS Form 3768, *Asbestos Permit Application and Notification for Demolition and Renovation*, be acquired by the contractor and posted onsite during all permitted projects. Contractors must post this form when the project will remove the following: at least 260 linear feet, 160 square feet, or 35 cubic 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 the 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 an asbestos inspector licensed by the North Carolina HHCU. 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 North Carolina HHCU prior to each demolition and upon request for renovations; a building inspection report will be acceptable only if the inspection was performed during the 3 years prior to the demolition. A copy of the report should also be forwarded to the Asbestos Program Manager.

During a renovation or demolition project, a contractor who suspects additional ACM is present must immediately report the suspected area to the ROICC or Contract Representative.

For specific work procedures and requirements for glove bag projects, refer to 29 CFR 1926.1101.

8.5. DISPOSAL OF ACM WASTE

Contractors can dispose of ACM waste at the MCB Camp Lejeune Sanitary Landfill after first coordinating with the MCB Camp Lejeune Landfill office through the ROICC or Contract Representative. The contractor must provide the MCB Camp Lejeune Landfill with Form DHHS 3787, *North Carolina Health Hazards Control Unit's Asbestos*

Waste Shipment Record. The contractor must submit this form to the North Carolina HHCU for all permitted asbestos removal projects.

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9.0 LEAD-BASED PAINT

Lead was used in paint for its color and water-resistant properties until it was banned in 1978 for its highly toxic properties that may cause a range of health problems, especially in young children. Improper removal of lead-based paint (LBP) may result in paint chips and dust, which may contaminate a structure inside and out. The North Carolina DHHS regulations require any person who performs an inspection, risk assessment, or abatement to be certified. North Carolina DHHS also requires a person to obtain a permit for conducting an abatement of a child-occupied facility or target housing.

9.1. 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 the ROICC or Contract Representative, who will contact the appropriate Environmental Department or Safety Representative if additional clarification is necessary.

9.1.1. Key Definitions

- **Abatement.** The permanent removal or elimination of all LBP hazards.
- **Demolition.** The removal of any load-bearing walls or structure.

- **Inspection.** A surface-by-surface investigation to determine the presence of LBP, and a report explaining the results of the investigation.
- **Lead-Based Paint.** Surface coatings that contain lead in amounts equal to or in excess of 1.0 milligram per square centimeter, as measured by X-ray fluorescence (XRF) or laboratory analysis, 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 745 Subpart L, and adopted by the State of North Carolina under North Carolina General Statute Chapter 130A, Article 19A).
- **Renovation.** Alteration of a facility or its components in any way.
- **Target Housing.** Any housing constructed before 1978, with the exception of housing for the elderly and persons with disabilities (unless a child under the age of 6 lives there) and residential dwellings where the living areas are not separated from the sleeping areas (efficiencies, studio apartments, dormitories, etc.).

9.1.2. Key Concepts

- **Disposal.** Analysis is required to determine proper disposal of waste (non-hazardous or hazardous). A Toxic Characteristic Leaching Procedure (TCLP) analysis must be conducted to determine whether lead levels have exceeded 5 parts per million (ppm), which is the RCRA threshold for HW determination.
- **LBP Survey.** A LBP survey is required prior to disturbing painted surfaces, to determine whether the paint meets the criteria of lead containing over 1.0 milligram per square centimeter or over 0.5 percent by weight.
- **Training.** LBP training requirements set forth by the OSHA must be followed by all personnel involved in all LBP removal activities. MCB Camp Lejeune Base Safety tracks this training for contract staff, as the Safety Office houses the Lead Program Manager.

9.1.3. Environmental Management System

Contractor practices associated with LBP include the following:

- Construction/demolition/renovation
- HW 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.

9.2. OVERVIEW OF REQUIREMENTS

Contractors operating aboard the installation must be aware of and adhere to all applicable Federal, State, and local regulations and requirements regarding LBP activities, which include but may not be limited to the following:

- **Naval Facilities Engineering Service Center, Facilities Management Guide for Asbestos and Lead.** Summarizes asbestos and lead requirements that routinely impact facilities operations, in order to protect workers, building occupants, and the environment.
- **Lead-Based Paint Hazard Management Program, NC General Statutes, Chapter 130A, Article 19A. Section 130A-453.01 through 453.11.** Requires a person who performs an inspection, risk assessment, abatement, or abatement design work in a child-occupied facility (daycare center, pre-school, etc.) or housing built before 1978 to be certified and establishes the requirements for certification, including the oversight of required training. It also requires a person who conducts an abatement of a child-occupied facility or target housing to obtain a permit for the abatement; establishes work practice standards for LBP abatement activities; and has adopted requirements included in 40 CFR Part 745, Subpart L and 40 CFR Part 745, Subpart D.

- **Lead-Based Paint Hazard Management Program for Renovation, Repair, and Painting (RRP), 10A NCAC 41C.0900.** Common renovation activities may create hazardous lead dust and chips by disturbing LBP, which may be harmful to adults and children. This article requires that dust sampling technicians, firms, and individuals performing renovation, repair, and painting projects for compensation that disturb LBP in housing and child-occupied facilities built before 1978 be certified and follow specific work practices to prevent lead contamination. Child-occupied facilities include, but are not limited to, child care facilities and schools (with children under the age of 6) that were built before 1978.

- **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 the OSHA requirements for construction activities where workers may come into contact with lead.

- **40 CFR Part 745, Lead-Based Paint Poisoning Prevention in Certain Residential Structures.** Ensures that (1) LBP 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.

9.3. RESPONSIBILITIES BEFORE RENOVATION OR DEMOLITION

Buildings constructed prior to 1978 are assumed to contain LBP.

Ordinary renovation and maintenance activities may create dust that contains lead, but following lead-safe work practices may help mitigate or prevent lead hazards. The North Carolina RRP Program (10A NCAC 41C.0900) mandates that contractors, property managers, and others working for compensation in homes and child-occupied facilities built before 1978 be trained in and use lead-safe work practices. In addition, it mandates that contractors provide the owner and occupants with *The Lead-Safe Certified Guide to Renovate Right* information pamphlet, which is found at the following website: http://epi.publichealth.nc.gov/lead/pdf/RenovateRight.pdf

Individuals must be certified by the State of North Carolina to perform RRP activities for compensation in housing and child-occupied facilities built before 1978. A firm engaged in regulated renovation activities (such as RRP that disturbs more than 6 square feet of interior painted surfaces or 20 square feet of exterior painted surfaces, or dust sampling after renovation) must be a certified renovation firm.

To address the hazards associated with the improper abatement or removal of LBP, any person who performs an inspection, risk assessment, abatement, or abatement design work in a child-occupied facility (child development centers, preschools, etc.) or housing built before 1978 must be certified by the State of North Carolina. Any person who conducts an abatement of a child-occupied facility or target housing must also obtain a permit for the abatement. Individuals conducting LBP abatement activities in North Carolina, such as inspections, risk assessments, LBP hazards abatement, clearance testing, or abatement project design in housing and child-occupied facilities built before 1978, must be certified by the State of North Carolina. A firm engaged in abatement activities must be a certified lead abatement firm.

Prior to any renovation or demolition aboard the installation that involves the disturbance of painted surfaces, a LBP survey must be completed by an inspector certified in North Carolina, retained through the ROICC or Public Works Division (PWD). Certain projects will use PWD 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 XRF or lab analysis, or 0.5 percent by weight). Naval Facilities Guide Specifications and contract documents must be implemented for contracts where LBP is to be abated/removed prior to demolition or renovation.

If the area is to be reoccupied, final clearance must be conducted, including a visual inspection and sample collection, prior to reoccupation. Clearance on all projects involving abatement must be provided by a certified risk assessor or a certified LBP inspector. Clearance for RRP projects may be conducted by a certified risk assessor, certified LBP inspector, or certified dust sampling technician.

9.4. PERMITS

Contractors must obtain a North Carolina LBP Abatement Permit from North Carolina DHHS when lead paint is removed from targeted structures (child-occupied facilities or housing built prior to 1978).

9.5. DISPOSAL

If the LBP survey determines that LBP will be abated as part of a renovation or demolition project, analytical samples must be taken to determine whether the material is hazardous.

If the LBP survey determines that LBP will be abated as part of a renovation or demolition project, the contractor must take analytical samples to determine whether the waste material is hazardous. Usually, a 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. A list of these accredited labs is available by contacting (703) 849-8888 or visiting

http://apps.aiha.org/qms_aiha/public/pages/reports/publicScopeView.aspx?ProgramCode=37&Version=2.

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 HW regulatory disposal levels, consult the ROICC or Contract Representative to determine whether if the contract allows for the disposal of the material in the MCB Camp Lejeune Sanitary Landfill. Lead waste is only accepted on Mondays through Thursdays from 0700 to 1000.

If the abated LBP is above HW regulatory levels, refer to Section 7.0 of this guide for information on HW management and disposal requirements.

9.6. TRAINING

Before the project begins, workers who are subject to lead exposure during abatement or removal activities must be trained according to the OSHA regulations in 29 CFR 1926.62 concerning lead exposure in construction, and they must receive all training and certification specified by 10A NCAC 41C.0800 and 10A NCAC 41C.0900. The contractor is responsible for providing this training before initiating any work aboard MCB Camp Lejeune.

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10.0 NATURAL RESOURCES

The installation has stewardship and recovery responsibilities over the natural resources 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 working 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 after the work is complete, and confining construction activities to 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.

10.1. KEY DEFINITIONS AND CONCEPTS

Please consult the ROICC or Contract Representative with any questions or concerns about the information in this section.

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, etc.) on the site or within the project area, please consult the ROICC or Contract Representative, who will contact the Environmental Conservation Branch.

10.1.1. Key Definitions

- **Conservation.** The planned management, use, and protection of natural resources to provide their sustained use and continued benefit to present and future generations.
- **Ecosystem.** A dynamic, natural complex of living organisms interacting with each other and with their associated nonliving environment.
- **Habitat.** An area where a plant or animal species lives, grows, and reproduces, and the environment that satisfies its life requirements.
- **Natural Resource.** Soil, water, air, plants, and animals, according to the Natural Resources Conservation Service.
- **Endangered or Threatened Species.** Federally listed taxon that is "in danger of extinction throughout all or a significant portion of its range" or "likely to become endangered within the foreseeable future throughout all or a significant portion of its range."
- **Riparian Buffer.** Vegetated area bordering a body of water, such as a stream, lake, or pond.

- **Wetland.** 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. Wetlands generally include swamps, marshes, bogs and similar areas, per the EPA.

10.1.2. Key Concepts

- **Coastal Zone Management Act (CZMA) of 1972.** Requires each installation to ensure that its operations, activities, projects, and programs affecting the coastal zone in or on coastal lands or waters are consistent with the federally approved Coastal Zone Management Plan of the State.
- **Ecosystem Management.** A goal-driven approach to managing natural and cultural resources that supports present and future mission requirements; preserves ecosystem integrity; is at a scale compatible with natural processes; is cognizant of natural processes' time scales; recognizes social and economic viability within functioning ecosystems; is adaptable to complex, changing requirements; and is realized through effective partnerships among private, local, State, tribal, and Federal interests. Ecosystem management is a process that considers the environment as a complex system functioning as a whole, not as a collection of parts, and recognizes that people and their social and economic needs are a part of the whole.

- **Integrated Natural Resources Management Plan (INRMP).** A planning document using ecosystem management principles to direct the management and conservation of installation natural resources, which includes all elements of natural resources management applicable to the installation.
- **National Environmental Policy Act.** Requires Federal agencies, including the USMC, to consider the environmental impacts of projects prior to implementation. All projects that support military training, minor and major military construction, maintenance, and natural resources management actions are reviewed for potential environmental impacts. Contractors must obtain and review any NEPA documentation associated with their projects. All NEPA documentation can be obtained from the ROICC or Contract Representative.
- **Threatened and Endangered Species.** Specific requirements regarding protected areas on the installation apply to contractor activities. Eight federally threatened and endangered species are currently managed at MCB Camp Lejeune – red-cockaded woodpecker, green sea turtle, loggerhead sea turtle, rough-leaved loosestrife, seabeach amaranth, piping plover, red knot, and American alligator. In addition, as of March 25, 2015, the U.S. Fish and Wildlife Service lists six species as threatened and nine as endangered for Onslow County, NC. Consult the ROICC or Contract Representative to determine if there are any project

requirements regarding threatened or endangered species.

- **Timber.** Contractors must ensure that the ROICC or Contract Representative notify the EMD's Forest Management Program prior to conducting site work. Timber will not be released to contractors without the approval of the Forest Management Program.
- **Waters of the United States.** All waters that are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce; interstate waters; the territorial seas; impoundments; tributaries; adjacent waters including wetlands, ponds, lakes, oxbows, and impoundments; waters determined to have a significant nexus; Carolina bays; Pocosins; and waters within the 100-year floodplain or within 4,000 feet of the high tide line or ordinary high water mark; per 33 U.S.C. 1251 *et seq*. Section 328.3.
- **Wetlands.** Any work in installation waters or wetlands requires a permit prior to the start of an activity.

10.1.3. Environmental Management System

Contractor practices associated with natural resources include the following:

- Erosion/runoff control
- Fish stocking
- Habitat management

- Land clearing
- Live fire range operations
- Road construction and maintenance
- Soil excavation/grading
- Timber management
- Urban wildlife management

The potential impacts of these activities on the environment include air emissions, sedimentation, eutrophication of surface waters (addition of nutrients that stimulate aquatic plant growth and depletes oxygen), degradation of habitat, impacts to marine mammals, damage to commercial and noncommercial timber, impacts to endangered species and natural resources, and degradation of soil quality.

10.2. OVERVIEW OF REQUIREMENTS

Contractors operating aboard the installation must be aware of and adhere to all applicable regulations and requirements regarding natural resources, which include but may not be limited to the following:

- **Bald and Golden Eagle Protection Act of 1940, as Amended (16 USC 688 *et seq.*).** Prohibits taking, possessing, and transporting bald eagles and golden eagles and importing and exporting their parts, nests, or eggs. The definition of "take" includes pursue, shoot, shoot at, poison, wound, capture, trap, collect, molest, or disturb.

- **BO 5090.11A, Protected Species Program.** Sets forth regulations and establishes responsibilities to ensure the conservation of threatened and endangered species and species at risk aboard MCB Camp Lejeune.
- **BO 5090.12, Environmental Impact Review Procedures.** Implements NEPA 1969 and NEPA policy and guidance in Chapter 12 of MCO P5090.2A.
- **Clean Water Act of 1972.** Establishes the basic structure for regulating wastewater discharges and placing fill materials into the waters of the United States.
- **CZMA of 1972 (16 USC 1451 *et seq.*).** Requires that Federal actions affecting any land/water use or coastal zone natural resource be implemented consistent with the enforceable policies of an approved State coastal management program. Requires concurrence from the State before taking an action affecting the use of land, water, or natural resources of the coastal zone.
- **Endangered Species Act of 1973 (16 USC 1531 *et seq.*).** Requires all Federal agencies to carry out programs to conserve federally listed endangered and threatened species of plants and wildlife.
- **EO 11990, Protection of Wetlands, 24 May 1977.** Addresses Federal agency actions required to identify and protect wetlands, minimize the risk of wetlands destruction or modification, and preserve

and enhance the natural and beneficial values of wetlands.

- **EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds, 10 January 2001.** Requires each Federal agency taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations to develop and implement a plan to promote the conservation of migratory bird populations.

- **Marine Mammal Protection Act of 1972 (MMPA), as Amended (16 USC 1361 *et seq.*).** Mandates a moratorium on the killing, capturing, harming, and importing of marine mammals and marine mammal products. The MMPA also prohibits the taking of any marine mammal, including to harass, hunt, capture, collect, or kill any marine mammal, including any of the following: collection of dead animals or their parts, restraint or detention of a marine mammal, tagging a marine mammal, the negligent or intentional operation of an aircraft or vessel, or any other negligent or intentional act that results in disturbing or molesting a marine mammal.

- **Migratory Bird Treaty Act of 1918, as Amended (16 USC 703 *et seq.*).** Protects migratory birds (listed in 50 CFR 10.13) and their nests and eggs and establishes a permitting process for the taking of migratory birds by establishing a Federal prohibition to "pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause

to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird or any part, nest, or egg of any such bird."

- **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 USMC assets.

- **NEPA 1969 (42 U.S.C. 4321 *et seq*.).** Requires Federal agencies, including the USMC, to consider the environmental impacts of projects before the decisionmaker 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.

- **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.

- **Sikes Act of 1960, as Amended (16 USC 670 *et seq*.).** Requires military installations to manage natural resources for multipurpose uses and public access appropriate for those uses, as well as ensuring no net loss to training, testing or other defined

missions of the installation through the development and implementation of an INRMP.

- **Neuse River Basin Riparian Buffer Rules (15A NCAC 02B.0233).** Require a 50-foot riparian buffer that is divided into two zones. The 30 feet closest to the water (Zone 1) must remain undisturbed. The outer 20 feet (Zone 2) may include managed vegetation, such as lawns or shrubbery. The riparian buffer rules also require diffuse flow of stormwater runoff. The buffers apply to intermittent streams, perennial streams, lakes, ponds, estuaries, and modified natural streams that are depicted on the most recent printed version of the soil survey map prepared by the Natural Resources Conservation Service or the 1:24,000 scale quadrangle topographic map prepared by the U.S. Geologic Survey.

10.3. NATIONAL ENVIRONMENTAL POLICY ACT

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 the design and construction/ implementation of the project. The documentation, when completed, is provided to the action proponent, who is expected to provide it to the ROICC or Contract Representative.

Consult the ROICC or Contract Representative to obtain or review any NEPA documentation associated with the project. 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.

Consult the ROICC or Contract Representative to obtain or review any NEPA documentation associated with the project.

10.4. TIMBER

Potential timber resources are identified during the NEPA process. The contractor is responsible for advising the ROICC or Contract Representative to notify EMD's Forest Management Program prior to beginning site work. Additionally, the ROICC or Contract Representative and/or contractor is required to notify the Forest Management Program if the contract has been amended with modifications to the site location.

MCB Camp Lejeune manages its forest in accordance with the installation INRMP. 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 to all forest products on construction projects. If the Government elects to harvest the timber, only merchantable timber will be removed.

Contractors must adhere to the following requirements when performing site work that may impact timber resources:

Protect existing trees that are to remain in place and that may be injured, bruised, defaced, or otherwise damaged by construction operations.

- 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 guy wires to nearby trees for anchorages without authorization from the ROICC or Contract Representative. (If these actions are authorized, the contractor is responsible for any resultant damage.)
- Protect 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 12.0 for disposal information for land-clearing debris.

10.5. THREATENED AND ENDANGERED SPECIES

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.

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 5090.11A lists threatened and endangered species that may be encountered at the installation. The following restrictions apply on the installation unless written permission is explicitly provided:

- Work on Onslow Beach or Brown's Island is not permitted between April 1 and October 31. Traffic

on the beaches should be limited to below the high tide line.

- Vehicles and lighting are prohibited on the beaches overnight between May 1 and October 31.
- Construction activities are prohibited within 1,500 feet of a bald eagle's nest (JD, MC, and IF Training area).
- Cutting or damaging pine trees is not permitted.
- Altering 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.

10.6. WETLANDS

10.6.1. 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 the wetlands size or legal necessity for a permit. Prior to the onset of

Contractors must incorporate avoidance and minimization measures to comply with the national policy to permit no overall net loss of wetlands.

construction, coordination with the Environmental Conservation Branch of EMD should have taken place during project design to ensure CWA permitting issues are addressed by the contractor at the earliest opportunity. Contractors must incorporate avoidance and minimization measures to comply with the national policy to permit no overall net loss of wetlands, as well as meeting concept design criteria while incorporating avoidance and minimization measures to protect wetlands, streams, and waters of the United States. Any proposed action that would significantly affect wetlands must be coordinated with the CG of MCB Camp Lejeune.

The contractor must ensure that construction of all buildings, facilities, and related amenities, including earthwork, grading, landscaping, drainage, 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 the legally defined wetlands on all USMC lands within the project area will be distributed to the ROICC or Contract Representative for use (if available) and included in all design products, including drawings, plans, and figures.

10.6.2. 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

If work in wetlands is required, know who is responsible for obtaining permits, and what the terms and conditions of the permits require.

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:

- U. S. Army Corps of Engineers (USACE), Section 404 Permit (individual or applicable nationwide permit); CWA of 1977, as Amended (Public Law 95-217, 33 U. S. C. 1251 et seq.)
- North Carolina Division of Water Resources (NCDWR), Section 401 Water Quality Certification – (15A NCAC 02H) NCDEQ; CWA of 1977, as Amended (Public Law 95-217, 33 U. S. C. 1251 et seq.)
- North Carolina Division of Coastal Management (NCDCM), Federal Consistency Determination (15A NCAC 07) NCDEQ; CZMA of 1972 (16 USC 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 aids 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 NCDWR, or the NCDCM if there is any question about whether activities could impact wetlands, streams, or protected buffers.

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.

10.6.3. Impacts

Any disturbance to the soil or substrate (bottom material) of a wetland or water body, including a stream bed or protected buffer, 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

10.6.4. 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 (USACE and NCDWR) in all phases of project planning, programming, and budgeting.

The contractor may be required to develop onsite mitigation, consisting of wetland/stream restoration or creation, for all unavoidable wetland and stream impacts, whenever possible and feasible.

The contractor may be required to develop onsite mitigation, if appropriate, consisting of wetland/stream/buffer restoration or creation, for all unavoidable wetland, stream, and buffer impacts, whenever possible and feasible. Use of USMC lands and lands of other entities may be permissible for mitigation purposes for USMC projects when consistent with EPA and USACE guidelines or permit provisions. Land within the project area suitable for establishment of mitigation may be evaluated by the contractor and used for mitigation where compatible with mission requirements and approved by the CG. Proposals for permanent resource areas must be approved by the Assistant Secretary of the Navy (Installations and Environment) or his/her designee.

Offsite mitigation is preferred and should be coordinated through the North Carolina Division of Mitigation Services or an approved private mitigation bank.

10.7. 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 upon completion of a contract or project. Temporary roads, parking areas, and similar temporarily used areas should be graded to conform to surrounding contours and the area restored, to the degree practical, to its state prior to any disturbing activities.

11.0 STORMWATER

MCB Camp Lejeune is responsible for stormwater permits associated with construction, industrial, or municipal activities that discharge to outfalls leading to receiving waters. The most applicable permit for contractors is the construction permit, since the majority of the contractor activities are affiliated with construction/renovation.

Please consult the ROICC or Contract Representative with any questions or concerns about the information in this section.

However, the contractor is also responsible for adhering to the requirements of the industrial and municipal permits held by MCB Camp Lejeune for all of the contractor activities on the installation. In essence, all contractors for the installation need to know and implement the necessary measures to prevent stormwater runoff and pollution runoff from land-disturbing activities (LDAs) and associated construction permit requirements, as well as industrial and municipal activities. The general requirements for each area, as they apply to contractors, are discussed in the following subsections.

11.1. 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 the ROICC or Contract Representative, who will contact the

appropriate environmental office if additional clarification is necessary.

11.1.1. Key Definitions

- **Best Management Practices.** 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 include structural and nonstructural stormwater controls, operation and maintenance procedures, treatment requirements, and practices to control site runoff (e.g., sediment, spillage or leaks, sludge or waste disposal, or drainage from material storage). See the following website for more information: http://deq.nc.gov/about/divisions/energy-mineral-land-resources/stormwater
- **Certificate of Stormwater Compliance.** A document providing approval for development activities that meet the requirements for coverage under a stormwater general permit.
- **Discharge (Pollutant).** The addition of any pollutant or combination of pollutants to waters of the United States from any point source, including, but not limited to, any spilling, leaking, pumping, pouring, emitting, emptying, or dumping of any pollutant; this excludes discharges in compliance with a National Pollution Discharge Elimination System (NPDES) permit.

- **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 its delegated authority in accordance with North Carolina General Statute 113A-57. Erosion and Sedimentation Control Plans show the devices and practices that are required to retain sediment generated by the land-disturbing activity within the boundaries of the tract during construction and upon development of the tract. *Note that in North Carolina, the Erosion and Sedimentation Control Plan and the NCG010000 Construction General Permit are considered the Stormwater Pollution Prevention Plan (SWPPP, or SPPP) for a construction site.* See the following website for more information:
  http://deq.nc.gov/about/divisions/energy-mineral-land-resources/stormwater

- **Land Disturbance.** Areas that are subject to clearing, excavating, grading, stockpiling, 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. *(See also point source discharge, below.)*

- **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. *(See also nonpoint source discharge, above.)*

- **Stormwater (Runoff).** The portion of precipitation (rain and/or snowmelt) that does not naturally infiltrate into the ground or evaporate but flows via overland flows, channels, or pipes into a defined surface-water channel or stormwater system during and immediately following a storm event. As the runoff flows over the land or impervious surfaces (such as streets, parking lots, and building rooftops), it accumulates sediment and/or other pollutants that could pollute receiving streams.
- **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 which is directly related to manufacturing, processing, or raw materials storage areas from an applicable industrial plant or activity, per 40 CFR 122.
- **Stormwater Associated with Municipal Activities.** The discharge of stormwater from municipal activities, including public works shops, vehicle maintenance shops, and other municipal activities, with the potential to cause stormwater pollution.

11.1.2. Key Concepts

- **Energy Independence and Security Act (EISA).** In December 2007, Section 438 of EISA was issued. This section requires that Federal facility projects over 5,000 square feet must "maintain or restore, to the maximum extent technically feasible, the predevelopment hydrology of the property with regard to temperature, rate, volume, and duration of flow." In January 2010, the DoD Policy of Implementing Section 438 of the EISA was issued; this document includes a flowchart with implementation steps.
- **Good Housekeeping.** Good housekeeping practices refer to the maintenance of a clean and orderly facility to prevent potential pollution sources from coming into contact with stormwater. The practices include procedures to reduce the possibility of mishandling materials or equipment. Good housekeeping practices benefit stormwater quality and also provide for a clean, safe place for employees and clients. *Note that good housekeeping is one of the six minimum control measures (MCMs) of the MS4 permit requirements.*
- **Low Impact Development (LID).** LID is a holistic approach that incorporates site-specific ecosystem and watershed-based considerations for planning and design. The goal of LID is to mimic a site's predevelopment hydrology by using design techniques that infiltrate, filter, store, evaporate, and detain runoff close to the source. LID seeks to control

non-point source pollutants "nature's way," through the application of plant-soil-water mechanisms that maintain and protect the ecological and biological integrity of receiving waters and wetlands.

- **National Pollution Discharge Elimination System.** The national program for issuing, modifying, revoking, reissuing, terminating, monitoring, and enforcing permits. The NPDES stormwater program regulates stormwater discharges from three potential stormwater sources, as follows:
  - **Construction Activities.** LDAs that disturb 1 or more acres need an NPDES permit. At a minimum, these permits require the development of a site-specific Erosion and Sedimentation Control Plan to address sediment controls during construction and upon development of the tract. As previously noted, the Erosion and Sedimentation Control Plan and the NCG010000 Construction General Permit are considered the SWPPP for a construction site in North Carolina. In the applicable areas of the installation, a State Stormwater Management Permit and coverage under the Construction General Permit may be required. *Note that construction site runoff control is also one of the six MCMs of the Municipal Separate Storm Sewer Systems (MS4) permit requirements.*
  - **Industrial Activities.** Owners and operators of industrial facilities that fall into any of the 30 industrial sectors identified by EPA stormwater

regulations need an NPDES Phase I permit if stormwater is discharged directly into surface water (or MS4). The permit regulations specify steps that facility operators must take prior to becoming eligible for permit coverage and actions that must be taken to continue coverage under an existing permit. These steps and actions include, but are not limited to, effluent limits, monitoring, inspection, sampling, reporting, and corrective action requirements.

- **Municipal Separate Storm Sewer Systems.** Owners and operators of MS4s need an NPDES Phase II permit. An MS4 is a system of pipes and drainage ditches within an urbanized area used to collect storm runoff and convey it to receiving waters. Polluted runoff is commonly transported through MS4s, from which it is often discharged untreated into local waterbodies.

- **Operational Requirements.** Equipment, discharge, and material use requirements that apply to all construction and industrial activities.

- **Post-Construction Requirements.** 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. *Note that post construction is one of the six MCMs of the MS4 permit requirements.*

- **Stormwater Pollution Prevention Plan.** A plan required by permits provided under NPDES that provides guidance to prevent stormwater pollution from construction, industrial, or municipal activities. *Note that the terminology for this plan (and associated acronym) varies somewhat from State to State.*

11.1.3. Environmental Management System

Contractor practices associated with stormwater include the following:

- Boat, ramp, dock cleaning
- Channel dredging
- Composting
- Construction/demolition/renovation
- Erosion/runoff control
- Fueling and fuel management/storage
- HM storage
- Land clearing
- Laundry
- Landscaping
- Livestock operations
- Pesticide/herbicide management and application
- Range residue clearance

- Road construction and maintenance
- Sewers
- Sidewalk and road deicing
- Soil excavation/grading
- Stormwater collection/conveyance
- Surface washing
- Vehicle parking
- Wash rack

Other activities that contractors could be involved in that may cause stormwater pollution include:

- Grounds maintenance (herbicide, pesticides, fertilizer, etc.)
- Outdoor material storage
- Building/roof repairs
- Industrial activities

The potential impacts of these activities on the environment include degradation of water quality and damage to public and private property due to flooding.

11.2. OVERVIEW OF REQUIREMENTS

Contractors operating aboard the installation must be aware of and adhere to all applicable regulations and requirements regarding potential stormwater contamination, which include but may not be limited to:

- **Clean Water Act of 1972.** Establishes the basic structure for regulating discharges of pollutants into the waters of the United States. The CWA establishes that no oil or hazardous substances should be discharged into or upon the navigable waters of the United States or adjoining shorelines, which may affect natural resources under the management of the United States through the following goals: (1) eliminate the introduction of pollutants into waters of the United States, and (2) develop water quality, which protects and propagates fish, shellfish, and wildlife and provides for recreation in and on the water.

- **40 CFR 122, National Pollutant Discharge Elimination System.** Requires industrial, construction, and municipal stormwater permits for the discharge of pollutants from any point source into waters of the United States.

- **15A NCAC Chapter 4.** Requires all persons conducting a 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.

    - Identify critical areas
    - Limit exposure areas
    - Limit time of exposure
    - Control surface water

- Control sedimentation
- Manage stormwater runoff

  More information can be found at:

  http://reports.oah.state.nc.us/ncac.asp?folderName=\Title%2015A%20-%20Environmental%20Quality\Chapter%2004%20-%20Sedimentation%20Control

- **15A NCAC 02H.1000 Stormwater Management.** The State Stormwater Management Program requires all persons conducting LDAs 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.

11.3. PRIOR TO SITE WORK

Contractors are required to address the following in the below section prior to beginning site work.

11.3.1. Construction Notifications

Any project involving LDAs aboard the installation must be reviewed by the installation's NEPA Review Board prior to the onset of work so that potential impacts of the project and associated mitigation measures (if necessary) can be determined. Documentation of this review should have been provided to the ROICC or Contract Representative and may include mandatory conditions affecting the construction/implementation of the project. Consult the ROICC or Contract Representative to obtain or review any NEPA documentation associated with the project in the contract.

Any project involving LDAs aboard the installation must be reviewed by the installation's NEPA Review Board prior to the onset of work.

11.3.2. Familiarity with the Stormwater Phase I Industrial Permit

Discharges of industrial stormwater have the potential to contain contaminants from industrial activity. Because of this, MCB Camp Lejeune holds a Stormwater Phase I industrial permit. This type of discharge is defined and regulated in 40 CFR 122, the EPA final rule regarding NPDES stormwater permitting.

Contractors are responsible for preparing project-specific permit applications and related plans and for coordinating the permit review schedule with the ROICC or Contract Representative.

Daily industrial operations discharging stormwater aboard MCB Camp Lejeune and MCAS New River are covered under an individual NPDES permit. In accordance with the permit, the installation maintains an industrial SWPPP that identifies potential sources of pollution that may affect the water quality of stormwater discharges associated with an industrial activity. Refer to Section 11.4 for more information on contractor responsibilities associated with this permit.

11.3.3. Familiarity with the Stormwater Phase II Municipal Permit

Discharges of municipal stormwater have the potential to contain contaminants from municipal activity. Because of this, MCB Camp Lejeune holds a Stormwater Phase II municipal permit. This type of discharge is defined and regulated in 40 CFR 122, the EPA final rule regarding NPDES stormwater permitting.

Daily municipal operations discharging stormwater aboard MCB Camp Lejeune and MCAS New River are covered under an NPDES permit. In accordance with the permit, the installation maintains a municipal Stormwater Plan to address the six MCMs of the permit, as well as other requirements. Refer to Section 11.4 for more information on contractor responsibilities associated with this permit.

11.3.4. Project-Specific Construction 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. MCB Camp Lejeune is the responsible party for all project-specific stormwater permits located outside of Public-Private Venture (PPV) housing. All permit-required plans and applications must be submitted to the appropriate MCB Camp Lejeune organization to go through internal approval prior to submission to the appropriate State agency. The permit review schedule should allow adequate time for internal review prior to State submission deadlines. Adequate review time fluctuates and is based on the type of permit application. Stormwater compliance should be coordinated with the appropriate PPV partner for housing-related projects outside the jurisdiction of MCB Camp Lejeune.

All permit-required plans and applications must go through internal approval before being submitted to the appropriate State agency.

Permit coverage is required under the North Carolina General Permit No. NCG010000 (General Permit) for construction activities that disturb 1 acre or more of land. Three copies of a proposed Erosion and Sedimentation Control Plan must be prepared and submitted to the NCDEQ Sedimentation Control Commission (or to an approved local program) at least 30 days prior to beginning construction activity to obtain coverage under the General Permit. A copy of the plan will be kept on file at the job site at all times while the site is active. **Coverage under the permit becomes effective when a plan approval is issued. No LDAs may take place prior to receiving the 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
- Development within 1 mile of and draining to any waters classified as High Quality Water (HQW) and rated "excellent" based on biological and physical/ chemical characteristics through the NCDWR monitoring or special studies, primary nursery areas designated by the Marine Fisheries Commission, and other functional nursery areas designated by the Marine Fisheries Commission
- Development that drains to an Outstanding Resource Water, which is a subset of HQW that is intended to protect unique and special waters having excellent water quality and being of exceptional ecological or recreational significance to the State or Nation

A State Stormwater Management Permit is required for all activities that will disturb 1 acre or more of land.

Because the installation is in a coastal county, any project that disturbs greater than 1 acre of land (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 NCDEQ, Division of Water Quality, after the construction plans and specifications are complete and before construction activities begin. Additional information is available on the NCDEQ website:

http://deq.nc.gov/about/divisions/energy-mineral-land-resources/stormwater

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.

11.4. 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 contractor's construction and/or the installation's industrial SWPPP, municipal stormwater plan, and applicable permits. The following requirements apply to all projects 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.

- All permitted erosion and sedimentation control projects will be inspected by the contractor at least once every 7 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. Inspection results shall be maintained by the designated contractor throughout the duration of an active construction project.

- Equipment used during the project activities 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.

- No POL products (e.g. fuels, lubricants, hydraulic fluids), coolants (e.g., antifreeze), or any other substance shall 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 or ground waters of the State, or storm drains. Disposal of spent fluids is outlined in Section 7.0.

- Implement spill prevention measures, clean up all spills immediately, and follow the spill reporting requirements presented in Section 5.0. 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. Refer to Section 5.0 for emergency and spill response procedures.

- Herbicide, pesticide, and fertilizer use shall be consistent with the Federal Insecticide, Fungicide, and Rodenticide Act and shall be used in accordance with label restrictions. Refer to Section 7.0 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, chemical storage, fuels storage, wood products, and empty storage drums. These materials should be stored under cover whenever practicable. Contact the ROICC or Contract Representative with any questions about whether an outdoor storage practice is acceptable.

- Use good housekeeping practices to maintain clean and orderly work areas, paying particular attention to those areas that may contribute pollutants to stormwater. For industrial activities, refer to the link below for more information on best management practices to prevent stormwater pollution. EPA Industrial Fact Sheet Series for Activities Covered by EPA's multi-sector general stormwater permit: http://www.epa.gov/npdes

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12.0 SOLID WASTE, RECYCLING, AND POLLUTION PREVENTION (P2)

Contractors should minimize the amount of solid waste requiring disposal in a landfill.

The installation has a proactive P2 and recycling program, and 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. HM and HW are discussed in Section 7.0 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.

12.1. 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 the ROICC or Contract Representative, who will contact the appropriate environmental office if additional clarification is necessary.

Please consult the ROICC or Contract Representative with any questions or concerns about the information in this section.

12.1.1. Key Definitions

- **Construction and Demolition Debris.** Inert materials generated during the construction, renovation, and demolition of buildings, roads, and bridges. C&D waste often contains bulky, heavy materials such as concrete, lumber (from buildings), asphalt (from roads and roofing shingles), gypsum (the main component of drywall), and glass (from windows).
- **Green Procurement (GP).** The purchase of products and services that are environmentally preferable, when compared with competing products that serve the same purpose, in accordance with federally mandated "green" procurement preference programs. GP is intended to have a lesser or reduced negative effect on human health and the environment, and to permit fulfilling the social, economic, and other requirements of present and future generations.
- **Pollution Prevention.** Reducing the amount of pollution entering waste streams or otherwise released to the environment through source reduction and process efficiencies.
- **Recycling.** Activities that may include collection, separation, and processing, by which products or other materials are recovered from the solid waste stream for use as raw materials in the manufacturing of new products. Recycling also includes using, reusing, or reclaiming materials, as well as processes

that regenerate a material or recover a usable product from it.

- **Municipal Solid Waste.** Any solid materials discarded, including garbage, construction debris, commercial refuse, non-hazardous materials, non-recyclable wood, or other non-recyclable material per BO 11350.1, Refuse Disposal Procedures.

12.1.2. Key Concepts

- **Pollution Prevention/Green Procurement.** Installation contractors are strongly encouraged to use P2 and GP practices.
- **Qualified Recycling Program (QRP).** An organized operation that diverts or recovers scrap or waste streams and that identifies, segregates, and maintains the integrity of the recyclable materials in order to maintain or enhance the marketability of the materials.
- **Recycling.** Recycling is required on the installation. The MCB Camp Lejeune Landfill (Base Landfill) Recycling Center accepts specified recyclables according to the schedule in Table 12-1. Call (910) 451-4214 prior to a bulk turn-in.
- **Solid Waste.** Solid waste is disposed of in accordance with contract specifications (off the installation or at the Base Landfill). Data related to disposal off the installation (to include C&D waste) must be provided to the ROICC or Contract Representative on a monthly basis.

- **Source Reduction.** Any practice that reduces the amount of any HM, pollutant, or contaminant entering any waste stream or released into the environment prior to recycling, treatment, and disposal that could reduce the hazard to public health and the environment. Source reduction may include equipment or technology modification; process or procedure modification; reformulation or redesign of products; substitution of raw materials; and improvements in housekeeping, maintenance, training, or inventory control.

12.1.3. Environmental Management System

Contractor practices associated with solid waste, recycling, and P2 include the following:

- Battery management
- Building operation/maintenance/repair
- Composting
- Construction/demolition/renovation
- Equipment operation/maintenance/disposal
- Grease traps
- HW disposal offsite transport
- Land clearing
- Livestock operations
- Metal working
- Packaging/unpackaging

- Paint removal
- Painting
- Parts replacement
- Polishing
- Range residue clearance
- Recreational facilities operation
- Road construction maintenance
- Rock crushing operations
- Solid waste collection/transportation
- Storage tank management
- Urban wildlife management
- Vehicle maintenance

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.

12.2. 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 P2, which include but may not be limited to the following:

- **BO 5090.17, Solid Waste Reduction – Qualified Recycling Program.** Provides guidance for solid

waste reduction, P2, 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.
- **DoD Instruction 4715.4, Pollution Prevention.** Establishes the DoD requirement for installation QRPs and calls for GP.
- **EO 13423, Strengthening Federal Environmental, Energy and Transportation Management.** Integrates prior practices, strategies, and requirements to further enhance the environmental and energy performance and compliance requirements. The EO sets goals in several environmental areas, including recycling.
- **EO 13514, Federal Leadership in Environmental, Energy, and Economic Performance.** Expands on the environmental performance requirements for Federal agencies, to include setting goals for solid waste diversion.
- **Pollution Prevention Act of 1990 (42 USC 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 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, including permitting, licensing, and reporting requirements. The SWDA encourages the reuse of waste through recycling and requires the procurement of products that contain recycled materials.

12.3. SOLID WASTE REQUIREMENTS

Contractors must follow all Federal, State, and local requirements regarding the collection, storage, and disposal of solid waste. Contact the ROICC or Contract Representative for additional information regarding solid waste requirements.

At a minimum, the following actions are required for 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 the use of the Base Landfill is authorized for disposal. If the Base Landfill is authorized, the contractor must contact the Base Landfill Operations Clerk to ensure the contract is registered in the Landfill Tracking System. Recycling should be coordinated with the ROICC or Contract Representative and the Landfill Manager.

2. Provide the weight of ALL waste, both MSW and C&D, that is either disposed of or recycled, to the ROICC or Contract Representative, with a copy to the Landfill Manager. This requirement does not apply if the landfill/recycling facility picks up or accepts materials directly from the contractor. If contractors transport waste offsite for disposal, it is mandatory that they track the material weight and provide that information to their ROICC or Contract Representative for input into the annual Pollution Prevention Annual Data Summary.

In addition, contractors producing solid waste on the installation are required to take these steps:

- Pick up solid waste, separate it according to material type, and place it in covered containers of the correct type that are regularly emptied for recycling or landfilling.
- Verify that the solid waste contains no HM or HW.
- 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.

12.3.1. MCB Camp Lejeune Landfill Acceptable Waste Streams

To dispose of waste at the Base Landfill, contractors must be authorized with a valid construction pass and placard representing the related contract. Contractors must also contact the Landfill Operator prior to unloading refuse. Contact the ROICC or Contract Representative with any questions regarding use of the landfill or to coordinate disposal.

The Base Landfill accepts certain types of solid waste under the conditions specified in Table 12-1. Base Landfill hours of operation are 0730 to 1530, Monday through Friday, but ACM waste must be delivered between 0700 and 1000, Monday through Thursday. Each material must be separated into different loads.

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Table 12-1. Base Landfill Requirements

No Personal Property/ Off-Base Trash Accepted
Landfill Operating Hours
0700-1500 Monday – Thursday 0700-1400 Friday
Wood Products
The following products may be mixed together and delivered to the landfill: • Scrap lumber (unpainted) • Embark boxes (broken down) • Pallets (broken/untreated) The following products must be separated and delivered to the landfill: • Trees (cut to 10 feet or less and free of soil) • Leaves and scrubs Serviceable pallets
Lead Based Painted Wood Products
• Delivered before 1400 Monday – Thursday • Not accepted on Friday • Cut in less than 8-foot lengths Wrapped in 6-millimeter plastic bags/sealed
Asbestos (all types)
• Appointment needed (910-451-5011 / 2946) • Delivered by 1000 (Mon – Thurs.) • Not accepted on Friday • Double wrapped in 6-millimeter plastic bags

• Sealed with duct tape Labeled and manifested prior to delivery
Organic Products
• Leaves, pine straw, grass, and shrub clippings • No bags or containers allowed • No twigs or limbs over 2 inches in diameter • Less than 6-foot lengths
Concrete
• Delivered separately from other items • Wire and rebar must be cut off flush with exposed surfaces • Concrete and culverts • Bricks and blocks • Mortar products
Soil
Non-contaminated soil accepted
Recyclable Products (Must be separated and dropped off at a designated recycling drop-off point or at a Recycling Center)
• Wood pallets (delivered separately) • White paper (mixed flat or shredded) • Newspaper • Magazines • Military publications (binders removed) • Phone books • Plastic and glass (containers or bottles) • Toner cartridges • Cardboard (delivered separately if in bulk)

• Vinyl siding (delivered separately, in less than 6-foot lengths) • Asphalt shingles (delivered separately) Scrap metals
Other Related Information
Asphalt may be accepted in small quantities, as needed, at the discretion of the Landfill Manager (large quantities of asphalt must be taken off the installation).
All furniture must be accompanied by a DD Form 1348, with a classification of rejected by the Base Property Office **AND** downgraded to scrap by Defense Logistics Agency Disposition Services (DLADS).
All other Base or USMC property must be accompanied by a DD Form 1348 and downgraded to scrap by DLADS.
Scrap materials related to **ordinance, ammunition or dangerous items**, including containers, tubes, and packing, must also be accompanied by Ammunition, Explosives, and Other Dangerous Articles (AEDA) certifications and copies of the certifier and verifier's appointment letters.
Phone Numbers: (area code 910) • Landfill Manager 451-4998 • Recycling Manager 451-4214 • Landfill Fax 451-9935 • Landfill Clerk 451-2946 • EMD 451-5837 • EOD 451-0558

Unacceptable Items
• Hazardous Waste • Liquid Waste • Useable Appliances • Paint and Paint Cans • Appliances • Electronics • Computer Equipment • Batteries • Wire (Communication/Barbed/ Concertina) • Oyster Shells • Contaminated Soil • Tires • 55-Gallon Drums • Oil Filters • Petroleum Containers • Regulated Medical Waste • PCBs or PCB containers • Demilitarized Waste • Construction and Demolition Debris (unless specified in the contract)

12.4. RECYCLING REQUIREMENTS

The installation's QRP is managed by the EMD in collaboration with the Public Works Division. Reducing solid waste saves money and helps protect the environment by conserving natural resources. Additionally, USMC facilities are mandated to recycle, and the installation must meet solid waste diversion goals specified in EO 13514, the

DoD Strategic Sustainability Performance Plan, and the EMS.

12.4.1. Recycling Center

The MCB Camp Lejeune Recycling Center, Building 982, is co-located with the Base Landfill on Piney Green Road. Normal working hours are Monday through Thursday, 0700–1500, and Friday, 0700-1400. All materials should be brought to the Recycling Center. Have the ROICC or Contract Representative contact the Recycling Center at (910) 451-4214 for additional details. Call Recycling Coordinator at (910) 451-4214 for specific types and categories of materials accepted.

The following types and categories of materials are accepted for recycling but must be delivered to the Recycling Center on Piney Green Road:

- Scrap metal
- Steel (high temperature, corrosion resistant)
- Brass (includes spent/fired munitions, but excludes brass casings above .50 caliber; please call the Recycling Coordinator at (901) 451-4214 for details and documentation requirements)
- Copper and copper wire
- Aluminum (plate, sheet, scrap) and aluminum cans
- Paper (white, news, magazine)
- Cardboard

- Glass bottles (no window, windshields, or drinking glass)
- Plastic bottles
- Toner cartridges

Special arrangements may be made for other materials (C&D waste) or larger volumes of commonly recycled materials from events such as C&D. Regulations set forth in BO 11350.1 must be followed.

12.4.2. 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.** Take empty metal paint cans to Building S-962 for recycling. Turn in all HM cans or HM containers that are generated from MCB Camp Lejeune or MEF contracts to Building S-962 on Michael Road on the scheduled contractor turn-in day. Have the ROICC or Contract Representative contact EMD for more information. Any waste generated from this process must be managed appropriately.
- **Other Metals.** Take other metals to the DLADS disposal area in Lot 201, following the guidelines of BO 5090.17.

- **Red Rag Recycling.** Contractors should seek a red rag program to supply and launder shop rags. This service supplies clean rags and picks them up after use. The rags are laundered offsite and returned.
- **Universal Waste.** See Section 7.0 of this guide for management procedures.
- **Unused Hazardous Materials.** Turn in these materials to the HM Free Issue Point, Building 977 on Michael Road. Have the ROICC or Contract Representative contact the Free Issue Point at (910) 451-1482.
- **White Rag Recycling.** White rags are used in painting (these have no dye and thus do not interfere with these types of operations) and may be laundered offsite in a program analogous to the red rag recycling service.

12.5. POLLUTION PREVENTION AND GREEN PROCURMENT

MCB Camp Lejeune is subject to GP requirements. GP implements environmentally protective principles in the procurement arena and includes preferential use of the following:

- Products made from recovered materials
- Biobased products
- Water- and energy-efficient products
- Alternatives to ozone-depleting substances

- Non-toxic and less-toxic products
- Electronics that meet Electronic Product Environmental Assessment Tool standards
- Products that do not contain toxic chemicals, hazardous substances, or other pollutants targeted for reduction and elimination by the DoD
- Products with alternative fuel use/increased fuel efficiency
- Environmentally preferable purchasing practices

Contractors are encouraged to employ GP practices whenever feasible.

13.0 POTENTIAL DISCOVERY OF UNDOCUMENTED CONTAMINATED SITES

MCB Camp Lejeune was placed on the EPA National Priorities List, effective November 4, 1989. To ensure the protection of human health and the environment, a proactive Installation Restoration Program has been established to assess and remediate various sites on the installation. Numerous investigations have been performed to ensure that all of the installation's contaminated sites have been found, but additional contaminated areas may still exist. It is the contractor's responsibility to notify the ROICC or Contract Representative of any unforeseen site conditions while on the installation. It is recommended that any contractors performing intrusive activities on the installation be properly trained in accordance with the OSHA standards in 29 CFR 1910.120(e). If intrusive activities are planned for 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.

Contact the ROICC or Contract Representative with questions or concerns about the information in this section.

13.1. 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 the ROICC or Contract Representative, who will contact the appropriate environmental office if additional clarification is necessary.

13.1.1. Key Definitions

- **Free Product.** A discharged HM/HW, POL, or environmental pollutant that is present in the environment as a floating or sinking non-aqueous phase liquid that exists in its free state (i.e., exceeds the solubility limit of liquids or saturation limit of soil/solids).
- **National Priorities List.** List of sites of national priority among the known releases or threatened releases of hazardous substances, pollutants, or contaminants.
- **Petroleum, Oil, and Lubricants.** A broad term that includes all petroleum and associated products or oil of any kind or in any form, including, but not limited to, petroleum, fuel oil, vegetable oil, animal oil, sludge, oil refuse, and oil mixed with wastes.
- **Unforeseen Site Condition.** A potentially hazardous or unanticipated site condition encountered on a job site.

- **Munitions and Explosives of Concern.** Military munitions that may pose explosives safety risks, including MEC, UXO, DMM, and munitions constituents present in a high enough concentration to present an explosives hazard.

13.1.2. Key Concepts

- **Notification.** Contractors must notify the ROICC or Contract Representative, in writing, of any unforeseen site conditions prior to disturbing them.
- **Response.** Contractors must stop working and evacuate work areas if unforeseen site contaminants, HM, or MEC/DMM/UXO are suspected to be present.

13.1.3. Environmental Management System

Unforeseen site conditions are potentially applicable to all EMS practices conducted aboard MCB Camp Lejeune.

13.2. OVERVIEW OF REQUIREMENTS

Contractors operating aboard the installation must be aware of and adhere to all applicable regulations and requirements regarding unforeseen site conditions, which include but may not be limited to the following:

- **CERCLA of 1980 and Superfund Amendments & Reauthorization Act (SARA) of 1986.** Establishes the Nation's HW site cleanup program.

- **Occupational Safety and Health Standards, 29 CFR 1910.** Federal standards that govern occupational health and safety to ensure the protection of employees from recognized hazards, such as exposure to toxic chemicals, excessive noise levels, mechanical dangers, heat or cold stress, or unsanitary conditions. The standards include provisions for many facets of employee safety and health, including, but not limited to, employee training, personal protective equipment, HM communication, medical surveillance, and emergency planning.

13.3. UNFORESEEN SITE CONDITION PROCEDURES

Contractors must promptly, before the conditions are disturbed, give a written notice to the ROICC or Contract Representative of (1) any subsurface or latent physical conditions at the site that differ materially from those indicated in the contract, or (2) any unknown physical conditions at the site, of an unusual nature, that differ materially from those ordinarily encountered.

The ROICC or Contract Representative will investigate the site conditions promptly after receiving the notice.

The most common unforeseen conditions at MCB Camp Lejeune typically relate to POL contamination and MEC/DMM/UXO. Procedures for these scenarios are provided in the following sections.

13.3.1. Petroleum, Oil, and Lubricants

The most frequently encountered condition that requires EMD assistance is the presence of a POL odor while excavating. If an odor or any free product is encountered during construction or excavation activities, take the following actions:

- 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.

If there is an odor, stop work and immediately clear the area of all personnel to a safe distance upwind of the suspected area.

Please note that if contaminated soil is removed during excavation activities, the soil will have to be characterized prior to disposition. While it is staged and awaiting characterization sampling results, contaminated soil is to be placed within a bermed area on an impervious surface or barrier and securely covered with plastic or appropriate

material. Sample results and characterization will determine the ultimate disposition of the soil. In accordance with installation policy, contaminated soil is not permitted to be reintroduced into excavations.

Recognize

Retreat

Report

13.3.2. Munitions and Ordnance

MCB Camp Lejeune has been in operation as a military training installation since the early 1940s. As such, munitions or an ordnance item may be encountered during site excavation or construction activities. MEC, DMM, or UXO at MCB Camp Lejeune and its outlying areas typically include flares, mines, grenades, rockets, artillery projectiles, bulk explosives, fuses, or blasting caps. These items may vary in condition from very good/easily recognizable to unrecognizable, fragmented, or corroded scrap metal. MEC, DMM, or UXO may be encountered on the ground surface, partially buried, or completely buried.

Contractors operating aboard the installation should follow the "3R" concept if a possible munitions or ordnance item is discovered: **"Recognize, Retreat, and Report."**

Recognize

Retreat

Report

- **Recognize.** Contractors with the potential to encounter any possible MEC, DMM, or UXO should have a basic knowledge of these items. The item does not have to

be specifically recognized or identified, but it is important for personnel to recognize the potential hazard.

- **Retreat.** If a suspected MEC, DMM, or UXO item is encountered, leave the immediate area and DO NOT DISTURB the item. If possible, note the general size and shape of the item, any markings, and the location.
- **Report.** Report all occurrences to the appropriate authority, including any observations (e.g., size, shape, markings, and location).

Stop work immediately if a project unearths a hazardous material, such as MEC/DMM/UXO, and report the situation to the ROICC or Contract Representative.

If a project unearths any potential MEC/DMM/UXO, recognize the potential hazard. Stop work immediately, and have all personnel clear the immediate area. Report the situation and any observations to the ROICC or Contract Representative, who will then report the item to Range Control and Explosive Ordnance Disposal (EOD). The following link is to a 6-minute "UXO Safety" awareness training video that provides additional guidance.

http://www.lejeune.marines.mil/OfficesStaff/ExplosivesSafety/ %20trainingandguides.aspx

For other emergency response procedures, please refer to Section 5.0 of this guide.

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14.0 PERMITTING

Contractors operating aboard the installation must ensure that all relevant environmental permits are obtained before work commences onsite. 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 permits related to the environment are provided in Section 14.3.

14.1. 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 the ROICC or Contract Representative, who will contact the appropriate environmental office if additional clarification is necessary.

Please consult the ROICC or Contract Representative with any questions or concerns about the information in this section.

14.1.1. Key Definitions

- **Major Source.** Any source that emits or has the potential to emit 100 tons per year or more of any criteria air pollutant in accordance with Title V of the CAA.

- **Permit.** A legally enforceable document required by statutory regulation for potential sources of pollution that is required for operations that may have an environmental impact. Permits may be administered at the Federal, State, or local level.
- **Target Housing.** Any housing constructed before 1978, with the exception of housing for the elderly and persons with disabilities (unless a child under the age of 6 lives or is expected to live there) and residential dwellings where the living areas are not separated from the sleeping areas (efficiencies, studio apartments, dormitories, etc.).

14.1.2. 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. Additional information on North Carolina permits is found on the following webpage: http://deq.nc.gov/about/divisions/environmental-assistance-customer-service/deacs-permit-guidance/environmental-permit-assistance

Consult the ROICC or Contract Representative for additional information concerning the contract's permit requirements. The contractor is responsible for ensuring that all required permits are acquired prior to any work aboard MCB Camp Lejeune.

14.1.3. Environmental Management System

Currently, no practices are associated with permitting under the EMS.

14.2. OVERVIEW OF REQUIREMENTS

Please refer to the individual sections of this Guide for applicable permitting regulations and requirements for each environmental media. Many permits have specific timetables for submittal prior to project initiation. Contractors must consult the permit requirements and ensure that all pertaining permits are obtained in the required timeframe.

14.3. PROJECT PERMITS AND APPROVALS

The NCDEQ website (http://deq.nc.gov/) is a useful reference for determining required permits and obtaining necessary forms.

Prior to work being awarded, EMD's NEPA Section should have performed an environmental review of the installation-associated action proponent to comply with NEPA 1969. The outcome of this review would be either a Decision Memorandum or an Environmental Assessment. 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 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 NCDEQ. In some cases, EMD must submit the permit application. Please direct questions to the ROICC or Contract Representative.

Some 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 may also be required. The NCDEQ website (http://deq.nc.gov/) 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 onsite for review upon request.

14.3.1. Stormwater (Section 11.0)

- **NPDES Stormwater Discharge Permit for Construction Activities (also referred to as General Permit No. NCG010000).** Required for all LDAs that exceed 1 acre; also requires an accompanying Erosion and Sedimentation Control Plan.
- **General Permit SWG050000.** Required for residential development activities within the 20 coastal counties (including Onslow County) located within 1/2 mile and draining to class SA waters (waters classified as SA are tidal salt waters that are

used for commercial shellfishing or marketing purposes) that disturb less than 1 acre if adding more than 10,000 square feet of built-upon area that will result in a built-upon area greater than 12 percent of the total project area.

- **High-Density Stormwater Permit.** Required when (1) the LDA exceeds 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 1 acre and impervious surfaces are less than 25 percent of the total project area when adjacent to non-SA waters or less than 12 percent of the total project area when adjacent to SA waters.

14.3.2. Asbestos (Section 8.0)

- **Asbestos Permit Application and Notification for Demolition/Renovation.** DHHS Form 3768, available at the following website (under *Forms & Applications*):

  http://epi.publichealth.nc.gov/asbestos/ahmp.html

14.3.3. Lead-Based Paint (Section 9.0)

- **North Carolina Lead-Based Paint Abatement Permit Application.** Any person or firm conducting an abatement of a child-occupied facility or target

housing is required to obtain a Lead Hazard Management Plan Permit. The application is available at the following website: http://epi.publichealth.nc.gov/lead/pdf/LeadAbatePermit08-07.pdf

14.3.4. Air Quality (Section 4.0)

- **Construction Permits.** Construction permits are required for all new stationary sources and all existing stationary sources that are added to or are modified with new equipment that may emit air pollutants. Permits may be required for the construction or modification of the following types of emission sources:
  - Boilers
  - Generators
  - Engine test stands
  - Surface coating/painting operations
  - Refrigerant recovery and recycling operations for other ozone-depleting substances, such as industrial chillers, refrigerators, air conditioning compressors, or cleaning agents.
  - Chemical or mechanical paint removal, 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

- **New Source Review Permit.** A New Source Review permit is a pre-construction permit that authorizes the construction of new major sources of air pollution or major modifications of existing sources.

14.3.5. Wetlands (Section 10.6)

- **Section 404 Clean Water Act Permit.** Contractors working aboard the installation will not perform any work in waters of the United States or wetlands (see definition below) without an approved permit (even if the work is temporary). Unavoidable impacts to wetlands or waters of the United States will require coordination and written approval from the USACE for a Section 404 CWA permit (individual or applicable nationwide permit), the NCDWR for a Section 401c Water Quality certification, and the NCDCM for a Federal Consistency Determination. Failure to acquire written authorization for making impacts to wetlands and/or waters of the United States may result in significant project delays or design modifications. See the following website for more information:

  http://www.epa.gov/laws-regulations

14.3.6. Drinking Water/Wastewater

- **Approval of Engineering Plans and Specifications for Water Supply Systems.** Applicants must submit engineering plans and specifications at least 30 days prior to the date upon which the Authorization to Construct is desired. Authorization to Construct must be obtained prior to onset of work.
- **Wastewater Extension Permit.** NCDEQ Form FTA 02/03 – Rev. 3 04/05. Applicants submitting Form FTA 02/03 should plan to allow the State approximately 90 days to issue the permit. The Wastewater Extension Permit must be obtained prior to onset of work.