NAVFAC SPECIFICATION NO. 05-14-0146

REPLACE BOILER AT BUILDING AS-710

AT THE

MARINE CORPS AIR STATION, NEW RIVER, JACKSONVILLE, NORTH CAROLINA

DESIGN BY:

CBHF Engineers, PLLC Wilmington, North Carolina

A/E Contract: N40085-15-D-0815

SPECIFICATION PREPARED BY:

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Date: June 10, 2015

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05140146

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LIST OF DRAWINGS

Contract drawings are as follows:

NAVFAC S		TITLE
DWG NO. I	NO.	11116
60016360 G	G-1	COVER SHEET AND DRAWING INDEX
60016361 M	1-1	MECHANICAL NOTES, LEGEND & ABBREVIATIONS
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60016370 M	1-10	MECHANICAL DEMOLITION ISOMETRIC DIAGRAMS
60016371 M	1-11	MECHANICAL DEMOLITION ISOMETRIC DIAGRAMS
		MECHANICAL NEW WORK ISOMETRIC DIAGRAMS
		MECHANICAL NEW WORK ISOMETRIC DIAGRAMS
60016374 M	1-14	MECHANICAL DIAGRAMS, CONTROLS & SEQUENCES
60016375 M	I-15	MECHANICAL SCHEDULES
60016376 M	1-16	MECHANICAL DETAILS
60016377 E	E-1	ELECTRICAL LEGEND, RISER, ABBREVIATIONS, NOTES,
		AND DETAIL
		ELECTRICAL GENERAL AND DEMOLITION NOTES
		ELECTRICAL DEMOLITION, PLANS AND SCHEDULES
		ELECTRICAL POWER PLANS
60016381 E	I-5	ELECTRICAL PANEL SCHEDULES - REVISED
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		FIRE ALARM DEMOLITION PLAN
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60016388 F	7A-3	FIRE ALARM DETAILS

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 replacing a 30 year old Kewanee oil-fired boiler (2107 lbs/hr) with a natural gas-fired condensing boilers. The current boiler provides steam to converters on the heating hot water loop and domestic hot water loop. Steam is utilized in the kitchen to boost the water temperature for the dishwasher. The government is providing a new dishwasher with auxiliary gas-fired booster heater that shall be installed by the contractor for this project. Heating hot water pump will be replaced with redundant pumps. Three existing air handlers will require existing 2-way control valves be replaced with 3-way control valves. Additionally, the existing fire alarm control panel will be replaced with new panel and will be installed in a new location and incidental related work.

1.1.2 Location

The work shall be located at the Marine Corps Air Station, New River, Jacksonville, North Carolina approximately as shown. The exact location will be indicated by the Contracting Officer.

1.2 EXISTING WORK

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

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

1.3 GOVERNMENT-FURNISHED MATERIAL AND EQUIPMENT

Pursuant to Contract Clause "FAR 52-245-2, Government - Furnished Property (Short Form)", the Government will furnish the following materials and equipment for installation by the Contractor:

DESIGNATION NO. DESCRIPTION QUANTITY

Dishwasher Dishwasher 1

1.3.1 Delivery Schedule

Notify the Contracting Officer in writing at least 30 calendar days in advance of the date on which the materials and equipment are required. Pick up materials and equipment no later than 30 calendar days after the required date. When materials and equipment are not picked up by the 30th day, the Contractor will be charged for storage at the rate of \$200 per month or fraction thereof.

1.3.2 Delivery Location

The materials and equipment are located within 20 miles of the jobsite.

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 SPECIAL SCHEDULING REQUIREMENTS

- a. Have materials, equipment, and personnel required to perform the work at the site prior to the commencement of the work.
- b. Building AS710 will remain in operation during the entire construction period. The Contractor shall conduct his operations so as to cause the least possible interference with normal operations of the activity.
- c. Permission to interrrupt any utility service shall be requested in writing a minimum of 15 calendar days prior to the desired date of interruption.

1.2 CONTRACTOR ACCESS AND USE OF PREMISES

1.2.1 Station Regulations

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

1.2.2 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.

1.2.3 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.

1.2.4 Occupied and Existing Building

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

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

Provide dust covers or protective enclosures to protect existing work that remains and Government material located in the building during the construction period.

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

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

The building can be closed for a maximum 5 days to allow the existing dishwasher complete removal and the new dishwasher to be installed and operational. The dishwasher shall be considered operational once the vendor has commissioned the installation, started up the dishwasher and the dishwasher is available for washing dishes. The contractor shall include in bid price and provide a temporary way to wash dishes if providing an operational dishwasher and removing the existing dishwasher requires more than 5 days.

The contractor shall not work in the dining area during the daily lunch rush, 1100-1330.

The contractor shall only close one head at a time, the operational head will be converted to unisex until both heads are complete.

1.2.5 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, and fire alarm shall be considered utility cutovers pursuant to the paragraph entitled "Work Outside Regular Hours." This time limit includes time for deactivation and reactivation.

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.
- 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:
- 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 and HVAC TAB Inspection

All contract requirements of Section 23 09 23.13, BACnet DIRECT DIGITAL CONTROL SYSTEMS FOR HVAC," Section 23 05 92, "TESTING/ADJUSTING/BALANCING: SMALL HEATING/VENTILATING/COOLING SYSTEMS," shall be accomplished directly by a first tier subcontractor. No work required by Section 23 09 23.13 or 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 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, "TESTING/ADJUSTING/BALANCING: SMALL HEATING/VENTILATING/COOLING SYSTEMS" 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 5 activities and a maximum of 15 activities. The schedule shall identify as a minimum:

a. Construction time for all major systems and components;

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 Submittal Descriptions (SD)

SD-01 Preconstruction Submittals

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

SD-02 Shop Drawings

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

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

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

SD-03 Product Data

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

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

SD-04 Samples

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

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

Field samples and mock-ups constructed on the project site establish standards by which the ensuring work can be judged. Includes assemblies or

portions of assemblies which are to be incorporated into the project and those which will be removed at conclusion of the work.

SD-05 Design Data

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

SD-06 Test Reports

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

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

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

Investigation reports

Daily checklists

Final acceptance test and operational test procedure

SD-07 Certificates

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

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

Confined space entry permits.

SD-08 Manufacturer's Instructions

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

SD-09 Manufacturer's Field Reports

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

Factory test reports.

SD-10 Operation and Maintenance Data

Data intended to be incorporated in operations and maintenance manuals.

SD-11 Closeout Submittals

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

As-built drawings

Special warranties

Posted operating instructions

Training plan

1.2.4 Approving Authority

Person authorized to approve submittal.

1.2.5 Work

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

1.3 SUBMITTALS

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

SD-11 Closeout Submittals

Submittal register

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 (1) 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 (1) 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 N40085-14-B-0146, 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 (Signature when applicable)	, Date	
Certified by QC manager (Signature)	, Date	"

- 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 #N40085-14-B-0146."

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:

CBHF Engineers, PLLC 3808 Park Avenue Wilmington NC, 28401

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.

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 --

			SUBMIT	TAL RE	GISTER							CONTRACT	NO.				
		LOCATION Boiler at Buildi	ng AS-710			CONTRAC	TOR				•						
	100	Bollet at Ballat	1976710		G	SC	CONTRACTO HEDULE DA	R: TES	CON	ITRACTOR ACTION		APP	ROVING AU	THOF	RITY		
A C T I V I T Y N	TRANSMITTAL NO	S P E C S E C T	DESCRIPTION ITEM SUBMITTED	P A R A G R A P H	OVT OR A/E REVWR	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	A C T I O N C O D E	DATE OF ACTION	FROM	DATE FWD TO OTHER REVIEWER	FROM OTH	A C T I O N C O D E	DATE OF ACTION	MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARK:
a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(1)	(m)	(n)	(o)	(p)	(q)	(r)
		01 20 00	SD-01 Preconstruction Submittals														
T			Schedule of prices	1.3													
T		01 30 00	SD-01 Preconstruction Submittals														
十			List of contact personnel	1.4.1													
T		01 32 16	SD-01 Preconstruction Submittals														
T			Construction schedule	1.2													
Ť			Equipment delivery schedule	1.3													
T		01 33 00	SD-11 Closeout Submittals														
Ť		0.000	Submittal register	1.4.1													
十			Complete Submittal Package	1.6.1		1											
十		01 35 29	SD-01 Preconstruction Submittals	1		1											
\dagger		2. 00 20	Accident Prevention Plan (APP)	1.9													
\dagger			Activity Hazard Analysis (AHA)	1.10		1											
十			Crane Critical Lift Plan	1.9.1		1											
T			Crane Work Plan	1.9.1		1											
\dagger			Crane Operators	1.7.1.4		1											
\dagger			SD-06 Test Reports			1											
†			Reports	1.14													
\dagger			Accident Reports	1.14.1													
†			Monthly Exposure Reports	1.14.3										H			
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1.14.5

1.11

1.14.6

Violations
Crane Reports

SD-07 Certificates

Confined Space Entry Permit

Certificate of Compliance

		SUBMI	TTAL RE	EGISTER					·		CONTRACT	NO.		·		
	DLOCATION				CONTRAC	TOR				<u> </u>						
Replac	e Boiler at Build	ding AS-710		_												
				G O	SC	CONTRACTO HEDULE DA	R: TES	CON	NTRACTOR ACTION		APF	ROVING AU	THOF	RITY		
T R A A N S T I I I I I I I I I I I I I I I I I I	S P E C S E C T	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	CLASSIFICATION	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR		FROM OTH	ACTION CODE	DATE OF ACTION	MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
(a) (b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(I)	(m)	(n)	(0)	(p)	(p)	(r)
	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	2.1													
		Backflow Preventer Tests	3.1													
		SD-07 Certificates														
		Backflow Tester Certifications	1.3													
		Backflow Preventers Certificate	1.3.1													
	01 57 19	SD-01 Preconstruction Submittals														
		Environmental protection plan	1.6.1													
		Preconstruction survey	1.6.4													
		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													
		Environmental Plan Review	1.6.3													
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Annual Report of Products

SD-07 Certificates

01 60 00

Containing Recovered Materials

2.1

		SUBMIT	TAL RE	GISTER							CONTRACT	NO.				
	LOCATION e Boiler at Buil	ding AS-710			CONTRAC	TOR										
				G		CONTRACTO			NTRACTOR ACTION		APP	ROVING AU	THOF	RITY		
T R A N S M I T T A L N O	SPEC SECT	DESCRIPTION ITEM SUBMITTED	P A R A G R A P H	OVT OR A/E REVWR	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	A C T I O N C O D E	DATE OF ACTION	FROM	DATE FWD TO OTHER REVIEWER	FROM OTH	ACT-ON CODE	DATE OF ACTION	MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARK
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1	01 60 00	Certificate of North Carolina	1.2.1													
		Licensed Applicator														
		SD-11 Closeout Submittals														
		Field Pesticide/Herbicide	3.2													
		Management Record Form														
	01 78 00	SD-10 Operation and Maintenance														
		Data														
1		Equipment/product warranty list	1.4.1													
1		SD-11 Closeout Submittals														
1		As-built drawings	1.2.1													
1		Record of materials	1.2.2													
1		Maximo requirements	1.3													
		Complete Submittal Package	1.6													
		Equipment/product warranty tag	1.4.2													
T	02 41 00	SD-01 Preconstruction Submittals	· · · · <u>-</u>													
\top	1 00	Existing Conditions	1.10													
\top		SD-07 Certificates	1 •													
T		Demolition Plan	1.2.1													
1		Notification	1.7	1												
+		SD-11 Closeout Submittals	l										H			
+		Receipts	3.3.4										H			
+	100.00.40	Receipts	J.U. T	 				-			l		Ь—			

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02 82 16

SD-06 Test Reports
Air sampling results

Pressure differential recordings

for local exhaust system
Clearance sampling

1.5.2

1.5.3

3.3.3.2

			SUBMIT	TTAL RE	GISTER	2						CONTRACT	NO.				
		LOCATION Boiler at Build	ding AS-710			CONTRAC	TOR				·						
	<u></u>				G	SC	CONTRACTO HEDULE DA	R: TES	CON	ITRACTOR ACTION		APF	ROVING AU	THOF	RITY		
A CTTIVITTY NOO	TRANSMITTAL NO	%РЕС %ЕСТ	DESCRIPTION ITEM SUBMITTED	P A R A G R A P H	OVT OR A/E REVWR	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	A C T I O N C O D E	DATE OF ACTION	FROM	DATE FWD TO OTHER REVIEWER	FROM OTH	ACTION CODE	DATE OF ACTION	MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(I)	(m)	(n)	(o)	(p)	(p)	(r)
T		02 82 16	SD-07 Certificates														
T			Asbestos hazard abatement plan	1.5.1													
T			SD-11 Closeout Submittals														
7			Asbestos Waste Shipment	1.5.4													
T			Record N.C. (DHHS-HHCU) For														
T			3787														
T			Daily log	1.5.5													
T			North Carolina permit	1.5.6													
T			Asbestos Inspection Reporting	1.5.7													
T			Form														
T		03 30 00	SD-02 Shop Drawings														
T			Reinforcing steel	1.6.2.1													
T			Formwork	3.2.4													
Ť			SD-03 Product Data														
T			Materials for curing concrete	2.4.6													
†			Joint sealants	2.4.9													
†			Joint filler	2.4.8													
†			Carton Forms	2.1.2													
†			Cement	2.4.1													
T			Portland Cement	2.4.1.1													
†			Ready-Mix Concrete	2.3.2													
+						 	1 	1	_					\vdash			

Vapor retarder

Vapor retarder

Bonding Materials

Floor Finish Materials

Concrete Curing Materials

2.4.5

2.4.5

2.6

2.7

2.3.3

		SUBMI	TTAL RE	GISTER	1						CONTRACT	NO.				
	LOCATION Boiler at Build	ding AS-710			CONTRAC	TOR										
- Place	Doner at Built	ally AC-710		G	SC	CONTRACTO HEDULE DA	R: TES	CON	NTRACTOR ACTION		APF	PROVING AU	THOF	RITY		
TRANSMITTAL NO	S P E C S E C T	DESCRIPTION ITEM SUBMITTED	P A R A G R A P H	OVT OR A/E REVWR	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	A C T I O N C O D E	DATE OF ACTION	FROM	DATE FWD TO OTHER REVIEWER	FROM OTH	Ď	DATE OF ACTION	MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
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	03 30 00	Reinforcement	2.5													
		Liquid Chemical Floor Hardener	2.7.1													
		Waterstops	2.2.1													
		Waterstops	2.4.9.3													
		Waterstops	3.14.2													
		Wood Forms	2.1.1													
		SD-05 Design Data														
		mix design	2.3.1													
		SD-06 Test Reports														
		Concrete mix design	1.6.3.1													
		Aggregates	1.6.3.1													
		Compressive strength tests	3.12.2.3													
		Air Content	3.12.2.4													
		Slump	2.8.4													
		Air Entrainment	2.8.1													
	07 84 00	SD-02 Shop Drawings														
		Firestopping Materials	2.1													
		SD-06 Test Reports						$ldsymbol{ldsymbol{ldsymbol{eta}}}$								
4		• .														

3.3

1.4.2

1.4.1

3.10 3.10

2.1

Inspection
SD-07 Certificates
Inspector Qualifications

stencil

09 90 00

Firestopping Materials

Installer Qualifications

SD-02 Shop Drawings

Piping identification

		SUBMIT	TAL RE	GISTER	}						CONTRACT	NO.				
	LOCATION Boiler at Build	ling AS 710			CONTRAC	TOR										
еріасе	Boller at Bullo	IIII A3-710		G O		CONTRACTO HEDULE DA		CON	NTRACTOR ACTION		APF	ROVING AU	THOR	RITY		
T R A N S M I I T T A L N O O	SPEC SECT	DESCRIPTION ITEM SUBMITTED	P A R A G R A P H	OVT OR A/E REVWR	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	FROM	DATE FWD TO OTHER REVIEWER	FROM OTH	ACT-OZ CODE	DATE OF ACTION	MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
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	09 90 00	SD-03 Product Data														
		Materials	2.1													
		Coating	2.1													
		Manufacturer's Technical Data	2.1													
		Sheets														
		SD-04 Samples														
		Color	1.9													
		SD-07 Certificates														
		Qualification Testing	1.3.1.2													
		SD-08 Manufacturer's Instructions														
		Application instructions	3.2.1													
		Mixing	3.6.2													
		Manufacturer's Material Safety	1.6.2													
		Data Sheets														
		SD-10 Operation and Maintenance														
		Data														
		Coatings:	2.1													
1	22 00 00	SD-03 Product Data														
		Water heaters	2.2													
		Welding	1.5.1													
		SD-06 Test Reports														
		Tests, Flushing and Disinfection	3.4													
1		SD-07 Certificates														
	i	14 1 15 15 1	4.0		1	1			1							

Materials and Equipment

SD-03 Product Data

23 00 00

1.3

		SUBMIT	TAL RE	GISTER							CONTRACT	NO.				
	LOCATION Boiler at Build	ding AS-710			CONTRAC	TOR				L						
				G	SC	ONTRACTO HEDULE DA	R: TES	CON	NTRACTOR ACTION		APP	ROVING AU	THOF	RITY		
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	23 00 00	Centrifugal Type Power Roof	2.8.1.1													
_		Ventilators														
_		Test Procedures	1.4.4													
_		SD-06 Test Reports			1			_								
		Performance Tests	3.5		1											
		SD-08 Manufacturer's Instructions			1											
_		Manufacturer's Installation	3.2		1											
-		Instructions														
-		SD-10 Operation and Maintenance														
+		Data						-								
_		Operation and Maintenance	3.7.1					-								
+		Manuals	0044		1			\vdash						<u> </u>	\vdash	
-		Centrifugal Type Power Roof	2.8.1.1		1			\vdash								
+	00.05.00	Ventilators			1			\vdash						<u> </u>	\vdash	
+	23 05 92	SD-06 Test Reports	4.4.4	-	1			\vdash	-				_		\vdash	
+	00.07.00	Certified TAB Report	1.4.1		1			\vdash								
+	23 07 00	SD-03 Product Data	0.4		1			\vdash							\vdash	
+		Piping insulation	2.1		1			\vdash							\vdash	
_		Piping insulation finishes	2.1.3	.	1	<u> </u>								L		

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2.4

1.3.1.1

1.3.1.2

Accessory materials

SD-02 Shop Drawings

Control system drawings title

compounds

List of I/O Points

sheet

23 09 23.13

Adhesives, sealants, and coating 2.3

			SUBMIT	TTAL RE	GISTER							CONTRACT	NO.				
		LOCATION				CONTRAC	ΓOR										
Repl	ace	Boiler at Buildi	ng AS-710														
					G		ONTRACTO			NTRACTOR ACTION		APP	ROVING AU	THOR	RITY		
ACTIVITY NO	TRANSMITTAL NO	S P E C S E C T	DESCRIPTION ITEM SUBMITTED	P A R A G R A P H	OVT OR A/E REVWR	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	A C T I O N C O D E	DATE OF ACTION	FROM	DATE FWD TO OTHER REVIEWER	FROM OTH	ACT-OZ CODE	DATE OF ACTION	MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
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_		23 09 23.13	Control System Components List	1313													
┪		20 00 20:10	Control system schematics	1.3.1.4													
7			HVAC Equipment Electrical	1.3.1.5													
_			Ladder diagrams	1.0.1.0													
_			Component wiring diagrams	1.3.1.6													
_			Terminal strip diagrams	1.3.1.7													
7			BACnet communication	1.3.1.8													
7			architecture schematic	1.0.1.0													
†			SD-03 Product Data														
†			Direct Digital Controllers	2.1.3													
ヿ			BACnet Gateways	2.1.3.13													
_			Sensors and Input Hardware	2.2													
_			Output Hardware	2.3													
T			Surge and transient protection	2.4.2													
寸			SD-05 Design Data														
寸			Performance Verification Testing	3.5.2		1			T								
一			Plan	5.5.2		1			T								
7			Pre-Performance Verification	3.5.4		1											
寸			Testing Checklist	3.5.1		1											
寸			SD-06 Test Reports			1											
ヿ			Performance Verification Testing	3.5.11		1											
		+	Report	1		+		1	_	 					-		$\overline{}$

SD-07 Certificates

Reports

Contractor's Qualifications

SD-09 Manufacturer's Field

1.5.6

		SUBMI	TTAL RI	EGISTER			<u> </u>		<u> </u>		CONTRACT	NO.				
	ND LOCATION				CONTRAC	TOR										
epla	ce Boiler at Build	ing AS-710	i	1						i	 					
				G	SC SC	ONTRACTO HEDULE DA	R: TES	CON	NTRACTOR ACTION		APF	PROVING AL	JTHOF	RITY		
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1	23 09 23.13	Pre-PVT Checklist	3.5.1													
T		SD-10 Operation and Maintenance														
		Data														
T		BACnet Direct Digital Control	1.3													
1		Systems														
1		Controls System Operators	3.4													
T		Manuals														
1		SD-11 Closeout Submittals														
1		Training documentation	3.6.1													
1	23 11 25	SD-02 Shop Drawings														
1		Gas Piping System	1.4.2													
T		Gas Piping System	2.2													
1		Gas Piping System	3.2													
1		SD-03 Product Data														
十		Pipe and Fittings	1.5													
十		Gas equipment connectors	1.4.2													
十		Gas Piping System	1.4.2													
T		Gas Piping System	2.2													
T		Gas Piping System	3.2													
T		Pipe Coating Materials	2.1													
丅		Pressure regulators	2.5													
丅		Valves	2.3													
丅		Warning and identification tape	2.2.4													
一		SD-06 Test Reports														

3.15

3.15.1

Testing
Pressure Tests

		SUBMI	TTAL RE	GISTER							CONTRACT	NO.				
	D LOCATION				CONTRAC	TOR										
Replac	e Boiler at Buildir	ng AS-710	ī													
				G	SC	ONTRACTO HEDULE DA	R: TES	CON	NTRACTOR ACTION		APF	ROVING AU	THOF	RITY		
A A N N C S M I I I I I I I I I I I I I I I I I I	S P E C S E C	DESCRIPTION ITEM SUBMITTED	P A R A G R A P H	OVT OR A/E REVWR	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	FROM OTH	ACT-OZ CODE	DATE OF ACTION	MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
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\top	23 11 25	Test With Gas	3.15.2													
		SD-07 Certificates														
		Welders procedures and	1.4.1													
		qualifications														
		assigned number, letter, or	1.4.1													
		symbol														
		SD-08 Manufacturer's Instructions														
		pipe coating materials	2.1													
		SD-10 Operation and Maintenance														
		Data														
		Gas facility system and	1.2.1													
		equipment operation														
		Gas facility system maintenance	1.2.2													
		Gas facility equipment	1.2.3													
		maintenance														
\top	23 21 13.00 20	SD-02 Shop Drawings														
一	1	Hot water heating system	1.3.1													
\top		SD-03 Product Data	1													
\top	1	Pumps	2.2.1													
\top	1	Hot water heating pipe	2.1.1													
\top		SD-06 Test Reports	1													
\top		Hydrostatic test of piping system	3.3.1													
\top	1	Auxiliary equipment and	3.3.2													
-		- many a quinter to the	† · · · · · · ·	1	1	1								l		

Auxiliary equipment and accessory tests
SD-07 Certificates
Welding procedures

1.5.2.1

		SUBMIT	TAL RE	GISTER		CONTRACT NO.										
	D LOCATION	40 740			CONTRACTOR											
plac	e Boiler at Buildir	1g AS-710				ONTRACTO	5.	001	ITD A OTOD		A DE		ITUO	NTV		
				G	sc	ONTRACTO HEDULE DA	TES	CON	NTRACTOR ACTION		APF	ROVING AU	THOR	RITY		
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	23 21 13.00 20	Welder's qualifications	1.5.2.2													
		SD-02 Shop Drawings														
		Fuel train	2.2.1													
		SD-03 Product Data														
		Boilers	2.1													
		Boiler trim and control equipment														
		Burners and control equipment	2.2													
		Direct Vent	2.3.17													
		Boiler Circulating Pump	2.6													
		SD-06 Test Reports														
		Operational tests	3.4.1													
		SD-07 Certificates														
		Boilers	2.1													
		Boiler trim and control equipment	2.3													
		Burners and control equipment	2.2													
		SD-08 Manufacturer's Instructions														
		Boilers	2.1													
		Feedwater treatment feeder	2.3.7													
		SD-10 Operation and Maintenance														
		Data														
		Boilers	2.1													
		SD-11 Closeout Submittals														
		boilers	2.1													
1	26 20 00	SD-02 Shop Drawings							I	1			I			

2.10

Panelboards SD-03 Product Data

		SUBMIT	ΓTAL RE	GISTER					CONTRACT	NO.			
TITLE AND LOCATION Replace Boiler a	N at Building AS-710				CONTRACT	OR		·					
				G		ONTRACTOR	CONTRACTOR ACTION		APP	ROVING AU	THORI	ITY	
T R				0 V C T									

	Replace Boiler at Building AS-710						CONTRACTOR										
					G	C SC	ONTRACTO	R: TES	CON	NTRACTOR ACTION		APF	PROVING AU	THOF	RITY		
A C T I V I T Y	TRANSMITTAL NO	S P E C S E C T	DESCRIPTION ITEM SUBMITTED	P A R A G R A P T	CLASSIFICATION	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	A C T I O N C O D E	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION	MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(I)	(m)	(n)	(o)	(p)	(p)	(r)
		26 20 00	Receptacles	2.9													
			Circuit breakers	2.10.2													
			Switches	2.8													
			Enclosed circuit breakers	2.11													
			Motor controllers	2.15										_			
			Manual motor starters	2.16													
			SD-06 Test Reports											_			
			600-volt wiring test	3.2.2										_			
\rightarrow			Grounding system test	3.2.4										_			
-			Ground-fault receptacle test	3.2.3													
			SD-07 Certificates	0.40										_			
-		00.04.70	Fuses	2.13										_			
-		28 31 76	SD-02 Shop Drawings	2.1.2										<u> </u>			
-+			Nameplates Wiring Diagrams	3.2.1													
-			System Layout	1.4.1										\vdash			
$\overline{}$			System Operation	2.3													
-			Notification Appliances	2.16		 			\vdash	 				\vdash			
\dashv			Amplifiers	2.14					\vdash					\vdash			
			SD-03 Product Data				1										
			Technical Data And Computer	1.4.2					T								
\neg			Software														
				2.13													
			Control Unit (FMCP)														
			Terminal cabinets	3.2.2													
			Transmitters	2.20													

		SUBMI	EGISTER							CONTRACT NO.						
	LOCATION Boiler at Buildi	ing AS-710			CONTRAC	TOR										
				G		ONTRACTO			ITRACTOR ACTION		APP	ROVING AU	THOR	ITY		
TRANSMITTAL NO	S P E C S E C T	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	OVT OR A/E REVWR	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACT-ON CODE	DATE OF ACTION	FROM	DATE FWD TO OTHER REVIEWER	FROM OTH	ACH-OZ CODE	DATE OF ACTION	MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARK:
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	28 31 76	Batteries	2.12.1													
		Battery chargers	2.12.2													
-		Remote Fire Alarm Annunciator	2.3.2													
		(RA)	0.40													
1		Smoke sensors Notification appliances	2.10 2.16													
		Notification appliances Addressable interface devices	2.7													
+		Amplifiers	2.14													
+		7 (III) IIII (III)	 	t	1	1				.			-			

T Y N O	A L N O	S E C T	DESCRIPTION ITEM SUBMITTED	G# R A P H	A R T E I V O W N R	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	C O D E	DATE OF ACTION	FROM	TO OTHER	DATE RCD FROM OTH REVIEWER	CODE	DATE OF ACTION	CONTR/ DATE RCD FRM APPR AUTH	REMARKS
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(1)	(m)	(n)	(o)	(p)	(q)	(r)
		28 31 76	Batteries	2.12.1													
			Battery chargers	2.12.2													
			Remote Fire Alarm Annunciator	2.3.2													
			(RA)														
			Smoke sensors	2.10													
			Notification appliances	2.16													
			Addressable interface devices	2.7													
			Amplifiers	2.14													
			Tone generators	2.14													
			Digitalized voice generators	2.14													
			Digital alarm communicator	2.20.1													
			transmitter (DACT)														
			Local Operating Console (LOC)	1.3													
			SD-05 Design Data														
			Battery power	2.12.1.2													
			Battery chargers	2.12.2													
			SD-06 Test Reports														
			Field Quality Control	3.6													
			Testing Procedures	3.6.1													
			Smoke sensor testing	2.10.2													
			SD-07 Certificates														
			Installer	1.6.1.4													
			Formal Inspection and Tests	3.6.2.2													
			Final Testing	3.6.2.3													
			SD-09 Manufacturer's Field														
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SECTION 01 35 29

SAFETY AND OCCUPATIONAL HEALTH REQUIREMENTS

07/14

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 within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI 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	(2014) 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 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 ${\tt SUBMITTAL\ PROCEDURES:}$

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)

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.).
- 1. 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

Work performed under this contract shall meet Level 2.

1.7.1.1 Site Safety and Health Officer (SSHO)

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

Level 1:

Worked on similar projects.

10-hour OSHA construction safety class or equivalent within last 3 years.

Competent person training as needed.

Level 2:

A minimum of 3 years safety work on similar project.

30-hour OSHA construction safety class or equivalent within last 3 years.

Competent person training as needed.

Level 3:

A minimum of 5 years safety work on similar projects.

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

An average of at least 24 hours of formal safety training each year for the past 5 years.

Competent person training as needed.

Level 4:

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

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

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

Level 5:

Provide an Associate Safety Professional (ASP); Certified Safety

Trained Supervisor (STS); and/or Construction Health & Safety Technician (CHST) at the work site to perform safety management, surveillance, inspections, and safety enforcement for the Contractor to meet the designated safety level in paragraph 1.7. The ASP, STS, and/or CHST shall be the safety and occupational health "competent person" as defined by USACE EM 385-1-1. The ASP, STS, and/or CHST shall be at the work site at all times whenever work or testing is being performed and shall conduct and document daily safety inspections. The ASP, STS, and/or CHST shall have no other duties other than safety and occupational health management, inspections, and enforcement on this contract. A minimum of 10 years safety work of a progressive nature with at least 5 years of experience on similar projects. 30-hour OSHA construction safety class or equivalent within the

last 5 years.

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

Level 6:

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

A minimum of 10 years safety work of a progressive nature with at least 5 years of experience on similar projects. 30-hour OSHA construction safety class or equivalent within the last 5 years.

An average of at least 24 hours of formal safety training each year for the past 5 years with training for competent person status for at least the following areas of competency: 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.

Competent Person for Confined Space Entry 1.7.1.2

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:

- Identify the structure, location, and designation of confined and permit-required confined spaces where work is done;
- 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;
- 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 ${\bf Propertion}$

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. $\ensuremath{\mathsf{E}}$
- 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: 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 requirements for periodic retraining/certification; outline requirements for supervisory and employee safety meetings.
- i. Occupant Protection Plan. The safety and health aspects of lead-based paint removal, prepared in accordance with Section 02 83 19.00 10 Lead Based Paint Hazard Abatement, Target Housing & Child Occupied Facilities, 02 82 33.13 20 Removal/Control and Disposal of Lead Containing 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"
- 1. 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. 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.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.

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

PART 3 EXECUTION

3.1 CONSTRUCTION AND/OR OTHER WORK

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

3.1.1 Hazardous Material Use

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

3.1.2 Hazardous Material Exclusions

Notwithstanding any other hazardous material used in this contract, radioactive materials or instruments capable of producing ionizing/non-ionizing radiation (with the exception of radioactive material and devices used in accordance with USACE EM 385-1-1 such as nuclear density meters for compaction testing and laboratory equipment with radioactive sources) as well as materials which contain asbestos, mercury or polychlorinated biphenyls, di-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.A.16.

3.3.2 Fall Protection Equipment

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

3.3.2.1 Personal Fall Arrest Equipment

Personal fall arrest equipment, systems, subsystems, and components shall meet ANSI Z359.1. Only a full-body harness with a shock-absorbing lanyard or self-retracting lanyard is an acceptable personal fall arrest device. Body belts may only be used as a positioning device system (for uses such as steel reinforcing assembly and in addition to an approved fall arrest system). Harnesses shall have a fall arrest attachment affixed to the body support (usually a Dorsal D-ring) and specifically designated for attachment to the rest of the system. Only locking snap hooks and carabiners shall be used. Webbing, straps, and ropes shall be made of synthetic fiber. The maximum free fall distance when using fall arrest equipment shall not exceed 1.8 m (6 feet). The total fall distance and any swinging of the worker (pendulum-like motion) that can occur during a fall shall always be taken into consideration when attaching a person to a fall arrest system.

3.3.3 Fall Protection for Roofing Work

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

a. Low Sloped Roofs:

- (1) For work within 1.8 m (6 feet) of an edge, on low-slope roofs, personnel shall be protected from falling by use of personal fall arrest systems, guardrails, or safety nets. A safety monitoring system is not adequate fall protection and is not authorized.
- (2) For work greater than 1.8 m (6 feet) from an edge, warning lines shall be erected and installed in accordance with $29 \ CFR \ 1926.500$ and USACE EM 385-1-1.
- b. Steep Roofs: Work on steep roofs requires a personal fall arrest system, guardrails with toe-boards, or safety nets. This requirement also includes residential or housing type construction.

3.3.4 Safety Nets

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

3.3.5 Existing Anchorage

Existing anchorages, to be used for attachment of personal fall arrest equipment, shall be certified (or re-certified) by a qualified person for fall protection in accordance with ANSI Z359.1. 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, installed, certified and used under the supervision of a qualified person for fall protection as part of a complete fall arrest system which maintains a safety factor of 2 (29 CFR 1926.500).

3.3.7 Guardrail Systems

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

3.3.8 Rescue and Evacuation Procedures

When personal fall arrest systems are used, the 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.
- 1. A weight handling equipment operator shall not leave his position at the controls while a load is suspended.
- $\ensuremath{\mathtt{m}}.$ 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 ELECTRICAL

3.7.1 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.

3.7.2 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.

3.7.3 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 qualifications 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.

3.7.4 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.

3.7.5 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.

3.8 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.

3.9 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.

3.10 HOUSEKEEPING

3.10.1 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.

3.10.2 Falling Object Protection

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

-- End of Section --

Special Permission Energized Electrical Work Permit

Permit Number:

Part I: Request	for Special Permission	Job Order/Contract Numbe	r:	
(1) Description of	circuit/equipment:			
(2) Job Location:				
(3) Description of	work to be done:			
(4) Justification of	f why the circuit/equipment can	not be de-energized:		
(5) Anticipated Du	uration of Work Requiring Spec	ial Permission: (hours/minutes)	On (date)	
(6) Means Employ	yed to Restrict Access of Unquali	fied Persons:		
(7) Shock Hazard	Analysis:			
Voltage A	Approach Boundaries: (distance)	Limited Restricted	Prohibited	Flash
(8) Flash Hazard	Analysis: Calorie PPE required	(8 minimum)		
Approach Boundar	ries to be crossed: (Check as app	licable) Limited Restricted	d Prohibited Flash	Protection
(10) Source of Ligh	Safety Glasses Arc Flash Face Shield rate Arc Flash Hood rated 20 o Safety Helmet Balaclava (Head Sock) Hearing Protection (single Voltage Rated Tools Hazard Risk Category 3 o atting: Outside Daylight Inside	oves with Leather Protectors ed 10-cal/cm sq or more cal/cm sq or more e level) Clothing e Existing Artificial Tempor		•
(11) Name of Empl	oyee(s) Assigned to Job and will	receive job briefing before begi	nning work (sign in sheet req	uired):
Requested By	Name Typed	Organization (BL / I	FEAD / PWO)	Phone #
	Signature	<u> </u>		
Construction Sa Notification:	nmended Approval afety Manager Concurrence			
Operation Offic	eer:]	Date:		
Executive Office	er:	_Date:		
Approved by:	ommanding Officer / Design	I	Date	
C	ommanumg Omcer / Desigi	iicc		

SECTION 01 42 00

SOURCES FOR REFERENCE PUBLICATIONS

01/07

PART 1 GENERAL

1.1 REFERENCES

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

1.2 ORDERING INFORMATION

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

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Farmington Hills, MI 48333-9094

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Internet: http://www.aci-int.org

AOK 5/01 LOK 2/01

ACOUSTICAL SOCIETY OF AMERICA (ASA)

1305 Walt Whitman Road, Suite 300

Melville, NY 11747-4300

Ph: 516-576-2360 Fax: 631-923-2875 E-mail: asa@aip.org

Internet: http://asa.aip.org

AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE (AHRI)

2111 Wilson Blvd, Suite 500

Arlington, VA 22201 Ph: 703-524-8800 Fax: 703-562-1942

Internet: http://www.ahrinet.org

AIR MOVEMENT AND CONTROL ASSOCIATION (AMCA)

30 W. University Dr.

Arlington Heights, IL 60004-1893

Ph: 847-394-0150

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Publications e-mail: asapubs@abdintl.com
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Fax: 202-638-4833
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E-mail: aabchq@aol.com
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     732-981-0060 OR 800-701-4333
Fax: 732-981-9667
Internet: http://www.ieee.org
E-mail: customer.services@ieee.org
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Fax: 703-379-1546
Internet: http://www.intlcode.org
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Ph: 41-22-919-0211
Fax: 41-22-919-0300
Internet: http://www.iec.ch
e-mail: info@iec.ch
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INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)
1, rue de Varembe'
Case Postale 56
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Internet: http://www.iso.ch
e-mail: central@iso.ch
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Internet: http://www.nfpa.org
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-- 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.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

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

1.2 SUBMITTALS

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

SD-11 Closeout Submittals

Quality Control Plan (QC PLAN)

Submit a QC plan within 15 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 onsite 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.

1.6 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.
- 1. 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 OC MEETINGS

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

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

- Rework items completed since last meeting;
- c. Review the status of submittals:
 - Submittals reviewed and approved since last meeting
 - Submittals required in the near future;
- d. Review the work to be accomplished in the next 2 weeks and 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 \pm 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.

-- End of Section --

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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

SUBMITTALS

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

SD-03 Product Data

Backflow preventers

SD-06 Test Reports

Backflow Preventer Tests

SD-07 Certificates

Backflow Tester Certifications

Backflow Preventers Certificate of Full Approval

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.
- 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. <u>Condition ONE</u> (Sustained winds of 74 mph or greater expected within 12 hours): If still on the job site, the contractor will be required to immediately leave the base until the storm passes and the base is reopened.

1.6 STORAGE AREAS

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

1.6.1 Storage Size and Location

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

1.6.2 Storage in Existing Buildings

The Contractor will be working in an existing building; the storage of material will be allowed in the mechanical room only.

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, 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 must be included in the latest edition of the List of Approved Backflow Prevention Assemblies issued by the FCCCHR List and be accompanied by a Certificate of Full Approval from FCCCHR List.

After installation conduct Backflow Preventer Tests and provide test reports verifying that the installation meets the FCCCHR Manual Standards.

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). 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)
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 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

49 CFR 178

Specifications for Packagings

1.2 Contractor Liabilities for Environmental Protection

Contractors shall complete and provide environmental training documentation for training required by Federal, State, and local regulations.

1.3 DEFINITIONS

1.3.1 Sediment

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

1.3.2 Solid Waste

Rubbish, debris, garbage, and other discarded solid materials, except 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 $40\ \text{CFR}\ 261$ 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

Environmental protection plan

Preconstruction survey report

SD-11 Closeout Submittals

Solid waste disposal permit

Disposal permit for hazardous waste

Environmental training documentation

Permit to transport hazardous waste

Hazardous waste certification

Environmental Plan Review

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 $40\ \text{CFR}\ 261$, $40\ \text{CFR}\ 262$, and $40\ \text{CFR}\ 263$.

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 ENVIRONMENTAL PROTECTION PLAN

1.6.1 Contents of Environmental Protection Plan

- a. Include any hazardous materials (HM) planned for use on the station shall be included in the station HM Tracking Program maintained by the Safety Department. To assist this effort, submit a list (including quantities) of HM to be brought to the station and copies of the corresponding material safety data sheets (MSDS). Submit this list to the Contracting Officer. At project completion, remove any hazardous material brought onto the station. Account for the quantity of HM brought to the station, the quantity used or expended during the job, and the leftover quantity which (1) may have additional useful life as a HM and shall be removed by the Contractor, or (2) may be a hazardous waste, which shall then be removed as specified herein.
- b. The Environmental Protection Plan shall list and quantify any Hazardous Waste (HW) to be generated during the project.
- c. In accordance with station regulations, store HW near the point of generation up to a total quantity of one quart of hazardous waste or 55 gallons of hazardous waste. Move any volume exceeding these quantities to a HW permitted area within 3 days. Prior to generation of HW, contact Contracting Officer for labeling requirements for storage of hazardous wastes.
- d. In accordance with station regulations, substitute materials as necessary to reduce the generation of HW and include a statement

to that effect in the Environmental Plan.

- e. Contact Contracting Officer for conditions in the area of the project which may be subject to special environmental procedures. Include this information in the Preconstruction Survey. Describe in the Environmental Protection Plan any permits required prior to working the area, and contingency plans in case an unexpected environmental condition is discovered.
- f. Obtain permits for handling HW, and deliver completed documents to Contracting Officer for review. File the documents with the appropriate agency, and complete disposal with the approval of Contracting Officer. Deliver correspondence with the State concerning the environmental permits and completed permits to Contracting Officer.

1.6.2 Environmental Protection Plan Format

The Environmental Protection Plan shall follow the following format:

ENVIRONMENTAL PROTECTION PLAN

Contractor Organization Address and Phone Numbers

- 1. Hazardous materials to be brought onto the station
- 2. MSDS package
- 3. Employee training documentation
- 4. HW storage plan
- 5. HW to be generated
- 6. Preconstruction survey results
- 7. Permitting requirements identified

1.6.3 Environmental Plan Review

Fourteen days after the environmental protection meeting, submit the proposed environmental plan for further discussion, review, and approval.

1.6.4 Preconstruction Survey

Perform a preconstruction survey of the project site with the Contracting Officer, and take photographs showing existing environmental conditions in and adjacent to the site.

1.7 ADMINISTRATIVE REQUIREMENTS

1.7.1 Licenses and Permits

Obtain licenses and permits pursuant to "FAR 52.236-7, Permits and Responsibilities."

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.

1.8 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."

1.9 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 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 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.

3.5.1 Disposal of Metal Paint Cans

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

3.5.2 Disposal of Rubbish and Debris

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

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

3.5.3 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

3.6 CONTROL AND DISPOSAL OF HAZARDOUS WASTE

3.6.1 Hazardous Waste Generation

Handle generated hazardous waste in accordance with 40 CFR 262.

3.6.2 Hazardous Waste Disposal

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

3.6.3 Hazardous Waste Storage

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

3.6.4 Spills of Oil and Hazardous Materials

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

3.6.5 Lead-Acid Batteries

Dispose of lead-acid batteries that are not damaged or leaking at a State-approved battery recycle or at a permitted or interim status hazardous waste TSD facility. For lead-acid batteries that are leaking or have cracked casings, dispose of the electrolyte solution using one of the following alternatives:

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

interim status hazardous waste TSD facility.

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

3.6.6 Mercury Control

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

3.6.7 Petroleum Products

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

3.7 DUST CONTROL

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

3.8 QUARANTINE FOR IMPORTED FIRE ANT (4/82)

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

- a. Certification is required for the following articles and they shall not be moved from the reservation to any point outside Onslow County and adjacent designated areas unless accompanied by a valid inspection certificate issued by an Officer of the Plant Protection and Quarantine Program (PPQ) of the U.S. Department of Agriculture.
 - (1) Bulk soil
 - (2) Used mechanized soil-moving equipment. (Used mechanized soil-moving equipment is exempt if cleaned of loose noncompacted soil).
 - (3) Other products, articles, or means of conveyances, if it is determined by an inspector that they present a hazard of transporting spread of the imported fire ant and the person in

possession thereof has been so notified.

b. Authorization for movement of equipment outside the imported fire and regulated area shall be obtained from USDA, Animal and Plant Health Inspection Service (APHIS), Plant Protection and Quarantine (PPQ), Box 28, Goldsboro, North Carolina, 27533-0028, Attn: Mr. William Scroggins or Mr. Frank Best, telephone (919) 735-1941. If Mr. Scroggins or Mr. Best are not available, contact Mr. Jim Kelley at (910) 815-4667, the supervisor's office in Wilmington. Requests for inspection shall be made sufficiently in advance of the date of movement to permit arrangements for the services of authorized inspectors. The equipment shall be prepared and assembled so that it may be readily inspected. Soil on or attached to equipment, supplies, and materials shall be removed by washing with water or such other means as necessary to accomplish complete removal. Resulting spoil shall be wasted as necessary and as directed.

ANNUAL REPORT OF PRODUCTS CONTAINING RECOVERED MATERIALS

Page 1 of 3

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	<u>UNIT</u>	QUANTITY (CRM)	TOTAL QUANTITY
A. Insulation 1. Loose fill	======================================	======================================	======================================
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

Page 2 of 3

	MATERIAL	<u>DEFINITION</u>
==== 1. 	Quantity (CRM)	Quantity used containing recovered materials.
2.	Total Quantity	Quantity used containing recovered materials plus quantity used not containing recovered materials.
3.	Unit	Ft3 (cubic feet), Ft2 (square feet), m3 (cubic meters), yd3 (cubic yards), box (number of boxes used), \$ Amt (dollar value of material used)
4 . 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."
-==	 	or printing."

APPENDIX A

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======================================	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.
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.

-- End of Section --

Marine Corps Base (MCB) Camp Lejeune Contractor Environmental Guide



August 2008



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- Attachment 3-1 Spill Reporting Form
- **Attachment 4-1** Weekly Hazardous Waste (HW) Site Inspection Form, MCB Camp Lejeune
- **Attachment 4-2** Weekly Hazardous Waste (HW) Site Inspection Form, MCAS New River
- **Attachment A** MCB Camp Lejeune, NC/MCAS New River General EMS and Environmental Awareness Training for Contractors and Vendors

1.0 CONTRACTOR ENVIRONMENTAL GUIDE OVERVIEW

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

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

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

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

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

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

1.1 KEY DEFINITIONS AND CONCEPTS

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

1.1.1 Key Definitions

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

1.1.2 Key Concepts

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

1.2 INSTALLATION BACKGROUND

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

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

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

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

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

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

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

1.2.2 Expectations

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

1.3 OVERVIEW OF REQUIREMENTS

1.3.1 Contractor Environmental Guide

The following information is contained in the guide:

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

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

1.3.2 Environmental and EMS Training

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

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

All contractors should provide both EMS and General Environmental Awareness training to their employees. This guide, along with the training materials in Attachment A, satisfy these training requirements. The This guide and associated EMS and General Environmental Awareness training module is provided for review to contractors and their employees performing work aboard MCB Camp Lejeune.

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

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

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

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

1.4 POINTS OF CONTACT

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

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

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

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

Table 1-2. Environmental Emergency Contacts

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

2.0 ENVIRONMENTAL MANAGEMENT SYSTEM

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

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

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

2.1 KEY DEFINITIONS AND CONCEPTS

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

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

2.1.1 Key Definitions

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

2.1.2 Key Concepts

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

2.2 OVERVIEW OF REQUIREMENTS

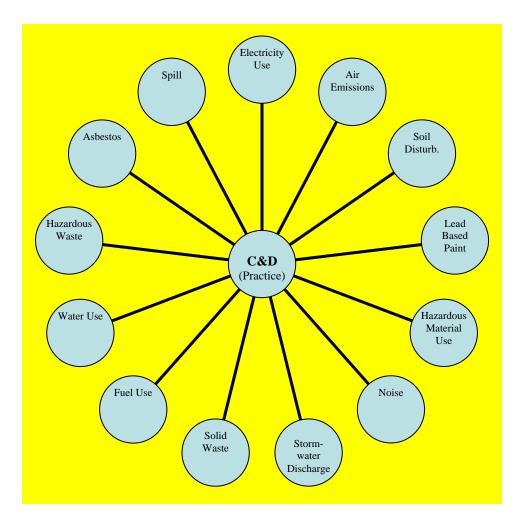
Contractors must be aware of, and adhere to, all regulations and requirements concerning EMS, including the following:

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

2.3 ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)

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

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



2.4 EMS RESPONSIBILITIES

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

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

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

2.5 CONTRACTOR ENVIRONMENTAL GUIDE AND EMS

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

MCB CAMP LEJEUNE PRACTICES	Env. Emergency Response/ Spill Response, Section 3.0	HM/HW, Section 4.0	Unforeseen Site Conditions, Section 5.0	Asbestos, Section 6.0	Lead Based Paint, Section 7.0	Stormwater, Section 8.0	Solid Waste, Recycling, and P2, Section 9.0	Training, Section 10.0	Cultural Resources, Section 11.0	Permitting, Section 12.0	Air Quality, Section 13.0	Natural Resources, Section 14.0
Battery Replacement							•					
Building Maintenance–General		•		•			•					
Building Operation–General		•					•					
Catch Basin Cleaning	a		a)			•		a)				
Construction/Demolition	un n		un	•	•	•	•	Camp Lejeune	•	•		•
Controlled Burn Operations	9 <u>.</u>		e je					əje			•	•
Degreasing	Ţ	•	Ž) L			•	
Engine Operation and Maintenance	Ē	•	Ē					m			•	
Equipment Calibration	Ca	•	Ca					Ca				
Equipment Disposal	B		CB				•	CB				
Equipment Operation and	Ž		Ž					Ž				
Maintenance	ard	•	ard	•				ard		•		•
Erosion Control	poq		poq			•		pog		_		•
Fuel Storage–Containers Fueling	∀ 5		∀ 5					٩				
Grinding	tec		itec					tec				
HM Storage	pp		onp		•	•		onp				
HM Transportation	ou	•	ou					one				
HW Generation	C	•	C				•	s C		•		
HW Satellite Accumulation Area	Ç	•	Ç					ce		•		
Land Clearing	Practices Conducted Aboard MCB Camp Lejeune		Practices Conducted Aboard MCB Camp Lejeune			•	•	ıcti	•	•		•
Landscaping	Pra					•		II Practices Conducted Aboard MCB				
Material Storage Handling	₹	•	=				•	ΑII				
Mowing	<u> </u>		<u> </u>			•		0				
Outfall Cleaning	le]		[e]			•		le]				
Packaging/Unpackaging	ab		ab				•	ab				
Paint Removal	olic		Applicable To A		•			olic			•	
Painting	Applicable To	•	Apı					Applicable To			•	
Painting Preparation		•										
Parts Replacement				•								
PCB Disposal		•										
Pesticide/Herbicide Application		•								•		
Range Residue Clearance						•				•		

MCB Camp Lejeune Practices	Emergency Response/ Spill Response, Chapter 3.0	HM/HW, Chapter 4.0	Unforeseen Site Conditions, Chapter 5.0	Asbestos, Chapter 6.0	Lead Based Paint, Chapter 7.0	Stormwater, Chapter 8.0	Recycling and Pollution Prevention, Chapter 9.0	Training, Chapter 10.0	Cultural Resources, Chapter 11.0	Permitting, Chapter 12.0	Air Quality, Chapter 13.0	Natural Resources, Chapter 14.0
Refrigerant Replacement	æ	•	m					<u>m</u>			•	
Riparian Buffer Maintenance	MC		MC			•		MC				•
Rock Crushing Operations	ırd		rd				•	ırd		•		
Runoff Sedimentation Basins	pos		pog			•		pog				
Sediment Traps	Ψp		∀			•		ΨÞ				
Soil Excavation/Grading	cte		cte			•		cte	•			•
Solid Waste Recycling Collection/Transportation	ondu		ondu				•	ondu		•		
Storage Tank Cleaning and Maintenance	ractices Cond Camp Lejeune	•	ractices Condi Camp Lejeune					ractices Condi Camp Lejeune		•		
Stormwater Collection/Conveyance System	Applicable To All Practices Conducted Aboard MCB Camp Lejeune		Applicable To All Practices Conducted Aboard MCB Camp Lejeune			•		To All Practices Conducted Aboard MCB Camp Lejeune				
Stormwater Engineering Controls Operation and Maintenance	To All		To All			•		To All		•		
Stump/Brush Removal	ple		ple			•	•	Applicable	•			•
Vehicle Operation	lica		lica				•	lica				
Vehicle Parking	dd		dd			•		dd				
Vehicle/Equipment Fluid Change	4	•	⋖					٧				

3.0 ENVIRONMENTAL EMERGENCY RESPONSE/SPILL RESPONSE

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

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

3.1 KEY DEFINITIONS AND CONCEPTS

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

3.1.1 Key Definitions

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

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

3.1.2 Key Concepts

• Environmental Emergency Response Contacts:

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

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

3.1.3 Environmental Management System

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

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

3.2 OVERVIEW OF REQUIREMENTS

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

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

3.3 Spill Notification

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

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

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

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

3.4 Follow-Up

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

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

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

Attachment 3-1

Spill Reporting Form

SPILL REPORTING FORM

CALL RECEIVED BY:	RESPONDED BY:
SUBJ:	
	TIME:
2. SOURCE:	
(Include Serial Number of equipment if	
3. LOCATION BUILDING:	
	Name of Responder:
5. UNIT/AGENCY:	POC:
6. ESTIMATED AMOUNT:	GALLONS QUARTS PINTS (Circle One)
7. TYPE OF SUBSTANCE:	
9. SLICK DESCRIPTION: (NONE)	OR
10. ACTION TAKEN:	
12. OIL SPILL MOVEMENT: (NON	E) OR
13. DAMAGE: (NONE) OR	
14. POTENTIAL DANGER: (NONE)	OR
15. CAUSE OF SPILL:	
16. PARTIES PERFORMING SPILL	L REMOVAL:
17. ASSISTANCE REQUIRED: NO A	ADDITIONAL OR
** 18. TELEPHONE REPORT WAS	MADE TO NRC—TIMEDATE
CONFIRMATION NUMBER ISNC DIVISION OF EMERGENCY	TIME TELEPHONE REPORT WAS MADE TO DATE, POC IS
	N HAMILTON, ENVIRONMENTAL COMPLIANCE NAGEMENT DIVISION, INSTALLATION AND

ENVIRONMENT DEPARTMENT, AT (910) 451-1482.

4.0 HAZARDOUS MATERIALS/HAZARDOUS WASTE MANAGEMENT

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

4.1 KEY DEFINITIONS AND CONCEPTS

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

4.1.1 Key Definitions

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

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

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

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

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

4.1.2 Key Concepts

None.

4.1.3 Environmental Management System

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

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

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

4.2 OVERVIEW OF REQUIREMENTS

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

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

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

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

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

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

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

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

4.3 HAZARDOUS MATERIALS REQUIREMENTS

If a project uses hazardous materials:

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

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

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4.4 UNIVERSAL WASTE REQUIREMENTS

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

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

Representative.

Do not store large

materials. Keep on

hand only what can be used.

quantities of

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

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

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

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

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

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

4.5 HAZARDOUS WASTE REQUIREMENTS

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

If a project generates hazardous waste:

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

4.5.1 Storage

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

• Words: HAZARDOUS WASTE.

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

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

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

4.5.2 Manifesting and Disposal

Disposal of hazardous waste generated by contractors must be coordinated with the Installation. Hazardous and universal waste generated aboard MCB Camp Lejeune and MCAS New River must be transported off-base by a permitted hazardous waste transporter and must include a hazardous waste manifest. These procedures must be followed:

- The MCB Camp Lejeune or MCAS New River USEPA ID number is used for disposal of all contractor-generated hazardous waste.
- Only personnel from the Installation who have been designated in writing by the Commanding Officer can sign the hazardous waste manifest. Your ROICC or Contract Representative should contact RCRS at (910) 451-1482 (MCBCL) or EAD at (910) 449-5997 (MCASNR) regarding manifesting regulated and non-regulated wastes off-site.
- Under NO circumstances can a contractor or ROICC or Contract Representative sign a hazardous waste manifest or use another USEPA ID number for wastes generated at Installation.

4.6 NON-RCRA-REGULATED WASTE REQUIREMENTS

Non–RCRA-regulated wastes include used oil and oil filters, used antifreeze, contaminated wipes, discarded electronic equipment, and batteries not managed as universal waste.

4.6.1 Used Oil and Oil Filters

Used motor oil itself is *not* regulated as a hazardous waste in North Carolina if it is recycled or burned for energy recovery. If used oil is not recycled, the generator must determine prior to disposal whether it is a hazardous waste. Used oil must be collected in drums marked "Used Oil." If the Used Oil storage container has a volume of 55 gallons or more, it must be stored in secondary containment. Coordinate with RCRS at (910) 451-1482 (MCBCL) or EAD at (910) 449-5997 (MCASNR) for pickup when the drum is full or the contract is finished.

Only personnel from EMD who have been designated in writing by the MCB Camp Lejeune Commanding Officer can sign the hazardous waste manifest.

- Do not dump used oil into drains, sinks, or trash containers, or onto the ground.
- Do not store used oil in open buckets or drip pans, damaged or rusted containers, or containers that cannot be fully closed.
- Do not mix used oil with other waste materials.

Used oil filters are not regulated as hazardous waste in North Carolina as long as they are not mixed with listed hazardous wastes. To qualify for this exclusion, the following conditions must be met:

- Used oil filters must be gravity hot-drained by puncturing the filter anti-drain back valve or filter dome and hot draining into a "Used Oil" storage drum. "Hot-drained" means that the oil filter is drained at a temperature that approximates the temperature at which the engine operates. All used oil filters will be hot-drained for a minimum of 24 hours before turn-in to RCRS at Bldg. S-962 on Michael Road (MCBCL) or EAD at Bldg AS-4225 on Canal Street (MCASNR).
- Any incidental spillage that occurs must be cleaned up with Dry Sweep, rags, or "oil socks."
- Drained used oil filters must be collected in a container that is in good condition and is labeled with the words "Drained Used Oil Filters."
- No other waste streams should be deposited in containers collecting used oil filters for disposal.
- Drained used oil filters will be turned into RCRS at Bldg. S-962 on Michael Road on a weekly basis on Wednesday from 1300 to 1500 (MCBCL) or to EAD at Bldg AS-4225 on Canal Street (MCASNR).

4.6.2 Used Antifreeze

Used antifreeze is considered a hazardous waste because of its toxicity unless it is recycled or placed in an approved storage area. Used antifreeze will be containerized in spill proof containers and turned in at RCRS on a weekly basis at Bldg. S-962 on Michael Road, for recycling. For used

antifreeze generated aboard MCAS New River, contact EAD at (910) 449-5997 for turn-in instructions.

4.6.3 Petroleum-Contaminated Wipes/Oily Rags

Petroleum-contaminated wipes and oily rags are to be managed as non-regulated waste. Follow these procedures:

- Store oil-contaminated wipes and oily rags in metal containers because of their flammability/combustibility to protect them from the weather.
- Do not throw these non-regulated waste items into solid waste dumpsters or garbage cans.
- Turn petroleum-contaminated wipes and oily rags that are not on a red rag contract into RCRS at Bldg. S-962 on Michael Road on a weekly basis on Wednesday from 1300 to 1500 (MCBCL) hour or to EAD at Bldg AS-4225 on Canal Street (MCASNR).

4.6.4 Used Electronic Equipment

Used electronic equipment usually contains lead solder or polychlorinated biphenyl (PCB) oils (i.e., light ballast). These items will be turned in as they are generated. Have your ROICC or Contract Representative contact RCRS (MCBL) at (910) 451-1482 or EAD (MCASNR) at (910) 449-5997 for proper handling and turn-in procedures.

4.6.5 New and Used Batteries (Not Regulated as Universal Waste)

- Store compatible batteries together (i.e., lithium batteries should be stored with other lithium batteries).
- Store batteries off the ground to prevent them from coming into contact with water.
- Store lead-acid batteries away from an open flame.
- Place rechargeable batteries in plastic bags before storing them with other rechargeable batteries.
- Do not dispose of batteries unless authorized.

• Have your ROICC or Contract Representative contact RCRS at (910) 451-1482 or EAD at (910) 449-5997 for proper handling and turn-in procedures.

Attachment 4-1

Weekly Hazardous Waste (HW) Site Inspection Form MCB Camp Lejeune

MCB Camp Lejeune Weekly Hazardous Waste (HW) Site Inspection Universal Waste (UW)/Satellite Accumulation Area (SAA)

Unit Evaluated: Evaluation By (Site Manager):			Evaluation Date:// Evaluation Time:/	
QUESTION	YES	NO	Location of Discrepancy <u>and</u> Proposed Corrective Action	

QUESTION	YES	NO	Logotion of Disagrapanay and
QUESTION	ILS	NO	Location of Discrepancy <u>and</u> Proposed Corrective Action
1. Is housekeeping maintained in acceptable			110posed corrective redion
manner?			
2. Is any HW present at site?			
3. Are HW containers properly marked?			
4. Are HW containers in serviceable			
condition			
5. Are container bungs, caps, openings properly secured?			
6. Is unit spill plan/activation prominently			
posted?			
7. Is 911 spill response sign posted?			
8. Are "Danger-Unauthorized Personnel			
Keep Out" signs posted so they may be			
seen from any approach?			
9. Are "No Smoking" signs posted?			
10. Does the site have emergency			
communication system or two man rule in effect? If the two man rule is implemented			
is there a sign with the legend "Two Man			
Rule in Effect" posted?			
11. Are properly charged fire extinguishers			
as well as eye wash stations present and are			
they inspected at least monthly?			
12. Is the post indicator valve in good operating condition and secured in the			
closed position, are there any structural			
defects such as cracked concrete?			
13. Is the proper spill response equipment			
readily available?			
14. Is the site designated, recognizable, and			
is the EMD Authorization posted within the			
site as to be visible to personnel placing waste into the container? (SAA site only)			
15. Are all hazardous wastes properly			<u> </u>
segregated and stored in the designated			
site?			
16. Are there any hazardous materials being			
stored in the Satellite Accumulation Area or			
< 90 day storage site?			

Attachment 4-2

Weekly Hazardous Waste (HW) Site Inspection Form MCAS New River

Weekly Hazardous Waste Storage Area Inspection Form

Squadron: Inspector:			
Date: Sign	nature:		
Question	Yes	<u>No</u>	Corrective Actions or N/A
1. Is the HW container located at or near the			
point of generation?			
2. Is the HW container DOT approved?3. Is the HW container marked correctly with			
the words Hazardous Waste, correct noun			
name of contents, NSN'S and unit designator?			
4. Is the HW container closed and wrench			
tight when not adding to the container?			
5. If a funnel is left in place, does that funnel			
have a plug or ball valve to be considered			
closed or secured?			
6. Is the HW container in good condition? (no			
excessive rust or dents in critical areas, seals			
are in place, no bulging or collapsing and no			
signs of spillage or leakage)			
7. Is the Spill Contingency Plan posted and in			
plain view?			
8. Is the SAA Site approval letter from EAD			
posted at the SAA site?			
9. Is the SAA Site limited to Authorized			
Personnel only?			
10. Is the HW container below the proper			
ullage for a liquid to expand? (4 inches from			
the top) 11. Are SAA HW containers moved to the 90-			
Day Site within 72 hours when filled to the proper ullage or weight capacity of the			
container?			
12. (90 Day-Site only) Are all palletized waste			
streams correctly marked with Hazardous			
Waste or Universal Waste, noun name of the			
waste, NSN and unit designator on the pallet			
or wall of the waste structure?			
13. (90 Day-Site only) Are all HW containers			
turned into DRMO prior to the 90 th day since			
the ASD?			
14. Are there adequate spill response supplies			
readily available for use in case of spill or			
leakage?			
15. Is there a means of emergency			
communications between storage facilities and			
working spaces?	-		
16. Is the SAA site or 90 Day-Site in a good			
state of police?			

5.0 UNFORESEEN SITE CONDITIONS

Marine Corps Base (MCB) Camp Lejeune was placed on the U.S. Environmental Protection Agency's (USEPA's) National Priorities List (NPL) effective November 4, 1989. To ensure the protection of human health and the environment, a proactive Installation Restoration Program has been established and is in the process of assessing and remediating various sites on the Installation. Numerous investigations have been performed on the Installation to ensure that all contaminated sites have been found, but additional contaminated areas may still exist. As a contractor, it is your responsibility to notify the ROICC or Contract Representative of any unforeseen site conditions you encounter while on the Installation. It is recommended that any contractors performing intrusive activities on the Installation be properly trained in accordance with the Occupational Safety and Health Act (OSHA) standards as written in 29 CFR 1910.120(e). If intrusive activities are planned in known contaminated areas, all required environmental training should be completed *prior* to working at MCB Camp Lejeune. Copies of training records should be available upon request by federal or state regulators.

5.1 KEY DEFINITIONS AND CONCEPTS

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

5.1.1 Key Definitions

- National Priorities List (NPL). Lists the sites of national priority among the known releases or threatened releases of hazardous substances, pollutants, or contaminants.
- **Unforeseen Site Condition.** A potentially hazardous, unanticipated site condition encountered on a job site.

5.1.2 Key Concepts

• **Notification.** Contractors must notify the ROICC or Contract Representative of any unforeseen site conditions.

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

• **Response.** Contractors must stop working and evacuate work areas in the event unforeseen site contaminants are suspected.

5.2 OVERVIEW OF REQUIREMENTS

Contractors operating aboard the Installation must be aware of, and adhere to, all applicable regulations and requirements regarding unforeseen site conditions.

 Comprehensive Environmental Response, Compensation, and Liability (CERCLA) Act of 1980 and Superfund Amendments & Reauthorization Act (SARA) of 1986. Establishes the nation's hazardous waste site cleanup program.

5.3 UNFORESEEN SITE CONDITION PROCEDURES

5.3.1 Petroleum, Oil, and Lubricants (POL)

The most frequent condition encountered that requires EMD assistance is the presence of a petroleum, oil, or lubricant odor while excavating. If you notice an odor, take the following action:

- Stop work.
- Immediately clear the area of all personnel to a safe distance upwind of the suspected area.
- Call the Fire and Emergency Services Division (911) immediately if personnel are affected or injured by the suspected contaminant.
- Call the Fire and Emergency Services Division to properly secure the area.
- Notify the ROICC or Contract Representative so that the EMD Spill Response Team will be contacted to determine the appropriate course of action.

Please note that while staged and awaiting sampling results and proper disposal, the contaminated soil is to be placed on and covered with plastic. [Note: Per the Resource Conservation and Recovery Act, the North Carolina Department of Environment and Natural Resources does not allow contaminated soils to be reintroduced into excavations].

If you notice an odor, stop work and immediately clear the area of all personnel to a safe distance upwind of the suspected area.

5.3.2 Munitions and Ordnance

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

For other emergency response procedures, please refer to Section 3.0 of this guide.

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

6.0 ASBESTOS

Contractors working aboard the Installation must follow Federal and state regulations for the proper notifications and management of asbestos associated with demolition and renovation projects, as well as Installation requirements.

6.1 KEY DEFINITIONS AND CONCEPTS

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

6.1.1 Key Definitions

- **Asbestos.** A group of natural minerals that separate into strong, very fine fibers that are heat resistant and extremely durable.
- **Asbestos-Containing Material (ACM).** Any material containing more than one (1) percent asbestos, per 29 CFR 1101.
- Category I Nonfriable ACM. Asbestos-containing packings, gaskets, resilient floor covering, and asphalt roofing products containing more than one percent asbestos, per 40 CFR 61.
- Category II Nonfriable ACM. Any material, excluding Category I nonfriable ACM, containing more than one (1) percent asbestos that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure, per 40 CFR 61.
- **Demolition.** The removal of any load-bearing walls or structure.
- **Friable.** Any ACM that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure (may include damaged ACM that was previously identified as nonfriable), per 40 CFR 763.
- **Glove Bag.** A sealed compartment with attached inner gloves that is used for the handling of ACM.

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

- **Presumed Asbestos-Containing Material (PACM).** Thermal system insulation and surfacing material found in buildings constructed no later than 1980, per 29 CFR 1926.
- Regulated Asbestos-Containing Material (RACM). Includes friable ACM, Category I nonfriable ACM that has become friable, Category I nonfriable ACM that has been sanded, ground, cut, etc., and Category II nonfriable ACM that has a high probability of becoming crumbled, pulverized, or reduced to powder during demolition or renovation, per 40 CFR 61.
- **Renovation.** Altering a facility or its components in any way, including the stripping or removal of RACM, per 40 CFR 61.

6.1.2 Key Concepts

- **Demolition Notification**. North Carolina law requires notification for all demolitions, regardless of whether asbestos is present, 10 working days prior to starting demolition.
- **Disposal**. ACM waste can be accepted at the MCB Camp Lejeune Sanitary Landfill. Work with the ROICC or your Contract Representative to coordinate the disposal through the MCBCL Landfill office at (910) 451-2946.
- Removal Requirements. Permits for asbestos removal or demolition must be obtained when RACM present exceeds 160 linear feet, 260 square feet, or 35 cubic feet. Additionally, proper work practice procedures must be followed during demolition or renovation operations.
- Renovation Notification. If RACM is present within a structure, North Carolina law requires notification of renovation 10 working days prior to starting renovation.

6.1.3 Environmental Management System

Practices, or activities, associated with asbestos management include the following:

- Building maintenance-general
- Construction/demolition

- Equipment operation and maintenance
- Parts replacement

The potential impacts of these activities on the environment include soil contamination and degradation of water quality, air quality, and quality of life.

6.2 OVERVIEW OF REQUIREMENTS

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

- Asbestos Hazard and Emergency Response Act (AHERA), 1986.
 AHERA was written primarily to provide officials in schools, grades K-12, with rules and guidance for the management of asbestoscontaining materials.
- Asbestos School Hazard Abatement Reauthorization Act (ASHERA), 1992. This act extended AHERA regulations to cover public and commercial buildings
- National Emission Standards for Hazardous Air Pollutants
 (NESHAP), Subpart A, General Provisions, and Subpart M,
 Asbestos, 40 CFR 61. Includes standards for asbestos demolition
 and renovation, disposal, and administrative requirements.
- Naval Facilities Guide Specifications and Engineering Control of Asbestos Materials. Covers the requirements for safety procedures and requirements for the demolition, removal, encapsulation, and disposal of asbestos-containing materials.
- North Carolina Asbestos Hazard Management Program, NC
 General Statutes Chapter 130A, Article 19; 10A NCAC 41C
 .0601-.0608 and .0611. Incorporates 40 CFR Part 763 and 29 CFR
 1926.1101 by reference and outlines criteria for asbestos exposures in public areas, accreditation of persons conducting asbestos management activities, and asbestos permitting and fee requirements.

Safety and Health Regulations for Construction, Asbestos, 29
 CFR 1926.1101. Regulates asbestos exposure in construction activities.

6.3 RESPONSIBILITIES BEFORE A DEMOLITION OR RENOVATION PROJECT

Prior to starting a demolition or renovation project, contractors must:

- Know whether ACM or PACM is present in the buildings involved in the project,
- Complete the necessary notifications,
- Understand what actions to take if ACM or PACM is unexpectedly encountered during project execution, and
- Know how to properly dispose of ACM.

6.3.1 Identification of ACM and PACM

Contract documents will identify the presence of ACM and PACM.

Contact your ROICC or Contract Representative with questions regarding the presence of ACM or PACM as identified in these documents.

6.3.2 Notification

To maintain accurate files and records, the ROICC or Contract Representative is required to notify the EMD Asbestos Program Manager, who is part of the Installations and Environment Department, of all work involving asbestos removals, including glove bag projects.

A demolition/renovation notification form DHHS 3768 must be submitted to the NC Health Hazards Control Unit (NCHHCU) 10 working days in advance of demolition activities, regardless of whether asbestos is present. This form must be posted on-site during the entire duration of the project. Have your ROICC or Contract Representative contact the Asbestos Program Manager with questions or concerns about requirements for notification of demolition or renovation.

The ROICC or Contract Representative is required to notify Camp Lejeune's Asbestos Program Manager of all work involving asbestos removals, including glove bag projects.

A demolition/
renovation
notification form
DHHS 3768 must
be submitted to the
NCHHCU 10
working days in
advance of
demolition
activities,
regardless of
whether asbestos
is present.

6.3.3 Removal

If ACM is present, it must be removed before the area is disturbed during renovation or demolition activities (except in certain rare instances). Certification and handling requirements for asbestos removal are provided in 10A NCAC 41C and the Asbestos NESHAP. Refer to these regulations for detailed requirements.

6.3.4 Training

North Carolina regulations require that all persons who perform asbestos management activities in the State of North Carolina must be accredited by the NCHHCU under the appropriate accreditation category (i.e. Building Inspector, Project Supervisor, Abatement Worker). Training documentation should be available upon request.

6.4 RESPONSIBILITIES DURING A DEMOLITION OR RENOVATION PROJECT

North Carolina regulations require that Form DHHS 3768, *Asbestos Permit Application and Notification for Demolition and Renovation*, be posted on-site during all permitted projects. Contractors must post this form when the project will remove the following: 35 cubic feet, 160 square feet, or 260 linear feet of RACM or asbestos that might become regulated as a result of handling. The form must also be posted for nonscheduled asbestos removal that will exceed these numbers in a calendar year.

During a renovation or demolition project, if the contractor suspects the presence of additional ACM other than those materials identified in contract documents, the contractor must immediately report the suspected area to the ROICC or Contract Representative. Before proceeding, the facility must be inspected by a person who has been trained and accredited in North Carolina as an asbestos building inspector by the NCHHCU. The individual performing the asbestos survey will coordinate with the ROICC or Contract Representative throughout the process. A legible copy of the building inspection report must be provided to the NCHHCU prior to each demolition and upon request for renovations; a building inspection report will be acceptable only if the inspection was performed during the three

Form DHHS 3768 must be posted on-site during all permitted projects.

During a renovation or demolition project, if the contractor suspects additional ACM, the contractor must immediately report the suspected area to the ROICC or Contract Representative.

years before the demolition. A copy of the report should also be forwarded to the Asbestos Program Manager.

For glove bag project requirements, please refer to 29 CFR 1926.1101 for specific work procedures.

6.5 DISPOSAL OF ACM WASTE

Contractors can dispose of ACM waste at the MCB Camp Lejeune Sanitary Landfill after first coordinating with the MCBCL Landfill office, through their ROICC or Contract Representative. The contractor must provide the MCBCL Landfill with Form DHHS 3787, *North Carolina Health Hazards Control Unit's Asbestos Waste Shipment Record*. The form must be submitted to NCHHCU for all permitted asbestos removal projects by the contractor.

7.0 LEAD-BASED PAINT

The improper removal of lead-based paint (LBP) may result in the production of paint chips and dust, which may contaminate a structure inside and out. The North Carolina Department of Health and Human Services (NCDHHS) regulations require any person who performs an inspection, risk assessment, or abatement to be certified. NCDHHS also requires a person who conducts an abatement of a child-occupied facility or target housing to obtain a permit for the abatement.

7.1 KEY DEFINITIONS AND CONCEPTS

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

7.1.1 Key Definitions

- **Abatement.** The permanent elimination of lead-based paint hazards.
- **Demolition.** The removal of any load-bearing walls or structure.
- Inspection. A surface-by-surface investigation to determine the presence of lead-based paint and a report explaining the results of the investigation.
- **Lead-Based Paint (LBP).** Surface coatings that contain lead in amounts equal to or in excess of 1.0 milligram per square centimeter, or more than 0.5 percent by weight, per 40 CFR 745.
- Lead-Containing Paint. Surface coatings that contain lead in any amount greater than the laboratory reporting limit but less than 1.0 milligram per square centimeter, or less than 0.5 percent by weight, per 29 CFR 1926.62 and 29 CFR 1910.1025; also contained in 40 CFR Part 745 Subpart L, and have been adopted by the State of North Carolina under NC General Statute Chapter 130A, Article 19A.

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

• **Renovation.** Alteration of a facility or its components in any way.

7.1.2 Key Concepts

- Disposal. Analysis is required to determine proper disposal of waste (nonhazardous or hazardous). A Toxic Characteristic and Leaching Process analysis must be conducted to determine whether lead levels have exceeded 5 parts per million, which is the RCRA level for hazardous waste determination.
- Lead-Based Paint Survey. A lead-based paint survey is required prior to the disturbance of painted surfaces to determine whether the paint meets the criteria of a lead-based paint.
- Training. Lead-based paint training requirements set forth by the
 Occupational Safety and Health Administration (OSHA) are to be
 followed by personnel involved in all lead-based paint removal
 activities. MCBCL Base Safety tracks this training for contract staff,
 as the Safety Office houses the Lead Program Manager.

7.1.3 Environmental Management System

Practices, or activities, associated with LBP include the following:

- Construction/demolition
- Hazardous material storage
- Hazardous material transportation
- Paint removal

The potential impacts of these activities on the environment include the potential degradation of soil, water, and air environments, and the potential exposure of Installation occupants. Camp Lejeune still contains living quarters that have lead-based paint on the inside of the structures.

7.2 OVERVIEW OF REQUIREMENTS

Contractors operating aboard the Installation must be aware of, and adhere to, all applicable regulations and requirements regarding LBP activities, including the following:

Naval Facilities Engineering Service Center, Facilities
 Management Guide for Asbestos and Lead. Ensures the protection of workers, building occupants, and the environment.

- 10A NCAC 41C .0800, Lead-Based Paint Hazard Management Program. Requires (1) all individuals and firms involved in LBP activities to be certified and (2) all LBP activities to be carried out in accordance with 40 CFR 745.
- 29 CFR 1926, Safety and Health Regulations for Construction. Contains OSHA requirements for construction activities where workers may have contact with lead.
- 40 CFR Part 745, Lead-Based Paint Poisoning Prevention in Certain Residential Structures. Ensures that (1) lead-based paint abatement professionals, including workers, supervisors, inspectors, risk assessors, and project designers, are well trained in conducting LBP activities and (2) inspections for the identification of LBP, risk assessments for the evaluation of LBP hazards, and abatements for the permanent elimination of LBP hazards are conducted safely, effectively, and reliably by requiring certification of professionals.

7.3 RESPONSIBILITIES BEFORE RENOVATION OR DEMOLITION

Prior to any renovation or demolition aboard the Installation that involves the disturbance of painted surfaces, a LBP survey must be completed by a certified inspector, retained through the ROICC or Public Works (PW) offices. Certain projects will use PW staff to conduct the sampling and other projects will use contracted personnel. Buildings constructed prior to 1978 are assumed to contain LBP; therefore, no LBP survey is necessary. The LBP survey (through sampling and analysis) will determine whether painted surfaces meet the criteria of LBP (lead content equal to or greater than 1.0 milligram per square centimeter as measured by X-ray fluorescence (XRF) or lab analysis, or 0.5 percent by weight). For contracts where LBP is to be removed prior to demolition or renovation, the associated Naval Facilities Guide Specifications and contract documents must be implemented.

7.4 PERMITS

Contractors must obtain Lead Removal permits from NCDHHS when lead paint is removed from targeted housing (child-occupied facilities and housing built prior to 1978).

Buildings constructed prior to 1978 are assumed to contain LBP. If the LBP survey determines that LBP will be abated as part of a renovation or demolition project, analytical samples must be taken to determine whether the material is hazardous.

7.5 DISPOSAL

If the LBP survey determines that LBP will be abated as part of a renovation or demolition project, analytical samples must be taken by the contractor to determine whether the material is hazardous. Usually a Toxic Characteristic Leaching Process (TCLP) sample is collected from a "representative" sample of the material removed. The laboratory conducting the sample analysis must be accredited by the Environmental Lead Laboratory Accreditation Program (ELLAP). A list of these accredited labs is available by contacting (703) 849-8888.

If the LBP is removed from the underlying building material, then the paint is the waste stream. If the LBP is removed with the building material, then both materials are considered the waste stream.

If the lead content is below hazardous waste (HW) regulatory disposal levels, consult with your ROICC or Contract Representative to determine whether your contract allows for the disposal material in the MCB Camp Lejeune Sanitary Landfill.

If the abated LBP is above HW regulatory levels, refer to Section 4.0 of this guide for information on HW management and disposal requirements.

7.6 TRAINING

Before the project begins, workers who are subject to exposure of lead during abatement or removal activities must be trained according to the OSHA regulation in 29 CFR 1926.62 concerning lead exposure in construction. The contractor is responsible for providing this training.

8.0 STORMWATER

There are three types of stormwater discharge that contractors for the Installation must address if they plan on disturbing land: industrial, construction, and post-construction stormwater runoff. The general requirements for each area as they apply to contractors are discussed in the following subsections.

8.1 KEY DEFINITIONS AND CONCEPTS

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

8.1.1 Key Definitions

- Best Management Practices (BMPs). Schedules of activities,
 prohibitions of practices, maintenance procedures, and other
 management practices to prevent or reduce the pollution of Waters
 of the United States. BMPs can include treatment requirements,
 operational procedures, and practices to control site runoff, spillage
 or leaks, sludge or waste disposal, or drainage from raw material
 storage. BMPs may also denote structural and nonstructural
 stormwater treatment devices and measures.
- Erosion and Sedimentation Control Plan. Any plan, amended plan, or revision to an approved plan submitted to the North Carolina Division of Land Resources or delegated authority in accordance with North Carolina General Statute 113A-57. Erosion and Sedimentation Control Plans show the devices and practices that will retain sediment generated by the land-disturbing activity within the boundaries of the tract during construction and upon development of the tract.
- Land Disturbance. Areas that are subject to clearing, excavating, grading, stockpiling earth materials, and placement/removal of earth material.
- Nonpoint Source Discharge. All discharges from stormwater runoff that cannot be attributed to a discernible, confined, and discrete conveyance.

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

- Point Source Discharge. Any discernible, confined, and discrete
 conveyance, including but specifically not limited to, any pipe,
 ditch, channel, tunnel conduit, well, discrete fissure, container,
 rolling stock, or concentrated animal feeding operation from which
 pollutants are or may be discharged to Waters of the State.
- **Stormwater.** Stormwater runoff, snow melt runoff, and surface runoff and drainage, per 40 CFR 122.
- Stormwater Associated with Construction Activities. The discharge of stormwater from construction activities including clearing, grading, and excavating that result in a land disturbance of equal to or greater than 1 acre, per 40 CFR 122.
- Stormwater Associated with Industrial Activities. The discharge from any conveyance that is used for collecting and conveying stormwater and that is directly related to manufacturing, processing, or raw materials storage areas from an applicable industrial plant or activity, per 40 CFR 122.

8.1.2 Key Concepts

- **Operational Requirements.** Equipment, discharge, and material use requirements that apply to all construction and industrial activities.
- Permit Requirements. Land-disturbing projects may be subject
 to a variety of permit requirements to protect surface water quality
 from both construction and post-construction stormwater runoff.
 In the applicable areas of the Installation, a State Stormwater
 Management Permit and coverage under the Construction General
 Permit may be required.
- Post-Construction. The management of stormwater generated on a stable, established site after the construction process is complete. The State Stormwater Management Program sets forth requirements for post-construction stormwater runoff control.

8.1.3 Environmental Management System

Practices, or activities, associated with stormwater include the following:

- Catch basin cleaning
- Construction/demolition

- Erosion control
- Fuel storage–containers
- Hazardous material storage
- Land clearing
- Landscaping
- Mowing
- Outfall cleaning
- Range residue clearance
- Riparian buffer maintenance
- Runoff sedimentation basins
- Sediment traps
- Soil excavation/grading/grubbing
- Stormwater collection/conveyance system
- Stormwater engineering controls operation and maintenance
- Stump/brush removal
- Vehicle parking

The potential impacts of these activities on the environment include degradation of water quality and damage to public & private property due to flooding.

8.2 OVERVIEW OF REQUIREMENTS

Contractors operating aboard the Installation must be aware of, and adhere to, all applicable regulations and requirements regarding potential stormwater contamination, including the following.

- 40 CFR 122, National Pollutant Discharge Elimination System.
 Requires permits for the discharge of pollutants from any point source into Waters of the United States.
- 15 NCAC 02H. 0100, Point Source Discharges to the Surface Waters. Requires permits for control of sources of water pollution by providing the requirements and procedures for application and issuance of state NPDES permits for discharge from an outlet, point source, disposal system discharging to the surface waters of the state, and for the construction and operations of treatment works with such a discharge.
- **15A NCAC Chapter 4.** Requires all persons conducting land-disturbing activity to take all reasonable measures to protect

all public and private property from damage caused by the release of sediments from the activity. The primary tool used to accomplish the objective is the development of an Erosion and Sedimentation Control Plan. The plan must

- o Identify critical areas,
- o Limit exposure areas,
- o Limit time of exposure,
- o Control surface water,
- o Control sedimentation, and
- Manage stormwater runoff.
- 15A NCAC 02H. 1000 Stormwater Management. The State Stormwater Management Program requires all persons conducting land-disturbing activities that (1) require a Coastal Area Management Act (CAMA) Major Development Permit or an Erosion and Sedimentation Control Plan, and (2) are located within coastal counties or drain to specific classifications of water bodies, to protect surface waters and highly productive aquatic resources from the adverse impacts of uncontrolled high-density development or the potential failure of stormwater control measures. To receive permit approval, projects must limit the density of development, reduce the use of conventional collection systems in favor of vegetative systems, and incorporate post-construction, structural BMPs.

Any project involving land-disturbing activities aboard the Installation has been reviewed by the Installation's NEPA Review Board prior to the onset of work.

8.3 Prior to Site Work

8.3.1 Notifications

Any project involving land-disturbing activities aboard the Installation has been reviewed by the Installation's National Environmental Policy Act (NEPA) Review Board prior to the onset of work. Documentation of this review should have been provided to your ROICC or Contract Representative and may include mandatory conditions affecting the construction/implementation of the project. Consult with your ROICC or Contract Representative to obtain or review any NEPA documentation associated with the project in your contract.

8.3.2 Stormwater Phase I Permit

Discharges of industrial stormwater have the potential to contain contaminants from industrial activity. This type of discharge is defined and regulated in 40 CFR 122, the USEPA final rule regarding National Pollutant Discharge Elimination System (NPDES) stormwater permitting.

Daily industrial operations discharging stormwater aboard MCB Camp Lejeune and MCAS New River are covered under NPDES Permit NCS000290.

8.3.3 Project-Specific Permits

Contractors are responsible for preparing all project-specific stormwater permit applications and related plans and for coordinating the permit review schedule with the ROICC or Contract Representative. For projects located outside of Public-Private Venture (PPV) housing, MCB Camp Lejeune is the responsible party for all project-specific stormwater permits. (All permit-required plans and applications must go through internal approval before being submitted to the appropriate state agency.) The permit review schedule should allow adequate time for internal review prior to state submission deadlines. For housing-related projects located outside of the jurisdiction of MCB Camp Lejeune, stormwater compliance should be coordinated with the appropriate PPV contractor.

For construction activities that disturb one acre or more of land, permit coverage is required under the North Carolina General Permit No.

NCG010000 (General Permit). To obtain coverage under the General Permit, three copies of a proposed Erosion and Sedimentation Control Plan must be prepared and submitted to the NCDENR Sedimentation Control Commission (or to an approved local program) at least 30 days prior to beginning construction activity. Another copy of the plan will be kept on file at the job site. Coverage under the permit becomes effective upon issuance of a plan approval. No land-disturbing activities may take place prior to receiving plan approval. The approved plan is considered a requirement or condition of the General Permit; deviation from the approved plan will constitute a violation of the terms and conditions of the permit unless prior approval for the deviations has been obtained.

A State Stormwater Management Permit, issued in accordance with 15A NCAC 02H. 1000, is required for all development activities that require a CAMA Major Development Permit or an Erosion and Sedimentation Control Plan and that meet any of the following criteria:

• Development within the 20 coastal counties

Contractors are responsible for preparing all project-specific stormwater permit applications and related plans and for coordinating the permit review schedule with the ROICC or Contract Representative.

All permit-required plans and applications must go through internal approval before being submitted to the appropriate state agency.

- Development that drains to an Outstanding Resource Water (ORW)
- Development within one mile of and draining to a High Quality Water (HQW)

A State
Stormwater
Management
Permit is required
for all activities
that will disturb
one acre or more
of land.

Because the Installation is located in a coastal county, any project that disturbs greater than one acre of land (hence requiring coverage under the General Permit for construction activity) will also require a State Stormwater Management Permit. A State Stormwater Management Permit Application must be submitted and filed with the NCDENR, Division of Water Quality, following completion of the construction plans and specifications and prior to commencement of construction activities. Copies of this form are available at the NCDENR website: http://h2o.enr.state.nc.us/su/Forms_Documents.htm#sswmp. The State Stormwater Management Permits typically specify design standards for conveyance systems and structural BMPs, a schedule of compliance, and general conditions to which the permittee must adhere.

8.4 Responsibilities During Site Work

The contractor is responsible for maintaining the quality of the stormwater runoff and preventing pollution of stormwater at the construction/job site. The job site may be inspected by Installation environmental personnel to ensure compliance with the Installation Stormwater Pollution Prevention Plan and applicable permits. The following requirements apply to all projects occurring at the Installation that have the potential to impact water quality:

- Any changes to the project area that do not comply with the approved Erosion and Sedimentation Control Plan, alter the approved post-construction stormwater conveyance system, or could otherwise significantly change the nature or increase the quantity of pollutants discharged should be immediately communicated to the ROICC or Contract Representative.
- Equipment utilized during the project activity must be operated and maintained in such a manner as to prevent the potential or actual pollution of the surface or ground waters of the state.
- All permitted erosion and sedimentation control projects will be inspected by the contractor at least once every seven calendar days

(unless discharges to a 303(d)-Listed water body are occurring) and within 24 hours after any storm event greater than 0.5 inch of rain per 24-hour period, as required by the North Carolina General Permit No. NCG010000 (General Permit). Inspection results shall be maintained by the designated contractor throughout the duration of the active construction project.

- Fuels, lubricants, coolants, hydraulic fluids, or any other petroleum products shall not be discharged onto the ground, into surface waters, or down storm drains (to include leaking vehicles, heavy equipment, pumps and/or structurally deficient containers of hazardous materials).
- Spent fluids shall be disposed of in a manner so as not to enter surface, ground waters of the state, or storm drains. Disposal of spent fluids is outlined in Section 4.0.
- Implement spill prevention measures, clean up all spills immediately, and follow spill reporting requirements presented in Section 3.0. Any spilled fluids shall be cleaned up to the extent practicable and disposed of in a manner so as not to allow their entry into the water, surface or ground, of the state. Please refer to Section 3.0 for emergency and spill response procedures.
- Herbicide, pesticide, and fertilizer usage during construction activity shall be consistent with the Federal Insecticide, Fungicide, and Rodenticide Act and shall be in accordance with label restrictions. Please refer to Section 4.0 for additional information on Hazardous Material/Hazardous Waste Management.
- Particular care must be used when storing materials outside.
 Materials and equipment stored outside that could potentially affect the quality of stormwater runoff include, but are not limited to, garbage dumpsters, vehicles, miscellaneous metals, wood products, and empty storage drums. If there is any question about whether an outdoor storage practice is acceptable, contact the ROICC or Contract Representative.
- Use good-housekeeping practices to maintain work areas in a clean and orderly manner, paying particular attention to those areas that may contribute pollutants to stormwater.

9.0 SOLID WASTE, RECYCLING, AND POLLUTION PREVENTION

The Installation has a proactive pollution prevention (P2) and recycling program. Contractors should minimize the amount of solid waste requiring disposal in a landfill. This section addresses solid waste, including both municipal solid waste (MSW) and construction and demolition (C&D) waste. Hazardous materials and hazardous waste are discussed in Section 4.0 of this guide. Contractors are required to comply with all Federal, state, and local laws and regulations for proper disposal and recycling of all solid wastes.

Contractors should minimize the amount of solid waste requiring disposal in a landfill.

9.1 KEY DEFINITIONS AND CONCEPTS

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

9.1.1 Key Definitions

- Construction and Demolition (C&D) Debris. Materials generated during the construction, renovation, and demolition of buildings, roads, and bridges. C&D debris often contains bulky, heavy materials that include concrete, wood (from buildings), asphalt (from roads and roofing shingles), gypsum (the main component of drywall), etc.
- **Green Procurement (GP).** The purchase of environmentally preferable products and services in accordance with Federally mandated "green" procurement preference programs. GP is intended to protect the environment and reduce energy consumption.
- **Pollution Prevention (P2).** Reducing the amount of a hazardous substance or pollutant entering waste streams or otherwise released to the environment prior to recycling, treatment, or disposal.
- **Recycling.** A series of activities that includes collecting, sorting and processing recyclables into raw materials, and manufacturing raw

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

- materials into new products per the US Environmental Protection Agency (USEPA).
- Solid Waste. Any solid, semisolid, liquid, or contained gaseous materials discarded, including garbage, construction debris, commercial refuse, sludge from water supply or waste treatment plants or from air pollution control facilities, and other discarded materials, per the Resource Conservation and Recovery Act (RCRA) of 1976.

9.1.2 Key Concepts

- Pollution Prevention/Green Procurement. Pollution prevention and green procurement practices are strongly encouraged for Installation contractors.
- **Recycling.** Recycling is required on the Installation. The MCBCL Recycling Center accepts specified recyclables.
- Solid Waste. The location for disposal of solid waste will be in accordance with contract specifications (off-base or MCBCL Landfill). Data related to off-base disposal (to include C&D waste) must be provided to the ROICC or Contract Representative on a monthly basis.

9.1.3 Environmental Management System

Practices, or activities, associated with solid waste, recycling, and pollution prevention, include the following:

- Battery replacement
- Building maintenance-general
- Building operation-general
- Construction/demolition
- Equipment disposal
- Hazardous waste recycling
- Land clearing
- Material storage handling
- Packaging/unpackaging
- Rock crushing operations
- Solid waste recycling collection/transportation
- Stump/brush removal

• Vehicle operation

The potential impacts of these activities on the environment include soil degradation, surface water quality degradation, depletion of landfill space, and depletion of nonrenewable resources.

9.2 OVERVIEW OF REQUIREMENTS

Contractors operating aboard the Installation must be aware of, and adhere to, all applicable regulations and requirements regarding solid waste disposal, recycling, and pollution prevention, including the following:

- Base Order (BO) 5090.4, Solid Waste Reduction Qualified Recycling Program (QRP). Provides guidance for solid waste reduction, pollution prevention, and management of recyclable materials.
- BO 11350.2D, Refuse Disposal Procedures. Establishes
 procedures for the separation, collection, and disposal of refuse and
 the disposal of waste wood products.
- Pollution Prevention Act (PPA) of 1990 (42 U.S.C. 13101 et seq.).
 Establishes the national policy that "pollution should be prevented or reduced at the source whenever feasible," and establishes the following hierarchy: source reduction, recycling, treatment, and disposal.
- Resource Conservation and Recovery Act (RCRA) of 1976.
 Governs the disposal of solid waste and establishes Federal waste disposal standards and requirements for state and regional authorities. The objectives of Subtitle D are to assist in developing and encouraging methods for the disposal of solid waste that are environmentally sound and that maximize the utilization of valuable resources recoverable from solid waste.
- Solid Waste Disposal Act (SWDA) of 1965. Requires Federal
 facilities to comply with all Federal, state, interstate, and local
 requirements concerning the disposal and management of solid
 wastes.

At a minimum, the following actions are required by all contractors:

1. Prior to performing work that will or may generate solid waste at the Installation, all contractors must provide their ROICC or Contract

Representative with a copy of their Solid Waste Disposal Permit unless MCBCL's landfill is being utilized for disposal. Recycling is encouraged and can be coordinated with the ROICC or Contract Representative and the Landfill Manager.

2. Provide the weights of <u>ALL</u> wastes, both solid and C&D that are either disposed of or recycled to the ROICC or Contract Representative with a copy to the Landfill Manager. This requirement does not apply in instances where the Landfill/Recycling facility picks up or accepts materials directly from the contractor. If contractors are transporting waste off-site for disposal, it is mandatory that they track the material weight and provide that information to their ROICC or Contract Representative.

9.3 SOLID WASTE REQUIREMENTS

Contractors producing solid waste on the Installation are required to take these steps:

- Pick up solid waste and place it in covered containers that are regularly emptied.
- Prevent contamination of the site and the surrounding areas when handling and disposing of waste.
- Leave the project site clean upon completion of a project.

9.3.1 MCBCL Landfill Acceptable Waste Streams

The MCBCL Landfill accepts certain types of solid waste under the conditions specified in Table 9-1. MCBCL Landfill hours of operation are 0800 to 1530, Monday through Friday. Contractors must have a construction pass and a copy of the face of the related contract to enter the MCBCL Landfill and dispose of waste. Contractors must also contact the Landfill Operator prior to unloading refuse. Each material must be separated into different loads.

Table 9-1. MCBCL Landfill Requirements

Waste Category ^a	Example	Requirements
Mixed Debris	Sheetrock, plaster, ceramic tiles	Items may be mixed together
Painted Masonry and Concrete	Concrete, block, brick	 Separate from other items Lead-painted or mastic-contaminated masonry or concrete must be separated from unpainted concrete products Remove reinforcement wire and rebar flushed with exposed surfaces
Unpainted Masonry and Concrete	Concrete, block, brick	 Separate from other items Remove reinforcement wire and rebar flushed with exposed surfaces
Nonrecyclable Cardboard	N/A	Dispose of cardboard only if the MCBCL Recycling Center has rejected the cardboard
Nonrecyclable Wood Pallets	N/A	Dispose of pallets only if the MCBCL Recycling Center has rejected the pallets
Treated Wood	Piling, power poles	Separate from other items
Untreated/Unpainted Wood	Lumber, stumps, limbs	Separate from other items
Organic Matter	Leaves, grass clippings	Separate from other itemsNo bags or containers are allowed
Fiberglass Tanks	N/A	Clean tanks before delivering to the landfill

^a Metals are not accepted at the landfill and must be removed from each waste category prior to disposal. Metal construction debris should be disposed of at the DRMO. Disposal requirements set forth in BO 11350.2D should be followed.

9.4 RECYCLING REQUIREMENTS

The Installation Recycling program is managed by the MCBCL Landfill, with assistance from the EMD. The MCBCL Landfill plays a vital role in the Installation's effort to reduce the amount of solid waste requiring disposal. Reducing solid waste saves money and helps to protect the environment by conserving natural resources. Additionally, Marine Corps facilities are mandated to recycle.

9.4.1 MCBCL Recycling Center

The MCBCL Recycling Center, Bldg. 982, is co-located with the landfill on Piney Green Road. Normal working hours are Monday through Friday, 0730–1530. All materials can be brought to the Recycling Center. For details, have your ROICC or Contract Representative contact the Recycling Center for details at (910) 451-2946. The following types and categories of materials are accepted for recycling at the Recycling Center:

- Wood pallets
- White Paper (mixed flat or shredded)
- Newspaper
- Magazines
- Military publications (binders removed)
- Phone books
- Plastic and glass (containers or bottles)
- Toner cartridges

The following types and categories of materials are accepted for recycling but must be delivered to the Defense Reutilization and Marketing Office (DRMO) at Lot 203:

- Scrap metal
- Steel (high temperature, corrosion resistant)
- Brass (includes spent/fired munitions)
- Copper and copper wire
- Aluminum (plate, sheet, scrap) and aluminum cans

Special arrangements can be made for other materials (C&D debris) or larger volumes of commonly recycled materials from events such as

construction and deconstruction. Regulations set forth in BO 11350.2D must be followed.

9.4.2 Other Recyclables

- Asphalt Pavement. Asphalt must be removed and delivered to an
 asphalt recycling facility. Contractors must provide a record of the
 total tons of asphalt recycled and the corporate name and location of
 the recycling facility to their ROICC or Contract Representative,
 with a copy to the Landfill Manager.
- Empty Metal Paint Cans. Empty metal paint cans shall be taken to Bldg. S-962 for recycling. All HM cans or HM containers that are generated from MCBCL or Marine Expeditionary Force contracts will be turned into Bldg. S-962 on Michael Rd. on the scheduled contractor turn-in day. Have your ROICC or Contract Representative contact EMD at (910) 451-1482 for more information. Any waste generated from this process must be managed appropriately.
- Other Metals. Other metals must be taken to the DRMO disposal area in Lot 201.
- Red Rags Recycling. A basewide program is in place to supply and launder shop rags through an off-site contractor, Aramark, in Savannah, Georgia. Almost all work centers on the Installation use this "Red-Rags" service wherein clean rags are supplied by the contractor and picked up after use. The rags are then laundered offsite and returned. This has reduced rag/POL-contaminated nonregulated waste by over 85 percent.
- **Universal Waste.** See Section 4.0 of this guide for management procedures.
- Unused Hazardous Materials. These materials can be turned into Bldg. 908 HM Free Issue point on Michael Rd. Have your ROICC or Contract Representative contact the Free Issue Point at (910) 451-1718.
- White Rags Recycling. Analogous to the red rags program, white
 rags have recently been introduced into painting operations at MCB
 Camp Lejeune. An off-site contractor, Aramark, in Savannah,
 Georgia, launders used rags. The white rags have no dye in the cloth

that can interfere with painting operations. Laundering the white rags reduces disposal of paint-related waste.

9.5 POLLUTION PREVENTION AND GREEN PROCUREMENT

MCB Camp Lejeune is subject to green procurement (GP) requirements. GP implements environmentally protective principles in the procurement arena and includes preferential use of the following:

- Recovered materials products
- Biobased products
- Water and energy efficient products
- Alternatives to ozone depleting substances
- Electronics meeting Electronic Produce Environmental Assessment Tool standards
- Products that do not contain toxic chemicals, hazardous substances, and other pollutants targeted for reduction and elimination by the Department of Defense
- Alternative fuel use/increased fuel efficiency
- Environmentally preferable purchasing practices

Contractors are encouraged to employ GP practices whenever feasible.

10.0 TRAINING

It is the contractor's responsibility to ensure that every employee has the required training to perform his or her duties in compliance with Federal, state, and local regulatory requirements.

To minimize the environmental impact of operations occurring on the Installation, all civilian and military personnel, including contractors, are required to receive both Environmental Management System (EMS) and general environmental awareness training at the level necessary for their job function. The training presentation provided as Attachment A satisfies these training requirements.

NOTE It is the contractor's responsibility to know and comply with Federal, state, and local regulations. Installation environmental personnel, upon request from the ROICC or Contract Representative, will assist contractors with compliance issues; however, the primary burden of regulatory identification, familiarity, and compliance lies with the contractor. This training *does not* replace any required regulatory environmental training (i.e., asbestos abatement worker training) as per contract requirements. Any required environmental training should be completed *prior* to working at MCB Camp Lejeune. Copies of training records should be available upon request by federal or state regulators.

To minimize the environmental impact of operations aboard the Installation, all contractors are required to receive both EMS and general environmental awareness training at the level necessary for their job function.

10.1 KEY DEFINITIONS AND CONCEPTS

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

10.1.1 Key Definitions

None.

10.1.2 Key Concepts

Comprehensive Environmental Training and Education
 Program (CETEP). The Marine Corps training program designed to ensure that high-quality, efficient, and effective environmental

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

training, education, and information are provided at all levels of the Marine Corps.

- Environmental Management System (EMS). The part of the overall management system that includes organizational structure, planning activities, responsibilities, practices, procedures, processes, and resources for developing, implementing, achieving, reviewing, and maintaining the Environmental Policy.
- **EMS Training.** Instruction that is designed to ensure that military and civilian personnel, including contractors and vendors, become familiar with the Installation's EMS and how it functions
- General Environmental Awareness Training. Instruction that is designed to ensure that Installation personnel, including contractors and vendors, become familiar with the MCB Camp Lejeune and MCAS New River environmental policies and programs for regulatory compliance, natural resource conservation, pollution prevention, and environmental protection. General EMS and Environmental Awareness Training for Contractors and Vendors is required for all contractors working aboard the Installation. The training presentation is included as Attachment A. Documentation of receipt of this training should be maintained by the contractor and be available upon request.

10.2 OVERVIEW OF REQUIREMENTS

Contractors operating aboard the Installation must be aware of, and adhere to, all applicable regulations and requirements concerning training, including the following:

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

10.3 REQUIRED TRAINING

10.3.1 General Environmental Awareness

In accordance with Department of Defense (DoD) instructions and Marine Corps Orders (MCO), the Installation has implemented a Comprehensive Environmental Training and Education Program (CETEP). A major

component of the CETEP is to provide general environmental awareness training to all individuals associated with the installation, including contractors and vendors. Attachment A is provided to contractors and their employees performing work aboard the Installation to utilize for general environmental awareness training.

10.3.2 Environmental Management System (EMS)

In addition to CETEP requirements, the Installation has implemented a basewide EMS per Executive Order 13423, *Strengthening Federal Environmental, Energy, and Transportation Management*, and DoD and Marine Corps EMS policy. The EMS highlights the fact that the authority and principal responsibility for controlling environmental impacts belong to those commands, units, offices, and personnel (including contractors and vendors) whose activities have the potential to impact the environment. Attachment A is provided to contractors and their employees performing work aboard the Installation to utilize for EMS Training.

10.3.3 Recordkeeping

All training records, including other applicable environmental training, should be maintained on-site by the contractor for review upon request.

Attachment A is provided to contractors and their employees performing work aboard the Installation to utilize for EMS and general environmental awareness training.

11.0 CULTURAL RESOURCES

The Installation enjoys a rich history, and remnants of our past can be found throughout the installation. As contractors, it is your responsibility to notify the Resident Officer in Charge of Construction (ROICC) or your Contract Representative immediately if you encounter suspected archaeological sites, artifacts, or human remains during your activities.

11.1 KEY DEFINITIONS AND CONCEPTS

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

11.1.1 Key Definitions

- Archaeological Resource. Any material remains of human life or activities that are at least 100 years old and are capable of providing scientific or human understanding of past human behavior and cultural adaptation, including the site on which the remains are located. Examples include structures, tools, debris, organic waste, human remains, artistic representations, and shipwrecks.
- Cultural Resource. A generic term commonly used to include buildings, structures, districts, sites, and objects of significance in history, architecture, archaeology, engineering, or culture per MCO P5090.2A.
- Historic Resource. Any prehistoric or historic district, site, building, structure, or object significant in United States history, architecture, archaeology, engineering, or culture and included, or eligible for listing, the National Register of Historic Places (NRHP) per the National Historic Preservation Act (NHPA) of 1966 and MCO P5090.2A.

11.1.2 Key Concepts

• **Notification.** Contractors must notify the ROICC or Contract Representative if any cultural resources are encountered.

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

• **Policy.** It is DoD policy to preserve significant historic and archaeological resources.

11.1.3 Environmental Management System

Practices, or activities, associated with cultural resources include the following:

- Construction/demolition
- Land clearing
- Soil excavation/grading
- Stump/brush removal

The potential impacts of these activities on the environment include damage to cultural resources and degradation of soil quality.

11.2 OVERVIEW OF REQUIREMENTS

It is DoD policy to integrate the archeological and historic preservation requirements of applicable laws with the planning and management of activities under DoD control; to minimize expenditures through judicious application of options available in complying with applicable laws; and to encourage practical, economically feasible rehabilitation and adaptive use of significant historical resources.

Contractors operating aboard the Installation must be aware of, and adhere to, all applicable regulations and requirements regarding cultural resources, including the following:

- Archaeological and Historic Preservation Act of 1974 (16 U.S.C. 469 et seq.). Amends the Reservoir Salvage Act to extend its provisions beyond the construction of dams to any terrain alteration resulting from any Federal construction project or Federally licensed project, activity, or program.
- ARPA of 1979 (16 U.S.C. 470 (aa) et seq. Requires Federal land managers to issue permits for the excavation or removal of artifacts from lands under their jurisdiction. The Act requires that relevant Native American tribes be notified of permit issuance if significant religious or cultural sites will be affected. It prohibits the excavation, damage, alteration, or defacement of an archaeological site unless permitted by the Federal land manager.

- DoD Directive 4710.1, Archaeological and Historic Resources
 Management. Provides policy for the management of
 archaeological and historic resources on land and in water under
 DoD control.
- Executive Order (EO) 11593, May 13, 1971. Requires all Federal agencies to administer cultural properties under their control. Agencies are required to direct their policies, plans, and programs so that significant sites and structures are preserved.
- Historic Sites, Buildings, and Antiquities Act of 1935 (Public Law 74-292, 16 U.S.C. 461 et seq.). States that it is Federal policy to preserve historic and prehistoric properties of national significance.
- National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321 et seq.). States that it is Federal policy to preserve important historic, cultural, and natural aspects of our national heritage and that it is a requirement to consider environmental concerns during project planning and execution.
- National Historic Preservation Act (NHPA) of 1966 (16 U.S.C. 470 et seq.). Establishes historic preservation as a national policy and requires Federal agencies undertaking actions that may affect NRHP-eligible historic properties to consult with state historic preservation offices and the Advisory Council on Historic Preservation. Section 110 of the Act requires Federal agencies to inventory, evaluate, identify, and protect cultural resources that are determined eligible for listing in the NRHP.
- Public Buildings Cooperative Use Act of 1976 (Public Law 94-541). Encourages adaptive reuse of historic buildings as administrative facilities for Federal agencies.

11.3 PROCEDURES

All contractors are expected to follow these procedures:

 Notify the ROICC or Contract Representative immediately if suspected archaeological sites, artifacts, or human remains are encountered during your activities. Notify the ROICC or Contract Representative immediately if suspected archaeological sites, artifacts, or human remains are encountered during your activities.

- Stop work in the immediate area of the discovery until directed by the ROICC or Contract Representative to resume work.
- Be particularly aware of your surroundings when working in a
 designated historic area. A summary of key cultural, archaeological,
 and historic areas/sites is available at the following website:
 http://www.lejeune.usmc.mil/EMD/CULTURAL/HOME.htm

Remember, the Government retains ownership and control over historical and archaeological resources.

12.0 PERMITTING

Contractors operating aboard the Installation must ensure that all relevant environmental permits are obtained before work commences on-site. Contractors must work with their ROICC or Contract Representative to determine permitting responsibilities prior to beginning work. Contractors must adhere to all permit conditions. Examples of environmentally related permits are provided in Section 12.3.

12.1 KEY DEFINITIONS AND CONCEPTS

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

12.1.1 Key Definitions

• **SA Waters.** Surface water that is suitable for recreation and for commercial shellfish harvesting.

12.1.2 Key Concepts

• **Permits.** Prior to beginning work aboard the Installation, consult applicable permit requirements and ensure that they are met before work begins. Copies of all applicable permits/authorizations should be retained onsite for the life of the project.

12.2 OVERVIEW OF REQUIREMENTS

Please refer to the individual sections of this Guide for applicable permitting regulations and requirements that relate to each environmental medium. Many permits have specific timetables for submittal prior to project initiation. Contractors must consult the permit requirements and ensure that the permits are obtained in the required time frame.

12.3 PROJECT PERMITS AND APPROVALS

Prior to work being awarded, the Installation-associated action proponent should have had an environmental review by the Installation's National If you have any questions or concerns about the information in this section, please consult with your ROICC or Contract Representative.

The NCDENR website (http://www.enr.sta te.nc.us) is a useful reference for determining required permits and obtaining necessary forms.

Environmental Policy Act (NEPA) Section to comply with the NEPA of 1969. The outcome of this review would have been in the form of a Decision Memorandum (DM) or an Environmental Assessment (EA). Contractors must refer to their contract and the requirements outlined in the NEPA documentation for specific permitting requirements. EMD Program Managers are available for guidance; however, if the contractor is tasked with preparing permit applications, the contractor is expected to have the necessary capability and expertise required to complete the submittals in accordance with the guidance provided by the regulatory agency that issues the permit. In addition, EMD must be provided with copies of all permits submitted to the North Carolina Department of Environment and Natural Resources (NCDENR). In some cases, EMD must submit the permit application. Please direct questions to your ROICC or Contract Representative.

Examples of permits that may be required are discussed in applicable sections of this Guide. The following list of permits is not meant to be all inclusive. Please be aware that other permits not listed in this section may be required. The NCDENR website (http://www.enr.state.nc.us) is a useful reference for determining required permits and obtaining necessary forms. In addition, any inspection and/or data collection required by the permits must be retained on site for review upon request.

12.3.1 Stormwater (Section 8.0)

- National Pollutant Discharge Elimination System (NPDES)
 Stormwater Discharge Permit for Construction Activities (also referred to as General Permit No. NCG010000). Required for all land-disturbing activities (LDA) that exceed one (1) acre; also requires an accompanying Erosion and Sedimentation Control Plan.
- **High-Density Stormwater Permit.** Required when the (1) LDA exceeds one (1) acre and impervious surfaces are greater than or equal to 25 percent of the total project area adjacent to non-SA waters or greater than or equal to 12 percent of the total project area adjacent to SA water; OR (2) total development exceeds 10,000 square feet of impervious surface.

• Low-Density Stormwater Permit. Required when the LDA exceeds one (1) acre and impervious surfaces are less than 25 percent when adjacent to non-SA waters or less than 12% when adjacent to SA waters.

12.3.2 Asbestos (Section 6.0)

 Asbestos Permit Application and Notification for Demolition/Renovation. DHHS Form 3768, available at the following website: http://www.epi.state.nc.us/epi/asbestos/ahmp.html

12.3.3 Air Quality (Section 13.0)

- Clean Air Act Title V Construction and Operation Permit.
 Required for the construction of the following types of emission sources:
 - Boilers
 - Generators
 - Engine Test Stands
 - Surface Coating/Painting Operations
 - Refrigerant Operations (e.g., Chillers)
 - Chemical or Mechanical Depainting, Abrasive Blasting, Grinding, or Other Surface Preparation Activities
 - Fuel Storage and Fuel Dispensing
 - Woodworking Shops
 - Welding Shops
 - Bulk Chemical or Flammables Storage
 - Open Burning
 - Fire Training
 - Rock Crushing or other dust-causing activities

EMD must submit all permit applications directly to the North Carolina Division of Air Quality.

12.3.4 Wetlands (Section 14.0)

work in Waters of the United States or wetlands without an approved permit (even if the work is temporary). Unavoidable impacts to wetlands or waters of the U.S. will require coordination and written approval from the US Army Corps of Engineers for a Section 404 Clean Water Act Permit (Individual or applicable Nationwide Permit), the NC Division of Water Quality for a Section 401 Clean Water Act, Water Quality certification, and the NC Division of Coastal Management for a Federal Consistency Determination. Failure to acquire written authorization for impacts to wetlands and/or waters of the U.S. may result in significant project delays or design modifications. The action proponent must coordinate with Land and Conservation Resources Section, ECON at (910) 451-5063/7235 during project design to ensure Clean Water Act permitting issues are addressed at the earliest opportunity.

12.3.5 Drinking Water/Wastewater

- Approval of Engineering Plans and Specifications for Water Supply Systems. Applicant submits engineering plans and specifications at least 30 days prior to the date upon which the Authorization to Construct is desired. Must have Authorization to Construct prior to onset of work.
- Wastewater Extension Permit. NCDENR Form FTA 02/03 Rev. 3 04/05. Applicant submitting Form FTA 02/03 should plan accordingly and allow the State approximately 90 days to issue the permit. Permit must be in hand prior to onset of work.

13.0 AIR QUALITY

The Air Quality Program is responsible for ensuring that the Installation complies with all applicable Federal and state air quality regulations. Your ROICC or Contract Representative can provide a copy of Base Order 5090.6, Air Quality Management, which has additional information.

13.1 KEY DEFINITIONS AND CONCEPTS

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

13.1.1 Key Definitions

- Ozone-Depleting Substance (ODS). Chemicals, such as certain refrigerants, that cause depletion of the stratospheric ozone layer.
- **Title V Permit.** Permit issued under the Clean Air Act Amendments (CAAA) for all major sources of air pollution. All emission sources at the Installation must be listed on the permit.

13.1.2 Key Concepts

- **Emission Sources**. Please have your ROICC or Contract Representative check with the EMD before beginning any emitting activity to determine whether any recordkeeping requirements apply.
- Permitted Sources. Ensure that construction permits are in place prior to beginning construction.

13.1.3 Environmental Management System

Practices, or activities, associated with air quality include the following:

- Controlled burn operations
- Degreasing
- Engine operation and maintenance
- Paint removal
- Painting

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

• Refrigerant replacement

The potential impacts of these activities on the environment include degradation of air quality, degradation of quality of life, and depletion of nonrenewable resources.

13.2 OVERVIEW OF REQUIREMENTS

Contractors operating aboard the Installation must be aware of, and adhere to, all applicable regulations and requirements regarding air quality, including the following:

- Clean Air Act Amendments of 1990. Protect human health and clean air resources by establishing standards and regulations for the control of air pollutants.
- **Title V Permit.** Outlines the requirements that the Installation must follow to ensure air quality compliance.
- Base Order (BO) 5090.6, Air Quality Management. Implements
 policies and procedures at the Installation level that all personnel
 must follow in order to demonstrate compliance with the Title V
 Permit and USMC requirements.
- Base Bulletin (BBul) 6280, Open Burning of Vegetative Debris.

 Outlines procedures for conducting open burning in accordance with state regulations and Installation procedures.

13.3 PERMIT REQUIREMENTS

A permit is required prior to the construction of any emission source. Timely submittal of the permit application is required to obtain the permit prior to commencing construction.

The Installation has a single permit, the Clean Air Act Title V Construction and Operating Permit, that includes all stationary air emission sources located at the facility; therefore, all permit application submittals to the North Carolina Division of Air Quality (NCDAQ) must be coordinated through the EMD. NCDAQ will review and process the application then issue a permit to construct and operate or to modify the emission source(s). A permit is required prior to the construction of any emission source. Timely submittal of the permit application is required to obtain the final permit prior to commencing construction. The most common types of emission sources at the Installation are as follows:

- Boilers
- Generators
- Engine Test Stands
- Surface Coating/Painting Operations
- Depainting (Chemical or Mechanical), Abrasive Blasting, or Other Surface Preparation Activities
- Fuel Storage and Fuel Dispensing
- Grinding
- Woodworking
- Welding
- Refrigerant Recovery and Recycling Operations or other Ozone-Depleting Substances (e.g., Halon fire extinguishing, cleaning agents)
- Bulk Chemical and Flammable Materials Storage

13.4 ADDITIONAL ACTIVITIES OF CONCERN

Other activities that do not necessarily require modification to the Title V Permit, but that must be coordinated with or tracked by EMD or the State Division of Air Quality, include:

- Use of Refrigerants and other ODS. Includes installation, removal, replacement, conversion, or service of chillers and other refrigerant-containing equipment.
- Open Burning (e.g., right-of-way clearing, storm debris burning). Only vegetative debris may be burned (i.e., NO paper products, trash, treated lumber, shingles, or other synthetic materials). Any plans to conduct open burning activities at the facility must be communicated to EMD and the Fire and Emergency Services Division. Your ROICC or Contract Representative can provide a copy of Base Bulletin 6280, which contains a summary of the Installation's open burning requirements. Any open burning activities that will take place within 1,000 feet of an occupied dwelling require a waiver and approval from occupants and NCDAQ. A waiver form can be downloaded at this site: http://daq.state.nc.us/enf/openburn/openburn_1000ft.pdf
 Five designated sites have been permitted for storing and/or burning storm debris. They are located in the following areas: Mainside on

Sawmill Road, Courthouse Bay, Camp Johnson, Camp Geiger, and MCAS New River. Only storm debris can be accumulated at these sites. EMD must notify the Division of Air Quality if the Installation intends to burn the storm debris at one of these sites. Contact your ROICC or Contract Representative for more information.

• Fire training outside of designated fire training pits. State approval is required to conduct fire training outside of the designated fire training pits. First, complete the Notification of Open Burning for the Training of Firefighting Personnel form. The form is available at the following site:

http://daq.state.nc.us/enf/openburn/ob_firetrain.pdf

An accredited North Carolina Asbestos Inspector must inspect any structure to be burned to ensure that it is free from asbestos before the training exercise. Turn in the completed form to EMD for submittal to NCDAQ and the Division of Public Health, Health

Hazards Control Unit.

• **Dust-causing activities (e.g., rock crushing).** Wet suppression is required during the entire dust-causing operation. Ensure that an adequate water supply is available, and coordinate with the Fire and Emergency Services Division if access to a fire hydrant is necessary.

14.0 NATURAL RESOURCES

The Installation has stewardship and recovery responsibilities over the natural resources located on the installation. These responsibilities are regulated under numerous laws described in this section. The Installation ensures compliance with these laws through an interdisciplinary process of review and coordination of all activities occurring on the installation. Contractors performing work on the Installation are responsible for complying with conditions and measures imposed on their work as a result of this process; these responsibilities include preserving the natural resources within the project boundaries and outside the limits of permanent work, restoring work sites to an equivalent or improved condition on completion of work, and confining construction activities to within the limits of the work indicated or specified. The contractor is advised that the Installation is subject to strict compliance with Federal, State, and Local wildlife laws and regulations. The contractor must not disturb wildlife (birds, nesting birds, mammals, reptiles, amphibians, and fish) or the native habitat adjacent to the project area except when indicated or specified.

14.1 KEY DEFINITIONS AND CONCEPTS

The following key definitions and concepts are associated with natural resources management. If you have any questions or concerns about the information in this section or require assistance regarding any wildlife matters (snakes, nesting birds, nuisance wildlife) on the site or within the project area, please consult with your ROICC or Contract Representative, who will contact Environmental Conservation Branch (ECON) at 910-451-7235 (during working hours) or 910-451-7235 (after working hours).

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

14.1.1 Key Definitions

• Natural Resource. Soil, water, air, plants, and animals, according to the Natural Resources Conservation Service.

- Threatened or Endangered Species. Federally listed plants and animals that are likely to become either endangered or extinct in the foreseeable future.
- Wetland. An area that is regularly saturated by surface water or groundwater and contains vegetation that is adapted for life in saturated soil conditions per the United States Environmental Protection Agency (USEPA).

14.1.2 Key Concepts

- National Environmental Policy Act (NEPA) of 1969. Contractors must obtain and review any NEPA documentation associated with their projects.
- Threatened and Endangered Species. Specific requirements regarding protected areas on the Installation apply to contractor activities.
- **Timber.** Contractors must ensure that the ROICC or Contract Representative notify the Forest Management Program prior to conducting site work. Timber will not be released to contractors without the approval of the Forest Management Program.
- **Wetlands.** Any work in Installation waters or wetlands requires a permit prior to the start of an activity.

14.1.3 Environmental Management System

Practices, or activities, associated with natural resources include the following:

- Construction/demolition
- Controlled burn operations
- Erosion control
- Land clearing
- Riparian buffer maintenance
- Soil excavation/grading
- Stump/brush removal

The potential impacts of these activities on the environment include air emissions, sedimentation, eutrophication of surface waters, degradation of habitat, impacts to marine mammals, damage to commercial and noncommercial timber, impacts to endangered species and cultural resources, and degradation of soil quality.

14.2 OVERVIEW OF REQUIREMENTS

Contractors operating aboard the Installation must be aware of, and adhere to, all applicable regulations and requirements regarding natural resources, including the following:

- BO 5090.11, Protected Species Program. Sets forth regulations and establishes responsibilities to ensure conservation of threatened and endangered species and species at risk aboard MCB Camp Lejeune.
- Clean Water Act (CWA) of 1972. Establishes the basic structure for regulating discharges of pollutants into the Waters of the United States.
- Marine Corps Order (MCO) P5090.2A, Environmental
 Compliance and Protection Manual. Provides guidance and
 instruction to installations to ensure the protection, conservation, and
 management of watersheds, wetlands, natural landscapes, soils,
 forests, fish and wildlife, and other natural resources as vital Marine
 Corps assets.
- NEPA of 1969 (42 U.S.C. 4321 et seq.). Requires Federal agencies, including the Marine Corps, to consider the environmental impacts of projects before the decision maker proceeds with the implementation. All projects that support military training, major and minor military construction, maintenance, and natural resources management actions are reviewed for potential environmental impacts.
- BO 11000.1D, Environmental Impact Review Procedures. Implements the NEPA of 1969 and NEPA policy and guidance in Chapter 12 of MCO P5090.2A.
- **Rivers and Harbors Act of 1899.** Prohibits the excavation, filling, or alteration of the course, condition, or capacity of any port, harbor, or channel without prior approval from the Chief of Engineers.

Consult with your ROICC or Contract Representative to obtain or review any NEPA documentation associated with the project in your contract.

The contractor is responsible for advising the ROICC or Contract Representative to notify the Forest Management Program at (910) 451-7223 prior to beginning site work.

14.3 National Environmental Policy Act (NEPA)

Staff specialists from various Installation departments participate in the NEPA process, which coordinates the review of projects and documents environmental impacts (or lack thereof) for projects before implementation.

The documentation of this review process occasionally includes mandatory conditions affecting design and construction/implementation of the project. The documentation, when completed, is provided to the action proponent, who is expected to provide it to his or her ROICC or Contract Representative.

Consult with your ROICC or Contract Representative to obtain or review any NEPA documentation associated with the project in your contract. The documentation marks the end of the NEPA review process; it does not constitute approval for the proponent of the action to implement the action. Some contracts may include stipulations from the NEPA document that must be implemented prior to the onset of work to prevent environmental impacts and violations of Federal or state rules and regulations. Stipulations could include: replacing monitoring wells if damages occur from contractor operations; stopping work if contamination is encountered; notification that a wetlands permit is required; seasonal restrictions, etc.

14.4 Timber

Potential timber resources are identified during the NEPA process. The contractor is responsible for advising the ROICC or Contract Representative to notify the Forest Management Program at (910) 451-7223 prior to beginning site work. Additionally, the ROICC or Contract Representative and/or contractor is required to notify the Forest Management Program in the event the contract has been amended with modifications to the site location.

The Forest Management Program maintains first right of refusal for all timber products on construction projects and will determine whether the government will harvest the timber or release it to the contractor. The government retains exclusive rights for all forest products on construction projects. If the government elects to harvest the timber, only merchantable

timber will be removed. Per MCO P5090.2A, Chapter 11, "Forest products will not be given away, abandoned, carelessly destroyed, used to offset costs of contracts, or traded for products, supplies, or services."

Contractors must adhere to the following requirements when performing site work that may impact timber resources:

- Do not remove, cut, deface, injure, or destroy trees or shrubs, without authorization from the ROICC or Contract Representative.
- Do not fasten or attach ropes, cables, or guys to existing nearby trees
 for anchorages without authorization from the ROICC or Contract
 Representative. (In such cases that these actions are authorized, the
 contractor shall be responsible for any resultant damage.)
- Protect existing trees that are to remain in place and that may be injured, bruised, defaced, or otherwise damaged by construction operations.
- With the ROICC or Contract Representative's approval, use approved methods of excavation to remove trees with 30 percent or more of their root systems destroyed.
- With the ROICC or Contract Representative's approval, remove trees and other landscape features scarred or damaged by equipment operations, and replace with equivalent, undamaged trees and landscape features.

Please refer to Section 9.0 for disposal information for land-clearing debris.

14.5 Threatened and Endangered Species

With the exception of improved roadways, entry into a threatened or endangered species site or shorebird nesting area marked with signs and/or white paint is prohibited without written permission from Installation personnel. BO 5090.11 lists threatened and endangered species residing on Installation. The following restrictions apply on the Installation unless written permission is received from Installation personnel:

Protect existing trees that are to remain in place and that may be injured, bruised, defaced, or otherwise damaged by construction operations.

Entry into a threatened or endangered species site or shorebird nesting area marked with signs and/or white paint is prohibited without written permission from Installation personnel.

- Work on Onslow Beach or Brown's Island is not permitted between 1 April and 31 October. Traffic on the beaches should be limited to below the high tide line.
- Vehicles and lighting are prohibited on the beaches overnight between 1 May and 31 October.
- Construction activities are prohibited within 1500 feet of a bald eagle's nest (JD Training area).
- Cutting or damaging of pine trees is not permitted.
- Alteration of hydrology through excavation, ditching, etc., is prohibited.
- Fish and wildlife must not be disturbed.
- Water flows may not be altered; the native habitat adjacent to the project and critical to the survival of fish and wildlife may not be significantly disturbed, except as indicated or specified.

14.6 Wetlands

14.6.1 Avoidance

In accordance with MCO P5090.2A, all facilities and operational actions must avoid, to the maximum degree feasible, wetlands destruction or degradation regardless of wetland size or legal necessity for a permit. Prior to the onset of construction, coordination with the Land and Conservation Resources Section of EMD should have taken place during project design to ensure Clean Water Act permitting issues are addressed by the contractor at the earliest opportunity. Contractors must incorporate avoidance and minimization measures in order to comply with the national policy to permit no overall net loss of wetlands. Any proposed action significantly affecting wetlands must be coordinated with the Commanding Officer of MCB Camp Lejeune.

The contractor must ensure that construction of all buildings, facilities and related amenities, including earthwork, grading, landscaping, drainage,

¹ Contractor must meet concept design criteria while incorporating avoidance and minimization measures to protect wetlands, streams and Waters of the United States.

Contractors must incorporate avoidance and minimization measures in order to comply with the national policy to permit no overall net loss of wetlands.

stormwater management, parking lot and paved roadway, sidewalks, site excavation, sanitary sewer system extensions, and domestic water extensions, avoids, to the maximum degree feasible, wetlands destruction or degradation.

Identified and mapped boundaries of legally defined wetlands on all Marine Corps lands within the project area will be distributed to the ROICC or Contract Representative for use (if available) and shall be included in all design products including drawings, plans, and figures.

14.6.2 **Permits**

All unavoidable potential impacts to wetlands or Waters of the United States require prior coordination as described in this section. Failure to acquire written authorization for impacts to wetlands and/or Waters of the United States may result in significant project delays or design modifications.

No discharge of fill material, mechanized land clearing, or any other activity is allowed in jurisdictional wetlands or Waters of the United States without the proper approvals. The contractor may be responsible for obtaining the following permits (including pre-permit coordination, preparation, and submission of all permit applications after review and concurrence by the Installation) and complying with all regulations and requirements stipulated by the State of North Carolina as conditions upon issuance of the permits:

- United States Army Corps of Engineers (USACE), Section 404
 Permit (Individual or applicable Nationwide Permit); Clean Water
 Act (CWA) of 1977, as Amended (Public Law 95-217, 33 U. S. C.
 1251 et seq.)
- North Carolina Division of Water Quality (NCDWQ), Section 401
 Water Quality Certification (15A NCAC 02H) N.C. Department of
 Environment and Natural Resources (NCDENR); Clean Water Act
 (CWA) of 1977, as Amended (Public Law 95-217, 33 U. S. C. 1251
 et seq.)

If work in wetlands is required, be sure you know who is responsible for obtaining permits, and what the terms and conditions of the permits require.

 North Carolina Division of Coastal Management (NCDCM), Federal Consistency Determination (15A NCAC 07) NCDENR; Coastal Zone Management Act (CZMA) of 1972 (16 U. S. C. 1451 et seq.)

Two types of activities generally require a permit from the USACE:

- Activities within navigable waters. Activities such as dredging, constructing docks and bulkheads, and placing navigation aides require review under Section 10 of the Rivers and Harbors Act of 1899 to ensure that they will not cause an obstruction to navigation.
- Activities in wetlands and Waters of the United States (regulated by Section 404 of the CWA of 1972). A major aspect of the regulatory program under Section 404 of the CWA is determining which areas qualify for protection as wetlands. Contractors should contact the USACE, the NCDWQ, or the NCDCM if there is any question about whether performing any activities could impact wetlands.

Contractors working on the Installation will not perform any work in Waters of the United States or wetlands without an approved permit (even if the work is temporary). Examples of temporary discharges include dewatering of dredged material prior to final disposal and temporary fills for access roadways, cofferdams, storage, and work areas.

14.6.3 Impacts

Any disturbance to the soil or substrate (bottom material) of a wetland or water body, including a stream bed, is an impact and may adversely affect the hydrology of an area. Discharges of fill material generally include the following, without limitation:

- Placement of fill material that is necessary for the construction of any structure or impoundment requiring rock, sand, dirt, or other material for its construction; site-development fills for recreational, industrial, commercial, residential, and other uses; and causeways or road fills
- Dams and dikes
- Artificial islands

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).

- Property protection or reclamation devices such as riprap, groins, seawalls, breakwaters, revetments, and beach nourishment
- Levees
- Fill for intake and outfall pipes and subaqueous utility lines
- Fill associated with the creation of ponds
- Any other work involving the discharge of fill or dredged material

14.6.4 Mitigation

Any facility requirement that cannot be sited to avoid wetlands must be designed to minimize wetlands degradation and must include compensatory mitigation as required by wetland regulatory agencies in all phases of project planning, programming, and budgeting.

The contractor may be required to develop on-site mitigation, consisting of wetland/stream restoration or creation for all unavoidable wetland and stream impacts whenever possible and feasible. Use of Marine Corps lands and lands of other entities may be permissible for mitigation purposes for Marine Corps projects when consistent with USEPA and USACE guidelines or permit provisions. Land within the project area suitable for establishment of wetlands mitigation may be evaluated by the contractor and used for mitigation where compatible with mission requirements and approved by the Commanding Officer. Proposals for permanent resource areas must be approved by the Assistant Secretary of the Navy (Installations and Environment) or his/her designee.

Off-site mitigation should be proposed only if there is no other reasonable compensatory mitigation alternative.

14.7 Temporary Construction

Traces of temporary construction facilities, such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other signs of construction, should be removed. Temporary roads, parking areas, and similar temporarily used areas should be graded to conform to surrounding contours.

The contractor may be required to develop on-site mitigation consisting of wetland/stream restoration or creation for all unavoidable wetland and stream impacts whenever possible and feasible.

General EMS & Environmental Awareness Training for Contractors & Vendors



Attachment (1)



MCB Camp Lejeune, NC/ MCAS New River



General EMS and Environmental Awareness Training for Contractors and Vendors





Disclaimer

- This training does not replace any required regulatory environmental training as per your contract
 - Required environmental training should be completed *prior* to working aboard the Installation
 - Training records should be available for review upon request





Training Overview

- EMS and the Environmental Policy
- Environmental Management Division
- General Environmental Awareness
- Spill Response Basics
- Summary





EMS and the Environmental Policy







What is an EMS?

- MCB Camp Lejeune and MCAS New River have implemented an Environmental Management System (EMS) that is founded on the principles of our respective **Environmental Policy**.
- The purpose of the EMS is to sustain and enhance mission readiness and access to training areas through effective and efficient environmental management.
- The EMS emphasizes that the authority and principal responsibility for controlling environmental impacts belong to those commands, units, offices, and personnel, *including contractors and vendors*, whose activities have the potential to impact the environment.



Why have an EMS?

"To sustain our operations and training capabilities, and to safeguard land-use availability, will comply with environmental laws and conserve the natural and cultural resources with which it has been entrusted."

Excerpt from the Commanding Officer's Environmental Policy Statement



What YOU Need to Know

- The Installation has an EMS
- These three goals are the foundation of our Environmental Policy:
 - 1. Comply with relevant environmental laws and regulations
 - 2. Prevent pollution
 - 3. Continually improve our EMS





YOUR EMS Responsibilities

- Be aware of the Environmental Policy
- Be familiar with spill procedures
- Keep your eyes open for potential problems
- Report any environmental problems or concerns promptly and notify your ROICC or Contract Representative
- Utilize this training for your workers





Environmental Management Division (EMD), MCBCL

Environmental Affairs Department (EAD), MCASNR





EMD/EAD can help!

- The appropriate environmental office works with your ROICC or Contract Representative to ensure:
 - Proper management of waste
 - Compliance with regulations
 - Required environmental plans are developed and followed, if applicable
 - Required environmental training material is provided for contractor use





What Does EMD/EAD Do for You?



■ If you have EMS or environmentally related questions, contact your ROICC or Contract Representative who will then work with EMD & EAD to determine how to proceed



Remember...

ALL environmental program requirements are applicable to ALL contractors and vendors working aboard the Installation!





General Environmental Awareness





Water Quality

- Construction/demolition and other projects can result in:
 - Stormwater pollution
 - Erosion and sedimentation

■ If a project could impact water quality:

- Don't dispose of oil, chemicals, or any other material/debris down storm drains
- Keep sediment, leaves, and construction debris away from storm drains (use barriers)
- Sediment Erosion Control Plans are required for sites when more than 1 acre will be disturbed





Used Oil

■ Oil handling/changing operations can result in:

- Spills
- Waste



Groundwater, stormwater, or soil contamination

■ If a project involves the use of oil:

- Perform maintenance in paved, designated areas
- Recycle used oil, oil filters, and other fluids...don't dump down storm drain or dispose of in the trash
- Clean up spills immediately and properly!





Air Quality

If a project could impact air quality:

Prior to beginning operations, have your ROICC or Contract Representative contact the Installation Air Quality Program representative for applicable Federal and state permitting requirements



- Follow all permit requirements, including material usage recordkeeping for Title V permit sources
- Notify your ROICC or Contract Representative before bringing new equipment on site
- Notify your ROICC or Contract Representative before modifying an existing permitted source (including physical changes and material changes). Examples of permitted sources include boilers, generators, fuel tanks, and welding/soldering operations





Hazardous Waste Management

■ Hazardous waste generation can result in:

- Consumption of natural resources
- Increased Regulatory Burden

■ If a project generates hazardous waste:

- Reduce/Minimize the generation of hazardous waste
- Contact your ROICC or Contract Representative if unsure how to manage a waste
- Don't put hazardous wastes into general trash dumpsters
- Ensure satellite accumulation areas (SAA) are managed properly
 - Notify your ROICC or Contract Representative prior to creating a new SAA!
- Ensure hazardous waste drums are labeled and lids are secured





Hazardous Materials

- If a project requires the use hazardous material (HAZMAT):
 - Keep flammable materials in HAZMAT lockers
 - Don't store large quantities keep on hand only what you will use
 - Maintain MSDSs for each material on-site
 - Place materials stored outside in secondary containment to prevent spill/reduce releases
 - Stop work if you unearth a hazardous material (i.e., ordnance) and report to your ROICC or Contract Representative





PCB and Asbestos

■ If a project generates or involves the removal of PCB or asbestos:

Manage and handle PCB and asbestos only if you are properly trained



Manage PCB and asbestos in proper containers with appropriate labeling





Solid Waste Management

- Solid waste generation can result in:
 - Consumption of natural resources
 - Decreased landfill space





- Reduce/Reuse/Recycle when possible; meet contract requirements for recycling
- Contact your ROICC or Contract Representative if unsure how to manage a waste
- Don't put unauthorized wastes into general trash dumpsters Recyclable products should be placed in appropriate containers & not co-mingled with solid waste
- Don't use government-owned dumpsters for your contractor waste and debris



Good Housekeeping

- Poor housekeeping can result in:
 - Fines, termination of contract
 - Environmental contamination, spills
 - Injuries



- Maintain good housekeeping:
 - **DO** store flammable materials in HAZMAT lockers
 - **DO** ensure containers are labeled and lids are secured
 - **DO** keep stormwater drains clear of debris
 - **DO** clean up work sites at the end of *each* day
 - **DO** clean up spills immediately and properly
 - DO clean up work area after job completion
 - **DON'T** pour material down storm or floor drains
 - **DON'T** stockpile waste put it where it belongs!



Spill Response Basics





If You Have or See a Spill...

Call 911





Natural Resources — Threatened & Endangered Species

The Installation is currently home to nine federally listed endangered species: red-cockaded woodpecker (RCW), green sea turtle, loggerhead sea turtle), rough-leaved loosestrife, seabeach amaranth, piping plover, American alligator, and American bald eagle and Hirst's panic grass.





- The following restrictions apply:
 - Construction activities are restricted within 1500 ft of a bald eagle's nest
 - Vehicles & lighting are prohibited on the beaches overnight = 1 May -31 Oct
 - Cutting or damaging pine trees in not permitted
 - Fish & wildlife must not be disturbed





Natural Resources – Wetlands

- The US Army Corps of Engineers defines a wetland as "areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions."
- No discharge of fill material, mechanized land clearing, or any other activity is allowed in jurisdictional wetlands or Waters of the United States without the proper approvals.
- Permits will be required



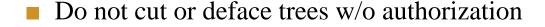




Natural Resources – Timber

There are over 127,000 acres of forested land aboard the Installation

- The MCBCL Forest Management Program has 1st right of refusal for all timber products on construction projects
 - The following restrictions apply:



- Protect existing trees that are to remain in place
- Do not fasten or attach ropes or cables to existing nearby trees for anchorages w/o authorization





Cultural Resources

The Installation manages a variety of historic and prehistoric archaeological sites, as well as historic structures.

■ IF YOU FIND A BONE, BOTTLE OR PIECE OF POTTERY THAT YOU THINK MIGHT HAVE ARCHAELOGICAL OR HISTORIC INTEREST, DON'T PICK IT UP. IF YOU FIND ANY OF THESE THINGS, MARK THE AREA & NOTIFY THE BASE ARCHAEOLOGIST, EMD AT 451-5063.











Summary





Summary

- MCB Camp Lejeune and MCAS New River protect, preserve, and enhance their natural resources through their EMS and Environmental Policies
 - **We comply** with relevant environmental laws and regulations
 - We prevent pollution
 - **We continually improve** the EMS
- YOU are responsible for complying with applicable environmental requirements too
- If you aren't sure what to do...**ASK**!
 - Your ROICC or Contract Representative and EMD/EAD are here to help





Remember...

Consult the *Contractor Environmental Guide* for more detailed information pertaining to environmental requirements applicable to the work you do.

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



SECTION 01 60 00

REQUIREMENTS FOR PESTICIDE AND HERBICIDE COORDINATION

02/12

PART 1 GENERAL

1.1 SUBMITTALS

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

SD-07 Certificates

Certificate of North Carolina Licensed Applicator

SD-11 Closeout Submittals

Completed Field Pesticide/Herbicide Management Record Form

1.2 QUALITY ASSURANCE

1.2.1 Certificate of North Carolina Licensed Applicator

A North Carolina licensed applicator is required. Submit a copy of the certificate(s) to the Base Pest Management Coordinator (PMC) through the Contracting Officer.

PART 2 PRODUCTS

2.1 PESTICIDE/HERBICIDE LIST FOR CAMP LEJEUNE

The Contractor shall comply with Base Regulations and use only approved pesticides listed on the current "Approved Pesticide List for Camp Lejeune, NC". The attached document is current as of the date indicated but may be revised at any time. The approved list that is current at the time of application must be utilized. Contact the Contract Officer to obtain the current approved list.

PART 3 EXECUTION

3.1 COORDINATION WITH BASE PEST MANAGEMENT COORDINATOR (PMC)

Contractor shall coordinate with the PMC before proceeding with any pesticide/herbicide application.

3.2 FIELD PESTICIDE/HERBICIDE MANAGEMENT RECORD FORM

Following the pesticide/herbicide application, the Contractor shall complete the attached Field Pesticide/Herbicide Management Record Form and submit to the Base Pest Management Coordinator (PMC) through the Contracting Officer. The completed form(s) shall be submitted within 15 days after application.

-- End of Section --

APPROVED PESTICIDE LIST FOR CAMP LEJEUNE NC

IPM - APPENDIX E

Updated: 5 Jan 2012

IPW - APPENDIA E		
Trade Name		REMARKS
Demon TC	Insecticide	Approve
<u> </u>	Rodenticide	Approve***
Demand CS (NSN#6840-01-428-6646)	Insecticide	Approve
Reward (NSN#6840-01-005-7523)	AQUATIC weeds	Approve
Archer	Roaches	Approve
Monument 75WG	Weeds	Approve
Barricade 4FL	Insecticide	Approve
Demon Max	Insecticide	Approve
Subdue 2E (Discontinued:use until depleted)	Fungicide	Approve
Barricade 65 WG	Crabgrass,weeds	Approve
Primo MAXX	Growth Regulator	Approve
Demon WP	Insecticide	Approve
Demon EC	Insecticide/Gen Household	Approve
Demon TC	Ants, Termites	Approve
Weather Block	Rodenticide	Approve***
Demand CS	Insecticide	Approve
Demon WP	Insecticide	Approve
Pyrocide	Insecticide	Approve
Archer	Roaches	Approve
Conquer	Insecticide	Approve
Cirrus Fogging Concentrate	Insecticide	Approve
Three-Way (Labeled "DANGER")	Herbicide	Approve
Stonewall .43% Plus Fertilizer	Herbicide	Approve
ULD BP-300	Insecticide	Approve
Pro-Control Fogger II	Insecticide	Approve
ULD BP-100	Insecticide	Approve
Avitrol Whole Corn	Avicide	Approve
Contrac All Weather Cake	Rodenticide	Approve***
Bell Rodent Cake (Quintox)	Rodenticide	Approve***
	Rodenticide	Approve***
Contrac Bait (Note: use only OUTSIDE of bldgs)	Rodenticide	Approve
Contrac All Weather Bait Blocks (NSN#6840-01-501-2858)	Rodenticide	Approve
	Rodenticide	Approve
Terro Ant Bait Gel	Insecticide	Approve
Tim-Bor	Termites	Approve
Maxforce Roach Control System	Insecticide	Approve
Maxforce Pharaoh Ant Killer	Insecticide	Approve
	Algaecide	Approve
	· · · · · · · · · · · · · · · · · · ·	Approve
	+	Approve
SpeedZone	· · · · · · · · · · · · · · · · · · ·	Approve
•	Weeds	Approve
	· • • • • • • • • • • • • • • • • • • •	Approve
Polaris AC (G10 Aerial Spray approved 5/18/2010)	·	Approve
		Approve
	Insecticide	Approve
Ortho Home Defense	HINSCULLIGE	
Ortho Home Defense Ortho Weed B-Gone / Crabgrass Killer	Weeds/Crabgrass	Approve
	Demon TC WeatherBlok XT (formerly 10182-339) Demand CS (NSN#6840-01-428-6646) Reward (NSN#6840-01-005-7523) Archer Monument 75WG Barricade 4FL Demon Max Subdue 2E (Discontinued:use until depleted) Barricade 65 WG Primo MAXX Demon WP Demon EC Demon TC Weather Block Demand CS Demon WP Pyrocide Archer Conquer Cirrus Fogging Concentrate Three-Way (Labeled "DANGER") Stonewall 43% Plus Fertillizer ULD BP-100 Avitrol Whote Corn Contrac All Weather Cake Bell Rodent Cake (Quintox) Liqua-Tox II (NSN#6840-00-753-4972) Contrac Blox (Super Size) Terro Ant Bait Gel Tim-Bor Maxforce Pharaoh Ant Killer K-Tea Simazine 4L Gordans Brushkiller SpeedZone Southern Speedzone Cool Power	Demon TC Insecticide WeatherBick XT (formerly 10182-339) Rodenticide Demand CS (NSN#6840-01-428-6646) Insecticide Reward (NSN#6840-01-005-7523) AQUATIC weeds Archer Roaches Monument 75WG Weeds Barricade 4FL Insecticide Demon Max Insecticide Subdue 2E (Discontinued:use until depleted) Fungicide Barricade 65 WG Crabgrass, weeds Primo MAXX Growth Regulator Demon WP Insecticide Demon WP Insecticide/Gen Household Demon WP Insecticide/Gen Household Demon TC Ants, Termites Weather Block Rodenticide Demon WP Insecticide Demon WP Insecticide Demon WP Insecticide Pyrocide Insecticide Conquer Insecticide Cirrus Fogging Concentrate Insecticide Cirrus Fogging Concentrate Insecticide ULD BP-300 Insecticide ULD BP-300 Insecticide

241-299-228	Polaris AC	Herbicide	Approve
241-322	Amdro Pro Fire Ant Bait	Fire Ants	Approve
241-365	Plateau (NSN#6840-01-525-5869)	Herbicide	Approve
241-372	Sahara DG Herbicide	Cracks, Concrete	Approve
241-392	Phantom (NSN#6840-01-525-7139)	Insecticide	Approve
	Habitat (NSN#6840-01-532-5403)		:
241-426	(Note:only MCAS is approved for use to control alligator weeds)	Herbicide	Approve
241-430	Chopper Gen2 (Wildlife)	Herbicide	Approve
2724-274	Golden Malrin (NSN#6840-01-183-7244)	Flying insects	Approve
2724-304-50809	Gencor 5E	IGR	Approve
2724-311-50809	Gencor Fogger	IGR	Approve
2724-324-50809	Gencor Plus Fogger	IGR	Approve
2724-351	Gentrol IGR (NSN#6840-01-318-7416)	Roaches	Approve
2724-404-50809	Petcor Flea Spray	IGR	Approve
2724-421	Altosid XR Briquets (NSN#6840-01-424-2495)	AQUATIC mosquito larvae	Approve
2724-451	Prestrike IGR	Insecticides	Approve
2724-475	Extinguish Professional Fire Ant Bait	Fire Ants	Approve
2724-490	Precor 2000 Plus / Premise	Insecticide	Approve
279-3062	Dragnet	Insecticide	Approve
279-3105	Talstar Flowable Insecticide/Miticide	Insecticide	Approve
279-3162	Talstar lawn & Tree Flowable Insecticide/Miticide	Insecticide	Approve
279-3167	Talstar GC Granular Insecticide	Insecticide	Approve
279-3168	Talstar PL	Insecticide	Approve
279-3206	Talstar One (Pre-treat for Termites)(NSN#6840-01-525-6888)	Insecticide	Approve
3125-121	Baygon 2% Bait	Insecticide	Approve
3125-390	Tempo Ultra WP	Insecticide	Approve
3125-498	Tempo SC Ultra	Insecticide	Approve
352-346	Hyvar XL (NSN#6840-00-392-7593)	Herbicide	Approve
352-439	Escort XP	Kudzu	Approve
352-627	Advion Fire Ant Bait Granular	Insecticide	Approve
352-643	TranXit	Weeds	Approve
352-651	Advion Insect Granule	Rodenticide	Approve
352-652	Advion Cockroach Gel Bait	Insecticide/Roaches	Approve
352-664	Advion Ant Bait Arena	Insecticide	Approve
352-668	Advion Roach Arena	Roaches	Approve
352-746	Advion Ant Gel Bait	Ants	Approve
352-776	Arilon	Insecticide	Approve
35915-12-48234	Regal Wynstar	Weeds	Approve
397-13	SteriFab (Mattress Sanitizer)	Insecticide/Sanitizer	Approve
40208-2	RAZE	Crawling & Flying insects	Approve
42750-29	Weed-Hoe 108	Weeds	Approve
432-1217	TOP CHOICE Fire Ant / Fipronil (Labeled "RESTRICTED USE") (NSN#6840-01-585-9950)	Insecticide/Fire Ants	Approve
432-1223	ProStar 70 WP	Fungicide	Approve
432-1231	Illoxan 3EC (Discontinued:use until depleted)	Goosegrass, crabgrass	Approve
432-1251	Maxforce Roach Station	Insecticide	Approve
432-1254	Maxforce Gel Bait	Roaches	Approve
432-1255	Maxforce Granular Insect Bait	Insecticide	Approve
432-1256	Maxforce Ant Bait Stations (NSN#6840-01-298-1122)	Insecticide	Approve
432-1257	Maxforce FC (Sml Roach)	Insecticide	Approve
432-1264	Maxforce FC Ant Killer Bait Gel (NSN#6840-01-500-4579)	Insecticide	Approve
432-1318	Prokox Zenith 75 WSP	Turf Pests	Approve

432-1331	Premise (Pre Construction Insecticide)	Insecticide	Approve
432-1332	Premise 75 / Centerfire 75 WSP	Termites	Approve
432-1332-73748	Imaxx Pro	Insecticide	Approve
432-1368	Premise Gel	Insecticide	Approve
432-1375	Maxforce Fly Granular Bait (NSN#6840-01-518-5807)	Flying insects	Approve
432-1391	Premise Foam	Termites	Approve
432-1433	MaxForce FC Fire Ant Bait	Insecticide	Approve
432-1449	Premise Pro	Insecticide	Approve
432-1455	Maxforce Fly Spot Bait (NSN#6840-01-555-9369)	Insecticide	Approve
432-1460	Maxforce FC Magnum Roach Killer Bait Gel	Insecticide/Roaches	Approve
432-1477	ProStar 70 WDG	Insecticide	Approve
432-1483	Temprid SC	Ants, Roaches	Approve
432-667	SCOURGE (Labeled "RESTRICTED USE") Note: BASE use only	Mosquitos	Approve
102 001	SCOURGE (Labeled "RESTRICTED USE")(NSN#6840-01-359-8533)	Modulios	, pp. 515
432-716	Note: PrevMed or BASE use only	Mosquitos	Approve
432-763	Suspend SC	Ants	Approve
432-772	Delta Dust (NSN#6840-01-431-3345)	Bees,Wasps,Hornets	Approve
432-824	DeltaGard G Insecticide Granules	Ants	Approve
432-835	Delta Guard GC	Insecticide	Approve
432-836	DeltaGard G Insecticide Granules	Insecticide	Approve
432-900	Termidor 80 WG	Insecticide	Approve
432-901	Termidor SC	Insecticide	Approve
432-992	Drione Dust	Insecticide/Gen Household	Approve
44313-4-550	Borid	Insecticide	Approve
47000-73-1677	SSI-50	Insecticide	Approve
4787-23	Glyfos X-tra	Weeds & Vines	Approve
4816-353	Drione Insecticide	Insecticide	Approve
4822-167	OFF Deep Woods Insect Repellent-6 oz (SERVMART-GSA)	Insecticide	Locally approved
48234-15	RegalStar II Weed & Feed	Weeds	Approve
48813-1	Saf-T-Side	Insecticides	Approve
499-147	Whitmire PT 270 Dursban (Discontinued:use until depleted)	Insecticide	Restricted-cxld 2001
499-156	Whitmire PT 260 Diazinon (Discontinued:use until depleted)	Insecticide	Restricted-cxld 2004
499-233	Whitmire PT 170 X-clude	Insecticide	Approve
499-235	Whitmire PT 170A X-clude	Insecticide	Approve
499-290	PT 565 Plus XLO (NSN#6840-00-823-7849)	Roaches	Approve
499-294	Avert Dry Flowable Cockroach Bait/ Whitmire AvertPT310 Abamectin Dust (NSN#6840-01-561-9766)	Insecticide/Roaches	Approve
499-304	Cy-Kick CS Prescription Treatment	Insecticide	Approve
100.003	Wasp Freeze / Wasp Stopper II Plus / Whitmire PT 515 Wasp Freeze	I I I I I I I I I I I I I I I I I I I	, рргото
499-362	(NSN#6840-00-459-2243)	Wasps, bees, hornets	Approve
499-370	Advance 375A Select Granular Ant Bait / PT Advance Granular Ant Bait / Whitmire PT 370 Ascend Fire Ant Bait	Insecticides/Ants	Approve
499-373	PT Orthene / Orthene Crack & Crevice Residual	Ants,Roaches	Approve
499-381	PT Microcare	Insecticide	Approve
499-384	Perma Dust Boric Acid Aerosol (NSN#6840-01-287-3938)	Roaches	Approve
499-385	Tri-Die	Insecticide	Approve
499-394	Whitmire Avert Prescript Treatment 320 Crack&CreviceGelBait	Insecticide	Approve
499-404	Ultracide Flea IGR & Adulticide	Insecticide	Approve
499-406	Avert Prescription Treatment Cockroach Bait Gel Formula 2	Insecticide	Approve
499-410	Avert Prescription Treatment TC 93B Cockroach Bait Gel	Insecticide	Approve
499-444	PT 580P (Pyrethrins) / Whitmire P.I. Contact Insecticide	Insecticide	Approve
499-450	Pyrethrin / PBO / UDL BP-300 (NSN#6840-01-104-0780)	Adult Mosquitos	Approve
		* **********	
499-452	BP-100	Insecticide	Approve

499-459	Advance Dual Choice Ant Bait Stations	Insecticide	Approve
499-462	Pro-Control Plus	Insecticide	Approve
499-465	Pro-Control	Insecticide	Approve
499-470	Cy-Kick (NSN#6840-01-561-9717)	Insecticide	Approve
499-501	PT 250 Propoxur (NSN#6840-01-338-2486)	Insecticide	Approve
499-518	PT 2% Propoxur Bait	Insecticide	Approve
499-535	Cyhalocap CS	Pesticide	Approve
50404-5	Permanone Aerosol 0.5% (NSN#6480-01-278-1336) Bldg 1606 Re-issue	Tick/Mosquito Repellant	Approve
50404-6	Permanone Aerosol 0.5% (NSN#6480-01-278-1336) Bldg 1606 Re-issue	Tick/Mosquito Repellant	Locally approved
50534-202	Daconil Ultrex	Fungicide	Approve
51036-330-59807	OHP 6672 50W	Fungicide	Approve
51036-392	Bifenthrin Pro	Insecticide	Approve
524-343	Aqua Master	AQUATIC Herbicide	Approve
524-454	Honcho Plus Herbicide (G10 Aerial Spray approved 5/18/2010)	Weeds & Vines	Approve
524-465	Manage (Discontinued:use until depleted, see SedgeHammer)	Nutsedges	Approve
524-475	ROUND-UP PRO / Ranger Pro (NSN#6840-01-108-9578)	Herbicide/Weeds	Approve
524-535	Quick Pro Roundup (NSN#6840-01-399-0673)	Weeds & Vines	Approve
53883-118	Bifenthrin	Insecticide	Approve
53883-124	Bifen LP Granules	Insecticide	Approve
53883-125-48234	Broadcide (Labeled "RESTRICTED USE") Note: MCCS Golf Crs use	Insecticide	Approve
53883-165-73220	Qualif-Pro Bifenthrin 7.9 (Labeled "RESTRICTED USE") Note: MCCS Golf Crs use	Insecticide	Арргоче
55809-3	Wasp & Hornet Killer Plus (SERVMART-GSA)	Insecticide	Locally approved
56-42	JT Eaton Bait Block Rodenticide	Rodenticide	Approve
56-58	JT Eaton AC Formula (NSN#684CL0002194) Note: used in tamper-resistant bait stations unless they are being placed into rodent burrows	Rodenticide	Approve
58007-1	DEET repellent / Ultrathron/arthropod (NSN#6840-01-284-3982)	Mosquitos	Approve
58630-1	Snake-A-Way	Repellent	Approve
59639-114	Esteem Ant Bait	Fire Ants	Approve
59639-31	Orthene PCO Pellets	Insecticide	Approve
60063-26-10404	Stonewall 65WDG	Herbicide	Approve
6218-47	Summit Bti Briquets (NSN#6840-01-377-7049)	AQUATIC Mosquito larvae	Approve
62719-175	SnapShot 2.5 TG	Herbicide	Approve
62719-260	Crossbow Brush Killer	Weeds & Vines	Approve
62719-324	Rodeo / Accord (NSN#6840-01-356-8893)	AQUATIC herbicide	Approve
62719-37	Garion 3A (NAVFAC Disapproved 10/9/08)	Kudzu	Disapproved
62719-37-67690	Renovate 3 (Labeled "DANGER"-follow label/PPE guidelines)	Herblcide/Weeds	Approve
62719-388	Fore 80 WP Rainshield	Fungicide	Approve
62719-397	Kerb 50 WP	Weeds	Approve
62719-40	GARLON 4 / Element 4	Kudzu	Approve
62719-426	Dimension EC	Weeds	Approve
62719-529	Scythe Herbicide	Cracks, Flowerbeds	Approve
62719-553		Herbiclde	Approve
63120-1	Insect/Arthropod Repellent Fabric Treatment (Note: PrevMed Use)	Insecticide	Approve
64248-1	Maxforce Roach Control System	Insecticide	Approve
64248-11	Maxforce FC Roach Bait Stations	Insecticide	Approve
64248-12	Maxforce Large Roach Bait F03	Insecticide	Approve
64248-14	Maxforce FC Roach Killer Bait Gel	Insecticide	Approve
64248-19		Ants	Approve
64248-2		Ants	Approve
64248-21	Maxforce EC Bait Gel	Insecticide	Approve

64248-5	Maxforce Roach Killer Bait Gel	Roaches	Approve
64248-6	Maxforce Ant Killer/Granular Bait	insecticide	Approve
64405-1	Bora-Care Bora-Care	Insect/Fungicide	Approve
64405-2	Niban Fine Granular Bait	Fire Ants	Approve
64405-8	Tim-Bor	Wood Destroying Fungi	Approve
655-798	ExciteR	Insecticide	Approve
655-802	Larva-Lur	Insecticide	Approve
	PrimeraOne Chlorothalonii DF (Labeled "DANGER"-follow label/PPE		
66222-149-73220	guidelines) Note:MCCS Golf Crs use	Insecticide	Approve
66222-212-48234	Solace	Insecticide	Approve
66222-22	PRAMITOL 25E (NSN#6840-00-145-0013)	Weeds	Approve
67425-14	EcoPCO ACU	Insecticide	Approve
67425-15	EcoPCO WPX	Insecticide	Approve
6754-22-5802	Drione	Insecticide	Approve
6959-51	Cessco 5 E	Insecticide	Approve
70506-6	Tenguard	Insecticide	Approve
7173-188	Maki Pellets (NSN#6840-01-151-4884)	Rodenticide	Approve
7173-258	First Strike (NAVFAC Disapproved 8/12/2011)	Rodenticide	Disapproved
•	ROUND-UP READY TO-USE-PLUS (NSN#6840-01-377-7113)		
71995-33	"issued to units only thru SELF HELP:Office 451-0072"	Weeds	Approve
74005 00	ROUND-UP READY TO USE-PLUS POISON IVY],
71995-36	"issued to units only thru SELF HELP:Office 451-0072"	Polson Ivy/Vines	Approve
72155-55	Bayer Advanced	Insecticide	Approve
72155-58	Tempo 2.5 SC Ultra	Insecticide	Approve
73079-2	In Tice granular bait	Roaches	Approve
73342-1	AMDRO / Spectracide Fire Ant Killer (Lowe's) (NSN#6480-01-287-3913)	Fire Ants	Approve
7969-209	Termidor 80 WG (NSN#6840-01-483-3072)	Termites	Approve
7969-210	Termidor SC T/L (NSN#6840-01-483-3068)	Termites	Approve
7969-212	OVER & OUT (Fipronil)(Lowe's)	Fire Ants	Approve
81880-1-10163	SedgeHammer	Nuisedges	Approve
8254-5-56	Bird-B-Gone Transparent Bird Gel Repellent	Pigeons	Locally approved
8329-40	Biomist 1.5+7.5 ULV	Mosquitos	Approve
83487-1	Uncle Albert's Super Smart Ant Bait	Insecticide	Approve
83529-2	Midash 2SC T&O	Insecticide	Approve
9444-129	Borid	Insecticide	Approve
9444-131	Drax Ant Kill Gel	Insecticide	Approve
9444-135	Drax Ant Kil PF	Insecticide	Approve
9444-150	Turbo Aerosol (Aerosol Boric Acid)	insecticide	Approve
9444-158	Purge III (NAVFAC Disapproved 8/4/2000)	Files	Disapproved
9444-175	CB 80 Extra	Insecticide	Approve
9444-182	Air Devil Aerosol (NSN#6840-01-561-9726)	Insecticide	Approve
9444-183	Intruder HPX Aerosol	Roaches	Approve
9444-217	D-Force HPX (NSN#6840-01-561-9745)	Insecticide	Approve
9688-123-8845	Spectracide Immunox Fungicide Spray	Insecticide	Approve
9688-193-8845	HOTSHOT MAXATTRAX ULTRA ROACH BAIT (12 per pk)(Lowe's)	Insecticide	Locally approved
	HOTSHOT MAXATTRAX ANT BAIT (4 per pk)(Lowe's)	Insecticide	Locally approved
9688-237-8845	Spectracide Triazicide Insect Killer Concentrate	Insecticide	Approve
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FIFRA Exempt	Eco Exempt IC	Insecticide	Approve
Non-Toxic	Kleer-Out - Geraniol	Fire Ants	Locally approved
Not regulated	Allure Pheromone Moth Traps	Moth	Approve
Not regulated	Bac A Zap	Bacteria/Odor/Drain Fly	Approve

Not regulated	CatchMaster Glueboards	Rodents & Insects	Approve
Not regulated	Deer Stopper Concentrate-Messina Wildlife	Deer	Locally approved
Not regulated	Eco Exempt D	Insecticide	Approve
Not regulated	Eco Exempt G	Insecticide	Approve
Not regulated	EcoSMART (SERVMART-GSA)	Flying insects	Locally approved
Not regulated	Liquid Fertilizer	Housing area	Approve
Not regulated	Mosquito Barrier	Mosquitos	Арргоче
Not regulated	Osmocote Slow Release	Fertilizer not pesticide	Approve
Not regulated	Pyrethiums	Fruit Bug	Арргоче
Not regulated	StorGard Phèromone Traps	Moth	Approve
Approve***	Must be secured inside tamper-resistant bait boxes		

Camp Lejeune Pest Management Coordinator:Kimberly Ingram (Public Works Division/Inspection)@ 451-5794 kimberly.ingram@usmc.mil Link to the AUL for the PMP: http://www.lejeune.usmc.mil/emd1/Compliance/HazardousMaterialManagement/tabid/89/Default.aspx/http://www.lejeune.usmc.mil/emd1/Compliance/HazardousMaterialManagement/tabid/89/Default.aspx/

J-1503020-05

FIELD **PESTICIDE/HERBICIDE** MANAGEMENT RECORD FORM Revised 24 October 2012

PROJECT / CONTRACT #:
Instructions: A separate form will be filled out for EACH formulation at EACH location or building (if treating inside AND outside of a building, need two separate forms).
1. Date of Application:
2. Location: (Circle One) Inside or Outside
3. Building# and/or Name:
4. Type of Pest Control Operation:(i.e. Baiting, Power spray, Manual application of pesticide, ULV, etc.)
5. Site Description: (i.e. Office, Barracks, Housing, Warehouse, Snack Bar, Lawn, Unimproved Grounds, etc.)
6. Pest type:
7. Contractor/Subcontractor's Company Name:
8. Pesticide Used: 8a. Pesticide Trade Name:
8b. Pesticide Active Ingredient:
8c. EPA Registration#:
8d. Formulation (e.g., Liquid, Granular, Gel, EC, Aerosol, etc.)
9. Approximate total area treated:
10. Quantity of Pesticide Concentrate applied:
11. Quantity of Dilutant Applied (if applicable): 11a. Type of Dilutant : (i.e. Water, Oil, etc.) 11b. Units : (i.e. Floz, Gal, LT, ML, etc.)
12. Comments: (Survey results, wind conditions, sanitation deficiencies, etc.)
13. Print & Signature of Applicator:
14. Certification # of Applicator:

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.

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 SPECIFICATION MANUFACTURER MATERIALS USED WHERE DESIGNATION (MANUFACTURER'S USED DESIGNATION)

1.3 MAXIMO REQUIREMENTS

Submit maximo requirements as specified in Section 23 03 00 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			
Contract No.				
Inspector's Signature		Date	Accepted	
Construction Contractor:				
Address:				
Telephone:				
Warranty Contact:		-		
Name:				
Address:				
Telephone:				

1.5 MECHANICAL TESTING AND BALANCING

All contract requirements of Section 23 09 23.13, "BACnet DIRECT DIGITAL CONTROL SYSTEMS FOR HVAC," shall be fully completed, including all testing, prior to contract completion date. In addition, all contract requirements of Section 23 05 92, "TESTING/ADJUSTING/BALANCING: SMALL

STATION PERSONNEL TO PERFORM ONLY OPERATIONAL MAINTENANCE

HEATING/VENTILATING/COOLING SYSTEMS," 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 and 23 05 92 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 #N40085-14-B-0146."

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

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.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM E1971

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

1.2 SUBMISSION OF OPERATION AND MAINTENANCE DATA

Submit Operation and Maintenance (O&M) Data specifically applicable to this contract and a complete and concise depiction of the provided equipment, product, or system, stressing and enhancing the importance of system interactions, troubleshooting, and long-term preventative maintenance and operation. The subcontractors must compile and prepare data and deliver to the Contractor prior to the training of Government personnel. The Contractor must compile and prepare aggregate O&M data including clarifying and updating the original sequences of operation to as-built conditions. Organize and present information in sufficient detail to clearly explain O&M requirements at the system, equipment, component, and subassembly level. Include an index preceding each submittal. Submit in accordance with this section and Section 01 33 00 SUBMITTAL PROCEDURES.

1.2.1 Package Quality

Documents must be fully legible. Poor quality copies and material with hole punches obliterating the text or drawings will not be accepted.

1.2.2 Package Content

Data package content shall be as shown in the paragraph titled "Schedule of Operation and Maintenance Data Packages." Comply with the data package requirements specified in the individual technical sections, including the content of the packages and addressing each product, component, and system designated for data package submission, except as follows. Commissioned items without a specified data package requirement in the individual technical sections must use Data Package 3, 4 and 5. Commissioned items with a Data Package 1 or 2 requirement must use instead Data Package 3, 4 and 5.

1.2.3 Changes to Submittals

Manufacturer-originated changes or revisions to submitted data must be furnished by the Contractor 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.

1.2.4 Review and Approval

The Contractor's Commissioning Authority (CA) must review the commissioned systems and equipment submittals for completeness and applicability. The CA must verify that the systems and equipment provided meet the requirements of the Contract documents and design intent, particularly as they relate to functionality, energy performance, water performance, maintainability, sustainability, system cost, indoor environmental quality, and local environmental impacts. The CA must communicate deficiencies to the Contracting Officer. Upon a successful review of the corrections, the CA must recommend approval and acceptance of these O&M manuals to the Contracting Officer. This work is in addition to the normal review procedures for O&M data.

1.2.5 O&M Database

Develop a database from the O&M manuals that contains the information required to start a preventative maintenance program.

1.3 TYPES OF INFORMATION REQUIRED IN O&M DATA PACKAGES

1.3.1 Operating Instructions

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

1.3.1.1 Safety Precautions and Hazards

List personnel hazards and equipment or product safety precautions for all 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.

1.3.1.2 Operator Prestart

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

1.3.1.3 Startup, Shutdown, and Post-Shutdown Procedures

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

1.3.1.4 Normal Operations

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

1.3.1.5 Emergency Operations

Include Emergency Procedures for equipment malfunctions to permit a short period of continued operation or to shut down the equipment to prevent

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

1.3.1.6 Operator Service Requirements

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

1.3.1.7 Environmental Conditions

Include a list of Environmental Conditions (temperature, humidity, and other relevant data) that are best suited for the operation of each product, component or system. Describe conditions under which the item equipment should not be allowed to run.

1.3.1.8 Operating Log

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

1.3.2 Preventive Maintenance

Include the following information for preventive and scheduled maintenance to minimize corrective maintenance and repair for the installed model and features of each system. Include potential environmental and indoor air quality impacts of recommended maintenance procedures and materials.

1.3.2.1 Lubrication Data

Include preventative maintenance lubrication data, in addition to instructions for lubrication provided under paragraph titled "Operator Service Requirements":

- a. A table showing recommended lubricants for specific temperature ranges and applications.
- b. Charts with a schematic diagram of the equipment showing lubrication points, recommended types and grades of lubricants, and capacities.
- c. A Lubrication Schedule showing service interval frequency.

1.3.2.2 Preventive Maintenance Plan and Schedule

Include manufacturer's schedule for routine preventive maintenance, inspections, tests and adjustments required to ensure proper and economical operation and to minimize corrective maintenance. Provide manufacturer's projection of preventive maintenance work-hours on a daily, weekly, monthly, and annual basis including craft requirements by type of craft. For periodic calibrations, provide manufacturer's specified frequency and procedures for each separate operation.

1.3.2.3 Cleaning Recommendations

Provide environmentally preferable cleaning recommendations in accordance with ASTM E1971.

1.3.3 Corrective Maintenance (Repair)

Include manufacturer's recommended procedures and instructions for correcting problems and making repairs for the installed model and features of each system. Include potential environmental and indoor air quality impacts of recommended maintenance procedures and materials.

1.3.3.1 Troubleshooting Guides and Diagnostic Techniques

Include step-by-step procedures to promptly isolate the cause of typical malfunctions. Describe clearly why the checkout is performed and what conditions are to be sought. Identify tests or inspections and test equipment required to determine whether parts and equipment may be reused or require replacement.

1.3.3.2 Wiring Diagrams and Control Diagrams

Wiring diagrams and control diagrams shall be point-to-point drawings of wiring and control circuits including factory-field interfaces. Provide a complete and accurate depiction of the actual job specific wiring and control work. On diagrams, number electrical and electronic wiring and pneumatic control tubing and the terminals for each type, identically to actual installation configuration and numbering.

1.3.3.3 Maintenance and Repair Procedures

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

1.3.3.4 Removal and Replacement Instructions

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

1.3.3.5 Spare Parts and Supply Lists

Include lists of spare parts and supplies required for maintenance and repair to ensure continued service or operation without unreasonable delays. Special consideration is required for facilities at remote locations. List spare parts and supplies that have a long lead-time to obtain.

1.3.4 Corrective Maintenance Work-Hours

Include manufacturer's projection of corrective maintenance work-hours including requirements by type of craft. Corrective maintenance that requires completion or participation of the equipment manufacturer shall be identified and tabulated separately.

1.3.5 Appendices

Provide information required below and information not specified in the preceding paragraphs but pertinent to the maintenance or operation of the product or equipment. Include the following:

1.3.5.1 Product Submittal Data

Provide a copy of all SD-03 Product Data submittals required in the applicable technical sections.

1.3.5.2 Manufacturer's Instructions

Provide a copy of all SD-08 Manufacturer's Instructions submittals required in the applicable technical sections.

1.3.5.3 O&M Submittal Data

Provide a copy of all SD-10 Operation and Maintenance Data submittals required in the applicable technical sections.

1.3.5.4 Parts Identification

Provide identification and coverage for all parts of each component, assembly, subassembly, and accessory of the end items subject to replacement. Include special hardware requirements, such as requirement to use high-strength bolts and nuts. Identify parts by make, model, serial number, and source of supply to allow reordering without further identification. Provide clear and legible illustrations, drawings, and exploded views to enable easy identification of the items. When illustrations omit the part numbers and description, both the illustrations and separate listing shall show the index, reference, or key number that will cross-reference the illustrated part to the listed part. Parts shown in the listings shall be grouped by components, assemblies, and subassemblies in accordance with the manufacturer's standard practice. Parts data may cover more than one model or series of equipment, components, assemblies, subassemblies, attachments, or accessories, such as typically shown in a master parts catalog

1.3.5.5 Warranty Information

List and explain the various warranties and clearly identify the servicing and technical precautions prescribed by the manufacturers or contract documents in order to keep warranties in force. Include warranty information for primary components such as the compressor of air conditioning system.

1.3.5.6 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 all specific operation and maintenance procedures that must be performed to keep the warranty valid.

1.3.5.7 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.

1.3.5.8 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.

1.3.5.9 Testing and Performance Data

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

1.3.5.10 Field Test Reports

Provide Field Test Reports (SD-06) that apply to equipment associated with the system.

1.3.5.11 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.

1.4 TYPES OF INFORMATION REQUIRED IN CONTROLS O&M DATA PACKAGES

Include Data Package 5 and the following for control systems:

- a. Narrative description on how to perform and apply all functions, features, modes, and other operations, including unoccupied operation, seasonal changeover, manual operation, and alarms. Include detailed technical manual for programming and customizing control loops and algorithms.
- b. Full as-built sequence of operations.
- c. Copies of all checkout tests and calibrations performed by the Contractor (not Cx tests).
- d. Full print out of all schedules and set points after testing and acceptance of the system.
- e. Full as-built print out of software program.

f. Electronic File:

- (1) Assemble each manual into a composite electronically indexed file in PDF format. Provide HDD's, DVD's or CD's as appropriate, so that each one contains all maintenance and record files, and also the Project Record Documents and Training Videos, of the entire program for this facility.
- (2) Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
- (3) Link the index to separate files within the composite of files. Book mark maintenance and record files, that have a Table of

Contents, according to the Table of Contents

- g. Marking of all system sensors on the as-built floor plan and mechanical drawings with their control system designations.
- 1.5 SCHEDULE OF OPERATION AND MAINTENANCE DATA PACKAGES

Furnish the O&M data packages specified in individual technical sections. The required information for each O&M data package is as follows:

- 1.5.1 Data Package 1
 - a. Safety precautions
 - b. Cleaning recommendations
 - c. Maintenance and repair procedures
 - d. Warranty information
 - e. Contractor information
 - f. Spare parts and supply list
- 1.5.2 Data Package 2
 - a. Safety precautions
 - b. Normal operations
 - c. Environmental conditions
 - d. Lubrication data
 - e. Preventive maintenance plan and schedule
 - f. Cleaning recommendations
 - g. Maintenance and repair procedures
 - h. Removal and replacement instructions
 - i. Spare parts and supply list
 - j. Parts identification
 - k. Warranty information
 - 1. Contractor information
- 1.5.3 Data Package 3
 - a. Safety precautions
 - b. Operator prestart
 - c. Startup, shutdown, and post-shutdown procedures
 - d. Normal operations

- e. Emergency operations
- f. Environmental conditions
- g. Lubrication data
- h. Preventive maintenance plan and schedule
- i. Cleaning recommendations
- j. Troubleshooting guides and diagnostic techniques
- k. Wiring diagrams and control diagrams
- 1. Maintenance and repair procedures
- m. Removal and replacement instructions
- n. Spare parts and supply list
- o. Product submittal data
- p. O&M submittal data
- q. Parts identification
- r. Warranty information
- s. Testing equipment and special tool information
- t. Testing and performance data
- u. Contractor information
- 1.5.4 Data Package 4
 - a. Safety precautions
 - b. Operator prestart
 - c. Startup, shutdown, and post-shutdown procedures
 - d. Normal operations
 - e. Emergency operations
 - f. Operator service requirements
 - g. Environmental conditions
 - h. Lubrication data
 - i. Preventive maintenance plan and schedule
 - j. Cleaning recommendations
 - k. Troubleshooting guides and diagnostic techniques

- 1. Wiring diagrams and control diagrams
- m. Maintenance and repair procedures
- n. Removal and replacement instructions
- o. Spare parts and supply list
- p. Corrective maintenance man-hours
- q. Product submittal data
- r. O&M submittal data
- s. Parts identification
- t. Warranty information
- u. Personnel training requirements
- v. Testing equipment and special tool information
- w. Testing and performance data
- x. Contractor information
- 1.5.5 Data Package 5
 - a. Safety precautions
 - b. Operator prestart
 - c. Start-up, shutdown, and post-shutdown procedures
 - d. Normal operations
 - e. Environmental conditions
 - f. Preventive maintenance plan and schedule
 - g. Troubleshooting guides and diagnostic techniques
 - h. Wiring and control diagrams
 - i. Maintenance and repair procedures
 - j. Removal and replacement instructions
 - k. Spare parts and supply list
 - 1. Product submittal data
 - m. Manufacturer's instructions
 - n. O&M submittal data
 - o. Parts identification
 - p. Testing equipment and special tool information

- q. Warranty information
- r. Testing and performance data
- s. Contractor information

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

SECTION 02 41 00

DEMOLITION

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.

AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE (AHRI)

AHRI Guideline K (2009) Guideline for Containers for Recovered Non-Flammable Fluorocarbon

Refrigerants

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 (2008; Errata 1-2010; Changes 1-3 2010; Changes 4-6 2011; Change 7 2012) Safety and Health Requirements Manual

U.S. DEFENSE LOGISTICS AGENCY (DLA)

DLA 4145.25 (June 2000) Storage and Handling of
Liquefied and Gaseous Compressed Gases and
Their Full and Empty Cylinders

U.S. DEPARTMENT OF DEFENSE (DOD)

DOD 4000.25-1-M (2006) MILSTRIP - Military Standard Requisitioning and Issue Procedures

MIL-STD-129 (2007; Rev P; Change 4 2007) Military
Marking for Shipment and Storage

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

40 CFR 61 National Emission Standards for Hazardous

Air Pollutants

40 CFR 82 Protection of Stratospheric Ozone

49 CFR 173.301 Shipment of Compressed Gases in Cylinders

and Spherical Pressure Vessels

1.2 PROJECT DESCRIPTION

1.2.1 Demolition Plan

Prepare a Demolition Plan and submit proposed salvage, 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, a detailed description of methods and equipment to be used for each operation and of the sequence of operations. Identify components and materials to be salvaged for reuse or recycling with reference to paragraph Existing Facilities to be Removed. Append tracking forms for all removed materials indicating type, quantities, condition, destination, and end use. Coordinate with Waste Management Plan. 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 until authorization is received from the Contracting Officer. The work of this section is to be performed in a manner that maximizes salvage and recycling of materials. Remove rubbish and debris from the project site; do not allow accumulations inside or outside the buildings. The work includes demolition, salvage of identified items and materials, and removal of resulting rubbish and debris. Remove rubbish and debris from Government property daily, unless otherwise directed. Store materials that cannot be removed daily in areas specified by the Contracting Officer. In the interest of occupational safety and health, perform the work in accordance with EM 385-1-1, Section 23, Demolition, and other applicable Sections.

1.3 ITEMS TO REMAIN IN PLACE

Take necessary precautions to avoid damage to existing items to remain in place, to be reused, or to remain the property of the Government. Repair or replace damaged items as approved by the Contracting Officer. Coordinate the work of this section with all other work indicated. Construct and maintain shoring, bracing, and supports as required. Ensure that structural elements are not overloaded. Increase structural supports or add new supports as may be required as a result of any cutting, removal, or demolition work performed under this contract. Do not overload structural elements and pavements to remain. Provide new supports and reinforcement for existing construction weakened by demolition, 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 snow, 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, 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 operations. Prior to start of work, utilities serving each area of alteration or removal will be shut off by the Government and disconnected and sealed by the Contractor.

1.3.5 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, 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 AVAILABILITY OF WORK AREAS

Areas in which the work is to be accomplished will be available in and around the work site as designated by the Contracting Officer.

1.6 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:

SD-01 Preconstruction Submittals

Existing Conditions

SD-07 Certificates

Demolition Plan

Notification

SD-11 Closeout Submittals

Receipts

1.7 QUALITY ASSURANCE

Submit timely notification of demolition and renovation projects to Federal, State, regional, and local authorities in accordance with 40 CFR 61, Subpart M. Notify the State's environmental protection agency 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 not be permitted.

1.7.1 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. Vacuum and dust the work area as necessary.

1.8 PROTECTION

1.8.1 Traffic Control Signs

a. Where pedestrian and driver safety is endangered in the area of removal work, use traffic barricades with flashing lights. Notify the Contracting Officer prior to beginning such work.

1.8.2 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.

1.9 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.

1.10 EXISTING CONDITIONS

Before beginning any demolition 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 of structures. Fill material shall be waste products from demolition until all waste appropriate for this purpose is consumed.PART 3 EXECUTION

3.1 EXISTING FACILITIES TO BE REMOVED

Inspect and evaluate existing structures onsite for reuse. Existing construction scheduled to be removed for reuse shall be disassembled. Dismantled and removed materials are to be separated, set aside, and prepared as specified, and stored or delivered to a collection point for reuse, remanufacture, recycling, or other disposal, as specified. Materials shall be designated for reuse onsite whenever possible.

3.1.1 Utilities and Related Equipment

3.1.1.1 General Requirements

Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by the Contracting Officer. Do not interrupt existing utilities serving facilities occupied and used by the Government except when approved in writing and then only after temporary utility services have been approved and provided. Do not begin demolition work until all utility disconnections have been made. Shut off and cap utilities for future use, as indicated.

3.1.1.2 Disconnecting Existing Utilities

Remove existing utilities , as indicated and uncovered by work and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the Contracting Officer. When utility lines are encountered but are not indicated on the drawings, notify the Contracting Officer prior to further work in that area. Remove meters and related equipment and deliver to a location in accordance with instructions of the Contracting Officer.

3.1.2 Paving and Slabs

Remove concrete and asphaltic concrete paving and slabs as necessary for construction. Provide neat sawcuts at limits of pavement removal. Pavement and slabs designated to be recycled and utilized in this project shall be moved, ground and stored as directed by the Contracting Officer. Pavement and slabs not to be used in this project shall be removed from the Installation at Contractor's expense.

3.1.3 Masonry

Sawcut and remove masonry so as to prevent damage to surfaces to remain, to removed materials being salvaged 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 specified for the new work. Provide square, straight edges and corners where existing masonry adjoins new work and other locations. Masonry removed in pieces shall be crushed.

3.1.4 Concrete

Saw concrete along straight lines to a depth of a minimum 2 inch. Make each cut in walls perpendicular to the face and in alignment with the cut in the opposite face. Break out the remainder of the concrete provided that the broken area is concealed in the finished work, and the remaining concrete is sound. At locations where the broken face cannot be concealed, grind smooth or saw cut entirely through the concrete.

3.1.5 Miscellaneous Metal

Salvage shop-fabricated items such as access doors and frames, steel gratings, metal ladders, wire mesh partitions, metal railings, metal windows and similar items as whole units. Salvage light-gage and cold-formed metal framing, such as steel studs, steel trusses, metal gutters, roofing and siding, metal toilet partitions, toilet accessories and similar items. Scrap metal shall become the Contractor's property. Recycle scrap metal as part of demolition operations. Provide separate containers to collect scrap metal and transport to a scrap metal collection or recycling facility, in accordance with the Waste Management Plan.

3.1.6 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.

3.1.7 Air Conditioning Equipment

Remove air conditioning, refrigeration, and other equipment containing refrigerants without releasing chlorofluorocarbon refrigerants to the atmosphere in accordance with the Clean Air Act Amendment of 1990. Recover all refrigerants prior to removing air conditioning, refrigeration, and other equipment containing refrigerants and dispose of in accordance with the paragraph entitled "Disposal of Ozone Depleting Substance (ODS)." Turn in salvaged Class I ODS refrigerants as specified in paragraph, "Salvaged Materials and Equipment."

3.1.8 Mechanical Equipment and Fixtures

Disconnect mechanical hardware at the nearest connection to existing services to remain, unless otherwise noted. Disconnect mechanical equipment and fixtures at fittings. Remove service valves attached to the unit. Salvage each item of equipment and fixtures as a whole unit; listed, indexed, tagged, and stored. Salvage each unit with its normal operating auxiliary equipment. Transport salvaged equipment and fixtures, including motors and machines, to a designated storage area as directed by the Contracting Officer. Do not remove equipment until approved. Do not offer low-efficiency equipment for reuse.

3.1.8.1 Preparation for Storage

Remove water, dirt, dust, and foreign matter from units; tanks, piping and fixtures shall be drained; interiors, if previously used to store flammable, explosive, or other dangerous liquids, shall be steam cleaned. Seal openings with caps, plates, or plugs. Secure motors attached by flexible connections to the unit. Change lubricating systems with the proper oil or grease.

3.1.8.2 Piping

Disconnect piping at unions, flanges and valves, and fittings as required to reduce the pipe into straight lengths for practical storage. Store salvaged piping according to size and type. If the piping that remains can become pressurized due to upstream valve failure, end caps, blind flanges, or other types of plugs or fittings with a pressure gage and bleed valve shall be attached to the open end of the pipe to ensure positive leak control. Carefully dismantle piping that previously contained gas, gasoline, oil, or other dangerous fluids, with precautions taken to prevent injury to persons and property. Store piping outdoors until all fumes and residues are removed. Box prefabricated supports, hangers, plates, valves, and specialty items according to size and type. Wrap sprinkler heads individually in plastic bags before boxing. Classify piping not designated for salvage, or not reusable, as scrap metal.

3.1.8.3 Ducts

Classify removed duct work as scrap metal.

3.1.8.4 Fixtures, Motors and Machines

Remove and salvage fixtures, motors and machines associated with plumbing, heating, air conditioning, refrigeration, and other mechanical system installations. Salvage, box and store auxiliary units and accessories with the main motor and machines. Tag salvaged items for identification, storage, and protection from damage. Classify broken, damaged, or otherwise unserviceable units and not caused to be broken, damaged, or otherwise unserviceable as debris to be disposed of by the Contractor.

3.1.9 Electrical Equipment and Fixtures

Salvage motors, motor controllers, and operating and control equipment that are attached to the driven equipment. Salvage wiring systems and components. Box loose items and tag for identification. Disconnect primary, secondary, control, communication, and signal circuits at the point of attachment to their distribution system.

3.1.9.1 Fixtures

Remove and salvage electrical fixtures. Salvage unprotected glassware from the fixture and salvage separately. Salvage incandescent, mercury-vapor, and fluorescent lamps and fluorescent ballasts manufactured prior to 1978, boxed and tagged for identification, and protected from breakage.

3.1.9.2 Electrical Devices

Remove and salvage switches, switchgear, transformers, conductors including wire and nonmetallic sheathed and flexible armored cable, regulators, meters, instruments, plates, circuit breakers, panelboards, outlet boxes, and similar items. Box and tag these items for identification according to type and size.

3.1.9.3 Wiring Ducts or Troughs

Remove and salvage wiring ducts or troughs. Dismantle plug-in ducts and wiring troughs into unit lengths. Remove plug-in or disconnecting devices from the busway and store separately.

3.1.9.4 Conduit and Miscellaneous Items

Salvage conduit except where embedded in concrete or masonry. Consider corroded, bent, or damaged conduit as scrap metal. Sort straight and undamaged lengths of conduit according to size and type. Classify supports, knobs, tubes, cleats, and straps as debris to be removed and disposed.

3.2 CONCURRENT EARTH-MOVING OPERATIONS

Do not begin excavation, filling, and other earth-moving operations that are sequential to demolition work in areas occupied by structures to be demolished or deconstructed until all demolition in the area has been completed and debris removed. Fill holes, open basements and other hazardous openings.

3.3 DISPOSITION OF MATERIAL

3.3.1 Title to Materials

Except for salvaged items specified in related Sections, and for materials or equipment scheduled for salvage, all materials and equipment removed and not reused or salvaged, shall become the property of the Contractor and shall be removed from Government property. Title to materials resulting from demolition, and materials and equipment to be removed, is vested in the Contractor upon approval by the Contracting Officer of the Contractor's demolition, and removal procedures, and authorization by the Contracting Officer to begin demolition. The Government will not be responsible for the condition or loss of, or damage to, such property after contract award. Showing for sale or selling materials and equipment on site is prohibited.

3.3.2 Reuse of Materials and Equipment

Remove and store materials and equipment indicated to be reused or relocated to prevent damage, and reinstall as the work progresses.

3.3.3 Salvaged Materials and Equipment

Remove materials and equipment that are indicated to be removed by the Contractor and that are to remain the property of the Government, and deliver to a storage site.

- a. Salvage items and material to the maximum extent possible.
- b. Store all materials salvaged for the Contractor as approved by the Contracting Officer and remove from Government property before completion of the contract. On site sales of salvaged material is prohibited.
- c. Remove salvaged items to remain the property of the Government in a manner to prevent damage, and packed or crated to protect the items from damage while in storage or during shipment. Items damaged during removal or storage must be repaired or replaced to match existing items. Properly identify the contents of containers. Deliver the following items reserved as property of the Government to the areas designated by the Contracting Officer.
- Remove historical items in a manner to prevent damage. Deliver the following historical items to the Government for disposition: Corner stones, contents of corner stones, and document boxes wherever located on the site.
- e. Remove and capture all Class I ODS refrigerants in accordance with the Clean Air Act Amendment of 1990, and turn in to the Navy as directed by the Commanding Officer.

3.3.4 Disposal of Ozone Depleting Substance (ODS)

Class I and Class II ODS are defined in Section, 602(a) and (b), of The Clean Air Act. Prevent discharge of Class I and Class II ODS to the atmosphere. Place recovered ODS in cylinders meeting AHRI Guideline K suitable for the type ODS (filled to no more than 80 percent capacity) and provide appropriate labeling. Recovered ODS shall be removed from Government property and disposed of in accordance with 40 CFR 82. Products, equipment and appliances containing ODS in a sealed, self-contained system (e.g. residential refrigerators and window air conditioners) shall be disposed of in accordance with 40 CFR 82. Submit Receipts or bills of lading, as specified. Submit a shipping receipt or bill of lading for all containers of ozone depleting substance (ODS) shipped to the Defense Depot, Richmond, Virginia.

3.3.4.1 Special Instructions

No more than one type of ODS is permitted in each container. A warning/hazardous label shall be applied to the containers in accordance with Department of Transportation regulations. All cylinders including but not limited to fire extinguishers, spheres, or canisters containing an ODS shall have a tag with the following information:

- a. Activity name and unit identification code
- b. Activity point of contact and phone number
- c. Type of ODS and pounds of ODS contained

- d. Date of shipment
- e. Naval stock number (for information, call (804) 279-4525).

3.3.5 Transportation Guidance

Ship all ODS containers in accordance with MIL-STD-129, DLA 4145.25 (also referenced one of the following: Army Regulation 700-68, Naval Supply Instruction 4440.128C, Marine Corps Order 10330.2C, and Air Force Regulation 67-12), 49 CFR 173.301, and DOD 4000.25-1-M.

3.3.6 Unsalvageable and Non-Recyclable Material

Dispose of unsalvageable and non-recyclable noncombustible material in the disposal area dsignated by Contracting Officer.

3.4 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.

3.5 DISPOSAL OF REMOVED MATERIALS

3.5.1 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 in the Waste Management Plan. Storage of removed materials on the project site is prohibited.

3.5.2 Burning on Government Property

Burning of materials removed from demolished and deconstructed structures will not be permitted on Government property. Comply with Federal, State and local laws regulating the building and maintaining of brush and trash fires.

3.5.3 Removal to Spoil Areas on Government Property

Transport noncombustible materials removed from demolition structures to designated spoil areas on Government property.

3.5.4 Removal from Government Property

Transport waste materials removed from demolished and deconstructed structures, except waste soil, from Government property for legal disposal. Dispose of waste soil as directed.

3.6 REUSE OF SALVAGED ITEMS

Recondition salvaged materials and equipment designated for reuse before installation. Replace items damaged during removal and salvage operations or restore them as necessary to usable condition.

-- End of Section --

SECTION 02 82 16

REMOVAL AND DISPOSAL OF ASBESTOS MATERIALS (CAMP LEJEUNE COMPLEX)

03/10

PART 1 GENERAL

1.1 APPLICABLE NORTH CAROLINA LAW

North Carolina State General Statues 130A, Article 19-444-452 and 10A North Carolina Administrative Chapter (NCAC) 41C .0600 through .0611.

1.1.1 N.C. (DHHS-HHCU) Asbestos Accreditation

All personnel involved in asbestos removal shall be currently accredited for asbestos removal by N.C. (DHHS-HHCU). An application for accreditation may be requested from the State of North Carolina, Health Hazards Control Unit, Department of Health and Human Services, Division of Public Health,; 1912 Mail Service Center, Raleigh, NC 27699-1912; (919) 707-5950. Out of State accreditation will not be accepted.

1.2 REFERENCES

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z88.2	(1992)	Respiratory	Protection
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AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 732	(1995) Aging Effects of Artificial Weathering on Latex Sealants
ASTM D 1331	(1989; R 1995) Surface and Interfacial Tension of Solutions of Surface-Active Agents
ASTM E 84	(2000a) Surface Burning Characteristics of Building Materials
ASTM E 96	(1997; Rev A) Water Vapor Transmission of Materials
ASTM E 119	(1998) Fire Tests of Building Construction and Materials
ASTM E 736	(1992) Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members
ASTM E 1368	(1997) Visual Inspection of Asbestos Abatement Projects

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

29 CFR 1910.103	Respiratory Protection
29 CFR 1926.59	Hazard Communication
29 CFR 1926.1101	Asbestos
40 CFR 61, SUBPART A	General Provisions
40 CFR 61, SUBPART M	National Emission Standard for Hazardous Air Pollutants

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 560/5-85-024	(1985) Guidance for Controlling Asbestos Containing Materials in Buildings
EPA SW-846	(Rev O; Updates I, II, IIA, IIB, and III)

Test Methods for Evaluating Solid Waste
(Vol IA, IB, IC, and II)

UNDERWRITERS LABORATORIES (UL)

UL 586	(1996;	Rev	thru	Aug	1999)	High-Ef	fficiency,
	Partic [*]	ulate	e, Ai:	r Fil	lter U	nits	

1.3 DEFINITIONS

1.3.1 Asbestos Containing Material (ACM)

All building materials that have more than 1% of chrysotile, amosite, crocidolite, tremolite, anthopyhlite, or any other form of asbestos in the serpentine or anthobole class.

1.3.2 Action Level/Permissive Exposure Limit (PEL)

An airborne concentration of asbestos fibers, in the breathing zone of a worker equaling 0.1 fibers per cubic centimeter of air calculated as an 8-hour time weighted average.

1.3.3 Amended Water

Water containing a wetting agent or surfactant with a surface tension of 29 dynes per square centimeter when tested in accordance with ASTM D 1331 shall be utilized. In the event where wetting operations are suspended due to freezing temperatues, the operator or abatement contractor shall record the temperature on Form DHHS 3787..

1.3.4 Area Sampling

Sampling of asbestos fiber concentrations within the asbestos control area and outside the asbestos control area which approximates the concentrations of asbestos in the theoretical breathing zone but is not actually collected in the breathing zone of an employee.

1.3.5 Asbestos

The term asbestos includes chrysotile, amosite, crocidolite, tremolite, anthophyllite, and actinolite and any of these minerals that has been chemically treated or altered. Materials are considered to contain asbestos if the asbestos content is more than 1% of the material by area.

1.3.6 Asbestos Control Area

That area where asbestos removal operations are performed which is isolated by physical boundaries which assist in the prevention of the uncontrolled release of asbestos dust, fibers, or debris. Two examples of an asbestos control area are: a full containment and a "glovebag."

1.3.7 Asbestos Fibers

Those fibers having an aspect ratio of at least 3:1 and longer than 5 micrometers as determined by National Institute for Occupational Safety and Health (NIOSH) Method 7400.

1.3.8 Asbestos Permissible Exposure Limit

0.1 fibers per cubic centimeter of air as an 8-hour time weighted average as defined by 29 CFR 1926.1101 or other federal legislation having legal jurisdiction for the protection of workers health.

1.3.9 Background

Normal airborne asbestos concentration in an area similar to the asbestos abatement area but in an uncontaminated (with asbestos) state.

1.3.10 Contractor

The Contractor is that individual, or entity under contract to the Navy to perform the herein listed work.

1.3.11 Encapsulants

Specific materials in various forms used to chemically entrap asbestos fibers in various configurations to prevent these fibers from becoming airborne. There are four types of encapsulants as follows which must comply with performance requirements as specified herein.

- a. Removal Encapsulant (can be used as a wetting agent)
- b. Bridging Encapsulant (used to provide a tough, durable surface coating to asbestos containing material)
- c. Penetrating Encapsulant (used to penetrate the asbestos containing material down to substrate, encapsulating all asbestos fibers)
- d. Lock-Down Encapsulant (used to seal off or "lock-down" minute asbestos fibers left on surfaces from which asbestos containing material has been removed)

1.3.12 Friable Asbestos Material

Material that contains more than 1% asbestos by area and that can be crumbled, pulverized, or reduced to powder by hand pressure when dry.

1.3.13 Full Containment

Those engineering control techniques described in 29 CFR 1926.1101 for major asbestos removal, renovation and demolition operations.

1.3.14 Glovebag Technique

Those asbestos removal and control techniques put forth in 29 CFR 1926.1101.

1.3.15 HEPA Filter Equipment

High efficiency particulate air (HEPA) filtered vacuum and/or exhaust ventilation equipment with a filter system capable of collecting and retaining asbestos fibers. Filters shall retain 99.97 percent of particles 0.3 microns or larger as indicated in UL 586.

1.3.16 Navy Industrial Hygienist (NIH)

That industrial hygienist employed by the Navy to monitor, sample, and/or inspect the work separate from the original construction contract. The NIH can be either a Federal civil servant or a private consultant as determined by the Navy. In some instances the NIH shall perform assigned duties vicariously through a trained subordinate but only with the specific consent of the Contracting Officer.

1.3.17 Nonfriable Asbestos Material

Material that contains asbestos in which the fibers have been temporarily locked in by a bonding agent, coating, binder, or other material so that the asbestos is well bound and will not normally release asbestos fibers during any appropriate use, handling, storage or transportation. It is understood that asbestos fibers will be released under other conditions such as demolition or removal.

1.3.18 PCM - Phased Contrast Microscopy

A method of analyzing air samples for fibers using a light microscope.

1.3.19 PLM - Polarized Light Microscopy

A method of analyzing bulk samples for asbestos in which the sample is illuminated with polarized light (light which vibrates in only one plane) and viewed under a light microscope.

1.3.20 Personal Sampling

Air sampling to determine asbestos fiber concentrations within the breathing zone of a specific employee, performed in accordance with 29 CFR 1926.1101.

1.3.21 Supervising Air Monitor (SAM)

That supervising air monitor hired by the Contractor to perform the herein listed industrial hygiene tasks. In some instances, the SAM can perform this role vicariously through a trained subordinate, but only with the specific consent of the Contracting Officer. Under N.C. Statue, the SAM must make a site visit on any project exceeding 10 days and once every 30 days thereafter.

1.3.22 TEM

Refers to Transmission Electron Microscopy (TEM). Technique whereby a beam of electrons is transmitted through an ultra think specimen, interacting with the specimen as it passes through. An image is formed from the interaction of the electrons transmitted through the specimen; the image is magnified and focused onto an imaging device, such as a fluorescent screen, on a layer of photographic film, or to be detected by a sensor such as a CCB camera.

1.3.23 Time Weighted Average (TWA)

The TWA is an 8-hour time weighted average airborne concentration of asbestos fibers. At least three full shift samples per person are required to establish that person's TWA exposure.

1.3.24 Wetting Agent

That specific agent used to reduce airborne asbestos levels by physically bonding asbestos fibers to material to be removed. An equivalent wetting agent must have a surface tension of at least 29 dynes per square centimeter as tested in accordance with ASTM D 1331. In the event where wetting operations are suspended due to freezing temperatures, the operator or abatement contractor shall record the temperature on Form DHHS 3787.

1.4 REQUIREMENTS

1.4.1 Description of Work

The work covered by this section includes the handling of asbestos containing materials which are encountered during repair, construction and demolition projects and describes some of the resultant procedures and equipment required to protect workers and occupants of the building or area, or both, from contact with airborne asbestos fibers. The work also includes the disposal of the generated asbestos containing materials. The asbestos work includes the demolition and removal of asbestos containing gasket material, asbestos containing pipe insulation, asbestos containing fittings and elbows, and asbestos containing debris located within the mechanical room of building AS 710. This material will release airborne asbestos fibers during demolition and removal and therefore must be handled in accordance with North Carolina Regulations.

1.4.2 N. C. (DHHS-HHCU) North Carolina Department of Health and Human Services - Health Hazards Control Unit

Obtain necessary permits in conjunction with asbestos removal, hauling, and disposition, and furnish timely notification of such actions required by federal, state, regional, and local authorities. A permit is only required when you will be abating more than 260 linear feet, 160 square feet, or 35 cubic feet of an asbestos-containing building material. Also, if mechanical means of removing non-friable asbestos is utilized the contractor will need to provide permit. Notify the N.C. (DHHS-HHCU) and the Contracting Officer in writing 10 days prior to the commencement of work. Submit a copy of the permit to the Contracting Officer.

1.4.2.1 N.C. (DHHS-HHCU) mailing address is:

Health Hazards Control Unit

N.C. Department of Health and Human Services Division of Public Health 1912 Mail Service Center Raleigh, NC 27699-1912 Phone: (919) 733-0820

1.4.2.2 Changes in Work

Changes in Work which affect items on the attached form shall be covered by an amended form submitted to the same address.

1.4.3 Safety and Health Compliance

In addition to detailed requirements of this specification, comply with those applicable laws, ordinances, criteria, rules, and regulations of federal, state, regional, and local authorities regarding handling, storing, transporting, and disposing of asbestos waste materials. Comply with the applicable requirements of the current issue of 29 CFR 1926.1101, 40 CFR 61, SUBPART A, 40 CFR 61, SUBPART M. Submit matters of interpretation of standards to the appropriate administrative agency for resolution before starting the work. Where the requirements of this specification, applicable laws, rules, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirement as defined by the Contracting Officer shall apply.

1.4.4 Respiratory Protection Program

Establish and implement a respirator program as required by ANSI Z88.2 and 29 CFR 1910.103.

1.4.5 Supervising Air Monitor (SAM)

Conduct personal area/environmental air sampling and training under the direction of a North Carolina accredited supervising air monitor. For the purpose of this contract, the Contractor shall retain the services of a SAM to perform the Contractor's industrial hygiene tasks.

1.5 SUBMITTALS

Submit 4 copies of the following in accordance with Section 01 33 00, "Submittal Procedures."

SD-06 Test Reports

Air sampling results

Pressure differential recordings for local exhaust system

Clearance sampling

SD-07 Certificates

Asbestos hazard abatement plan (Abatement Design)

SD-11 Closeout Submittals

Asbestos Waste Shipment Record N.C. (DHHS-HHCU) Form 3787

Daily log

North Carolina permit

Asbestos Inspection Reporting Form

Closeout submittals shall be submitted within 60 days of asbestos activity completion.

1.5.1 Asbestos Hazard Abatement Plan (NC Abatement Design)

An asbestos abatement design shall be prepared by a N.C. accredited asbestos abatement designer. The plan shall be prepared, signed, and sealed, including accreditation number and date, by an accredited abatement designer. The respirator program and air monitoring strategies portion of this plan shall be prepared by the supervising air monitor. Such plan shall include but not be limited to the precise personal protective equipment to be used, the location of asbestos control areas including clean and dirty areas, buffer zones, showers, storage areas, change rooms, removal method, interface of trades involved in the construction, sequencing of asbestos related work, disposal plan, type of wetting agent and asbestos sealer to be used, locations of local exhaust equipment, planned air monitoring strategies, and a detailed description of the method to be employed in order to control pollution. The plan shall also include (both fire and medical emergency) response plans. The Contractor and designer shall meet with the Contracting Officer prior to beginning work, to discuss in detail the asbestos plan, including work procedures and safety precautions. The plan will be enforced as if an addition to the specification. Any changes required in the specification as a result of the plan shall be identified specifically in the plan. The plan shall comply with all federal and state requirements and this specification, and shall serve as the North Carolina Abatement Design. Submit a copy of plan to the Contracting Officer.

1.5.2 Air Sampling Results

Complete fiber counting and provide results to the SAM for review within 16 hours. Notify the Contracting Officer immediately of any airborne levels of asbestos fibers in excess of the acceptable limits. Submit sampling results to the Contracting Officer and the affected Contractor employees within 3 working days, signed by the employee performing air sampling, the employee that analyzed the sample, and the SAM.

1.5.3 Pressure Differential Recordings for Local Exhaust System

Provide a local exhaust system that creates a negative pressure of at least 0.02 inches of water relative to the pressure external of the enclosure and operate it continuously, 24 hours a day, until the enclosure of the asbestos control area is removed. Provide continuous 24-hour per day monitoring of the pressure differential with a pressure differential automatic recording instrument. Submit pressure differential recordings for each work day to the SAM for review and to the Contracting Officer within 24 hours from the end of each work day. Notify the Contractor and the Contracting Officer immediately of any variance in the pressure differential which could cause adjacent unsealed areas to have asbestos fiber concentrations in excess of 0.01 fibers per cubic centimeter or background whichever is higher. In no circumstance shall levels exceed 0.1 fibers per cubic centimeter.

1.5.4 Asbestos Waste Shipment Record N.C. (DHHS-HHCU) Form 3787

Record and report, to the Contracting Officer, the amount of asbestos containing material removed and released for disposal. Deliver the report for the previous day at the beginning of each day shift with amounts of material removed during the previous day reported in linear feet or square feet as described initially in this specification and in cubic feet for the amount of asbestos containing material released for disposal. Use "Asbestos Waste Shipment Record N.C. (DHHS-HHCU) Form 3787 for this report. A copy of the (DHHS-HHCU) Form 3787 must accompany any asbestos waste shipment to the Base sanitary landfill.

1.5.5 Daily Log

A daily log documenting work practices, sample locations, and all other asbestos related job conditions shall be maintained, by the testing lab and be available for Government examination throughout the course of work. At the completion of testing, a copy of this log shall be immediately delivered to the Government.

1.5.6 North Carolina Permit

As this project includes the removal of less then 160 sq. ft. /260 linear ft. of material, a NC HHCU permit is not required.

1.5.7 Asbestos Inspection Reporting Form

This Asbestos Inspection Reporting Form is included at the end of this section and shows the homogeneous areas involved with this project. The Contractor shall mark the line "confirmed ACM from this HA:" as either "Abated" or "Managed in Place." Abated shall be defined as removed. If an HA is partially abated, approximate the percentage of asbestos removed and mark in the comments area. Provide any other descriptive data, such as rooms/areas removed or rooms/areas where asbestos not removed. The intent of this requirement is to report "as built" conditions. The Contractor is not required to perform any additional asbestos surveys or inspections as a result of this paragraph. Include this report with drawing of abated areas with other closeout documentation.

1.6 PRE-ABATEMENT MEETING

The Contractor and designer shall meet with the Contracting Officer prior to beginning work, to discuss in detail the asbestos plan, including work procedures and safety precautions.

1.7 ASBESTOS INSPECTION REPORTING FORM AND ASBESTOS SAMPLE REPORTING FORM

These two forms are included at the end of this section for informational purposes. They do not define or modify the scope of work.

PART 2 PRODUCTS

2.1 ENCAPSULANTS

Shall conform to current USEPA requirements, shall contain no toxic or hazardous substances as defined in 29 CFR 1926.59, and shall conform to the following performance requirements. Use of encapsulants is generally restricted to the surface of the temporary enclosure and to areas that are not to be refinished such as attics and crawlspaces. The proposed use of

encapsulants shall be included in the abatement design.

2.1.1 Removal Encapsulants

Requirement Test Standard

Flame Spread - 25, Smoke ASTM E 84

Emission - 50

Life Expectancy - 20 years ASTM C 732,

Accelerated Aging Test

Permeability - Minimum 0.4 perms ASTM E 96

2.1.2 Lock-down Encapsulant

Requirement Test Standard

Flame Spread - 25, Smoke ASTM E 84

Emission - 50

Life Expectancy - 20 years ASTM C 732

Accelerated Aging Test

Permeability - Minimum 0.4 perms ASTM E 96
Fire Resistance - Negligible affect ASTM E 119
on fire resistance rating over 3

hour test (Tested with fireproofing over encapsulant applied directly

to steel member)

Bond Strength - 100 pounds of force/ ASTM E 736 foot (Tests compatibility with cementitious and fibrous

fire-proofing)

2.1.3 Plastic Sheet

Plastic sheet, polyethylene, 6 mil minimum thickness, unless otherwise specified, in sizes to minimize the frequency of joints. All asbestos material or debris will be at least double bagged or wrapped in two layers of 6 mil poly sheeting.

2.1.4 Tape

Capable of sealing joints of adjacent sheets or plastic sheets and for attachment of plastic sheet to finished or unfinished surfaces of dissimilar materials and capable of adhering under dry and wet conditions, including use of amended water.

2.1.5 Disposal Bags

Bags shall be a minimum of 6 mil thick polyethylene. Affix a warning and Department of Transportation (DOT) label to each bag or use bags with the approved warnings and DOT labeling preprinted on the bag.

2.1.6 Warning Labels

Provide labels conforming to 29 CFR 1926.1101 of sufficient size to be

clearly legible, displaying the following legend:

DANGER
CONTAINS ASBESTOS FIBERS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
DO NOT BREATHE DUST
AVOID CREATING DUST

PART 3 EXECUTION

3.1 DISPOSAL SITE

CAMP LEJEUNE SANITARY LANDFILL 982 PINEY GREEN ROAD CAMP LEJEUNE, NC 28542 (910) 451-5011

Base Sanitary Landfill shall be used for disposal of all asbestos waste. The Base Sanitary Landfill is approved and is available for use by the Contractor providing the following requirements are satisfied:

- a. The Contracting Officer must be informed at least five working days in advance of the anticipated delivery date of the asbestos material to the Landfill. On larger projects, the notification should be accompanied by a cubic yard estimate of the anticipated volume, updated weekly if the disposal period extends for more than one week. The Government will be responsible for digging the trenches and covering the debris at the end of the working day. Debris will not be accepted before 8:00 AM or after 10:00 AM, except in an emergency situation.
- b. Asbestos will be accepted only if adequately wet and double bagged in heavy-duty 6 mil plastic bags which are clearly marked "Asbestos." If a Contractor desires to handle the asbestos in a manner other than double-bagged, written application, along with a description of the proposed deviation, must be submitted to the OICC and Landfill Manager for approval.
- c. Asbestos insulated piping with the asbestos insulation intact will be accepted if the following requirements are met:
 - 1. The pipe is cut in eight foot or shorter lengths
 - 2. Each section of pipe is double wrapped, sealed, and labeled as asbestos.
 - 3. All pipe is palletized on a 7/8-inch, 4- by 8-foot sheet of plywood. The whole pallet is banded with a minimum of three 1-inch wide metal bands with the coupling on top and wrapped with 6-mil plastic. The pallet is not higher than 3-inches.
- d. All asbestos, except palletized pipe will be off loaded and placed in the trench pipe hand.
- e. Asbestos disposal is restricted to one designated location in the Landfill and the landfill operators must be informed of and direct each delivery. Asbestos shall be disposed of from 0800 to 1000 hours daily, except holidays and weekends. Trucks hauling

asbestos must be properly covered with tarpaulins or equivalent. Trucks not covered properly must be parked until the Contracting Officer approves corrective actions.

- f. The Contractor will ensure asbestos contaminated material delivered to the Base Sanitary Landfill contain no free liquids. Free liquids are defined as material which fails the EPA SW-846 free liquids test.
- g. The Contractor will include all asbestos waste shipment records (DHHS-HHCU Form 3787) that are filled out completely with the correct information, to the project manager after abatement job is completed.

3.2 EQUIPMENT

Make available to the Contracting Officer or the Contracting Officer's Representative, two complete sets of personal protective equipment as required herein for entry to the asbestos control area at all times for inspection of the asbestos control area. Provide equivalent training to the Contracting Officer or a designated representative as provided to Contractor employees in the use of the required personal protective equipment. Provide manufacturer's certificate of compliance for all equipment required to contain airborne asbestos fibers.

3.2.1 Respirators

Comply with 29 CFR 1926.1101 and 1910-134.

3.3 WORK PROCEDURE

Remove all friable and non-friable ACM in accordance with all Federal, State, and local Marine Corps regulations. Ensure that the asbestos abatement plan is followed throughout all aspects of the abatement process.

3.3.1 Furnishings

Movable furniture/misc. materials shall be pre cleaned and removed from the work area by the abatement contractor and stored within the facility at an area of the owner's choosing.

Non moveable equipment/msic. materials will remain in the work area. Cover and seal equipment and misc. materials with 6-mil plastic sheet.

3.3.2 Pipe Insulation

Pipe may be removed with the asbestos insulation in place by wrapping the entire length of pipe and associated insulation with double thickness 6 mil plastic secured with duct tape. Mechanically cutting of asbestos containing insulation is prohibited. When using the "candy-stripe" method the abatement contractor must use glovebag operations to establish an "asbestos free" area to cut the pipe into appropriate lengths. Cut piping simultaneously into lengths suitable for transportation to disposal area, but no greater than 8 feet in length. Continuously wet the cutting site during the process. As soon as a length of pipe is completely cut loose, cover exposed ends with double thickness 6 mil plastic secured with duct tape. If the pipe is to remain in service, the removed pipe must be replaced in accordance with this Specification, with a pipe of the same size that is removed.

3.3.3 Air Sampling

Sampling of airborne concentrations of asbestos fibers shall be performed in accordance with 29 CFR 1926.1101 and as specified herein. Sampling performed in accordance with 29 CFR 1926.1101 shall be performed by the SAM. Sampling performed for environmental and quality control reasons shall be performed by the SAM. Unless otherwise specified, use NIOSH Method 7400 for sampling and analysis. Monitoring may be duplicated by the Government at the discretion of the Contracting Officer. If the air sampling results obtained by the Government differ from those results obtained by the Contractor, the Government results shall prevail.

3.3.3.1 Sampling During Asbestos Work

The SAM shall provide personal and area sampling as indicated in 29 CFR 1926.1101 and governing environmental regulations. Thereafter, provided the same type of work is being performed, provide area sampling at least once every work shift close to the work inside the containment, outside the clean room entrance to the containment, and at the exhaust opening of the local exhaust system. Also, where an enclosure is not provided, conduct area monitoring of airborne asbestos fibers during the work shift at the designated limits of the asbestos work area at such frequency as recommended by the SAM and conduct personal samples of each worker engaged in asbestos handling (removal, disposal, transport and other associated work). If the quantity of airborne asbestos fibers monitored at the breathing zone of the workers or designated limits at any time exceeds background or 0.01 fibers per cubic centimeter whichever is lesser outside of the containment area, stop work, evacuate personnel in adjacent areas or provide personnel with approved protective equipment at the discretion of the Contracting Officer. This sampling may be duplicated by the government at the discretion of the Contracting Officer. If the air sampling results obtained by the government differ from those obtained by the Contractor, the government results shall prevail. If adjacent areas are contaminated as determined by the Contracting Officer, clean the contaminated areas, monitor, and visually inspect the area as specified herein. If sampling outside the containment shows airborne levels have exceeded background or 0.01 fibers per cubic centimeter, whichever is greater, stop all work, correct the condition(s) causing the increase, and notify the Contracting Officer immediately. In areas where the construction of a containment is not required, after initial TWAs are established and provided the same type of work is being performed, provide sampling at the designated limits of the asbestos work area at such frequency as recommended by the SAM. Where glovebag methods are used, perform personal and area air sampling at locations and frequencies that will accurately characterize the evolving airborne asbestos levels.

3.3.3.2 Sampling After Final Clean-Up (Clearance Sampling) For All Areas Unless Noted Otherwise

Provide area sampling of asbestos fibers using aggressive air sampling techniques as defined in the EPA 560/5-85-024 and establish an air borne asbestos concentration of less than 70 structures per square millimeter after final clean-up but before removal of the containment or the asbestos work control area. After final cleanup and the asbestos control area is dry but prior to clearance sampling, the SAM shall perform a visual inspection, in accordance with ASTM E 1368, to insure that the asbestos control and work area is free of any accumulations of dirt, dust, or debris. Use transmission electron microscopy (TEM) to analyze clearance

samples and report the results in accordance with current NIOSH criteria. The asbestos fiber counts from these samples shall be less than 70 structures per square millimeter or be not greater than the background, whichever is greater. Should any of the final samples indicate a higher value, the Contractor shall take appropriate actions to re-clean the area and shall repeat the sampling and TEM analysis at the Contractor's expense.

3.3.3 Sampling After Final Clean-Up (Clearance Sampling) For the Following Areas: Mechanical room.

Provide area sampling of asbestos fibers using aggressive air sampling techniques as defined in the EPA 560/5-85-024 and establish an air borne asbestos concentration of less than 0.01 fibers per cubic centimeter after final clean-up but before removal of the containment or the asbestos work control area. After final cleanup and the asbestos control area is dry but prior to clearance sampling, the SAM shall perform a visual inspection, in accordance with ASTM E 1368, to insure that the asbestos control and work area is free of any accumulations of dirt, dust, or debris. Should any of the final samples indicate a higher value, the Contractor shall take appropriate actions to re-clean the area and shall repeat the sampling and analysis at the Contractor's expense.

3.3.4 Lock Down

Prior to removal of plastic barriers and after pre-clearance clean up of gross contamination, a visual inspection by the SAM, of all areas affected by the removal of the asbestos contaminated materials for any visible fibers, shall be conducted and approved by the SAM. A post removal (lock down) encapsulant shall then be spray applied to ceiling, walls, floors and other areas exposed in the removal area. The exposed area shall include but not be limited to plastic barriers, furnishings and articles to be discarded as well as dirty change room, air locks for bag removal and decon chambers.

3.3.5 Site Inspection

While performing asbestos removal work, the Contractor shall be subject to on-site inspection by the Contracting Officer who may be assisted by or represented by safety or industrial hygiene personnel. If the work is found to be in violation of this specification, the Contracting Officer or his representative will issue a stop work order to be in effect immediately and until the violation is resolved. Standby time required to resolve the violation shall be at the Contractor's expense.

3.4 CLEAN-UP AND DISPOSAL

3.4.1 Housekeeping

Essential parts of asbestos dust control are housekeeping and clean-up procedures. Maintain surfaces of the asbestos control area free of accumulations of asbestos fibers. Give meticulous attention to restricting the spread of dust and debris; keep waste from being distributed over the general area. Use HEPA filtered vacuum cleaners. Do not blow down the space with compressed air. When asbestos removal is complete, all asbestos waste is removed from the work-site, final clean-up is completed, and final air sampling results are reported, the SAM will certify the area as safe and the Conrracting Officer will approve the abatement completion, before the signs can be removed. After final clean-up and acceptable airborne concentrations are attained but before the HEPA unit is turned off and the

containment removed, remove all pre-filters on the building HVAC system and provide new pre-filters. Dispose of filters as asbestos-contaminated materials. Reestablish HVAC mechanical, and electrical systems in proper work ing order. The Contracting Officer will visually inspect all surfaces within the containment for residual material or accumulated dust or debris. The Contractor shall re-clean all areas showing dust or residual materials. If re-cleaning is required, air sample and establish an acceptable asbestos airborne concentration after re-cleaning. The SAM will provide written certification that the work area is safe within all standards as referenced within this contract before unrestricted entry is permitted. The Government shall have the option to perform monitoring to certify the areas are safe before entry is permitted.

3.4.2 Title to Materials

All materials resulting from demolition work, except as specified otherwise, shall become the property of the Contractor and shall be disposed of as specified in applicable local, state, and Federal regulations and herein. All building materials that are cross contaminated must be disposed of as an ACM at Base Landfill.

3.4.3 Disposal of Asbestos

3.4.3.1 Procedure for Disposal

Collect asbestos waste, asbestos contaminated water, scrap, debris, bags, containers, equipment, and asbestos contaminated clothing which may produce airborne concentrations of asbestos fibers and place in sealed fiberproof, waterproof, non-returnable containers (e.g. double plastic bags 6 mils thick, cartons, drums or cans). Wastes within the containers must be wetted to insure the security of the material in case of container breeching. Affix a warning and Department of Transportation (DOT) label to each bag or use at least 6 mil thick bags with the approved warnings and DOT labeling preprinted on the bag. For temporary storage, store sealed impermeable bags in asbestos waste drums or skids. An area for interim storage of asbestos waste-containing drums or skids will be assigned by the Contracting Officer or his authorized representative. Procedure for hauling and disposal shall comply with 40 CFR 61, SUBPART M, state, regional, and local standards.

3.4.3.2 Disposal Material Shall Contain No Free Liquid

The Contractor will ensure asbestos contaminated material delivered to the Base Sanitary Landfill contain no free liquids. Free liquids are defined as material which fails the EPA SW-846 Free Liquids Test.

-- End of Section --

Asbestos Inspection Reporting Form

Required under contractual agreement with Marine Corps Base, Camp Lejeune

Instructions: Supply the following information by filling in the blanks or selecting (checking) appropriate boxes.

General Information

Building Number	Date of Activity
Contractor Name	Contract Number
	Inspector
	Accreditation Number
Public Works FOO	
Inspection Information	
Homogeneous Area (HA) ID Number: (for additional HAs, please use Continuation Sheets)	
Homogeneous Description:	Homogeneous Location:
ACM Type: Surfacing Material The	nermal System Insulation
Friability: High Moderate	☐ Low ☐ Non
Estimated Quantity of ACM:	Sq Feet Linear Feet Other
Damage Designation: Localized Distributed	Potential for Contact: Low Moderate High (by building occupants)
Influence of Vibration: Low Moderate High	Influence of Air Erosion: Low Moderate High
Overall Potential for Disturbance:	v Moderate High
	umber of Samples Collected: OTE: Sample Results Entered on the Asbestos Sample Reporting Forms)
Laboratory Sampling Analysis Method:	Polarized Light Microscopy (AHERA Recommendation) Other
Confirmed ACM from this HA: Abated or	r ☐ Managed in Place
Inspection Activity Resulting From: Total Renovation Partial Renovation (Please	Demolition e Describe)
Comments:	

Asbestos Sample Reporting Form

Instructions: Supply the following information by filling in the blanks or checking the appropriate box. An example entry is provided to illustrate a correct response.

Bldg No.	HA No.	Sample No.	Date	Description of Material Sampled	Location of Material Sampled	CHR ¹ %	AMO ¹	CRO ¹	Other ² %	Positive ³	Comments
Example	1	1	5/1/1996	Ceiling Tile 1'x1', white	ISMD Storage	ND	ND	ND			

¹Percent of chrysotile (chr), amocite (amo), and crocidolite (cro). If no amount was detected, then "ND" should be entered under the appropriate column.

²Comments describing other suspect mineral types.

³Indication of positive for asbestos (this box is checked where no quantitative results exist, but records indicate that the sample is positive for asbestos).

Homogeneous Area (HA) Continuation Form

Provide the following information for each additional HA

HA ID Number:	Bldg Number:	HA ID Number:	Bldg Number:
HA Description:	HA Location:	HA Description:	HA Location:
ACM Type: Surfacing Material The	ermal System Insulation	ACM Type: Surfacing Material The	rmal System Insulation
Friability: High Moderate	Low Non	Friability: High Moderate	Low Non
Est Qty of ACM:	Sq Ft LF Other	Est Qty of ACM:	Sq Ft LF Other
Damage	Potential Low Moderate for Contact: High	Damage	Potential Low Moderate for Contact: High
Influence of Low Vibration: Moderate High	Influence of Low Air Erosion: Moderate High	Influence of Low Vibration: Moderate High	Influence of Low Air Erosion: Moderate High
Overall Potential for Disturbance:	Low Moderate High	Overall Potential for Disturbance:	Low Moderate High
Percent Damage%	No. of Samples Collected:	Percent Damage%	No. of Samples Collected:
Laboratory Sampling analysis Metho	PLM Other	Laboratory Sampling analysis Metho	PLM Other
Confirmed ACM from this HA:	Abated or Managed in Place	Confirmed ACM from this HA:	Abated or Managed in Place
Inspection Activity Demolition Resulting From: Partial Renovation	Total Renovation tion (please describe)		Total Renovation ion (please describe)
Comments:		Comments:	

Asbestos Sample Reporting Continuation Form

Provide the following information for each additional asbestos sample.

Bldg No.	HA No.	Sample No.	Date	Description of Material Sampled	Location of Material Sampled	CHR ¹ %	AMO ¹	CRO ¹	Other ² %	Positive ³	Comments

¹Percent of chrysotile (chr), amocite (amo), and crocidolite (cro). If no amount was detected, then "ND" should be entered under the appropriate column.

²Comments describing other suspect mineral types.

³Indication of positive for asbestos (this box is checked where no quantitative results exist, but records indicate that the sample is positive for asbestos).

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

11/11

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 ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 182 (2005; R 2009) Standard Specification for Burlap Cloth Made from Jute or Kenaf and

Cotton Mats

AASHTO M 322M/M 322 (2010) Standard Specification for

Rail-Steel and Axle-Steel Deformed Bars

for Concrete Reinforcement

ACI INTERNATIONAL (ACI)

ACI/MCP-1 (2012) Manual of Concrete Practice Part 1

ACI/MCP-2 (2012) Manual of Concrete Practice Part 2

ACI/MCP-3 (2012) Manual of Concrete Practice Part 3

ACI/MCP-4 (2012) Manual of Concrete Practice Part 4

AMERICAN HARDBOARD ASSOCIATION (AHA)

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

AMERICAN WELDING SOCIETY (AWS)

AWS D1.4/D1.4M (2011) Structural Welding Code -

Reinforcing Steel

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A123/A123M (2013) Standard Specification for Zinc

(Hot-Dip Galvanized) Coatings on Iron and

Steel Products

ASTM A185/A185M (2007) Standard Specification for Steel

Welded Wire Reinforcement, Plain, for

Concrete

ASTM A496/A496M (2007) Standard Specification for Steel

Wire, Deformed, for Concrete Reinforcement

ASTM A497/A497M	(2007) Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete
ASTM A53/A53M	(2012) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A615/A615M	(2012) Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A706/A706M	(2009b) Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A767/A767M	(2009) Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement
ASTM A775/A775M	(2007b) Standard Specification for Epoxy-Coated Steel Reinforcing Bars
ASTM A82/A82M	(2007) Standard Specification for Steel Wire, Plain, for Concrete Reinforcement
ASTM A996/A996M	(2009b) Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement
ASTM C1017/C1017M	(2007) Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C1107/C1107M	(2011) Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM C143/C143M	(2010a) Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C150/C150M	(2012) Standard Specification for Portland Cement
ASTM C150/C150M ASTM C156	-
	Cement (2011) Standard Test Method for Water
ASTM C156	Cement (2011) Standard Test Method for Water Retention by Concrete Curing Materials (2007) Standard Specification for Sheet
ASTM C156 ASTM C171	Cement (2011) Standard Test Method for Water Retention by Concrete Curing Materials (2007) Standard Specification for Sheet Materials for Curing Concrete (2010) Standard Practice for Sampling

ASTM C231/C231M	(2010) Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C233/C233M	(2011) Standard Test Method for Air-Entraining Admixtures for Concrete
ASTM C260/C260M	(2010a) Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C309	(2011) Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C31/C31M	(2010) Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C33/C33M	(2011a) Standard Specification for Concrete Aggregates
ASTM C39/C39M	(2012) Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C42/C42M	(2012) Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C494/C494M	(2011) Standard Specification for Chemical Admixtures for Concrete
ASTM C595/C595M	(2012) Standard Specification for Blended Hydraulic Cements
ASTM C618	(2012) Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C881/C881M	(2010) Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
ASTM C920	(2011) Standard Specification for Elastomeric Joint Sealants
ASTM C932	(2006) Standard Specification for Surface-Applied Bonding Compounds for Exterior Plastering
ASTM C94/C94M	(2012) Standard Specification for Ready-Mixed Concrete
ASTM C989/C989M	(2012) Standard Specification for Slag Cement for Use in Concrete and Mortars
ASTM D1557	(2012) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000

ft-lbf/	/ft3)	(2700	kN-m/	m3)
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ASTM D1751 (2004; R 2008) Standard Specification for

Preformed Expansion Joint Filler for

Concrete Paving and Structural

Construction (Nonextruding and Resilient

Bituminous Types)

ASTM D1752 (2004a; R 2008) Standard Specification for

Preformed Sponge Rubber Cork and Recycled

PVC Expansion

(2007) Standard Specification for Joint ASTM D6690

and Crack Sealants, Hot Applied, for

Concrete and Asphalt Pavements

ASTM D7116 (2005) Standard Specification for Joint

Sealants, Hot Applied, Jet Fuel Resistant

Types, for Portland Cement Concrete

Pavement

ASTM E1745 (2011) Standard Specification for Water

Vapor Retarders Used in Contact with Soil

or Granular Fill under Concrete Slabs

ASTM E329 (2011c) Standard Specification for

Agencies Engaged in the Testing and/or

Inspection of Materials Used in

Construction

CONCRETE REINFORCING STEEL INSTITUTE (CRSI)

CRSI 10MSP (2009; 28th Ed) Manual of Standard Practice

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

(2009) DOC Voluntary Product Standard PS NIST PS 1

1-07, Structural Plywood

U.S. ARMY CORPS OF ENGINEERS (USACE)

COE CRD-C 572 (1974) Corps of Engineers Specifications

for Polyvinylchloride Waterstops

U.S. DEPARTMENT OF COMMERCE (DOC)

DOC/NIST PS1 (1995) Construction and Industrial Plywood

with Typical APA Trademarks

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS SS-S-200 (Rev E; Am 1; Notice 1) Sealant, Joint,

Two-Component, Jet-Blast-Resistant, Cold-Applied, for Portland Cement Concrete

Pavement

1.2 DEFINITIONS

a. "Cementitious material" as used herein must include all portland

cement, pozzolan, fly ash, ground granulated blast-furnace slag, and .

- b. "Exposed to public view" means situated so that it can be seen from eye level from a public location after completion of the building. A public location is accessible to persons not responsible for operation or maintenance of the building.
- c. "Chemical admixtures" are materials in the form of powder or fluids that are added to the concrete to give it certain characteristics not obtainable with plain concrete mixes.
- d. "Workability (or consistence)" is the ability of a fresh (plastic) concrete mix to fill the form/mould properly with the desired work (vibration) and without reducing the concrete's quality. Workability depends on water content, chemical admixtures, aggregate (shape and size distribution), cementitious content and age (level of hydration).

1.3 SUBMITTALS

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

SD-02 Shop Drawings

Reinforcing steel

Reproductions of contract drawings are unacceptable.

Provide erection drawings for concrete Formwork that show placement of reinforcement and accessories, with reference to the contract drawings.

SD-03 Product Data

Materials for curing concrete

Joint sealants

Submit manufacturer's product data, indicating VOC content. Manufacturer's catalog data for the following items must include printed instructions for admixtures, bonding agents, epoxy-resin adhesive binders, waterstops, and liquid chemical floor hardeners.

Joint filler

Carton Forms

Cement

Portland Cement

Ready-Mix Concrete

Vapor retarder

Bonding Materials

Floor Finish Materials

Concrete Curing Materials

Reinforcement

Liquid Chemical Floor Hardener

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.

Vapor retarder

Waterstops

Wood Forms

SD-05 Design Data

Concrete mix design

Thirty days minimum prior to concrete placement, submit a mix design for each strength and type of concrete. Submit a complete list of materials including type; brand; source and amount of cement, fly ash, pozzolans, , ground slag , and admixtures; and applicable reference specifications. Provide mix proportion data using at least three different water-cement ratios for each type of mixture, which produce a range of strength encompassing those required for each class and type of concrete required. If source material changes, resubmit mix proportion data using revised source material. Provide only materials that have been proven by trial mix studies to meet the requirements of this specification, unless otherwise approved in writing by the Contracting Officer. Indicate clearly in the submittal where each mix design is used when more than one mix design is submitted. Submit additional data regarding concrete aggregates if the source of aggregate changes. Submit copies of the fly ash, , and pozzolan test results, in addition. The approval of fly ash, , and pozzolan test results must be within 6 months of submittal date. Obtain acknowledgement of receipt prior to concrete placement.

SD-06 Test Reports

Concrete mix design

Aggregates

Compressive strength tests

Air Content

Slump

Air Entrainment

1.4 MODIFICATION OF REFERENCES

Accomplish work in accordance with ACI publications except as modified herein. Consider the advisory or recommended provisions to be mandatory.

Interpret reference to the "Building Official," the "Structural Engineer," and the "Architect/Engineer" to mean the Contracting Officer.

1.5 DELIVERY, STORAGE, AND HANDLING

Do not deliver concrete until vapor retarder, forms, reinforcement, embedded items, and chamfer strips are in place and ready for concrete placement. ACI/MCP-2 for job site storage of materials. Protect materials from contaminants such as grease, oil, and dirt. Ensure materials can be accurately identified after bundles are broken and tags removed. Do not store concrete curing compounds or sealers with materials that have a high capacity to adsorb volatile organic compound (VOC) emissions. Do not store concrete curing compounds or sealers in occupied spaces.

1.5.1 Reinforcement

Store reinforcement of different sizes and shapes in separate piles or racks raised above the ground . Protect from contaminants such as grease, oil, and dirt. Ensure bar sizes can be accurately identified after bundles are broken and tags removed.

1.6 QUALITY ASSURANCE

- 1.6.1 Design Data
- 1.6.2 Drawings

1.6.2.1 Reinforcing Steel

ACI/MCP-4. Indicate bending diagrams, assembly diagrams, splicing and laps of bars, shapes, dimensions, and details of bar reinforcing, accessories, and concrete cover. Do not scale dimensions from structural drawings to determine lengths of reinforcing bars.

1.6.3 Test Reports

1.6.3.1 Concrete Mix Design

Submit copies of laboratory test reports showing that the mix has been successfully tested to produce concrete with the properties specified and that mix must be suitable for the job conditions. Include mill test and all other test for cement, aggregates, and admixtures in the laboratory test reports. Provide maximum nominal aggregate size, gradation analysis, percentage retained and passing sieve, and a graph of percentage retained verses sieve size. Submit test reports along with the concrete mix design. Obtain approval before concrete placement.

1.6.4 Special Finisher Qualifications

1.7 ENVIRONMENTAL REQUIREMENTS

Provide space ventilation according to manufacturer recommendations, at a minimum, during and following installation of concrete curing compound and sealer. Maintain one of the following ventilation conditions during the curing compound/sealer curing period or for 72 hours after installation:

- a. Supply 100 percent outside air 24 hours a day.
- b. Supply airflow at a rate of 6 air changes per hour, when outside

temperatures are between 55 degrees F and 84 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.

1.7.1 Submittals for Environmental Performance

- a. Provide data indication the percentage of post-industrial pozzolan (fly ash, blast furnace slag) cement substitution as a percentage of the full product composite by weight.
- b. Provide data indicating the percentage of post-industrial and post-consumer recycled content aggregate.
- c. Provide product data indicating the percentage of post-consumer recycled steel content in each type of steel reinforcement as a percentage of the full product composite by weight.
- d. Provide product data stating the location where all products were manufactured
- e. For projects using FSC certified formwork, provide chain-of-custody documentation for all certified wood products.
- f. For projects using reusable formwork, provide data showing how formwork is reused.
- g. Provide MSDS product information data showing that form release agents meet any environmental performance goals such as using vegetable and soy based products.
- h. Provide MSDS product information data showing that concrete adhesives meet any environmental performance goals including low emitting, low volatile organic compound products.

1.8 QUALIFICATIONS FOR CONCRETE TESTING SERVICE

Perform concrete testing by an approved laboratory and inspection service experienced in sampling and testing concrete. Testing agency must meet the requirements of ASTM E329.

1.9 QUALIFICATIONS FOR WELDING WORK

1.10 CONCRETE SAMPLING AND TESTING

Testing by the Contractor must include sampling and testing concrete materials proposed for use in the work and testing the design mix for each class of concrete. Perform quality control testing during construction.

Sample and test concrete aggregate materials proposed for use in the work in accordance with ASTM C33/C33M.

Sample and test portland cement in accordance with ASTM C150/C150M.

Sample and test air-entraining admixtures in accordance with ASTM C233/C233M.

Testing must be performed by a Grade I Testing Technician.

PART 2 PRODUCTS

2.1 MATERIALS FOR FORMS

Provide wood, plywood, plastic, carton, or steel. Use plywood or steel forms where a smooth form finish is required.

2.1.1 Wood Forms

Provide lumber that is square edged or tongue-and-groove boards, free of raised grain, knotholes, or other surface defects. Provide plywood that complies with DOC/NIST PS1, B-B concrete form panels or better or AHA A135.4, hardboard for smooth form lining.

2.1.1.1 Concrete Form Plywood (Standard Rough)

Provide plywood that conforms to NIST PS 1, B-B, concrete form, not less than 5/8-inch thick.

2.1.1.2 Overlaid Concrete Form Plywood (Standard Smooth)

Provide plywood that conforms to NIST PS 1, B-B, high density form overlay, not less than 5/8-inch thick.

2.1.2 Carton Forms

Moisture resistant treated paper faces, biodegradable, structurally sufficient to support weight of wet concrete until initial set.

2.1.3 Steel Forms

Provide steel form surfaces that do not contain irregularities, dents, or sags.

2.2 FORM TIES AND ACCESSORIES

The use of wire alone is prohibited. Provide form ties and accessories that do not reduce the effective cover of the reinforcement.

2.2.1 Polyvinylchloride Waterstops

COE CRD-C 572.

2.2.2 Dovetail Anchor Slot

Preformed metal slot approximately 1 by 1 inch of not less than 22 gage galvanized steel cast in concrete. Coordinate actual size and throat opening with dovetail anchors and provide with removable filler material.

2.3 CONCRETE

2.3.1 Contractor-Furnished Mix Design

ACI/MCP-1, ACI/MCP-2, and ACI/MCP-3 except as otherwise specified. Indicate the compressive strength (f'c) of the concrete for each portion of the structure(s) .

Location	f'c (Min. 28-Day Comp. Strength (psi)	ASTM C33/C33M Maximum Nominal Aggregate (Size No.)	Range of Slump (inches)	Maximum Water-Cement Ratio (by weight)	Air Entr. (percent)
All areas	4000	57	4 +/- 1	0.50	6

Maximum slump shown above may be increased 1 inch for methods of consolidation other than vibration. Slump may be increased to 8 inches when superplasticizers are used. Provide air entrainment using air-entraining admixture. Provide air entrainment within plus or minus 1.5 percent of the value specified.

Proportion concrete mixes for strength at 56 days.

2.3.1.1 Mix Proportions for Normal Weight Concrete

Trial design batches, mixture proportioning studies, and testing requirements for various classes and types of concrete specified are the responsibility of the Contractor. Base mixture proportions on compressive strength as determined by test specimens fabricated in accordance with ASTM C192/C192M and tested in accordance with ASTM C39/C39M. Samples of all materials used in mixture proportioning studies must be representative of those proposed for use in the project and must be accompanied by the manufacturer's or producer's test report indicating compliance with these specifications. Base trial mixtures having proportions, consistencies, and air content suitable for the work on methodology described in ACI/MCP-1. In the trial mixture, use at least three different water-cement ratios for each type of mixture, which must produce a range of strength encompassing those required for each class and type of concrete required on the project. The maximum water-cement ratio required must be based on equivalent water-cement ratio calculations as determined by the conversion from the weight ratio of water to cement plus pozzolan, and ground granulated blast-furnace slag by weight equivalency method. Design laboratory trial mixture for maximum permitted slump and air content. Each combination of material proposed for use must have separate trial mixture, except for accelerator or retarder use can be provided without separate trial mixture. Report the temperature of concrete in each trial batch. For each water-cement ratio, at least three test cylinders for each test age must be made and cured in accordance with ASTM C192/C192M and tested in accordance with ASTM C39/C39M for 7 and 28 days. From these results, plot a curve showing the relationship between water-cement ratio and strength for each set of trial mix studies. In addition, plot a curve showing the relationship between 7 and 28 day strengths.

2.3.1.2 Required Average Strength of Mix Design

The selected mixture must produce an average compressive strength exceeding the specified strength by the amount indicated in ACI/MCP-2. When a concrete production facility has a record of at least 15 consecutive tests, the standard deviation must be calculated and the required average compressive strength must be determined in accordance with ACI/MCP-2. When a concrete production facility does not have a suitable record of tests to establish a standard deviation, the required average strength must follow ACI/MCP-2 requirements.

2.3.2 Ready-Mix Concrete

Provide concrete that meets the requirements of ASTM C94/C94M.

Ready-mixed concrete manufacturer must provide duplicate delivery tickets with each load of concrete delivered. Provide delivery tickets with the following information in addition to that required by ASTM C94/C94M:

Type and brand cement

Cement content in 94-pound bags per cubic yard of concrete

Maximum size of aggregate

Amount and brand name of admixtures

Total water content expressed by water/cement ratio

2.3.3 Concrete Curing Materials

2.3.3.1 Absorptive Cover

Provide burlap, cotton mats, and other absorbent materials for curing concrete, as described in ACI 308R.

2.3.3.2 Moisture-Retaining Cover

Provide waterproof paper cover for curing concrete conforming to ASTM C171, regular or white, or polyethylene sheeting conforming to ASTM C171, or polyethylene-coated burlap consisting of a laminate of burlap and a white opaque polyethylene film permanently bonded to the burlap; burlap must conform to ASTM C171, Class 3, and polyethylene film must conform to ASTM C171. When tested for water retention in accordance with ASTM C156, weight of water lost 72 hours after application of moisture retaining covering material must not exceed 0.039 gram per square centimeter of the mortar specimen surface.

2.3.3.3 Membrane-Forming Curing Compound

Provide liquid type compound conforming to ASTM C309, Type 1, clear, Type 1D with fugitive dye for interior work and Type 2, white, pigmented for exterior work.

2.4 MATERIALS

2.4.1 Cement

ASTM C150/C150M, Type I or II or ASTM C595/C595M, Type IP(MS) or IS(MS) blended cement except as modified herein. Provide blended cement that consists of a mixture of ASTM C150/C150M, Type II, cement and one of the following materials: ASTM C618 pozzolan or fly ash, ASTM C989/C989M ground granulated blast-furnace slag. For portland cement manufactured in a kiln fueled by hazardous waste, maintain a record of source for each batch. For exposed concrete, use one manufacturer for each type of cement, ground slag, fly ash, and pozzolan.

2.4.1.1 Portland Cement

Provide cement that conforms to $ASTM\ C150/C150M$, Type I, IA, II, or IIA. Use one brand and type of cement for formed concrete having exposed-to-view finished surfaces.

2.4.2 Water

Minimize the amount of water in the mix. The amount of water must not exceed 45 percent by weight of cementitious materials (cement plus pozzolans), and in general, improve workability by adjusting the grading rather than by adding water. Water must be fresh, clean, and; free from injurious amounts of oils, acids, alkalis, salts, organic materials, or other substances deleterious to concrete.

2.4.3 Nonshrink Grout

ASTM C1107/C1107M.

2.4.4 Admixtures

ASTM C494/C494M: Type A, water reducing; Type B, retarding; Type C, accelerating; Type D, water-reducing and retarding; and Type E, water-reducing and accelerating admixture. Do not use calcium chloride admixtures.

2.4.4.1 Air-Entraining

ASTM C260/C260M.

2.4.4.2 High Range Water Reducer (HRWR) (Superplasticizers)

ASTM C494/C494M, Type F and ASTM C1017/C1017M.

2.4.4.3 Pozzolan

Provide fly ash or other pozzolans used as admixtures that conform to ${\tt ASTM}$ C618.

2.4.5 Vapor Retarder

ASTM E1745 Class A polyethylene sheeting, minimum 10 mil thickness or other equivalent material.

2.4.6 Materials for Curing Concrete

Consider the use of water based or vegetable or soy based curing agents in lieu of petroleum based products. Consider agents that are not toxic and emit low or no Volatile Organic Compounds (VOC). Consider the use of admixtures that offer high performance to increase durability of the finish product but also have low toxicity and are made from bio-based materials such as soy, and emit low levels of Volatile Organic Compounds (VOC).

2.4.6.1 Impervious Sheeting

ASTM C171; waterproof paper, clear or white polyethylene sheeting, or polyethylene-coated burlap.

2.4.6.2 Pervious Sheeting

AASHTO M 182.

2.4.6.3 Liquid Membrane-Forming Compound

ASTM C309, white-pigmented, Type 2, Class B.

2.4.7 Liquid Chemical Sealer-Hardener Compound

Provide surface treatments containing certain chemicals, including sodium silicate and the fluosilicates of magnesium and zinc. Provide compound that does not reduce the adhesion of resilient flooring, tile, paint, roofing, waterproofing, or other material applied to concrete.

2.4.8 Expansion/Contraction Joint Filler

ASTM D1751, ASTM D1752, cork or 100 percent post-consumer paper meeting ASTM D1752 (subparagraphs 5.1 to 5.4). Material must be 1/2 inch thick.

2.4.8.1 Preformed Joint Filler Strips

2.4.9 Joint Sealants

2.4.9.1 Horizontal Surfaces, 3 Percent Slope, Maximum

ASTM D6690 or ASTM C920, Type M, Class 25, Use T. ASTM D7116 for surfaces subjected to jet fuel.

2.4.9.2 Vertical Surfaces Greater Than 3 Percent Slope

ASTM C920, Type M, Grade NS, Class 25, Use T...

2.4.9.3 Waterstops

Provide waterstops that are flat dumbbell type, not less than 3/16 inch for widths up to 5 inches, and not less than 3/8 inch for widths 5 inches and over.

2.4.9.4 Joint Sealant Compound

Provide cold-applied, two-component, elastomeric polymer type compound conforming to FS SS-S-200.

2.5 REINFORCEMENT

Galvanize bars, fabrics, connectors, and chairs.

2.5.1 Reinforcing Bars

ACI/MCP-2 unless otherwise specified. ASTM A615/A615M and AASHTO M 322M/M 322 with the bars marked A, S, W, Grade; or ASTM A996/A996M with the bars marked R, Grade, or marked A, Grade . ASTM A706/A706M. Galvanized, ASTM A123/A123M.

2.5.1.1 Galvanized Reinforcing Bars

Provide galvanized reinforcing bars that conform to ASTM A767/A767M, Class II with galvanizing before fabrication.

2.5.1.2 Weldable Reinforcing Bars

Provide weldable reinforcing bars that conform to ASTM A706/A706M and ASTM A615/A615M and Supplement S1, Grade 60, except that the maximum carbon content must be 0.55 percent.

2.5.1.3 Epoxy-Coated Reinforcing Bars

Provide epoxy-coated reinforcing bars that conform to ASTM A775/A775M, Grade 40 or Grade 60.

2.5.2 Mechanical Reinforcing Bar Connectors

ACI/MCP-2. Provide 125 percent minimum yield strength of the reinforcement bar.

2.5.3 Wire

ASTM A82/A82M or ASTM A496/A496M.

2.5.3.1 Welded Wire Fabric

ASTM A185/A185M or ASTM A497/A497M. Provide flat sheets of welded wire fabric for slabs and toppings.

2.5.3.2 Steel Wire

Wire must conform to ASTM A82/A82M.

2.5.4 Reinforcing Bar Supports

Provide bar ties and supports of coated or non corrodible material.

2.5.5 Dowels for Load Transfer in Floors

Provide dowels for load transfer in floors of the type, design, weight, and dimensions indicated. Provide dowel bars that are plain-billet steel conforming to ASTM A615/A615M, Grade 40. Provide dowel pipe that is steel conforming to ASTM A53/A53M.

2.5.6 Supports for Reinforcement

Supports include bolsters, chairs, spacers, and other devices necessary for proper spacing, supporting, and fastening reinforcing bars and wire fabric in place.

Provide wire bar type supports conforming to ACI/MCP-3, ACI/MCP-4 and CRSI 10MSP.

Legs of supports in contact with formwork must be hot-dip galvanized, or plastic coated after fabrication, or stainless-steel bar supports.

2.6 BONDING MATERIALS

2.6.1 Concrete Bonding Agent

Provide aqueous-phase, film-forming, nonoxidizing, freeze and thaw-resistant compound agent suitable for brush or spray application

conforming to ASTM C932.

2.6.2 Epoxy-Resin Adhesive Binder

Provide two-component, epoxy-polysulfide polymer type binder with an amine-type curing-agent conforming to ASTM C881/C881M.

2.7 FLOOR FINISH MATERIALS

2.7.1 Liquid Chemical Floor Hardener

Hardener must be a colorless aqueous solution containing a blend of magnesium fluorosilicate and zinc fluorosilicate combined with a wetting agent. Solution must contain not less than 1/2 pounds of fluorosilicates per gallon. An approved proprietary chemical hardener may be used provided hardener is delivered ready for use in manufacturer's original containers.

2.8 CLASSIFICATION AND QUALITY OF CONCRETE

2.8.1 Concrete Classes and Usage

Provide concrete classes, compressive strength, requirements for air entrainment, and usage as follows:

CONCRETE CLASS	MIN. 28-DAY COMPRESSIVE STRENGTH POUNDS PER SQ. IN.	REQUIREMENT FOR AIR ENTRAINMENT	USAGE
3a	3000	Air-entrained	For foundation concrete work exposed to freezing and thawing or subjected to hydraulic pressure, such as foundation walls, grade beams, pits, tunnels. For exterior concrete slabs, such as steps, platforms, walks
3N	3000	Nonair-entrained	For foundation concrete work not exposed to freezing and thawing or subjected to hydraulic pressure, such as footings, pile caps, foundation mats. For interior slabs on ground to be covered with resilient flooring
4A	4000	Air-entrained	For structural concrete work exposed to freezing and thawing, unless otherwise indicated or specified, such as exterior columns and spandrels

CONCRETE	MIN. 28-DAY COMPRESSIVE STRENGTH POUNDS PER SQ. IN.	REQUIREMENT FOR AIR ENTRAINMENT	USAGE
4N	4000	Nonair-entrained	For structural concrete work not exposed to freezing and thawing such as interior columns, beams, supported slabs and other structural members for interior slabs on ground subjected to foot traffic
2.5A	2500	Air-entrained	For concrete not reinforced and not exposed to freezing and thawing
2.5N	2500	Nonair-entrained	For concrete not reinforced and not exposed to freezing and thawing
5A	5000	Air-entrained	For structural concrete work as indicated
5N	5000	Nonair-entrained	For structural concrete work as indicated

2.8.2 Limits for Concrete Proportions

Provide limits for maximum water/cement ratio and minimum cement content for each concrete class as follows:

CONCRETE CLASS	MAX. WATER/CEMENT RATIO BY WEIGHT	MIN. CEMENT FOR 3- TO 4-INCH SLUMP, (NO. OF 94-POUND SACKS) PER CU. YD.
2.5A	0.58	4.75
2.5N	0.62	4.75
3A	0.50	5.25
3N	0.54	5.25
4A	0.46	6.0
4N	0.48	6.0
5A	0.41	6.5
5N	0.44	6.5

-		MIN. CEMENT F	FOR 3- TO 4-INCH
	'	, ,	F 94-POUND SACKS) PER
F	RATIO BY WEIGHT	CU. YD.	
* Weight of	f water to weight	of cement in	pounds in one cubic
yard of concrete.			

2.8.3 Maximum Size of Aggregate

Size of aggregate, designated by the sieve size on which maximum amount of retained coarse aggregate is 5 to 10 percent by weight, must be as follows:

3/8 inch	8	Nonreinforced slabs and	
		other flatwork having a	
		depth of less than	
		2-1/2 inches	

Maximum size of aggregate may be that required for most critical type of construction using that concrete class.

Specify gradation of aggregates for separate floor topping.

2.8.4 Slump

Provide slump for concrete at time and in location of placement as follows:

TYPE OF CONSTRUCTION	SLUMP
Footings, unreinforced walls	Not less than 1 inch nor more than 3 inches
Columns, beams, reinforced walls, monolithic slabs	Not less than 1 inch nor more than 4 inches
Ramps and other sloping surfaces	0 nor more than 3 inches

2.8.5 Total Air Content

Air content of exposed concrete and interior concrete must be in accordance with ASTM C260/C260M and/or as follows:

LIMITS OF CONCRETE EXPOSURE	REQUIREMENT FOR AIR ENTRAINMENT	MAXIMUM SIZE OF AGGREGATE	TOTAL AIR CONTENT BY VOLUME
Exposed to freezing and thawing or subjected to hydraulic pressure	Air-entrained	1-1/2 or 2 inches	4 to 6 percent
		3/4 inch	5 to 7 percent
		1/2 or 3/8 inch	6 to 8.5 percent

Provide concrete exposed to freezing and thawing or subjected to hydraulic pressure that is air-entrained by addition of approved air-entraining admixture to concrete mix.

PART 3 EXECUTION

3.1 EXAMINATION

Do not begin installation until substrates have been properly constructed; verify that substrates are plumb and true.

If substrate preparation is the responsibility of another installer, notify Architect/Engineer of unsatisfactory preparation before processing.

Check field dimensions before beginning installation. If dimensions vary too much from design dimensions for proper installation, notify Architect/Engineer and wait for instructions before beginning installation.

3.2 PREPARATION

Determine quantity of concrete needed and minimize the production of excess concrete. Designate locations or uses for potential excess concrete before the concrete is poured.

3.2.1 General

Surfaces against which concrete is to be placed must be free of debris, loose material, standing water, snow, ice, and other deleterious substances before start of concrete placing.

Remove standing water without washing over freshly deposited concrete. Divert flow of water through side drains provided for such purpose.

3.2.2 Subgrade Under Foundations and Footings

When subgrade material is semiporous and dry, sprinkle subgrade surface with water as required to eliminate suction at the time concrete is deposited. When subgrade material is porous, seal subgrade surface by covering surface with specified vapor retarder; this may also be used over semiporous, dry subgrade material instead of water sprinkling.

3.2.3 Subgrade Under Slabs on Ground

Before construction of slabs on ground, have underground work on pipes and conduits completed and approved.

Previously constructed subgrade or fill must be cleaned of foreign materials and inspected by the Contractor for adequate compaction and surface tolerances as specified.

Actual density of top 12 inches of subgrade soil material-in-place must not be less than the following percentages of maximum density of same soil material compacted at optimum moisture content in accordance with ASTM D1557.

SOIL MATERIAL	PERCENT MAXIMUM
	DENSITY
Capillary water barrier	100
Cohesionless soil material	100
Cohesive soil material	95

Finish surface of capillary water barrier under interior slabs on ground must not show deviation in excess of 1/4 inch when tested with a 10-foot straightedge parallel with and at right angles to building lines.

Finished surface of subgrade or fill under exterior slabs on ground must not be more than 0.02-foot above or 0.10-foot below elevation indicated.

Prepare subgrade or fill surface under exterior slabs on ground as specified for subgrade under foundations and footings.

3.2.4 Formwork

Complete and approve formwork. Remove debris and foreign material from interior of forms before start of concrete placing.

3.2.5 Edge Forms and Screed Strips for Slabs

Set edge forms or bulkheads and intermediate screed strips for slabs to obtain indicated elevations and contours in finished slab surface and must be strong enough to support vibrating bridge screeds or roller pipe screeds if nature of specified slab finish requires use of such equipment. Align concrete surface to elevation of screed strips by use of strike-off templates or approved compacting-type screeds.

3.2.6 Reinforcement and Other Embedded Items

Secure reinforcement, joint materials, and other embedded materials in position, inspected, and approved before start of concrete placing.

3.3 FORMS

ACI/MCP-2. Provide forms, shoring, and scaffolding for concrete placement. Set forms mortar-tight and true to line and grade. Chamfer above grade exposed joints, edges, and external corners of concrete 0.75 inch unless otherwise indicated. Provide formwork with clean-out openings

to permit inspection and removal of debris. Forms submerged in water must be watertight.

3.3.1 General

Construct forms to conform, within the tolerances specified, to shapes dimensions, lines, elevations, and positions of cast-in-place concrete members as indicated. Forms must be supported, braced, and maintained sufficiently rigid to prevent deformation under load.

3.3.2 Design and Construction of Formwork

Provide formwork design and construction that conforms to ACI/MCP-2, Chapter 4.

Provide forms that are tight to prevent leakage of cement paste during concrete placing.

Support form facing materials by structural members spaced close to prevent deflection of form facing material. Fit forms placed in successive units for continuous surfaces to accurate alignment to ensure a smooth completed surface within the tolerances specified. Where necessary to maintain the tolerances specified, such as long spans where immediate supports are not possible, camber formwork for anticipated deflections in formwork due to weight and pressure of fresh concrete and to construction loads.

Chamfer exposed joints, edges, and external corners a minimum of 3/4 inch by moldings placed in corners of column, beam, and wall forms.

Provide shores and struts with a positive means of adjustment capable of taking up formwork settlement during concrete placing operations. Obtain adjustment with wedges or jacks or a combination thereof. When adequate foundations for shores and struts cannot be secured, provide trussed supports.

Provide temporary openings in wall forms, column forms, and at other points where necessary to permit inspection and to facilitate cleaning.

Provide forms that are readily removable without impact, shock, or damage to concrete.

3.3.3 Coating

Before concrete placement, coat the contact surfaces of forms with a nonstaining mineral oil, nonstaining form coating compound, or two coats of nitrocellulose lacquer. Do not use mineral oil on forms for surfaces to which adhesive, paint, or other finish material is to be applied.

3.3.4 Reshoring

Reshore concrete elements where forms are removed prior to the specified time period. Do not permit elements to deflect or accept loads during form stripping or reshoring. Forms on columns, walls, or other load-bearing members may be stripped after 2 days if loads are not applied to the members. After forms are removed, reshore slabs and beams over 10 feet in span and cantilevers over 4 feet for the remainder of the specified time period in accordance with paragraph entitled "Removal of Forms." Perform reshoring operations to prevent subjecting concrete members to overloads, eccentric loading, or reverse bending. Provide reshoring elements with the

same load-carrying capabilities as original shoring and spaced similar to original shoring. Firmly secure and brace reshoring elements to provide solid bearing and support.

3.3.5 Reuse

Reuse forms providing the structural integrity of concrete and the aesthetics of exposed concrete are not compromised.

3.3.6 Forms for Standard Rough Form Finish

Give rough form finish concrete formed surfaces that are to be concealed by other construction, unless otherwise specified.

Form facing material for standard rough form finish must be the specified concrete form plywood or other approved form facing material that produces concrete surfaces equivalent in smoothness and appearance to that produced by new concrete form plywood panels.

For concrete surfaces exposed only to the ground, undressed, square-edge, 1-inch nominal thickness lumber may be used. Provide horizontal joints that are level and vertical joints that are plumb.

3.3.7 Forms for Standard Smooth Form Finish

Give smooth form finish concrete formed surfaces that are to be exposed to view or that are to be covered with coating material applied directly to concrete or with covering material bonded to concrete, such as waterproofing, dampproofing, painting, or other similar coating system.

Form facing material for standard smooth finish must be the specified overlaid concrete form plywood or other approved form facing material that is nonreactive with concrete and that produce concrete surfaces equivalent in smoothness and appearance to that produced by new overlaid concrete form plywood panels.

Maximum deflection of form facing material between supports and maximum deflection of form supports such as studs and wales must not exceed 0.0025 times the span.

Provide arrangement of form facing sheets that are orderly and symmetrical, and sheets that are in sizes as large as practical.

Arrange panels to make a symmetrical pattern of joints. Horizontal and vertical joints must be solidly backed and butted tight to prevent leakage and fins.

3.3.8 Form Ties

Provide ties that are factory fabricated metal, adjustable in length, removable or snap-off type that do allow form deflection or do not spall concrete upon removal. Portion of form ties remaining within concrete after removal of exterior parts must be at least 1-1/2 inches back from concrete surface. Provide form ties that are free of devices that leave a hole larger than 7/8 inch or less than 1/2 inch in diameter in concrete surface. Form ties fabricated at the project site or wire ties of any type are not acceptable.

3.3.9 Forms for Concrete Pan Joist Construction

Provide forms that are well-fitting, undamaged, factory-fabricated pan form units for concrete joist construction as indicated.

Form units complete with covers and end closures as required for the installation must be one of the following materials:

Steel, 16-gage, free from irregularities, dents, sag, and rust

Hardboard conforming to

Glass-fiber-reinforced plastic, molded under pressure, with matched dies, 0.11-inch maximum wall thickness

Asphalt-impregnated, corrugated material treated for moisture resistance with factory-applied polyethylene coating, with top and side cover joints taped where concrete is exposed.

Provide tight forms for concrete pan joist construction to prevent cement paste loss during concrete placing and to form a true, clean, smooth surface, free of honeycomb and rough exposed-aggregate areas. Take precautions, including blocking of adjoining pan units, to avoid lateral deflection of formwork during compaction of concrete.

3.3.10 Tolerances for Form Construction

Construct formwork to ensure that after removal of forms and prior to patching and finishing of formed surfaces, provide concrete surfaces in accordance with tolerances specified in ACI/MCP-1 and ACI/MCP-2.

3.3.11 Removal of Forms and Supports

After placing concrete, forms must remain in place for the time periods specified in ACI/MCP-4. Do not remove forms and shores (except those used for slabs on grade and slip forms) until the client determines that the concrete has gained sufficient strength to support its weight and superimposed loads. Base such determination on compliance with one of the following:

- a. The plans and specifications stipulate conditions for removal of forms and shores, and such conditions have been followed, or
- b. The concrete has been properly tested with an appropriate ASTM standard test method designed to indicate the concrete compressive strength, and the test results indicate that the concrete has gained sufficient strength to support its weight and superimposed loads.

Prevent concrete damage during form removal. Clean all forms immediately after removal.

3.3.11.1 Special Requirements for Reduced Time Period

Forms may be removed earlier than specified if ASTM C39/C39M test results of field-cured samples from a representative portion of the structure indicate that the concrete has reached a minimum of 85 percent of the design strength.

3.4 WATERSTOP SPLICES

Fusion weld in the field.

3.5 FORMED SURFACES

3.5.1 Preparation of Form Surfaces

Coat contact surfaces of forms with form-coating compound before reinforcement is placed. Provide a commercial formulation form-coating compound that does not bond with, stain, nor adversely affect concrete surfaces and impair subsequent treatment of concrete surfaces that entails bonding or adhesion nor impede wetting of surfaces to be cured with water or curing compounds. Do not allow excess form-coating compound to stand in puddles in the forms nor to come in contact with concrete against which fresh concrete is placed. Make thinning of form-coating compound with thinning agent of the type, in the amount, and under the conditions recommended by form-coating compound manufacturer's printed or written directions.

3.5.2 Tolerances

ACI/MCP-4 and as indicated.

3.5.3 As-Cast Form

Provide form facing material producing a smooth, hard, uniform texture on the concrete. Arrange facing material in an orderly and symmetrical manner and keep seams to a practical minimum. Support forms as necessary to meet required tolerances. Do not use material with raised grain, torn surfaces, worn edges, patches, dents, or other defects which can impair the texture of the concrete surface.

3.6 PLACING REINFORCEMENT AND MISCELLANEOUS MATERIALS

ACI/MCP-2. Provide bars, wire fabric, wire ties, supports, and other devices necessary to install and secure reinforcement. Reinforcement must not have rust, scale, oil, grease, clay, or foreign substances that would reduce the bond. Rusting of reinforcement is a basis of rejection if the effective cross-sectional area or the nominal weight per unit length has been reduced. Remove loose rust prior to placing steel. Tack welding is prohibited.

3.6.1 General

Provide details of reinforcement that are in accordance with ACI/MCP-3 and ACI/MCP-4 and as specified.

3.6.2 Vapor Retarder

Provide beneath the on-grade concrete floor slab. Use the greatest widths and lengths practicable to eliminate joints wherever possible. Lap joints a minimum of 12 inches. Remove torn, punctured, or damaged vapor retarder material and provide with new vapor retarder prior to placing concrete. Concrete placement must not damage vapor retarder .

3.6.3 Reinforcement Supports

Place reinforcement and secure with galvanized or non corrodible chairs,

spacers, or metal hangers. For supporting reinforcement on the ground, use concrete or other non corrodible material, having a compressive strength equal to or greater than the concrete being placed.

3.6.4 Splicing

As indicated. For splices not indicated ACI/MCP-2. Do not splice at points of maximum stress. Overlap welded wire fabric the spacing of the cross wires, plus 2 inches.

3.6.5 Future Bonding

Plug exposed, threaded, mechanical reinforcement bar connectors with a greased bolt. Provide bolt threads that match the connector. Countersink the connector in the concrete. Caulk the depression after the bolt is installed.

3.6.6 Cover

ACI/MCP-2 for minimum coverage, unless otherwise indicated.

3.6.7 Setting Miscellaneous Material

Place and secure anchors and bolts, pipe sleeves, conduits, and other such items in position before concrete placement. Plumb anchor bolts and check location and elevation. Temporarily fill voids in sleeves with readily removable material to prevent the entry of concrete.

3.6.8 Construction Joints

Locate joints to least impair strength. Continue reinforcement across joints unless otherwise indicated.

3.6.9 Expansion Joints and Contraction Joints

Provide expansion joint at edges of interior floor slabs on grade abutting vertical surfaces, and as indicated. Make expansion joints 1/2 inch wide unless indicated otherwise. Fill expansion joints not exposed to weather with preformed joint filler material. Completely fill joints exposed to weather with joint filler material and joint sealant. Do not extend reinforcement or other embedded metal items bonded to the concrete through any expansion joint unless an expansion sleeve is used. Provide contraction joints, either formed or saw cut or cut with a jointing tool, to the indicated depth after the surface has been finished. Complete saw joints within 4 to 12 hours after concrete placement. Protect joints from intrusion of foreign matter.

3.6.10 Fabrication

Shop fabricate reinforcing bars to conform to shapes and dimensions indicated for reinforcement, and as follows:

Provide fabrication tolerances that are in accordance with ACI/MCP-1, ACI/MCP-2 and ACI/MCP-3.

Provide hooks and bends that are in accordance with ACI/MCP-3 and ACI/MCP-4.

Reinforcement must be bent cold to shapes as indicated. Bending must be

done in the shop. Rebending of a reinforcing bar that has been bent incorrectly is not be permitted. Bending must be in accordance with standard approved practice and by approved machine methods.

Tolerance on nominally square-cut, reinforcing bar ends must be in accordance with ACI/MCP-3.

Deliver reinforcing bars bundled, tagged, and marked. Tags must be metal with bar size, length, mark, and other information pressed in by machine. Marks must correspond with those used on the placing drawings.

Do not use reinforcement that has any of the following defects:

- a. Bar lengths, depths, and bends beyond specified fabrication tolerances
- b. Bends or kinks not indicated on drawings or approved shop drawings
- c. Bars with reduced cross-section due to rusting or other cause

Replace defective reinforcement with new reinforcement having required shape, form, and cross-section area.

3.6.11 Placing Reinforcement

Place reinforcement in accordance with ACI/MCP-3 and ACI/MCP-4.

For slabs on grade (over earth or over capillary water barrier) and for footing reinforcement, support bars or welded wire fabric on precast concrete blocks, spaced at intervals required by size of reinforcement, to keep reinforcement the minimum height specified above the underside of slab or footing.

For slabs other than on grade, supports for which any portion is less than 1 inch from concrete surfaces that are exposed to view or to be painted must be of precast concrete units, plastic-coated steel, or stainless steel protected bar supports. Precast concrete units must be wedge shaped, not larger than 3-1/2 by 3-1/2 inches, and of thickness equal to that indicated for concrete protection of reinforcement. Provide precast units that have cast-in galvanized tie wire hooked for anchorage and blend with concrete surfaces after finishing is completed.

Contractor must cooperate with other trades in setting of anchor bolts, inserts, and other embedded items. Where conflicts occur between locating reinforcing and embedded items, the Contractor must notify the Contracting Officer so that conflicts may be reconciled before placing concrete. Anchors and embedded items must be positioned and supported with appropriate accessories.

Handle epoxy-coated reinforcing bars carefully to prevent damage to the coating. Use plastic-coated tie wire and supports of a type to prevent damage to the reinforcing bars.

Provide reinforcement that is supported and secured together to prevent displacement by construction loads or by placing of wet concrete, and as follows:

Provide supports for reinforcing bars that are sufficient in number and sufficiently heavy to carry the reinforcement they support, and in

accordance with ACI/MCP-3, ACI/MCP-4 and CRSI 10MSP. Do not use supports to support runways for concrete conveying equipment and similar construction loads.

Equip supports on ground and similar surfaces with sand-plates.

Support welded wire fabric as required for reinforcing bars.

Secure reinforcements to supports by means of tie wire. Wire must be black, soft iron wire, not less than 16 gage.

With the exception of temperature reinforcement, tied to main steel approximately 24 inches on center, reinforcement must be accurately placed, securely tied at intersections with 18-gage annealed wire, and held in position during placing of concrete by spacers, chairs, or other approved supports. Point wire-tie ends away from the form. Unless otherwise indicated, numbers, type, and spacing of supports must conform to ACI/MCP-3.

Bending of reinforcing bars partially embedded in concrete is permitted only as specified in ACI/MCP-3 and ACI/MCP-4.

3.6.12 Spacing of Reinforcing Bars

Spacing must be as indicated. If not indicated, spacing must be in accordance with the ACI/MCP-3 and ACI/MCP-4.

Reinforcing bars may be relocated to avoid interference with other reinforcement, or with conduit, pipe, or other embedded items. If any reinforcing bar is moved a distance exceeding one bar diameter or specified placing tolerance, resulting rearrangement of reinforcement is subject to approval.

3.6.13 Concrete Protection for Reinforcement

Concrete protection must be in accordance with the ACI/MCP-3 and ACI/MCP-4.

3.6.14 Welding

Welding must be in accordance with AWS D1.4/D1.4M.

3.7 BATCHING, MEASURING, MIXING, AND TRANSPORTING CONCRETE

ASTM C94/C94M, and ACI/MCP-2, except as modified herein. Batching equipment must be such that the concrete ingredients are consistently measured within the following tolerances: 1 percent for cement and water, 2 percent for aggregate, and 3 percent for admixtures. Furnish mandatory batch ticket information for each load of ready mix concrete.

3.7.1 Measuring

Make measurements at intervals as specified in paragraphs entitled "Sampling" and "Testing."

3.7.2 Mixing

ASTM C94/C94M and ACI/MCP-2. Machine mix concrete. Begin mixing within 30 minutes after the cement has been added to the aggregates. Place concrete within 90 minutes of either addition of mixing water to cement and

aggregates or addition of cement to aggregates if the air temperature is less than 84 degrees F. Reduce mixing time and place concrete within 60 minutes if the air temperature is greater than 84 degrees F except as follows: if set retarding admixture is used and slump requirements can be met, limit for placing concrete may remain at 90 minutes. Additional water may be added, provided that both the specified maximum slump and water-cement ratio are not exceeded. When additional water is added, an additional 30 revolutions of the mixer at mixing speed is required. Dissolve admixtures in the mixing water and mix in the drum to uniformly distribute the admixture throughout the batch.

3.7.3 Transporting

Transport concrete from the mixer to the forms as rapidly as practicable. Prevent segregation or loss of ingredients. Clean transporting equipment thoroughly before each batch. Do not use aluminum pipe or chutes. Remove concrete which has segregated in transporting and dispose of as directed.

3.8 PLACING CONCRETE

Place concrete as soon as practicable after the forms and the reinforcement have been inspected and approved. Do not place concrete when weather conditions prevent proper placement and consolidation; in uncovered areas during periods of precipitation; or in standing water. Prior to placing concrete, remove dirt, construction debris, water, snow, and ice from within the forms. Deposit concrete as close as practicable to the final position in the forms. Do not exceed a free vertical drop of 3 feet from the point of discharge. Place concrete in one continuous operation from one end of the structure towards the other. Position grade stakes on 10 foot centers maximum in each direction when pouring interior slabs and on 20 foot centers maximum for exterior slabs.

3.8.1 General Placing Requirements

Deposit concrete continuously or in layers of such thickness that no concrete is placed on concrete which has hardened sufficiently to cause formation of seams or planes of weakness within the section. If a section cannot be placed continuously, provide construction joints as specified. Perform concrete placing at such a rate that concrete which is being integrated with fresh concrete is still plastic. Deposit concrete as nearly as practical in its final position to avoid segregation due to rehandling or flowing. Do not subject concrete to procedures which cause segregation.

Concrete to receive other construction must be screeded to proper level to avoid excessive skimming or grouting.

Do not use concrete which becomes nonplastic and unworkable or does not meet quality control limits as specified or has been contaminated by foreign materials. Use of retempered concrete is permitted. Remove rejected concrete from the site.

3.8.2 Footing Placement

Concrete for footings may be placed in excavations without forms upon inspection and approval by the Contracting Officer. Excavation width must be a minimum of 4 inches greater than indicated.

3.8.3 Vibration

ACI/MCP-2. Furnish a spare, working, vibrator on the job site whenever concrete is placed. Consolidate concrete slabs greater than 4 inches in depth with high frequency mechanical vibrating equipment supplemented by hand spading and tamping. Consolidate concrete slabs 4 inches or less in depth by wood tampers, spading, and settling with a heavy leveling straightedge. Operate internal vibrators with vibratory element submerged in the concrete, with a minimum frequency of not less than 6000 impulses per minute when submerged. Do not use vibrators to transport the concrete in the forms. Penetrate the previously placed lift with the vibrator when more than one lift is required. Use external vibrators on the exterior surface of the forms when internal vibrators do not provide adequate consolidation of the concrete.

3.8.4 Hot Weather

Maintain required concrete temperature using Figure 2.1.5 in ACI/MCP-2 to prevent the evaporation rate from exceeding 0.2 pound of water per square foot of exposed concrete per hour. Cool ingredients before mixing or use other suitable means to control concrete temperature and prevent rapid drying of newly placed concrete. Shade the fresh concrete as soon as possible after placing. Start curing when the surface of the fresh concrete is sufficiently hard to permit curing without damage. Provide water hoses, pipes, spraying equipment, and water hauling equipment, where job site is remote to water source, to maintain a moist concrete surface throughout the curing period. Provide burlap cover or other suitable, permeable material with fog spray or continuous wetting of the concrete when weather conditions prevent the use of either liquid membrane curing compound or impervious sheets. For vertical surfaces, protect forms from direct sunlight and add water to top of structure once concrete is set.

3.8.5 Follow-up

Check concrete within 24 hours of placement for flatness, levelness, and other specified tolerances. Adjust formwork and placement techniques on subsequent pours to achieve specified tolerances.

3.8.6 Placing Concrete in Forms

Deposit concrete placed in forms in horizontal layers not exceeding 24 inches.

Remove temporary spreaders in forms when concrete placing has reached elevation of spreaders.

Consolidate concrete placed in forms by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping. Provide vibrating equipment adequate in number of units and power of each unit to properly consolidate concrete. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced points not farther apart than visible effectiveness of machine. Do not insert vibrator into lower courses of concrete that have begun to set. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of concrete mix.

Do not start placing of concrete in supporting elements until concrete previously placed in columns and walls is no longer plastic and has been in

place a minimum of 2 hours.

3.8.7 Placing Concrete Slabs

Place and consolidate concrete for slabs in a continuous operation, within the limits of approved construction joints until placing of panel or section is completed.

During concrete placing operations, consolidate concrete by mechanical vibrating equipment so that concrete is worked around reinforcement and other embedded items and into corners. Consolidate concrete placed in beams and girders of supported slabs and against bulkheads of slabs on ground by mechanical vibrators as specified. Consolidate concrete in remainder of slabs by vibrating bridge screeds, roller pipe screeds, or other approved method. Limit consolidation operations to time necessary to obtain consolidation of concrete without bringing an excess of fine aggregate to the surface. Concrete to be consolidated must be as dry as practical and surfaces thereof must not be manipulated prior to finishing operations. Bring concrete correct level with a straightedge and struck-off. Use bull floats or darbies to smooth surface, leaving it free of humps or hollows. Sprinkling of water on plastic surface is not permitted.

Provide finish of slabs as specified.

3.8.8 Bonding

Surfaces of set concrete at joints, except where bonding is obtained by use of concrete bonding agent, must be roughened and cleaned of laitance, coatings, loose particles, and foreign matter. Roughen surfaces in a manner that exposes the aggregate uniformly and does not leave laitance, loosened particles of aggregate, nor damaged concrete at the surface.

Obtain bonding of fresh concrete that has set as follows:

At joints between footings and walls or columns, between walls or columns and the beams or slabs they support, and elsewhere unless otherwise specified; roughened and cleaned surface of set concrete must be dampened, but not saturated, immediately prior to placing of fresh concrete.

At joints in exposed-to-view work; at vertical joints in walls; at joints near midpoint of span in girders, beams, supported slabs, other structural members; in work designed to contain liquids; the roughened and cleaned surface of set concrete must be dampened but not saturated and covered with a cement grout coating.

Provide cement grout that consists of equal parts of portland cement and fine aggregate by weight with not more than 6 gallons of water per sack of cement. Apply cement grout with a stiff broom or brush to a minimum thickness of 1/16 inch. Deposit fresh concrete before cement grout has attained its initial set.

Bonding of fresh concrete to concrete that has set may be obtained by use of a concrete bonding agent. Apply such bonding material to cleaned concrete surface in accordance with approved printed instructions of bonding material manufacturer.

3.9 SURFACE FINISHES EXCEPT FLOOR, SLAB, AND PAVEMENT FINISHES

3.9.1 Defects

Repair formed surfaces by removing minor honeycombs, pits greater than 1 square inch surface area or 0.25 inch maximum depth, or otherwise defective areas. Provide edges perpendicular to the surface and patch with nonshrink grout. Patch tie holes and defects when the forms are removed. Concrete with extensive honeycomb including exposed steel reinforcement, cold joints, entrapped debris, separated aggregate, or other defects which affect the serviceability or structural strength will be rejected, unless correction of defects is approved. Obtain approval of corrective action prior to repair. The surface of the concrete must not vary more than the allowable tolerances of ACI/MCP-4. Exposed surfaces must be uniform in appearance and finished to a smooth form finish unless otherwise specified.

3.9.2 Not Against Forms (Top of Walls)

Surfaces not otherwise specified must be finished with wood floats to even surfaces. Finish must match adjacent finishes.

3.9.3 Formed Surfaces

3.9.3.1 Tolerances

ACI/MCP-1 and as indicated.

3.9.3.2 As-Cast Rough Form

Provide for surfaces not exposed to public view. Patch these holes and defects and level abrupt irregularities. Remove or rub off fins and other projections exceeding 0.25 inch in height.

3.9.3.3 Standard Smooth Finish

Finish must be as-cast concrete surface as obtained with form facing material for standard smooth finish. Repair and patch defective areas as specified; and all fins and remove other projections on surface.

3.9.4 Grout Finish

Provide finish that is standard, smooth coated with grout as specified.

Give finish to interior and exterior concrete vertical surfaces that are to be exposed to view.

Grout is required consisting of one part portland cement to 1-1/2 parts fine aggregate by volume, mixed with water to produce a consistency of thick paint. Portland cement portion must be a blend of standard portland cement and white portland cement, proportioned as determined by trial mixes so that final color of grout when dry approximates color of surrounding concrete. Fine aggregate must pass No. 30 mesh sieve.

Surface of concrete is required to be wetted, and grout must be applied immediately to wetted surfaces. Spread grout over surface with clean burlap pads or sponge-rubber floats to fill pits, air bubbles, and surface holes. Remove excess grout by scraping, then rubbing surface with clean burlap to remove visible grout film. Keep grout damp by means of fog spray during setting period. Complete finish the day it is started, and make

limits of a finished area at natural breaks in finished surface.

3.10 FLOOR, SLAB, AND PAVEMENT FINISHES AND MISCELLANEOUS CONSTRUCTION

ACI/MCP-2, unless otherwise specified. Slope floors uniformly to drains where drains are provided. Where straightedge measurements are specified, Contractor must provide straightedge.

3.10.1 Finish

Place, consolidate, and immediately strike off concrete to obtain proper contour, grade, and elevation before bleedwater appears. Permit concrete to attain a set sufficient for floating and supporting the weight of the finisher and equipment. If bleedwater is present prior to floating the surface, drag the excess water off or remove by absorption with porous materials. Do not use dry cement to absorb bleedwater.

3.10.1.1 Scratched

Use for surfaces intended to receive bonded applied cementitious applications. After the concrete has been placed, consolidated, struck off, and leveled to a Class C tolerance as defined below, roughen the surface with stiff brushes of rakes before final set.

3.10.1.2 Floated

Use for exterior slabs where not otherwise specified. After the concrete has been placed, consolidated, struck off, and leveled, do not work the concrete further, until ready for floating. Whether floating with a wood, magnesium, or composite hand float, with a bladed power trowel equipped with float shoes, or with a powered disc, float must begin when the surface has stiffened sufficiently to permit the operation. During or after the first floating, check surface with a 10 foot straightedge applied at no less than two different angles, one of which is perpendicular to the direction of strike off. Cut down high spots and fill low spots during this procedure to produce a surface level within 1/4 inch in 10 feet.

3.10.1.3 Steel Troweled

Use for floors intended as walking surfaces and for reception of floor coverings. First, provide a floated finish. Next, the finish must be power troweled two times, and finally hand troweled. The first troweling after floating needs to produce a smooth surface which is relatively free of defects but which may still show some trowel marks. Perform additional trowelings done by hand after the surface has hardened sufficiently. The final troweling is done when a ringing sound is produced as the trowel is moved over the surface. Thoroughly consolidate the surface by the hand troweling operations. The finished surface must be essentially free of trowel marks and uniform in texture and appearance. The finished surface must produce a surface level to within 1/4 inch in 10 feet. On surfaces intended to support floor coverings, remove any defects of sufficient magnitude to show through the floor covering by grinding.

3.10.1.4 Broomed

Use on surfaces of exterior walks, platforms, patios, and ramps, unless otherwise indicated. Perform a floated finish, then draw a broom or burlap belt across the surface to produce a coarse scored texture. Permit surface to harden sufficiently to retain the scoring or ridges. Broom transverse

to traffic or at right angles to the slope of the slab.

3.10.1.5 Pavement

Screed the concrete with a template advanced with a combined longitudinal and crosswise motion. Maintain a slight surplus of concrete ahead of the template. After screeding, float the concrete longitudinally. Use a straightedge to check slope and flatness; correct and refloat as necessary. Obtain final finish by Round edges and joints with an edger having a radius of 1/8 inch.

3.10.1.6 Chemical-Hardener Treatment

Apply liquid-chemical floor hardener where indicated after curing and drying concrete surface. Dilute liquid hardener with water and apply in three coats. First coat must be one-third strength, second coat one-half strength, and third coat two-thirds strength. Apply each coat evenly and allow to dry 24 hours between coats.

Approved proprietary chemical hardeners must be applied in accordance with manufacturer's printed directions.

3.10.2 Concrete Walks

Provide 4 inches thick minimum. Provide contraction joints spaced every 5 linear feet unless otherwise indicated. Cut contraction joints one inch deep with a jointing tool after the surface has been finished. Provide 0.5 inch thick transverse expansion joints at changes in direction where sidewalk abuts curb, steps, rigid pavement, or other similar structures; space expansion joints every 50 feet maximum. Give walks a broomed finish. Unless indicated otherwise, provide a transverse slope of 1/48. Limit variation in cross section to 1/4 inch in 5 feet.

3.10.3 Pits and Trenches

Place bottoms and walls monolithically or provide waterstops and keys.

3.11 CURING AND PROTECTION

ACI/MCP-2 unless otherwise specified. Begin curing immediately following form removal. Avoid damage to concrete from vibration created by blasting, pile driving, movement of equipment in the vicinity, disturbance of formwork or protruding reinforcement, and any other activity resulting in ground vibrations. Protect concrete from injurious action by sun, rain, flowing water, frost, mechanical injury, tire marks, and oil stains. Do not allow concrete to dry out from time of placement until the expiration of the specified curing period. Do not use membrane-forming compound on surfaces where appearance would be objectionable, on any surface to be painted, where coverings are to be bonded to the concrete, or on concrete to which other concrete is to be bonded. If forms are removed prior to the expiration of the curing period, provide another curing procedure specified herein for the remaining portion of the curing period. Provide moist curing for those areas receiving liquid chemical sealer-hardener or epoxy coating. Allow curing compound/sealer installations to cure prior to the installation of materials that adsorb VOCs.

3.11.1 General

Protect freshly placed concrete from premature drying and cold or hot

temperature and maintain without drying at a relatively constant temperature for the period of time necessary for hydration of cement and proper hardening of concrete.

Start initial curing as soon as free water has disappeared from surface of concrete after placing and finishing. Keep concrete moist for minimum 72 hours.

Final curing must immediately follow initial curing and before concrete has dried. Continue final curing until cumulative number of hours or fraction thereof (not necessarily consecutive) during which temperature of air in contact with the concrete is above 50 degrees F has totaled 168 hours. Alternatively, if tests are made of cylinders kept adjacent to the structure and cured by the same methods, final curing may be terminated when the average compressive strength has reached 70 percent of the 28-day design compressive strength. Prevent rapid drying at end of final curing period.

3.11.2 Moist Curing

Remove water without erosion or damage to the structure. Prevent water run-off.

3.11.2.1 Ponding or Immersion

Continually immerse the concrete throughout the curing period. Water must not be more than 50 degrees F less than the temperature of the concrete. For temperatures between 40 and 50 degrees F, increase the curing period by 50 percent.

3.11.2.2 Fog Spraying or Sprinkling

Apply water uniformly and continuously throughout the curing period. For temperatures between 40 and 50 degrees F, increase the curing period by 50 percent.

3.11.2.3 Pervious Sheeting

Completely cover surface and edges of the concrete with two thicknesses of wet sheeting. Overlap sheeting 6 inches over adjacent sheeting. Provide sheeting that is at least as long as the width of the surface to be cured. During application, do not drag the sheeting over the finished concrete nor over sheeting already placed. Wet sheeting thoroughly and keep continuously wet throughout the curing period.

3.11.2.4 Impervious Sheeting

Wet the entire exposed surface of the concrete thoroughly with a fine spray of water and cover with impervious sheeting throughout the curing period. Lay sheeting directly on the concrete surface and overlap edges 12 inches minimum. Provide sheeting not less than 18 inches wider than the concrete surface to be cured. Secure edges and transverse laps to form closed joints. Repair torn or damaged sheeting or provide new sheeting. Cover or wrap columns, walls, and other vertical structural elements from the top down with impervious sheeting; overlap and continuously tape sheeting joints; and introduce sufficient water to soak the entire surface prior to completely enclosing.

3.11.3 Liquid Membrane-Forming Curing Compound

Seal or cover joint openings prior to application of curing compound. Prevent curing compound from entering the joint. Apply in accordance with the recommendations of the manufacturer immediately after any water sheen which may develop after finishing has disappeared from the concrete surface. Provide and maintain compound on the concrete surface throughout the curing period. Do not use this method of curing where the use of Figure 2.1.5 in ACI/MCP-2 indicates that hot weather conditions cause an evaporation rate exceeding 0.2 pound of water per square foot per hour.

3.11.3.1 Application

Unless the manufacturer recommends otherwise, apply compound immediately after the surface loses its water sheen and has a dull appearance, and before joints are sawed. Mechanically agitate curing compound thoroughly during use. Use approved power-spraying equipment to uniformly apply two coats of compound in a continuous operation. The total coverage for the two coats must be 200 square feet maximum per gallon of undiluted compound unless otherwise recommended by the manufacturer's written instructions. The compound must form a uniform, continuous, coherent film that does not check, crack, or peel. Immediately apply an additional coat of compound to areas where the film is defective. Re-spray concrete surfaces subjected to rainfall within 3 hours after the curing compound application.

3.11.3.2 Protection of Treated Surfaces

Prohibit pedestrian and vehicular traffic and other sources of abrasion at least 72 hours after compound application. Maintain continuity of the coating for the entire curing period and immediately repair any damage.

3.11.4 Liquid Chemical Sealer-Hardener

Apply sealer-hardener to interior floors not receiving floor covering and floors located under access flooring. Apply the sealer-hardener in accordance with manufacturer's recommendations. Seal or cover joints and openings in which joint sealant is to be applied as required by the joint sealant manufacturer. Do not apply the sealer hardener until the concrete has been moist cured and has aged for a minimum of 30 days. Apply a minimum of two coats of sealer-hardener.

3.11.5 Requirements for Type III, High-Early-Strength Portland Cement

The curing periods are required to be not less than one-fourth of those specified for portland cement, but in no case less than 72 hours.

3.11.6 Curing Periods

ACI/MCP-2 except 10 days for retaining walls, pavement or chimneys, 21 days for concrete that is in full-time or intermittent contact with seawater, salt spray, alkali soil or waters. Begin curing immediately after placement. Protect concrete from premature drying, excessively hot temperatures, and mechanical injury; and maintain minimal moisture loss at a relatively constant temperature for the period necessary for hydration of the cement and hardening of the concrete. The materials and methods of curing are subject to approval by the Contracting Officer.

3.11.7 Curing Methods

Accomplish curing by moist curing, by moisture-retaining cover curing, by membrane curing, and by combinations thereof, as specified.

Moist curing:

Accomplish moisture curing by any of the following methods:

Keeping surface of concrete wet by covering with water

Continuous water spraying

Covering concrete surface with specified absorptive cover for curing concrete saturated with water and keeping absorptive cover wet by water spraying or intermittent hosing. Place absorptive cover to provide coverage of concrete surfaces and edges with a slight overlap over adjacent absorptive covers.

Moisture-cover curing:

Accomplish moisture-retaining cover curing by covering concrete surfaces with specified moisture-retaining cover for curing concrete. Place cover directly on concrete in widest practical width, with sides and ends lapped at least 3 inches. Weight cover to prevent displacement; immediately repair tears or holes appearing during curing period by patching with pressure-sensitive, waterproof tape or other approved method.

Membrane curing:

Accomplish membrane curing by applying specified membrane-forming curing compound to damp concrete surfaces as soon as moisture film has disappeared. Apply curing compound uniformly in a two-coat operation by power-spraying equipment using a spray nozzle equipped with a wind guard. Apply second coat in a direction at right angles to direction of first coat. Total coverage for two coats must be not more than 200 square feet per gallon of curing compound. Respray concrete surfaces which are subjected to heavy rainfall within 3 hours after curing compound has been applied by method and at rate specified. Maintain continuity of coating for entire curing period and immediately repair damage to coating during this period.

Membrane-curing compounds must not be used on surfaces that are to be covered with coating material applied directly to concrete or with a covering material bonded to concrete, such as other concrete, liquid floor hardener, waterproofing, dampproofing, membrane roofing, painting, and other coatings and finish materials.

3.11.8 Curing Formed Surfaces

Accomplish curing of formed surfaces, including undersurfaces of girders, beams, supported slabs, and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed before end of curing period, accomplish final curing of formed surfaces by any of the curing methods specified above, as applicable.

3.11.9 Curing Unformed Surfaces

Accomplish initial curing of unformed surfaces, such as monolithic slabs, floor topping, and other flat surfaces, by membrane curing.

Unless otherwise specified, accomplish final curing of unformed surfaces by any of curing methods specified above, as applicable.

Accomplish final curing of concrete surfaces to receive liquid floor hardener of finish flooring by moisture-retaining cover curing.

3.11.10 Temperature of Concrete During Curing

When temperature of atmosphere is 41 degrees F and below, maintain temperature of concrete at not less than 55 degrees F throughout concrete curing period or 45 degrees F when the curing period is measured by maturity. When necessary, make arrangements before start of concrete placing for heating, covering, insulation, or housing as required to maintain specified temperature and moisture conditions for concrete during curing period.

When the temperature of atmosphere is 80 degrees F and above or during other climatic conditions which cause too rapid drying of concrete, make arrangements before start of concrete placing for installation of wind breaks, of shading, and for fog spraying, wet sprinkling, or moisture-retaining covering of light color as required to protect concrete during curing period.

Changes in temperature of concrete must be uniform and not exceed 37 degrees F in any 1 hour nor 80 degrees F in any 24-hour period.

3.11.11 Protection from Mechanical Injury

During curing period, protect concrete from damaging mechanical disturbances, particularly load stresses, heavy shock, and excessive vibration and from damage caused by rain or running water.

3.11.12 Protection After Curing

Protect finished concrete surfaces from damage by construction operations.

3.12 FIELD QUALITY CONTROL

3.12.1 Sampling

ASTM C172/C172M. Collect samples of fresh concrete to perform tests specified. ASTM C31/C31M for making test specimens.

3.12.2 Testing

3.12.2.1 Slump Tests

ASTM C143/C143M. Take concrete samples during concrete placement. The maximum slump may be increased as specified with the addition of an approved admixture provided that the water-cement ratio is not exceeded. Perform tests at commencement of concrete placement, when test cylinders are made, and for each batch (minimum) or every 20 cubic yards (maximum) of concrete.

3.12.2.2 Temperature Tests

Test the concrete delivered and the concrete in the forms. Perform tests in hot or cold weather conditions (below 50 degrees F and above 80 degrees F) for each batch (minimum) or every 20 cubic yards (maximum) of concrete, until the specified temperature is obtained, and whenever test cylinders and slump tests are made.

3.12.2.3 Compressive Strength Tests

ASTM C39/C39M. Make five test cylinders for each set of tests in accordance with ASTM C31/C31M. Take precautions to prevent evaporation and loss of water from the specimen. Test two cylinders at 7 days, two cylinders at 28 days, and hold one cylinder in reserve. Take samples for strength tests of each mix design of each batch of concrete placed each day not less than once a day, nor less than once for each 160 cubic yards of concrete, nor less than once for each 5400 square feet of surface area for slabs or walls. For the entire project, take no less than five sets of samples and perform strength tests for each mix design of concrete placed. Each strength test result must be the average of two cylinders from the same concrete sample tested at 28 days. If the average of any three consecutive strength test results is less than f'c or if any strength test result falls below f'c by more than 450 psi, take a minimum of three ASTM C42/C42M core samples from the in-place work represented by the low test cylinder results and test. Concrete represented by core test is considered structurally adequate if the average of three cores is equal to at least 85 percent of f'c and if no single core is less than 75 percent of f'c. Retest locations represented by erratic core strengths. Remove concrete not meeting strength criteria and provide new acceptable concrete. Repair core holes with nonshrink grout. Match color and finish of adjacent concrete.

3.12.2.4 Air Content

ASTM C173/C173M or ASTM C231/C231M for normal weight concrete . Test air-entrained concrete for air content at the same frequency as specified for slump tests.

3.12.2.5 Strength of Concrete Structure

Compliance with the following is considered deficient if it fails to meet the requirements which control strength of structure in place, including following conditions:

Failure to meet compressive strength tests as evaluated

Reinforcement not conforming to requirements specified

Concrete which differs from required dimensions or location in such a manner as to reduce strength

Concrete curing and protection of concrete against extremes of temperature during curing, not conforming to requirements specified

Concrete subjected to damaging mechanical disturbances, particularly load stresses, heavy shock, and excessive vibration

Poor workmanship likely to result in deficient strength

3.12.2.6 Testing Concrete Structure for Strength

When there is evidence that strength of concrete structure in place does not meet specification requirements, make cores drilled from hardened concrete for compressive strength determination in accordance with ASTM C42/C42M, and as follows:

Take at least three representative cores from each member or area of concrete-in-place that is considered potentially deficient. Location of cores will be determined by the Contracting Officer.

Test cores after moisture conditioning in accordance with ASTM C42/C42M if concrete they represent is more than superficially wet under service.

Air dry cores, (60 to 80 degrees F with relative humidity less than 60 percent) for 7 days before test and test dry if concrete they represent is dry under service conditions.

Strength of cores from each member or area are considered satisfactory if their average is equal to or greater than 85 percent of the 28-day design compressive strength of the class of concrete.

Core specimens will be taken and tested by the Government. If the results of core-boring tests indicate that the concrete as placed does not conform to the drawings and specification, the cost of such tests and restoration required must be borne by the Contractor.

Fill core holes solid with patching mortar and finished to match adjacent concrete surfaces.

Correct concrete work that is found inadequate by core tests in a manner approved by the Contracting Officer.

3.13 WASTE MANAGEMENT

As specified in the Waste Management Plan and as follows.

3.13.1 Mixing Equipment

Before concrete pours, designate Company-owned site meeting environmental standards for cleaning out concrete mixing trucks. Minimize water used to wash equipment.

3.13.2 Reinforcing Steel

Collect reinforcing steel and place in designated area for recycling.

3.13.3 Other Waste

Identify concrete manufacturer's or supplier's policy for collection or return of construction waste, unused material, deconstruction waste, and/or packaging material.

3.14 JOINTS

3.14.1 Construction Joints

Make and locate joints not indicated so as not to impair strength and appearance of the structure, as approved. Locate construction joints as

follows:

- a. In walls at not more than 60 feet in any horizontal direction; at top of footing; at top of slabs on ground; at top and bottom of door and window openings or where required to conform to architectural details; and at underside of deepest beam or girder framing into wall
- b. In columns or piers, at top of footing; at top of slabs on ground; and at underside of deepest beam or girder framing into column or pier
- c. Near midpoint of spans for supported slabs, beams, and girders unless a beam intersects a girder at the center, in which case construction joints in girder must offset a distance equal to twice the width of the beam. Make transfer of shear through construction joint by use of inclined reinforcement.
- d. In slabs on ground, so as to divide slab into areas not in excess of 1,200 square feet

Provide keyways at least 1-1/2-inches deep in construction joints in walls and slabs and between walls and footings; approved bulkheads may be used for slabs.

Joints must be perpendicular to main reinforcement. Reinforcement must be continued across construction joints.

3.14.2 Waterstops

Provide waterstops in construction joints as indicated.

Install waterstops to form a continuous diaphragm in each joint. Make adequate provisions to support and protect waterstops during progress of work. Make field joints in waterstops in accordance with waterstop manufacturer's printed instructions, as approved. Protect waterstops protruding from joints from damage.

3.14.3 Isolation Joints in Slabs on Ground

Provide joints at points of contact between slabs on ground and vertical surfaces, such as column pedestals, foundation walls, grade beams, and elsewhere as indicated.

Fill joints with premolded joint filler strips 1/2 inch thick, extending full slab depth. Install filler strips at proper level below finish floor elevation with a slightly tapered, dress-and-oiled wood strip temporarily secured to top of filler strip to form a groove not less than 3/4 inch in depth where joint is sealed with sealing compound and not less than 1/4 inch in depth where joint sealing is not required. Remove wood strip after concrete has set. Contractor must clean groove of foreign matter and loose particles after surface has dried.

3.14.4 Control Joints in Slabs on Ground

Provide joints to form panels as indicated.

Under and on exact line of each control joint, cut 50 percent of welded wire fabric reinforcement before placing concrete.

Joints must be 1/8-inch wide by 1/5 to 1/4 of slab depth and formed by

inserting hand-pressed fiberboard strip into fresh concrete until top surface of strip is flush with slab surface or by cutting the concrete with a saw after the concrete has set. After concrete has cured for at least 7 days, the Contractor must remove inserts and clean groove of foreign matter and loose particles.

In Hawaii, sawcutting will be limited to within 12 hours after set and at 1/4 slab depth.

3.14.5 Sealing Joints in Slabs on Ground

Isolation and control joints which are to receive finish flooring material must be sealed with joint sealing compound after concrete curing period. Slightly underfill groove with joint sealing compound to prevent extrusion of compound. Remove excess material as soon after sealing as possible.

Sealing is not required for isolation and control joints to be covered with finish flooring material. Groove must be left ready to receive filling material that is provided as part of finish floor covering work.

3.15 INSTALLATION OF ANCHORAGE DEVICES

3.15.1 General

Anchorage devices and embedded items required for other work that is attached to, or supported by, set and build in cast-in-place concrete as part of the work of this section, using setting drawings, instructions, and directions for work to be attached thereto.

3.15.2 Placing Anchorage Devices

Anchorage devices and embedded items must be positioned accurately and supported against displacement. Fill openings in anchorage devices such as slots and threaded holes with an approved, removable material to prevent entry of concrete into openings.

3.16 CONCRETE CONVEYING

3.16.1 Transfer of Concrete At Project Site

Handle concrete from point of delivery and transfer to concrete conveying equipment and to locations of final deposit as rapidly as practical by methods which prevent segregation and loss of concrete mix materials.

3.16.2 Mechanical Equipment for Conveying Concrete

Equipment must ensure a continuous flow of concrete at delivery end, as approved. Provide runways for wheeled concrete-conveying equipment from concrete delivery point to locations of final deposit. Interior surfaces of concrete conveying equipment must be free of hardened concrete, debris, water, snow, ice, and other deleterious substances.

3.17 CONCRETE FLOOR TOPPING

3.17.1 Standard Floor Topping

Provide topping for treads and platforms of metal steel stairs and elsewhere as indicated.

Materials

Provide materials that conform to requirements specified, except aggregate must be as follows:

TYPE OF AGGREGATE	SIEVE	PERCENT PASSING
Fine aggregate	3/8 in.	100
	No. 4	95 to 100
	No. 8	80 to 90
	No. 16	50 to 75
	No. 30	30 to 50
	No. 50	10 to 20
	No. 100	2 to 5
Coarse aggregate	1/2 in.	100
	3/8 in.	95 to 100
	No. 4	40 to 60
	No. 8	0 to 5

Standard Topping Mixture

Provide mixture that consists of one part portland cement, one part fine aggregate, and two parts coarse aggregate, by volume. Adjust exact proportions of fine and coarse aggregates to produce a well-graded total aggregate. Mixing water must not exceed 5 gallons per 94-pound sack of cement including unabsorbed moisture in aggregate. Maximum slump must be 2 inches.

Preparations Prior to Placing

When mixture is placed on a green concrete base slab, screed surface of base slab to a level not more than 1-1/2 inches nor less than 1 inch below required finish surface. Remove water and laitance from surface of base slab before placing topping mixture. As soon as water ceases to rise to surface of base slab, place topping mixture as specified.

When mixture is placed on a hardened concrete base slab, remove dirt, loose material, oil, grease, asphalt, paint, and other contaminants from base slab surface, leaving a clean surface. Prior to placing topping mixture, (2-1/2-inches minimum) slab surface must be dampened and left free of standing water. Immediately before topping mixture is placed, broom a coat of neat cement grout onto surface of slab. Do not allow cement grout to set or dry before topping mixture is placed.

When mixture is placed on a metal surface, such as metal pans for steel

stairs, remove dirt, loose material, oil, grease, asphalt, paint, and other contaminants from metal surface. Immediately before topping mixture is placed, spray or brush a coating of concrete bonding agent onto metal surfaces and do not be allow to set or dry before topping mixture is applied.

Mixing

Do the mixing of topping material at the site in a mechanical mixer of the batch type. Equip batch mixer with a suitable charging hopper, water storage tank, and water-measuring device and must be capable of mixing aggregates, cement, and water into a uniform mix within specified mixing time and of discharging mix without segregation. Provide mixer that bear a rating plate indicating rated capacity and recommended revolutions per minute.

Mix each batch of 2 cubic yards or less for not less than 1-1/2 minutes. Increase mixing time 15 seconds for each additional cubic yard or fraction thereof.

Clean mixer, and replace blades in drum when they have lost 10 percent of their original depth.

Truck-mixed topping may be used when approved. Specify truck-mixed topping for ready-mix concrete.

Placing

Spread standard topping mixture evenly on previously prepared base slab or metal surface, brought to correct level with a straightedge, and struck off. Topping must be consolidated, floated, checked for trueness of surface, and refloated as specified for float finish.

Finishing

Give trowel finish standard floor topping surfaces.

Give other finishes standard floor topping surfaces as indicated. Specify such finishes for required finish.

3.17.2 Heavy-Duty Floor Topping

Provide topping where indicated.

Heavy-duty Topping Mixture

Provide mixture that consists of 1 part portland cement and 2-1/2 parts emery aggregate or 1 part fine aggregate and 1-1/2 parts traprock coarse aggregate, by volume. Exact proportions of mixture must conform to recommendations of aggregate manufacturer. Mixing water must not exceed 3-1/4 gallons per 94-pound sack of cement including unabsorbed moisture in aggregate. Maximum slump must be 1 inch.

Base Slab

Screed surface of slab to a level no more than 1-1/2 inches nor less than 1 inch below grade of finished floor.

Give slab a scratch finish as specified.

Preparations prior to placing

Remove dirt, loose material, oil, grease, asphalt, paint and other contaminants from base slab surface. Prior to placing topping mixture, dampen slab surface and leave free of standing water. Immediately before topping mixture is placed, broom a coat of neat cement grout onto surface of slab. Allow cement grout to set or dry before topping mixture is placed.

Mixing

Do mixing of topping material at the site in a mechanical mixer of the batch type. Equip batch mixer with a charging hopper, water storage tank, and a water-measuring device and the batch mixer must be capable of mixing aggregates, cement, and water into a uniform mix within the specified mixing time and of discharging mix without segregation. Provide mixer that bears a rating plate indicating rated capacity and recommended revolutions per minute.

Mix each batch of 2 cubic yards or less for not less than 1-1/2 minutes.

Increase mixing time 15 seconds for each additional cubic yard or fraction thereof. Clean mixer, and replace pick-up and throw-over blades in drum when they have lost 10 percent of their original depth.

Placing

Spread heavy-duty topping mixture evenly on previously prepared base slab, and bring to correct level with a straightedge, and strike off. Provide topping that is consolidated, floated, and checked for trueness of surface as specified for float finish, except that power-driven floats is the impact type.

Finishing

Give trowel finish heavy-duty floor topping surfaces. Provide trowel finish as specified, except that additional troweling after first power troweling must be not less than three hand-troweling operations.

-- End of Section --

SECTION 07 84 00

FIRESTOPPING

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 SOCIETY FOR TESTING AND MATERIALS (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	(2007; R 2011) Fire-Resistive Joint Systems
ASTM E2174	(2014) Standard Practice for On-Site Inspection of Installed Fire Stops
ASTM E2307	(2010) 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 E699	(2009) Standard Practice for Evaluation of Agencies Involved in Testing, Quality Assurance, and Evaluating of Building Components
ASTM E814	(2013a) Standard Test Method for Fire Tests of Through-Penetration Fire Stops
ASTM E84	(2014) Standard Test Method for Surface Burning Characteristics of Building Materials
	DING AND DECEMBER (FM)

FACTORY MUTUAL ENGINEERING AND RESEARCH (FM)

FM 4991	(2013) Approval of Firestop Contractors
FM APP GUIDE	<pre>(updated on-line) Approval Guide http://www.approvalguide.com/</pre>

UNDERWRITERS LABORATORIES (UL)

UL 1479	(2003; Reprint Oct 2012) Fire Tests of Through-Penetration Firestops
UL 2079	(2004; Reprint Dec 2012) 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	(Current) Fire Resistance Directory

1.2 SYSTEM DESCRIPTION

1.2.1 General

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 around the boiler room.

- 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.
- c. Gaps requiring firestopping include gaps within the existing concrete block walls around the boiler room.

1.2.2 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 existing gaps. Firestop material shall be inspected and approved prior to final completion and enclosing of any assemblies that may conceal installed firestop.

1.2.3 Submittals Requirements

- a. 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. Submittal shall indicate the firestopping material to be provided for each type of application. Provide drawings that indicate location, "F" "T" and "L" ratings, and type of application.
- b. 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 the "Aging and Environmental Testing" portion of UL 1479. In lieu of certificates, drawings showing UL classified materials may be provided. Drawings showing evidence of testing by an alternate nationally recognized independent laboratory may be substituted.

- c. Submit documentation of training and experience for Installer.
- d. 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.

1.3 SUBMITTALS

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

SD-02 Shop Drawings

Firestopping Materials

SD-06 Test Reports

Inspection

SD-07 Certificates

Inspector Qualifications Firestopping Materials Installer Qualifications

1.4 QUALITY ASSURANCE

1.4.1 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. 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 written certification of training, and retain proof of certification for duration of firestop installation.

1.4.2 Inspector Qualifications

The inspector shall meet the criteria contained in ASTM E699 for agencies involved in quality assurance and 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.

1.5 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 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:

2.1.1 Fire Hazard Classification

Material shall have a flame spread of 25 or less, and a smoke developed rating of 50 or less, when tested in accordance with ASTM E84 or UL 723. Material shall be an approved firestopping material as listed in UL Fire Resistance or by a nationally recognized testing laboratory.

2.1.2 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. Firestop material must be free from Ethylene Glycol, PCB, MEK, or other types of hazardous chemicals.

2.1.3 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.

2.1.3.1 Through-Penetrations

Firestopping materials for through-penetrations, as described in paragraph SYSTEM DESCRIPTION, shall provide "F", "T" and "L" fire resistance ratings in accordance with ASTM E814 or UL 1479. Fire resistance ratings shall be as follows:

2.1.3.1.1 Penetrations of Boiler Room Walls, Floors, Floor-Ceiling Assemblies, and the ceiling membrane of Roof-Ceiling Assemblies

F Rating = 1 hour minimum, T Rating = 0 hour and L Rating = <10 cfm/sf Where L rating is required.

2.1.3.2 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.

2.1.4 Material Performance

All firestop materials are subject to these minimum standards of performance:

- a. Firestop material shall be capable of installation at temperatures of 35 to 120 degrees F.
- b. Material must be able to be frozen, thawed, and still maintain manufacturer approval for installation.
- c. Firestop material must convey a manufacturer's written warranty guaranteeing the performance of the material for the sustainable lifetime of the structure.
- d. Material must maintain a shelf life of no less than 2 years from date of manufacturing.
- e. Acceptable firestop cast-in-place devices are factory assembled intumescent lined round or oval plastic cylinders capable of protecting plastic, metallic, cable, and blank openings through the cast-in-place device equal to the fire resistance rating of the floor.

PART 3 EXECUTION

3.1 PREPARATION

Areas to receive firestopping shall be free of dirt, grease, oil, or loose materials which may affect the fitting or fire resistance of the firestopping system. For cast-in-place firestop devices, formwork or metal deck to receive device prior to concrete placement shall be sound and capable of supporting device. 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. 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 Data and Communication Cabling

Cabling for data and communication applications shall be sealed with re-enterable firestopping products and devices as indicated.

3.2.2.1 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 <5 cfm/sf measured at ambient temperature and 400 degrees F at 0 percent to 100 percent visual fill. Each device must be capable of retrofit applications and be available in square and round configurations with single and multiplex bracket systems provided. Firestop devices must also allow for plastic pipe, metallic pipe, and mixed multiple penetrations at plastic, metallic, insulated metallic, and cable through a single device.

3.2.2.2 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

3.3.1 General Requirements

For all projects, the remainder of the firestopped areas shall not be covered or enclosed until inspection is complete and approved by the

Manufacturer's Representative. The Manufacturer's Representative shall inspect the applications initially to ensure adequate preparations (clean surfaces suitable for application, etc.) and periodically during the work to assure that the completed work has been accomplished according to the manufacturer's written instructions and the specified requirements. 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.

3.3.2 Inspection Standards

Inspect all firestopping in accordance to $ASTM\ E2393$ and $ASTM\ E2174$ for firestop inspection, and document inspection results to be submitted to General Contractor and Government.

-- 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

ASME INTERNATIONAL (ASME)

ASME A13.1 (2007; R 2013) Scheme for the Identification of Piping Systems

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D235 (2002; R 2007) Mineral Spirits (Petroleum Spirits) (Hydrocarbon Dry Cleaning Solvent)

ASTM D4214 (2007) Standard Test Method for Evaluating the Degree of Chalking of Exterior Paint

Films

ASTM D4263 (1983; R 2012) 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 F1869 (2011) Measuring Moisture Vapor Emission

Rate of Concrete Subfloor Using Anhydrous

Calcium Chloride

MASTER PAINTERS INSTITUTE (MPI)

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 134	(Oct 2009) Galvanized Primer (Waterbased)
MPI 141	(Oct 2009) Interior High Performance Latex MPI Gloss Level 5
MPI 163	(Oct 2009) Exterior W.B. Light Industrial Coating, Semi-Gloss, MPI Gloss Level 5
MPI 23	(Oct 2009) Surface Tolerant Metal Primer
MPI 4	(Oct 2009) Interior/Exterior Latex Block Filler
MPI 47	(Oct 2009) Interior Alkyd, Semi-Gloss, MPI Gloss Level 5
MPI 50	(Oct 2009) Interior Latex Primer Sealer
MPI 79	(Oct 2009) Alkyd Anti-Corrosive Metal Primer
MPI 94	(Oct 2009) Exterior Alkyd, Semi-Gloss, MPI Gloss Level 5
MPI 94 SCIENTIFIC CERTIFICATI	Gloss Level 5
	Gloss Level 5
SCIENTIFIC CERTIFICATI	Gloss Level 5 ON SYSTEMS (SCS) (2000) Environmentally Preferable Product Specification for Architectural and Anti-Corrosive Paints
SCIENTIFIC CERTIFICATI SCS SP-01	Gloss Level 5 ON SYSTEMS (SCS) (2000) Environmentally Preferable Product Specification for Architectural and Anti-Corrosive Paints
SCIENTIFIC CERTIFICATI SCS SP-01 THE SOCIETY FOR PROTEC	Gloss Level 5 ON SYSTEMS (SCS) (2000) Environmentally Preferable Product Specification for Architectural and Anti-Corrosive Paints TIVE COATINGS (SSPC) (2000; E 2004) Shop, Field, and
SCIENTIFIC CERTIFICATI SCS SP-01 THE SOCIETY FOR PROTECT SSPC PA 1	Gloss Level 5 ON SYSTEMS (SCS) (2000) Environmentally Preferable Product Specification for Architectural and Anti-Corrosive Paints TIVE COATINGS (SSPC) (2000; E 2004) Shop, Field, and Maintenance Painting of Steel (1982; E 1995) A Guide to Safety in Paint
SCIENTIFIC CERTIFICATI SCS SP-01 THE SOCIETY FOR PROTECT SSPC PA 1 SSPC PA Guide 3	Gloss Level 5 ON SYSTEMS (SCS) (2000) Environmentally Preferable Product Specification for Architectural and Anti-Corrosive Paints TIVE COATINGS (SSPC) (2000; E 2004) Shop, Field, and Maintenance Painting of Steel (1982; E 1995) A Guide to Safety in Paint Application
SCIENTIFIC CERTIFICATI SCS SP-01 THE SOCIETY FOR PROTECT SSPC PA 1 SSPC PA Guide 3 SSPC SP 1	Gloss Level 5 ON SYSTEMS (SCS) (2000) Environmentally Preferable Product Specification for Architectural and Anti-Corrosive Paints TIVE COATINGS (SSPC) (2000; E 2004) Shop, Field, and Maintenance Painting of Steel (1982; E 1995) A Guide to Safety in Paint Application (1982; E 2004) Solvent Cleaning
SCIENTIFIC CERTIFICATI SCS SP-01 THE SOCIETY FOR PROTECT SSPC PA 1 SSPC PA Guide 3 SSPC SP 1 SSPC SP 10/NACE No. 2	Gloss Level 5 ON SYSTEMS (SCS) (2000) Environmentally Preferable Product Specification for Architectural and Anti-Corrosive Paints TIVE COATINGS (SSPC) (2000; E 2004) Shop, Field, and Maintenance Painting of Steel (1982; E 1995) A Guide to Safety in Paint Application (1982; E 2004) Solvent Cleaning (2007) Near-White Blast Cleaning
SCIENTIFIC CERTIFICATION SCS SP-01 THE SOCIETY FOR PROTECT SSPC PA 1 SSPC PA Guide 3 SSPC SP 1 SSPC SP 10/NACE No. 2 SSPC SP 12/NACE No.5	Gloss Level 5 ON SYSTEMS (SCS) (2000) Environmentally Preferable Product Specification for Architectural and Anti-Corrosive Paints TIVE COATINGS (SSPC) (2000; E 2004) Shop, Field, and Maintenance Painting of Steel (1982; E 1995) A Guide to Safety in Paint Application (1982; E 2004) Solvent Cleaning (2007) Near-White Blast Cleaning (2002) Surface Preparation and Cleaning of Metals by Waterjetting Prior to Recoating

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; Change 7 2012) Safety and Health Requirements Manual

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FED-STD-313 (Rev D; Notice 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

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

Materials

Coating

Manufacturer's Technical Data Sheets

SD-04 Samples

Color

Submit manufacturer's samples of paint colors. Cross reference color samples to color scheme as indicated.

SD-07 Certificates

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.

1.3 QUALITY ASSURANCE

1.3.1 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.

1.3.1.1 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.

1.3.1.2 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.

1.4 REGULATORY REQUIREMENTS

1.4.1 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.

1.4.2 Lead Content

Do not use coatings having a lead content over 0.06 percent by weight of nonvolatile content.

1.4.3 Chromate Content

Do not use coatings containing zinc-chromate or strontium-chromate.

1.4.4 Asbestos Content

Materials shall not contain asbestos.

1.4.5 Mercury Content

Materials shall not contain mercury or mercury compounds.

1.4.6 Silica

Abrasive blast media shall not contain free crystalline silica.

1.4.7 Human Carcinogens

Materials shall not contain $\frac{ACGIH}{ACGIH}$ 0100 confirmed human carcinogens (A1) or suspected human carcinogens (A2).

1.5 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.

1.6 SAFETY AND HEALTH

Apply coating materials using safety methods and equipment in accordance with the following:

Work shall comply with applicable Federal, State, and local laws and regulations, and with the ACCIDENT PREVENTION PLAN, including the Activity Hazard Analysis as specified in Section 01 35 29 SAFETY AND OCCUPATIONAL HEALTH REQUIREMENTS and in Appendix A of EM 385-1-1. The Activity Hazard Analysis shall include analyses of the potential impact of painting operations on painting personnel and on others involved in and adjacent to the work zone.

1.6.1 Safety Methods Used During Coating Application

Comply with the requirements of SSPC PA Guide 3.

1.6.2 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.

1.7 ENVIRONMENTAL CONDITIONS

Comply, at minimum, with manufacturer recommendations for space ventilation during and after installation.

1.7.1 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.

1.7.2 Post-Application

Vacate space for as long as possible after application. Wait a minimum of 48 hours before occupying freshly painted rooms. Maintain one of the following ventilation conditions during the curing period, or for 72 hours after application:

- a. Supply 100 percent outside air 24 hours a day.
- b. Supply airflow at a rate of 6 air changes per hour, when outside temperatures are between 55 degrees F and 85 degrees F and humidity is between 30 percent and 60 percent.
- c. Supply airflow at a rate of 1.5 air changes per hour, when outside air conditions are not within the range stipulated above.

1.8 SCHEDULING

Allow paint, polyurethane, varnish, and wood stain installations to cure prior to the installation of materials that adsorb VOCs, including .

1.9 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 indicated .

1.10 LOCATION AND SURFACE TYPE TO BE PAINTED

1.10.1 Painting Included

Where a space or surface is indicated to be painted, include the following unless indicated otherwise.

- a. Surfaces behind portable objects and surface mounted articles readily detachable by removal of fasteners, such as screws and bolts.
- b. New factory finished surfaces that require identification or color

coding and factory finished surfaces that are damaged during performance of the work.

c. Existing coated surfaces that are damaged during performance of the work.

1.10.1.1 Exterior Painting

Includes new surfaces, existing coated surfaces, and existing uncoated surfaces, of the buildings and appurtenances. Also included are existing coated surfaces made bare by cleaning operations.

1.10.1.2 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 metal deck; and
- b. Other contiguous surfaces.

1.10.2 Painting Excluded

Do not paint the following unless indicated otherwise.

- a. Surfaces concealed and made inaccessible by panelboards, fixed ductwork, machinery, and equipment fixed in place.
- b. Surfaces in concealed spaces. Concealed spaces are defined as enclosed spaces above suspended ceilings, furred spaces, attic spaces, crawl spaces, elevator shafts and chases.
- c. Steel to be embedded in concrete.
- d. Copper, stainless steel, aluminum, brass, and lead except existing coated surfaces.
- e. Hardware, fittings, and other factory finished items.

1.10.3 Mechanical and Electrical Painting

Includes field coating of 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.

1.10.4 MISCELLANEOUS PAINTING

Lettering shall be provided as scheduled on the drawings, shall be block

type, and shall be black enamel. Samples shall be approved before application.

1.10.5 Definitions and Abbreviations

1.10.5.1 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.

1.10.5.2 Batch Quality Conformance Testing

Batch quality conformance testing determines that the product provided is the same as the product qualified to the appropriate product specification. This testing shall only be accomplished by MPI testing lab.

1.10.5.3 Coating

A film or thin layer applied to a base material called a substrate. A coating may be a metal, alloy, paint, or solid/liquid suspensions on various substrates (metals, plastics, wood, paper, leather, cloth, etc.). They may be applied by electrolysis, vapor deposition, vacuum, or mechanical means such as brushing, spraying, calendaring, and roller coating. A coating may be applied for aesthetic or protective purposes or both. The term "coating" as used herein includes emulsions, enamels, stains, varnishes, sealers, epoxies, and other coatings, whether used as primer, intermediate, or finish coat. The terms paint and coating are used interchangeably.

1.10.5.4 DFT or dft

Dry film thickness, the film thickness of the fully cured, dry paint or coating.

1.10.5.5 DSD

Degree of Surface Degradation, the MPI system of defining degree of surface degradation. Five (5) levels are generically defined under the Assessment sections in the MPI Maintenance Repainting Manual.

1.10.5.6 EPP

Environmentally Preferred Products, a standard for determining environmental preferability in support of Executive Order 13101.

1.10.5.7 EXT

MPI short term designation for an exterior coating system.

1.10.5.8 INT

MPI short term designation for an interior coating system.

1.10.5.9 micron / microns

The metric measurement for 0.001 mm or one/one-thousandth of a millimeter.

1.10.5.10 mil / mils

The English measurement for 0.001 in or one/one-thousandth of an inch, equal to 25.4 microns or 0.0254 mm.

1.10.5.11 mm

The metric measurement for millimeter, $0.001\ \text{meter}$ or one/one-thousandth of a meter.

1.10.5.12 MPI Gloss Levels

MPI system of defining gloss. Seven (7) gloss levels (G1 to G7) are generically defined under the Evaluation sections of the MPI Manuals. Traditionally, Flat refers to G1/G2, Eggshell refers to G3, Semigloss refers to G5, and G10ss refers to G6.

Gloss levels are defined by MPI as follows:

Gloss	Description	Units	Units
Level		at 60 degrees	at 85 degrees
C1	Matta an Elat	0 +0 5	10 mars
G1	Matte or Flat	0 to 5	10 max
G2	Velvet	0 to 10	10 to 35
G3	Eggshell	10 to 25	10 to 35
G4	Satin	20 to 35	35 min
G5	Semi-Gloss	35 to 70	
G6	Gloss	70 to 85	
G7	High Gloss		

Gloss is tested in accordance with ASTM D523. Historically, the Government has used Flat (G1 / G2), Eggshell (G3), Semi-Gloss (G5), and Gloss (G6).

1.10.5.13 MPI System Number

The MPI coating system number in each Division found in either the MPI Architectural Painting Specification Manual or the Maintenance Repainting Manual and defined as an exterior (EXT/REX) or interior system (INT/RIN). The Division number follows the CSI Master Format.

1.10.5.14 Paint

See Coating definition.

1.10.5.15 REX

MPI short term designation for an exterior coating system used in repainting projects or over existing coating systems.

1.10.5.16 RIN

MPI short term designation for an interior coating system used in repainting projects or over existing coating systems.

PART 2 PRODUCTS

2.1 MATERIALS

Conform to the coating specifications and standards referenced in PART 3. Submit manufacturer's technical data sheets for specified coatings and solvents. 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, 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 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.
- 3.3 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 in accordance with SSPC SP 1 to remove oil and grease. Where shop coat is missing or damaged, clean according to SSPC SP 2, , , or . ; 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.
- 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.

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.

- 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 F1869. 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.

3.5 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.
 - 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: 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 before wood becomes dirty, warped.

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.

- 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.

Mixing and Thinning of Paints 3.6.2

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 0.125 L of suitable thinner per liter. The use of thinner shall not relieve the Contractor from obtaining complete hiding, full film thickness, or required gloss. Thinning shall not cause the paint to exceed limits on volatile organic compounds. Paints of different manufacturers shall not be mixed.

3.6.3 Two-Component Systems

Two-component systems shall be mixed in accordance with manufacturer's instructions. Any thinning of the first coat to ensure proper penetration and sealing shall be as recommended by the manufacturer for each type of substrate.

3.6.4 Coating Systems

a. Systems by Substrates: Apply coatings that conform to the respective specifications listed in the following Tables:

Table

- Division 3. Exterior Concrete Paint Table
- Division 4. Exterior Concrete Masonry Units Paint Table
- Division 5. Exterior Metal, Ferrous and Non-Ferrous Paint Table
- Division 6. Exterior Wood; Dressed Lumber, Paneling, Decking, Shingles Paint Table
- Division 9: Exterior Stucco Paint Table
- Division 10. Exterior Cloth Coverings and Bituminous Coated Surfaces Paint Table
- Division 3. Interior Concrete Paint Table
- Division 4. Interior Concrete Masonry Units Paint Table
 Division 5. Interior Metal, Ferrous and Non-Ferrous Paint Table
- Division 6. Interior Wood Paint Table
- Division 9: Interior Plaster, Gypsum Board, Textured Surfaces Paint Table
- b. Minimum Dry Film Thickness (DFT): Apply paints, primers, varnishes,

enamels, undercoats, and other coatings to a minimum dry film thickness of 1.5 mil each coat unless specified otherwise in the Tables. Coating thickness where specified, refers to the minimum dry film thickness.

- c. Coatings for Surfaces Not Specified Otherwise: Coat surfaces which have not been specified, the same as surfaces having similar conditions of exposure.
- d. Existing Surfaces Damaged During Performance of the Work, Including New Patches In Existing Surfaces: Coat surfaces with the following:
 - (1) One coat of primer.
 - (2) One coat of undercoat or intermediate coat.
 - (3) One topcoat to match adjacent surfaces.
- e. Existing Coated Surfaces To Be Painted: Apply coatings conforming to the respective specifications listed in the Tables herein, except that pretreatments, sealers and fillers need not be provided on surfaces where existing coatings are soundly adhered and in good condition. Do not omit undercoats or primers.

3.7 COATING SYSTEMS FOR METAL

Apply coatings of Tables in Division 5 for Exterior and Interior.

- a. Apply specified ferrous metal primer on the same day that surface is cleaned, to surfaces that meet all specified surface preparation requirements at time of application.
- b. Inaccessible Surfaces: Prior to erection, use one coat of specified primer on metal surfaces that will be inaccessible after erection.
- c. Shop-primed Surfaces: Touch up exposed substrates and damaged coatings to protect from rusting prior to applying field primer.
- d. Surface Previously Coated with Epoxy or Urethane: Apply MPI 101, 1.5 mils DFT immediately prior to application of epoxy or urethane coatings.
- e. Pipes and Tubing: The semitransparent film applied to some pipes and tubing at the mill is not to be considered a shop coat, but shall be overcoated with the specified ferrous-metal primer prior to application of finish coats.
- f. Exposed Nails, Screws, Fasteners, and Miscellaneous Ferrous Surfaces. On surfaces to be coated with water thinned coatings, spot prime exposed nails and other ferrous metal with latex primer MPI 107.
- 3.8 COATING SYSTEMS FOR CONCRETE AND CEMENTITIOUS SUBSTRATES

Apply coatings of Tables in Division 3, 4 and 9 for Exterior and Interior.

- 3.9 COATING SYSTEMS FOR WOOD AND PLYWOOD
 - a. Apply coatings of Tables in Division 6 for Exterior and Interior.
 - b. Prior to erection, apply two coats of specified primer to treat and prime wood and plywood surfaces which will be inaccessible after

erection.

c. Apply stains in accordance with manufacturer's printed instructions.

3.10 PIPING IDENTIFICATION

Piping Identification, Including Surfaces In Concealed Spaces: Provide in accordance with ASME A13.1. Place stenciling in clearly visible locations. On piping not covered by ASME A13.1, 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.

3.13 PAINT TABLES

All DFT's are minimum values. Acceptable products are listed in the MPI Green Approved Products List, available at http://www.specifygreen.com/APL/ProductIdxByMPInum.asp.

3.13.1 EXTERIOR PAINT TABLES

DIVISION 4: EXTERIOR CONCRETE MASONRY UNITS PAINT TABLE

- A. New and Existing concrete masonry on uncoated surface:
- 1. Latex

New; MPI EXT 4.2A-G5 (Semigloss) / Existing; MPI REX 4.2A-G5 (Semigloss)
Block Filler: Primer: Intermediate: Topcoat:
MPI 4 N/A MPI 11 MPI 11
System DFT: 11 mils

Topcoat: Coating to match adjacent surfaces.

DIVISION 5: EXTERIOR METAL, FERROUS AND NON-FERROUS PAINT TABLE STEEL / FERROUS SURFACES

A. New Steel that has been hand or power tool cleaned to SSPC SP 2 or SSPC SP 3 $\,$

```
STEEL / FERROUS SURFACES
1. Alkyd
   New; MPI EXT 5.1Q-G5 (Semigloss) Existing; MPI REX 5.1D-G5
                      Intermediate: Topcoat:
   Primer:
   MPI 23
                      MPI 94
                                          MPI 94
   System DFT: 5.25 mils
B. New Steel that has been blast-cleaned to SSPC SP 6/NACE No.3:
2. Alkyd
   New; MPI EXT 5.1D-G5 (Semigloss) / Existing; MPI REX 5.1D-G5
                     Intermediate: Topcoat:
   MPI 79
                      MPI 94
                                         MPI 94
   System DFT: 5.25 mils
C. Existing steel that has been spot-blasted to SSPC SP 6/NACE No.3:
1. Surface previously coated with alkyd or latex:
   Waterborne Light Industrial Coating
   MPI REX 5.1C-G5 (Semigloss)
   Spot Primer: Intermediate: Topcoat:
   MPI 79
                     MPI 163
                                      MPI 163
   System DFT: 5 mils
D. New and existing steel blast cleaned to SSPC SP 10/NACE No. 2:
1. Waterborne Light Industrial
   MPI EXT 5.1R-G5 (Semigloss)
   Primer:
                      Intermediate:
                                        Topcoat:
   MPI 101
                      MPI 108
                                         MPI 163
   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.:
EXTERIOR GALVANIZED SURFACES
F. New Galvanized surfaces:
3. Waterborne Primer / Waterborne Light Industrial Coating
   MPI EXT 5.3J-G5 (Semigloss)
                      Intermediate:
   Primer:
                                       Topcoat:
                      MPI 163
   MPI 134
                                      MPI 163
   System DFT: 4.5 mils
G. Galvanized surfaces with slight coating deterioration; little or no
   rusting:
1. Waterborne Light Industrial Coating
   MPI REX 5.3J-G5 (Semigloss)
   Primer:
                     Intermediate:
                                       Topcoat:
   MPI 134
                      N/A
                                         MPI 163
   System DFT: 4.5 mils
H. Galvanized surfaces with severely deteriorated coating or rusting:
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1. Waterborne Light Industrial Coating

MPI REX 5.3L-G5(Semigloss)

EXTERIOR GALVANIZED SURFACES

Primer: Intermediate: Topcoat: MPI 101 MPI 108 MPI 163

System DFT: 8.5 mils

- 3.13.2 INTERIOR PAINT TABLES
 - DIVISION 4: INTERIOR CONCRETE MASONRY UNITS PAINT TABLE
- A. New and uncoated Existing Concrete masonry:
- 1. High Performance Architectural Latex

MPI INT 4.2D-G5 (Semigloss)

Filler Primer: Intermediate: Topcoat: MPI 4 N/A MPI 141 MPI 141

System DFT: 11 mils

Fill all holes in masonry surface

- B. Existing, previously painted Concrete masonry:
- 1. High Performance Architectural Latex

MPI RIN 4.2K-G5 (Semigloss)

Spot Primer: Intermediate: Topcoat: MPI 50 MPI 141 MPI 141

System DFT: 4.5 mils

DIVISION 5: INTERIOR METAL, FERROUS AND NON-FERROUS PAINT TABLE

INTERIOR STEEL / FERROUS SURFACES

Α.

Metal,

Surfaces adjacent to painted surfaces (Match surrounding finish), 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-G5 (Semigloss)

Primer: Intermediate: Topcoat: MPI 79 MPI 141 MPI 141

System DFT: 5 mils

- C. Metal in other high-humidity areas not otherwise specified except floors, hot metal surfaces, and new prefinished equipment:
- 1. Alkyd

MPI INT 5.1E-G5 (Semigloss)

Primer: Intermediate: Topcoat: MPI 79 MPI 47 MPI 47

System DFT: 5.25 mils

-- 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.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z21.22 (1999; A 2001) Relief Valves for Hot Water Supply Systems

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)

ASSE 1003 (2009) Performance Requirements for Water Pressure Reducing Valves for Domestic Water Distribution Systems - (ANSI approved 2010)

ASSE 1005 (1999) Water Heater Drain Valves 3/4 Inch Size

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA 10084 (2005) Standard Methods for the Examination of Water and Wastewater

ASME INTERNATIONAL (ASME)

ASME B16.15	(1985; R 2004) Cast Bronze Threaded Fittings Classes 125 and 250
ASME B16.18	(2012) Cast Copper Alloy Solder Joint Pressure Fittings
ASME B16.22	(2001; R 2010) Standard for Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
ASME B31.1	(2007; Addenda a 2008; Addenda b 2009) Power Piping
ASME BPVC SEC IX	(2010) BPVC Section IX-Welding and Brazing Qualifications
ASME CSD-1	(2012) Control and Safety Devices for Automatically Fired Boilers

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

(2009) Standing Practice for Operating ASTM B 117

Salt Spray (Fog) Apparatus

ASTM B 88 (2003) Standard Specification for Seamless

Copper Water Tube

ASTM B 88M (2005) Standard Specification for Seamless

Copper Water Tube (Metric)

CSA AMERICA, INC. (CSA/AM)

CSA/AM Z21.10.3 (2004) Gas Water Heaters Vol.III, Storage

Water Heaters With Input Ratings Above 75,000 Btu Per Hour, Circulating and

Instantaneous

INTERNATIONAL CODE COUNCIL (ICC)

ICC NCPC (2006) North Carolina Plumbing Code

> MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-110 (2010) Ball Valves Threaded,

Socket-Welding, Solder Joint, Grooved and

Flared Ends

MSS SP-58 (2009) Pipe Hangers and Supports -

Materials, Design and Manufacture,

Selection, Application, and Installation

MSS SP-69 (2003; R 2004) Standard for Pipe Hangers

and Supports - Selection and Application

(2005a) Cast Iron Plug Valves, Flanged and MSS SP-78

Threaded Ends

MSS SP-80 (2008) Bronze Gate, Globe, Angle and Check

Valves

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

(2012) National Fuel Gas Code NFPA 54

SUBMITTALS

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

SD-03 Product Data

Water heaters

Welding

A copy of qualified procedures and a list of names and identification symbols of qualified welders and welding operators.

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-07 Certificates

Materials and Equipment

Where equipment is specified to conform to requirements of the ASME Boiler and Pressure Vessel Code, the design, fabrication, and installation shall conform to the code.

SD-10 Operation and Maintenance Data

Submit in accordance with Section 01 78 00 CLOSEOUT SUBMITTALS.

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 Oualifications

Products having less than a two-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturer's factory or laboratory tests, can be shown.

1.3.2 Service Support

The equipment items shall be supported by service organizations. Submit a certified list of qualified permanent service organizations for support of the equipment which includes their addresses and qualifications. These service organizations shall be reasonably convenient to the equipment installation and able to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

1.3.3 Manufacturer's Nameplate

Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

1.3.4 Modification of References

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction", or words of similar meaning, to mean the Contracting Officer.

1.3.4.1 Definitions

For the International Code Council (ICC) Codes referenced in the contract documents, advisory provisions shall be considered mandatory, the word "should" shall be interpreted as "shall." Reference to the "code official" shall be interpreted to mean the "Contracting Officer." For Navy owned property, references to the "owner" shall be interpreted to mean the "Contracting Officer." For leased facilities, references to the "owner" shall be interpreted to mean the "lessor." References to the "permit holder" shall be interpreted to mean the "Contractor."

1.3.4.2 Administrative Interpretations

For ICC Codes referenced in the contract documents, the provisions of Chapter 1, "Administrator," do not apply. These administrative requirements are covered by the applicable Federal Acquisition Regulations (FAR) included in this contract and by the authority granted to the Officer in Charge of Construction to administer the construction of this project. References in the ICC Codes to sections of Chapter 1, shall be applied appropriately by the Contracting Officer as authorized by his administrative cognizance and the FAR.

1.4 DELIVERY, STORAGE, AND HANDLING

Handle, store, and protect equipment and materials to prevent damage before and during installation in accordance with the manufacturer's recommendations, and as approved by the Contracting Officer. Replace damaged or defective items.

1.5 PERFORMANCE REQUIREMENTS

1.5.1 Welding

Procedures and welders shall be qualified in accordance with ASME BPVC SEC IX. Welding procedures qualified by others, and welders and welding operators qualified by another employer, may be accepted as permitted by ASME B31.1. The Contracting Officer shall be notified 24 hours in advance of tests, and the tests shall be performed at the work site if practicable. Welders or welding operators shall apply their assigned symbols near each weld they make as a permanent record.

1.6 REGULATORY REQUIREMENTS

Unless otherwise required herein, plumbing work shall be in accordance with ${\tt ICC\ NCPC}$.

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 VALVES

Valves shall be provided on supplies to equipment and fixtures. Valves 3 inches and larger shall have flanged iron bodies and bronze trim. 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
Cast-Iron Plug Valves, Flanged and Threaded Ends	MSS SP-78
Bronze Gate, Globe, Angle, and Check Valves	MSS SP-80
Water Pressure Reducing Valves	ASSE 1003
Water Heater Drain Valves	ASSE 1005
Temperature and Pressure Relief Valves for Hot Water Supply Systems	ANSI Z21.22
Temperature and Pressure Relief Valves for Automatically Fired Hot	ASME CSD-1
Water Boilers	Safety Code No., Part CW, Article 5

Description Standard

2.1.1 Relief Valves

Water heaters and hot water storage tanks shall have a combination pressure and temperature (P&T) relief valve. The pressure relief element of a P&T relief valve shall have adequate capacity to prevent excessive pressure buildup in the system when the system is operating at the maximum rate of heat input. The temperature element of a P&T relief valve shall have a relieving capacity which is at least equal to the total input of the heaters when operating at their maximum capacity. Relief valves shall be rated according to ANSI Z21.22. Relief valves for systems where the maximum rate of heat input is less than 200,000 Btuh shall have 3/4 inch minimum inlets, and 3/4 inch outlets. Relief valves for systems where the maximum rate of heat input is greater than 200,000 Btuh shall have 1 inch minimum inlets, and 1 inch outlets. The discharge pipe from the relief valve shall be the size of the valve outlet.

2.1.2 Thermostatic Mixing Valves

Provide thermostatic mixing valve for lavatory faucets. Mixing valves, thermostatic type, pressure-balanced or combination thermostatic and pressure-balanced shall be line size and shall be constructed with rough or finish bodies either with or without plating. Each valve shall be constructed to control the mixing of hot and cold water and to deliver water at a desired temperature regardless of pressure or input temperature changes. The control element shall be of an approved type. The body shall be of heavy cast bronze, and interior parts shall be brass, bronze, corrosion-resisting steel or copper. The valve shall be equipped with necessary stops, check valves, unions, and sediment strainers on the inlets. Mixing valves shall maintain water temperature within 5 degrees F of any setting.

2.2 WATER HEATERS

Water heater types and capacities shall be as indicated. Each water heater shall have replaceable anodes. Each primary water heater shall have controls with an adjustable range that includes 90 to 160 degrees F. Each gas-fired water heater shall have controls with an adjustable range that includes 120 to 180 degrees F. Hot water systems utilizing recirculation systems shall be tied into building off-hour controls. The thermal efficiencies and standby heat losses shall conform to TABLE III for each type of water heater specified. Plastic materials polyetherimide (PEI) and polyethersulfone (PES) are forbidden to be used for vent piping of combustion gases. A factory pre-charged expansion tank shall be installed on the cold water supply to each water heater. Expansion tanks shall be specifically designed for use on potable water systems and shall be rated for 200 degrees F water temperature and 150 psi working pressure. The expansion tank size and acceptance volume shall be as indicated.

2.2.1 Automatic Storage Type

Heaters shall be complete with control system and shall have ASME rated combination pressure and temperature relief valve.

2.2.1.1 Gas-Fired Type

Gas-fired water heaters shall conform to CSA/AM Z21.10.3.

2.3 ELECTRICAL WORK

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.

2.4 MISCELLANEOUS PIPING ITEMS

2.4.1 Pipe Sleeves

Provide where piping passes entirely through walls 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.

2.4.1.1 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.

2.4.2 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.

2.4.3 Nameplates

Provide 0.125 inch thick melamine laminated plastic nameplates, black matte finish with white center core, for equipment, gages, thermometers, and valves. Accurately align lettering and engrave minimum of 0.25 inch high normal block lettering into the white core. Minimum size of nameplates shall be 1.0 by 2.5 inches. Key nameplates to a chart and schedule for each system. Frame charts and schedules under glass and place where directed near each system. Furnish two copies of each chart and schedule.

PART 3 EXECUTION

3.1 WATER HEATERS

3.1.1 Relief Valves

No valves shall be installed between a relief valve and its water heater. The P&T relief valve shall be installed where the valve actuator comes in contact with the hottest water in the heater. Whenever possible, the

relief valve shall be installed directly in a tapping in the tank or heater; otherwise, the P&T valve shall be installed in the hot-water outlet piping. A vacuum relief valve shall be provided on the cold water supply line to the water heater and mounted above and within 6 inches above the top of the water heater.

3.1.2 Installation of Gas--Fired Water Heater

Installation shall conform to NFPA 54.

3.1.3 Heat Traps

Provide integral, factory manufactured or piping arranged heat traps on piping to and from each water heater on both hot and cold water connection. Piping arranged heat trap shall incorporate a minimum 12 inch deep loop to restrict natural tendency of hot water to rise during standby periods.

3.1.4 Connections to Water Heaters

Connections of metallic pipe to water heaters shall be made with dielectric unions or flanges.

3.1.5 Expansion Tank

A pre-charged expansion tank shall be installed on the cold water supply between the water heater inlet and the cold water supply shut-off valve. The Contractor shall adjust the expansion tank air pressure, as recommended by the tank manufacturer, to match incoming water pressure.

3.2 IDENTIFICATION SYSTEMS

3.2.1 Identification Tags

Identification tags made of brass, engraved laminated plastic, or engraved anodized aluminum, indicating service and valve number shall be installed on valves, except those valves installed on supplies at plumbing fixtures. Tags shall be 1-3/8 inch minimum diameter, and marking shall be stamped or engraved. Indentations shall be black, for reading clarity. Tags shall be attached to valves with No. 12 AWG, copper wire, chrome-plated beaded chain, or plastic straps designed for that purpose.

3.3 PAINTING

3.3.1 PAINTING OF NEW EQUIPMENT

New equipment painting shall be factory applied or shop applied, and shall be as specified herein, and provided under each individual section.

3.3.1.1 Factory Painting Systems

Manufacturer's standard factory painting systems may be provided subject to certification that the factory painting system applied will withstand 125 hours in a salt-spray fog test, except that equipment located outdoors shall withstand 500 hours in a salt-spray fog test. Salt-spray fog test shall be in accordance with ASTM B 117, and for that test the acceptance criteria shall be as follows: immediately after completion of the test, the paint shall show no signs of blistering, wrinkling, or cracking, and no loss of adhesion; and the specimen shall show no signs of rust creepage

beyond 0.125 inch on either side of the scratch mark.

The film thickness of the factory painting system applied on the equipment shall not be less than the film thickness used on the test specimen. If manufacturer's standard factory painting system is being proposed for use on surfaces subject to temperatures above 120 degrees F, the factory painting system shall be designed for the temperature service.

3.3.1.2 Shop Painting Systems for Metal Surfaces

Clean, pretreat, prime and paint metal surfaces; except aluminum surfaces need not be painted. Apply coatings to clean dry surfaces. Clean the surfaces to remove dust, dirt, rust, oil and grease by wire brushing and solvent degreasing prior to application of paint, except metal surfaces subject to temperatures in excess of 120 degrees F shall be cleaned to bare metal.

Where more than one coat of paint is specified, apply the second coat after the preceding coat is thoroughly dry. Lightly sand damaged painting and retouch before applying the succeeding coat. Color of finish coat shall be aluminum or light gray.

- a. Temperatures Less Than 120 Degrees F: Immediately after cleaning, the metal surfaces subject to temperatures less than 120 degrees F shall receive one coat of pretreatment primer applied to a minimum dry film thickness of 0.3 mil, one coat of primer applied to a minimum dry film thickness of one mil; and two coats of enamel applied to a minimum dry film thickness of one mil per coat.
- b. Temperatures Between 120 and 400 Degrees F: Metal surfaces subject to temperatures between 120 and 400 degrees F shall receive two coats of 400 degrees F heat-resisting enamel applied to a total minimum thickness of 2 mils.
- c. Temperatures Greater Than 400 Degrees F: Metal surfaces subject to temperatures greater than 400 degrees F shall receive two coats of 600 degrees F heat-resisting paint applied to a total minimum dry film thickness of 2 mils.

3.4 TESTS, FLUSHING AND DISINFECTION

3.4.1 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. .

3.4.2 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 valve.
- c. Temperature of each domestic hot-water supply.

3.4.3 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. 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.

3.5 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.

3.6 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.

3.7 PERFORMANCE OF WATER HEATING EQUIPMENT

Standard rating condition terms are as follows:

EF = Energy factor, overall efficiency.

ET = Thermal efficiency with 70 degrees F delta T.

EC = Combustion efficiency, 100 percent - flue loss when smoke = o (trace is permitted).

SL = Standby loss in W/sq. ft. based on 80 degrees F delta T, or in percent per hour based on nominal 90 degrees F delta T.

HL = Heat loss of tank surface area.

V = Storage volume in liters

3.7.1 Storage Water Heaters

3.7.1.1 Gas

Storage capacity of more than 100 gallons - or input rating more than 75,000 Btu/h: Et shall be 77 percent; maximum SL shall be 1.3+38/V, per CSA/AM Z21.10.3.

3.8 PRESSURE PIPING

TABLE II

	PIPE AND FITTING MATERIALS FOR P	RESSURE F	PIPING SYSTEMS
			SERVICE
Item	No. Pipe and Fitting Materials		В
	eamless copper water tube, STM B 88, ASTM B 88M	X**	X**
Ī	ast bronze threaded fittings, ASME B16.15 for use with Item 1	Х	X
<u> </u>	Wrought copper and bronze solder-joint pressure fittings, ASME B16.22 for use with Item 1	Х	X
I Z	Cast copper alloy solder-joint pressure fittings, ASME B16.18 for use with Item 1	X	X

A - Cold Water Service Aboveground

 $[\]mbox{\bf B}$ - Hot and Cold Water Distribution 180 degrees F Maximum Aboveground Indicated types are minimum wall thicknesses.

TABLE III STANDARD RATING CONDITIONS AND MINIMUM PERFORMANCE RATINGS FOR WATER HEATING EQUIPMENT

A. STORAGE WATER HEATERS

STORAGE

CAPACITY INPUT
GALLONS RATING TEST PROCEDURE REQUIRED FUEL PERFORMANCE

Gas 100 min. OR 75,000 Btu/h CSA/AM Z21.10.3 ET = 80 percent; SL = 1.3 + 38/V max.

TERMS:

ET = Thermal efficiency with 70 degrees F delta T.

SL = Standby loss in W/sq. ft. based on 80 degrees F delta T, or in

percent per hour based on nominal 90 degrees F delta T.

V = Storage volume in gallons

-- End of Section --

SECTION 23 00 00

AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEMS

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.

AIR MOVEMENT AND CONTROL ASSOCIATION (AMCA)

AMCA 201	(2002; R 2011) Fans and Systems
AMCA 210	(2007) Laboratory Methods of Testing Fans for Aerodynamic Performance Rating
AMCA 300	(2008) Reverberant Room Method for Sound Testing of Fans
AMCA 301	(2014) Methods for Calculating Fan Sound Ratings from Laboratory Test Data

AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE (AHRI)

AHRI Guideline D	(1996) Application and Installation of
	Central Station Air-Handling Units

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 62.1	(2010; Errata 2011; INT 3 2012; INT 4
	2012; INT 5 2013) Ventilation for
	Acceptable Indoor Air Quality

ASME INTERNATIONAL (ASME)

ASME A13.1	(2007; R 2013)	Scheme for the
	Identification	of Piping Systems

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A123/A123M	(2013) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A924/A924M	(2014) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM B117	(2011) Standard Practice for Operating Salt Spray (Fog) Apparatus

ASTM B766 (1986; R 2008) Standard Specification for

Electrodeposited Coatings of Cadmium

ASTM D1654 (2008) Evaluation of Painted or Coated

Specimens Subjected to Corrosive

Environments

ASTM D3359 (2009; E 2010; R 2010) Measuring Adhesion

by Tape Test

ASTM D520 (2000; R 2011) Zinc Dust Pigment

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1 (2014) Motors and Generators

NEMA MG 10 (2013) Energy Management Guide for

Selection and Use of Fixed Frequency Medium AC Squirrel-Cage Polyphase

Induction Motors

NEMA MG 11 (1977; R 2012) Energy Management Guide for

Selection and Use of Single Phase Motors

U.S. DEPARTMENT OF ENERGY (DOE)

PL-109-58 (1992; R 2005) Energy Efficient

Procurement Requirements

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

40 CFR 82 Protection of Stratospheric Ozone

UNDERWRITERS LABORATORIES (UL)

UL 6 (2007; Reprint Nov 2014) Electrical Rigid

Metal Conduit-Steel

UL 705 (2004; Reprint Dec 2013) Standard for

Power Ventilators

UL Bld Mat Dir (2012) Building Materials Directory

1.2 SYSTEM DESCRIPTION

Furnish ductwork, fittings, and accessories as required to provide a complete installation. Coordinate the work of the different trades to avoid interference between piping, equipment, structural, and electrical work. Provide complete, in place, all necessary offsets in ductwork, and all fittings, and other components, required to install the work as indicated and specified.

1.2.1 Mechanical Equipment Identification

The number of charts and diagrams shall be equal to or greater than the number of mechanical equipment rooms. Where more than one chart or diagram per space is required, mount these in edge pivoted, swinging leaf, extruded aluminum frame holders which open to 170 degrees.

1.2.1.1 Charts

Provide chart listing of equipment by designation numbers and capacities such as flow rates, pressure and temperature differences, heating and cooling capacities, horsepower, pipe sizes, and voltage and current characteristics.

1.2.2 Service Labeling

Label equipment with labels made of self-sticking, plastic film designed for permanent installation. Labels shall be in accordance with the typical examples below:

SERVICE	LABEL AND TAG DESIGNATION
Boiler Number	AS710-B1-#
Boiler Pump Number	AS710-BP1-#
Exhaust Fan Number	AS710-EF1-#
Heating Hot Water Pump Number	AS710-HWP1-#
Fuel-Fired Water Heater Number	AS710-GWH1-#
Air/Dirt Separator Number	AS710-AS1-#
Expansion Tank Number	AS710-XP1-#

1.2.3 Color Coding

Color coding of all piping systems shall be in accordance with ASME A13.1.

1.3 SUBMITTALS

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

SD-03 Product Data

Centrifugal Type Power Roof Ventilators Test Procedures

SD-06 Test Reports

Performance Tests

SD-08 Manufacturer's Instructions

Manufacturer's Installation Instructions

SD-10 Operation and Maintenance Data

Operation and Maintenance Manuals

Centrifugal Type Power Roof Ventilators

1.4 QUALITY ASSURANCE

Except as otherwise specified, approval of materials and equipment is based on manufacturer's published data.

- a. Where materials and equipment are specified to conform to the standards of the Underwriters Laboratories, the label of or listing with reexamination in UL Bld Mat Dir, and UL 6 is acceptable as sufficient evidence that the items conform to Underwriters Laboratories requirements. In lieu of such label or listing, submit a written certificate from any nationally recognized testing agency, adequately equipped and competent to perform such services, stating that the items have been tested and that the units conform to the specified requirements. Outline methods of testing used by the specified agencies.
- b. Where materials or equipment are specified to be constructed or tested, or both, in accordance with the standards of the ASTM International (ASTM), the ASME International (ASME), or other standards, a manufacturer's certificate of compliance of each item is acceptable as proof of compliance.
- c. Conformance to such agency requirements does not relieve the item from compliance with other requirements of these specifications.
- d. Where products are specified to meet or exceed the specified energy efficiency requirement of FEMP-designated or ENERGY STAR coveed product categories, equipment selected shall have as a minimum the efficiency rating identified under "Energy-Efficient Products" at http://www1.eere.energy.gov/femp/procurement.

These specifications conform to the efficiency requirements as defined in Public Law PL-109-58, "Energy Policy Act of 2005" for federal procurement of energy-efficient products. Equipment having a lower efficiency than ENERGY STAR or FEMP requirements may be specified if the designer determines the equipment to be more life-cycle cost effective using the life-cycle cost analysis methodology and procedure in 10 CFR 436.

1.4.1 Prevention of Corrosion

Protect metallic materials against corrosion. Manufacturer shall provide rust-inhibiting treatment and standard finish for the equipment enclosures. Do not use aluminum where connected to dissimilar metal. Protect aluminum by approved fittings, barrier material, or treatment. Ferrous parts such as anchors, bolts, braces, boxes, bodies, clamps, fittings, guards, nuts, pins, rods, shims, thimbles, washers, and miscellaneous parts not of corrosion-resistant steel or nonferrous materials shall be hot-dip galvanized in accordance with ASTM A123/A123M for exterior locations and cadmium-plated in conformance with ASTM B766 for interior locations.

1.4.2 Asbestos Prohibition

Do not use asbestos and asbestos-containing products.

1.4.3 Use of Ozone Depleting Substances, Other than Refrigerants

The use of Class I or Class II ODS's listed as nonessential in $40\ \text{CFR}\ 82$ Part $82.66\ \text{Subpart}\ \text{C}$ is prohibited. These prohibited materials and uses include:

- a. Any plastic party spray streamer or noise horn which is propelled by a chlorofluorocarbon
- b. Any cleaning fluid for electronic and photographic equipment which contains a chlorofluorocarbon; including liquid packaging, solvent wipes, solvent sprays, and gas sprays.
- c. Any plastic flexible or packaging foam product which is manufactured with or contains a chlorofluorocarbon, including, open cell foam, open cell rigid polyurethane poured foam, closed cell extruded polystyrene sheet foam, closed cell polyethylene foam and closed cell polypropylene foam except for flexible or packaging foam used in coaxial cabling.
- d. Any aerosol product or other pressurized dispenser which contains a chlorofluorocarbon, except for those listed in 40 CFR 82 Part 82.66 Subpart C.

Request a waiver if a facility requirement dictates that a prohibited material is necessary to achieve project goals. Submit the waiver request in writing to the Contracting Officer. The waiver will be evaluated and dispositioned.

1.4.4 Test Procedures

Submit proposed test procedures and test schedules for the performance tests of systems, at least 2 weeks prior to the start of related testing.

1.5 DELIVERY, STORAGE, AND HANDLING

Protect stored equipment at the jobsite from the weather, humidity and temperature variations, dirt and dust, or other contaminants. Additionally, cap or plug all pipes until installed.

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

Provide components and equipment that are standard products of manufacturers regularly engaged in the manufacturing of products that are of a similar material, design and workmanship. This requirement applies to all equipment, including diffusers, registers, fire dampers, and balancing dampers.

- a. Standard products are defined as components and equipment that have been in satisfactory commercial or industrial use in similar applications of similar size for at least two years before bid opening.
- b. Prior to this two year period, these standard products shall have been sold on the commercial market using advertisements in manufacturers' catalogs or brochures. These manufacturers' catalogs, or brochures shall have been copyrighted documents or have been identified with a manufacturer's document number.

c. Provide equipment items that are supported by a service organization. In product categories covered by ENERGY STAR or the Federal Energy Management Program, provide equipment that is listed on the ENERGY STAR Qualified Products List or that meets or exceeds the FEMP-designated Efficiency Requirements.

2.2 IDENTIFICATION PLATES

In addition to standard manufacturer's identification plates, provide engraved laminated phenolic identification plates for each piece of mechanical equipment. Identification plates are to designate the function of the equipment. Submit designation with the shop drawings. Identification plates shall be three layers, black-white-black, engraved to show white letters on black background. Letters shall be upper case. Identification plates 1-1/2-inches high and smaller shall be 1/16-inch thick, with engraved lettering 1/8-inch high; identification plates larger than 1-1/2-inches high shall be 1/8-inch thick, with engraved lettering of suitable height. Identification plates 1-1/2-inches high and larger shall have beveled edges. Install identification plates using a compatible adhesive.

2.3 EQUIPMENT GUARDS AND ACCESS

Fully enclose or guard belts, pulleys, chains, gears, couplings, projecting setscrews, keys, and other rotating parts exposed to personnel contact according to OSHA requirements.

2.4 ELECTRICAL WORK

- a. Provide motors, controllers, integral disconnects, contactors, and controls with their respective pieces of equipment, except controllers indicated as part of motor control centers. Provide electrical equipment, including motors and wiring, as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Provide manual or automatic control and protective or signal devices required for the operation specified and control wiring required for controls and devices specified, but not shown. For packaged equipment, include manufacturer provided controllers with the required monitors and timed restart.
- b. For single-phase motors, provide high-efficiency type, fractional-horsepower alternating-current motors, including motors that are part of a system, in accordance with NEMA MG 11. Integral size motors shall be the premium efficiency type in accordance with NEMA MG 1.
- c. For polyphase motors, provide squirrel-cage medium induction motors, including motors that are part of a system, and that meet the efficiency ratings for premium efficiency motors in accordance with NEMA MG 1. Select premium efficiency polyphase motors in accordance with NEMA MG 10.
- d. 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. Provide motors rated for continuous duty with the enclosure specified. Provide motor duty that allows for maximum frequency start-stop operation and minimum encountered interval between start and stop. Provide motor torque capable of accelerating the connected load within 20 seconds with 80 percent of the rated voltage maintained at motor terminals during one starting period. Provide motor starters complete with thermal overload protection and

other necessary appurtenances. Fit motor bearings with grease supply fittings and grease relief to outside of the enclosure.

2.5 ANCHOR BOLTS

Provide anchor bolts for equipment placed on concrete equipment pads or on concrete slabs. Bolts to be of the size and number recommended by the equipment manufacturer and located by means of suitable templates. Installation of anchor bolts shall not degrade the surrounding concrete.

2.6 PAINTING

Paint equipment units in accordance with approved equipment manufacturer's standards unless specified otherwise. Field retouch only if approved. Otherwise, return equipment to the factory for refinishing.

2.7 INDOOR AIR QUALITY

Provide equipment and components that comply with the requirements of ASHRAE 62.1 unless more stringent requirements are specified herein.

2.8 AIR SYSTEMS EQUIPMENT

2.8.1 Fans

Test and rate fans according to $\frac{AMCA}{210}$. Calculate system effect on air moving devices in accordance with $\frac{AMCA}{201}$ where installed ductwork differs from that indicated on drawings. Install air moving devices to minimize fan system effect. Where system effect is unavoidable, determine the most effective way to accommodate the inefficiencies caused by system effect on the installed air moving device. The sound power level of the fans shall not exceed 85 dBA when tested according to AMCA 300 and rated in accordance with AMCA 301. Provide all fans with an AMCA seal. Connect fans to the motors either directly or indirectly with V-belt drive. Use V-belt drives designed for not less than 150 percent of the connected driving capacity. Provide variable pitch motor sheaves for 15 hp and below, and fixed pitch as defined by AHRI Guideline D (A fixed-pitch sheave is provided on both the fan shaft and the motor shaft. This is a non-adjustable speed drive.). Select variable pitch sheaves to drive the fan at a speed which can produce the specified capacity when set at the approximate midpoint of the sheave adjustment. When fixed pitch sheaves are furnished, provide a replaceable sheave when needed to achieve system air balance. Provide motors for V-belt drives with adjustable rails or bases. Provide removable metal guards for all exposed V-belt drives, and provide speed-test openings at the center of all rotating shafts. Provide fans 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. Provide fan and motor assemblies with vibration-isolation supports or mountings as indicated. Use vibration-isolation units that are standard products with published loading ratings. Select each fan to produce the capacity required at the fan static pressure indicated. Provide sound power level as indicated. Obtain the sound power level values according to AMCA 300. Provide standard AMCA arrangement, rotation, and discharge as indicated. Provide power ventilators that conform to UL 705 and have a UL label.

2.8.1.1 Centrifugal Type Power Roof Ventilators

Provide direct driven centrifugal type fans with backward inclined,

non-overloading wheel. Provide hinged or removable and weatherproof motor compartment housing, constructed of heavy gauge aluminum. Provide fans with birdscreen, gravity dampers, roof curb, and extended base. Provide dripproof type motor enclosure. Use only lubricated bearings.

2.9 FACTORY PAINTING

Factory paint new equipment, which are not of galvanized construction. Paint with a corrosion resisting paint finish according to ASTM A123/A123M or ASTM A924/A924M. Clean, phosphatize and coat internal and external ferrous metal surfaces with a paint finish which has been tested according to ASTM B117, ASTM D1654, and ASTM D3359. Submit evidence of satisfactory paint performance for a minimum of 125 hours for units to be installed indoors and 500 hours for units to be installed outdoors. Provide rating of failure at the scribe mark that is not less than 6, average creepage not greater than 1/8 inch. Provide rating of the inscribed area that is not less than 10, no failure. On units constructed of galvanized steel that have been welded, provide a final shop docket of zinc-rich protective paint on exterior surfaces of welds or welds that have burned through from the interior according to ASTM D520 Type I.

Factory painting that has been damaged prior to acceptance by the Contracting Officer shall be field painted in compliance with the requirements of paragraph FIELD PAINTING OF MECHANICAL EQUIPMENT.

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

- a. Install materials and equipment in accordance with the requirements of the contract drawings and approved manufacturer's installation instructions. Accomplish installation by workers skilled in this type of work. Perform installation so that there is no degradation of the designed fire ratings of walls, partitions, ceilings, and floors.
- b. No installation is permitted to block or otherwise impede access to any existing machine or system. Install all hinged doors to swing open a minimum of 120 degrees. Provide an area in front of all access doors that clears a minimum of 3 feet. In front of all access doors to electrical circuits, clear the area the minimum distance to energized circuits as specified in OSHA Standards, part 1910.333 (Electrical-Safety Related work practices) and an additional 3 feet.
- c. Except as otherwise indicated, install emergency switches and alarms in conspicuous locations. Mount all indicators, to include gauges, meters, and alarms in order to be easily visible by people in the area.

3.2.1 Equipment and Installation

Provide frames and supports for fans. Anchor and fasten.

3.2.2 Kitchen Exhaust Ductwork

3.2.2.1 Concealed Ducts Conveying Moisture Laden Air

Fabricate concealed ducts conveying moisture laden air from minimum 18 gauge, Type 300 series, stainless steel Continuously weld joints to be liquid tight. Pitch ducts to drain at points indicated. Make transitions to other metals liquid tight, companion angle bolted and gasketed.

3.2.3 Dust Control

To prevent the accumulation of dust, debris and foreign material during construction, perform temporary dust control protection. Protect the distribution system (supply and return) with temporary seal-offs at all inlets and outlets at the end of each day's work. Keep temporary protection in place until system is ready for startup.

3.2.4 Power Roof Ventilator Mounting

Provide foamed 1/2 inch thick, closed-cell, flexible elastomer insulation to cover width of roof curb mounting flange. Where wood nailers are used, predrill holes for fasteners.

3.2.5 Power Transmission Components Adjustment

Test V-belts and sheaves for proper alignment and tension prior to operation and after 72 hours of operation at final speed. Uniformly load belts on drive side to prevent bouncing. Make alignment of direct driven couplings to within 50 percent of manufacturer's maximum allowable range of misalignment.

3.3 CLEANING

Thoroughly clean surfaces of piping and equipment that have become covered with dirt, plaster, or other material during handling and construction before such surfaces are prepared for final finish painting or are enclosed within the building structure. Before final acceptance, clean mechanical equipment, including piping, ducting, and fixtures, and free from dirt, grease, and finger marks. Incorporate housekeeping for field construction work which leaves all furniture and equipment in the affected area free of construction generated dust and debris; and, all floor surfaces vacuum-swept clean.

3.4 TESTING, ADJUSTING, AND BALANCING

Balance dishwasher exhaust per manufacturer's requirements.

3.5 PERFORMANCE TESTS

After testing, adjusting, and balancing is complete as specified, test each system as a whole to see that all items perform as integral parts of the system are evenly controlled. Make corrections and adjustments as necessary to produce the conditions indicated or specified.

Submit test reports for the performance tests in booklet form, upon completion of testing. Document phases of tests performed including initial test summary, repairs/adjustments made, and final test results in the reports.

3.6 CLEANING AND ADJUSTING

Thoroughly clean ducts, plenums, and casing of debris and blow free of small particles of rubbish and dust and then vacuum clean before installing outlet faces. Wipe equipment clean, with no traces of oil, dust, dirt, or paint spots. Maintain system in this clean condition until final acceptance. Properly lubricate bearings with oil or grease as recommended by the manufacturer. Tighten belts to proper tension. Adjust control valves and other miscellaneous equipment requiring adjustment to setting indicated or directed. Adjust fans to the speed indicated by the manufacturer to meet specified conditions. Maintain all equipment installed under the contract until close out documentation is received, the project is completed and the building has been documented as beneficially occupied.

3.7 OPERATION AND MAINTENANCE

3.7.1 Operation and Maintenance Manuals

Submit six manuals at least 2 weeks prior to field training. Submit data complying with the requirements specified in Section 01 78 23 OPERATION AND MAINTENANCE DATA. Submit Data Package 3 for the items/units listed under SD-10 Operation and Maintenance Data

-- End of Section --

SECTION 23 03 00

BASIC MECHANICAL MATERIALS AND METHODS

01/07

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM B 117 (2009) Standing Practice for Operating Salt Spray (Fog) Apparatus

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C2 (1997) National Electrical Safety Code (IEEE)

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1 (2014) Motors and Generators

NEMA MG 10 (2013) Energy Management Guide for Selection and Use of Fixed Frequency Medium AC Squirrel-Cage Polyphase Induction Motors

NEMA MG 11 (1977; R 2012) Energy Management Guide for Selection and Use of Single Phase Motors

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2014) National Electrical Code

RELATED REQUIREMENTS

This section applies to all sections of Division 23, "Mechanical" of this project specification, unless specified otherwise in the individual section.

1.3 QUALITY ASSURANCE

1.3.1 Material and Equipment Qualifications

Provide materials and equipment that are standard products of manufacturers regularly engaged in the manufacture of such products, which are of a similar material, design and workmanship. Standard products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year use shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2 year period.

1.3.2 Alternative Qualifications

Products having less than a two-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturer's factory or laboratory tests, can be shown.

1.3.3 Service Support

The equipment items shall be supported by service organizations. Submit a certified list of qualified permanent service organizations for support of the equipment which includes their addresses and qualifications. These service organizations shall be reasonably convenient to the equipment installation and able to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

1.3.4 Manufacturer's Nameplate

Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

1.3.5 Modification of References

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction", or words of similar meaning, to mean the Contracting Officer.

1.3.5.1 Definitions

For the International Code Council (ICC) Codes referenced in the contract documents, advisory provisions shall be considered mandatory, the word "should" shall be interpreted as "shall." Reference to the "code official" shall be interpreted to mean the "Contracting Officer." For Navy owned property, references to the "owner" shall be interpreted to mean the "Contracting Officer." For leased facilities, references to the "owner" shall be interpreted to mean the "lessor." References to the "permit holder" shall be interpreted to mean the "Contractor."

1.3.5.2 Administrative Interpretations

For ICC Codes referenced in the contract documents, the provisions of Chapter 1, "Administrator," do not apply. These administrative requirements are covered by the applicable Federal Acquisition Regulations (FAR) included in this contract and by the authority granted to the Officer in Charge of Construction to administer the construction of this project. References in the ICC Codes to sections of Chapter 1, shall be applied appropriately by the Contracting Officer as authorized by his administrative cognizance and the FAR.

1.4 DELIVERY, STORAGE, AND HANDLING

Handle, store, and protect equipment and materials to prevent damage before and during installation in accordance with the manufacturer's recommendations, and as approved by the Contracting Officer. Replace

damaged or defective items.

1.5 ELECTRICAL REQUIREMENTS

Furnish motors, controllers, disconnects and contactors with their respective pieces of equipment. Motors, controllers, disconnects and contactors shall conform to and have electrical connections provided under Section 26 20 00, "Interior Distribution System." Furnish internal wiring for components of packaged equipment as an integral part of the equipment. Extended voltage range motors will not be permitted. Controllers and contactors shall have a maximum of 120 volt control circuits, and shall have auxiliary contacts for use with the controls furnished. When motors and equipment furnished are larger than sizes indicated, the cost of additional electrical service and related work shall be included under the section that specified that motor or equipment. Power wiring and conduit for field installed equipment shall be provided under and conform to the requirements of Section 26 20 00, "Interior Distribution System."

1.6 ELECTRICAL INSTALLATION REQUIREMENTS

Electrical installations shall conform to IEEE C2, NFPA 70, and requirements specified herein.

1.6.1 New Work

Provide electrical components of mechanical equipment, such as motors, motor starters, control or push-button stations, float or pressure switches, solenoid valves, integral disconnects, and other devices functioning to control mechanical equipment, as well as control wiring and conduit for circuits rated 100 volts or less, to conform with the requirements of the section covering the mechanical equipment. Extended voltage range motors shall not be permitted. The interconnecting power wiring and conduit, control wiring rated 120 volts (nominal) and conduit, and the electrical power circuits shall be provided under Division 26, except internal wiring for components of package equipment shall be provided as an integral part of the equipment. When motors and equipment furnished are larger than sizes indicated, provide any required changes to the electrical service as may be necessary and related work as a part of the work for the section specifying that motor or equipment.

1.6.2 Modifications to Existing Systems

Where existing mechanical systems and motor-operated equipment require modifications, provide electrical components under Division 26.

1.6.3 High Efficiency Motors

1.6.3.1 High Efficiency Single-Phase Motors

Unless otherwise specified, single-phase fractional-horsepower alternating-current motors shall be high efficiency types corresponding to the applications listed in NEMA MG 11.

1.6.3.2 High Efficiency Polyphase Motors

Unless otherwise specified, polyphase motors, except motors integral to equipment with a total efficiency rating, shall be selected based on premium efficiency characteristics relative to the applications as listed in NEMA MG 10. Additionally, polyphase squirrel-cage medium induction

motors with continuous ratings shall meet or exceed energy efficient ratings in accordance with Table 12-6C of NEMA MG 1.

1.6.4 Three-Phase Motor Protection

Provide controllers for 3 phase motors rated one horsepower (.75 kilowatts) and larger with electronic phase-voltage monitors designed to protect motors from phase-loss, undervoltage, and 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 shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory as well as practical operation and maintenance work.

Instruction shall be given during the first regular work week after the equipment or system has been accepted and turned over to the Government for regular operation. The number of man-days (8 hours per day) of instruction furnished shall be as specified in the individual section. When more than 4 man-days of instruction are specified, use approximately half of the time for classroom instruction. Use other time for instruction with the equipment or system.

When significant changes or modifications in the equipment or system are made under the terms of the contract, provide additional instruction to acquaint the operating personnel with the changes or modifications.

1.8 ACCESSIBILITY

Install all work so that parts requiring periodic inspection, operation, maintenance, and repair are readily accessible. Install concealed valves, expansion joints, controls, dampers, and equipment requiring access, in locations freely accessible through access doors.

1.9 EQUIPMENT INVENTORY UPDATE

Submit information for each piece of equipment removed and supplied for use of Camp Lejeune to update the Maximo equipment inventory. For the purposes of this paragraph, inventoried equipment is defined as equipment listed on the Maximo Equipment Inventory Update form.

1.9.1 Requirements

The contractor shall prepare and submit one Maximo Equipment Inventory Update form for each individual item of inventoried equipment that is demolished, removed, replaced, or installed. (ex: three new condensing units would require the submission of three Equipment Inventory Update forms. The replacement of two existing air handling units with two new air handling units would require the submission of two Equipment Inventory Update forms). The contractor shall prepare and submit a VAV/TAB Room Number List for each VAV/Tab model installed in a single building. Only one Maximo Equipment Inventory Update form is required for each model of VAV or TAB in a single building.

1.9.1.1 Demolition of all equipment in a structure or facility

When all the inventoried equipment in a building or structure is demolished or removed, and not replaced, an Equipment Inventory Update form is not required.

1.9.1.2 Standards

The contractor shall provide accurate, complete, and legible information on all required forms. All required forms shall be completed and delivered to the Contracting Officer on or before the Beneficial Occupancy Date. All information on Equipment Inventory Update forms shall be obtained by visual inspection of equipment data plate(s).

1.9.1.3 Form Preparation

Each required Maximo Equipment Inventory Update form shall contain the following information:

- (1) The name and telephone number of an individual who can be contacted for clarification or additional information pertaining to the data on the form.
- (2) The date of data collection
- (3) The building or structure identification number and the specific location of the equipment within the structure (ex: 3d deck mech room)
- (4) A check adjacent to the description of the new or replacement item, and a check adjacent to the supplemental description if applicable (ex: circulating pump and HVAC or steam)
- (5) The Maximo number or serial number of the demolished or removed item, if applicable
- (6) All applicable data from the equipment data plate

Each Room Number List form shall contain the following information:

- (1) The name and telephone number of the individual providing the information
- (2) The date the form was completed
- (3) The building or structure identification number
- (4) A check in the box adjacent to each applicable room number

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 PAINTING OF NEW EQUIPMENT

New equipment painting shall be factory applied or shop applied, and shall be as specified herein, and provided under each individual section.

3.1.1 Factory Painting Systems

Manufacturer's standard factory painting systems may be provided subject to certification that the factory painting system applied will withstand 125 hours in a salt-spray fog test. Salt-spray fog test shall be in accordance with ASTM B 117, and for that test the acceptance criteria shall be as follows: immediately after completion of the test, the paint shall show no signs of blistering, wrinkling, or cracking, and no loss of adhesion; and the specimen shall show no signs of rust creepage beyond 0.125 inch on either side of the scratch mark.

The film thickness of the factory painting system applied on the equipment shall not be less than the film thickness used on the test specimen. If manufacturer's standard factory painting system is being proposed for use on surfaces subject to temperatures above 120 degrees F, the factory painting system shall be designed for the temperature service.

3.1.2 Shop Painting Systems for Metal Surfaces

Clean, pretreat, prime and paint metal surfaces; except aluminum surfaces need not be painted. Apply coatings to clean dry surfaces. Clean the surfaces to remove dust, dirt, rust, oil and grease by wire brushing and solvent degreasing prior to application of paint, except metal surfaces subject to temperatures in excess of 120 degrees F shall be cleaned to bare metal.

Where more than one coat of paint is specified, apply the second coat after the preceding coat is thoroughly dry. Lightly sand damaged painting and retouch before applying the succeeding coat. Color of finish coat shall be aluminum or light gray.

- a. Temperatures Less Than 120 Degrees F: Immediately after cleaning, the metal surfaces subject to temperatures less than 120 degrees F shall receive one coat of pretreatment primer applied to a minimum dry film thickness of 0.3 mil, one coat of primer applied to a minimum dry film thickness of one mil; and two coats of enamel applied to a minimum dry film thickness of one mil per coat.
- b. Temperatures Between 120 and 400 Degrees F: Metal surfaces subject to temperatures between 120 and 400 degrees F shall receive two coats of 400 degrees F heat-resisting enamel applied to a total minimum thickness of 2 mils.
- c. Temperatures Greater Than 400 Degrees F: Metal surfaces subject to temperatures greater than 400 degrees F shall receive two coats of 600 degrees F heat-resisting paint applied to a total minimum dry film thickness of 2 mils.

MAXIMO EQUIPMENT INVENTORY UPDATE

Employee:	Phone:	/_	/
Bldg:	Specific Location:		
Boiler Pump, Circulatir Water Heater	ng, Heating Water		
Demolished/Removed	Equipment		
Maximo no:	or Ser no:		
New Equipment			
Manufacturer:			
Ser no:			
	LP GasNat Gas		Air
Motor Data: HP	Volts Phase RLA	RPM Frame_	
Tons No. of Mo	tors no. of Belts_	Belt size(s)	CFM
KW Refrig type	e Refrig Qty	Filter Size(s)	

VAV/TAB Room Number List

Emplyee:	*	***************************************	——————————————————————————————————————			Phor	ne:	
Bldg:	<u> </u>					Date	*	
VAV/TAB	Model Nu	mber:						
VAV/TAB 100	130	160	200	230	260	300	330	360
128 <u> </u>	158 159		228 <u> </u>	258 259		328 <u> </u>	358 359	

<u>Instructions</u>

- (1) Confirm room numbers by visual inspection(2) Check the box next to each applicable room number

End of Section

SECTION 23 05 92

TESTING/ADJUSTING/BALANCING: SMALL HEATING/VENTILATING/COOLING SYSTEMS

01/07

PART 1 GENERAL

1.1 REFERENCES

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

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) water distribution systems including equipment and piping which are located within buildings.

1.2.1 Water Distribution Systems

Systems shall be TAB'd in compliance with this section. Obtain Contracting Officer's written approval before applying insulation to water distribution systems under Section 23 07 00, "Insulation for Mechanical Systems." At Contractor's option and with Contracting Officer's written approval, the piping systems may be insulated before systems are TAB'd. Piping insulation shall terminate immediately adjacent to each flow control valve, automatic control valve, or device. After completion of work under this section, the flow control valves and devices shall be insulated under Section 23 07 00, "Insulation for Mechanical Systems."

1.3 DEFINITIONS

- a. TAB team supervisor: TAB team engineer.
- b. TAB team technician: TAB team assistant.

- c. Field check group: One or more systems of the same basic type; the subgroup of a "field check group" is a "system."
- d. 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 10 to minus 10 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

Certified TAB Report

1.4.1 Certified TAB Report

Submit certified TAB report with a certification statement which attests that the procedures executed have been in full compliance with the requirements of NEBB Procedural Stds, AABC MN-1, or SMACNA TAB HVAC Sys. Certifications shall further attest that any/all known deficiencies in operation, performance, or water flows are clearly identified herein. 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) 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.
- 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.
- b. 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.
- c. 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. Water systems shall be proportionately balanced and reported in the certified TAB report. Provide instruments and consumables required to accomplish the TAB work. Conduct TAB work, including sound measurement 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 10 percent of the design values, that is, the values specified or indicated on the contract documents.

3.1.2 Data From TAB Field Work

After all TAB work has been completed, prepare a handwritten certified, pre-final TAB report using all report forms complete as specified for the final certified 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 10 to minus 10 percent of the design 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.

-- End of Section --

SECTION 23 07 00

INSULATION OF MECHANICAL SYSTEMS

03/11

PART 1 GENERAL

1.1 REFERENCES

MIL-C-20079

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 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 547	(1995) Mineral Fiber Preformed Pipe Insulation
ASTM C 552	(1991) Cellular Glass Thermal Insulation
ASTM C 612	(1993) Mineral Fiber Block and Board Thermal Insulation
ASTM C 916	(1985; R 1990) Adhesives for Duct Thermal Insulation
ASTM C 1136	(1995) Flexible, Low permeance Vapor Retarders for Thermal Insulation
ASTM D 828	(1993) Tensile Breaking Strength of Paper and Paperboard
ASTM E 84	(2000a) Surface Burning Characteristics of Building Materials
ASTM E 96	(1997; Rev A) Water Vapor Transmission of Materials
U.S. DEPARTMENT OF DEFE	ENSE (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

(Rev. H) Cloth, Glass: Tape, Textile

Glass; and Thread, Glass and Wire-Reinforced Glass

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 255

(2008; Reprint Aug 2013) Test for Surface Burning Characteristics of Building Materials

UNDERWRITERS LABORATORIES (UL)

UL 723

(2008; Reprint Aug 2013) Test for Surface Burning Characteristics of Building Materials

1.2 SYSTEM DESCRIPTION

Provide new and modify existing field-applied insulation for heating, ventilating, and cooling (HVAC) piping systems which are located within buildings; and for plumbing piping systems.

1.2.1 Piping Systems

Obtain Contracting Officer's written approval of HVAC water distribution systems under Section 23 05 92, "Testing/Adjusting/Balancing: Small Heating/Ventilating/Cooling Systems" before applying field-applied insulation to HVAC water distribution systems. At the Contractor's option and with Contracting Officer's written approval, the piping systems may be insulated before systems are tested, adjusted, and balanced (TAB'd). Piping insulation shall terminate immediately adjacent to each flow control valve, automatic control valve, or device. For chilled water and chilled-hot water piping, the ends of pipe insulation and the space between ends of pipe insulation and piping shall be sealed with waterproof vapor barrier coating. After systems are TAB'd, the control valves and devices shall be insulated.

1.3 DEFINITIONS

1.3.1 Finished Spaces

Spaces used for habitation or occupancy where rough surfaces are plastered, 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

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, except buried pipe requiring insulation, types of insulation required, and insulation thickness shall be as listed in Tables I herein. Unless otherwise specified, insulate all fittings, flanges, and valves, except valve stems, hand wheels, and operators. Provide factory premolded, 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 Cellular Glass Insulation

ASTM C 552, Type II.

2.1.2 Mineral Fiber

ASTM C 547, Class I.

2.1.3 Piping Insulation Finishes

2.1.3.1 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.

2.1.3.2 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 EQUIPMENT

Insulate all equipment and accessories as specified in Table II. In outside locations, provide insulation one inch thicker than specified. Increase the specified insulation thickness for equipment only where necessary to equal the thickness of angles or other structural members to make a smooth, exterior surface. Factory applied insulation shall meet the flame spread and smoke-developed rating of 25/50.

2.3 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

MTL-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.

2.4 ACCESSORY MATERIALS

2.4.1 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.

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. 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. 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. 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.

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 Cellular Glass

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. 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.

3.2.3 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 cellular glass (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. Vapor seal insulation around anchors.

3.2.4 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.

3.2.5 Flanges, Unions, Valves and Fittings for Hot Piping

Flanges, Unions, Valves, and Fittings Insulation (Except Flexible Unicellular) for Hot Piping: Factory fabricated removable and reusable insulation covers may be used. For inside domestic hot water, heating hot water, A/C condensate drains, high temperature hot water, steam and condensate return systems; exposed hot water piping and drains in handicap areas, place factory premolded, precut or field-fabricated segmented insulation of the same thickness and conductivity as the adjoining pipe insulation around the flange, union, valve, and fitting abutting the adjoining pipe insulation. If nesting size insulation is used, overlap 2 inches or one pipe diameter, whichever is larger. Use insulating cement to fill voids. Elbows insulated using segments shall have not less than three segments per elbow. Place and joint the segments with manufacturer's recommended water-vapor resistant, fire retardant, and adhesive appropriate for the temperature limit of the service. Upon completion of installation of insulation, apply two coats lagging adhesive with glass tape embedded between coats. Overlap tape seams one inch. Extend adhesive onto adjoining insulation not less than two inches. The total dry film thickness shall be not less than 1/16 inch. Where unions are indicated not to be insulated, taper the insulation to the union at a 45 degree angle. Coat the insulation and all purpose jacket with two coats of lagging adhesive and with glass tape embedded between coats. The total dry film thickness shall be not less than 1/16 inch. At the option of the Contractor, factory premolded one-piece PVC fitting covers may be provided in lieu of two coats of adhesive with tape embedded between coats. Factory premolded field-fabricated segment or blanket insert insulation shall be provided under the fitting covers. Install factory premolded one-piece PVC fitting covers over the insulation and secure by stapling, taping with PVC vapor barrier tape, or with metal or plastic tacks made for securing PVC fitting covers. Do not provide PVC fitting covers where exposed to the weather. Provide PVC fitting covers only in ambient temperatures below 150 degrees F.

3.3 EQUIPMENT INSULATION

3.3.1 General Procedures

Apply equipment insulation suitable for temperature and service in rigid block or semirigid board or flexible form to fit as closely as possible to equipment. Groove or score insulation where necessary to fit the contours of equipment. Stagger end joints where possible. Bevel the edges of the insulation for cylindrical surfaces to provide tight joints. Join sections of cellular glass insulation with bedding compound. After the cellular glass insulation is in place on areas to be insulated, except where metal-encased, fill joints, seams, chipped edges, or depressions with bedding compound to form a smooth surface. Fill mineral fiber joints with insulating cement. Bevel insulation around name plates, ASME and access plates. For insulation on equipment that must be opened periodically for inspection, cleaning, or repair, construct insulation to be removable and replaceable without damage. Protect exposed insulation corners with corner angles under wires and bands.

3.3.2 Pumps

Insulate pumps used for hot service with 2-inch thick rigid mineral fiber insulation as follows: Insulate pumps by forming a box around the pump housing, drive shaft, and piping. Apply insulation to inside surfaces of 20-gage galvanized or stainless steel sheet-metal boxes having openings for drive shaft and pipes. Construct the box by forming the bottom and sides using joints which do not leave raw ends of insulation exposed. Band bottom and sides to form a rigid housing that does not rest on the pump. Between top cover and sides, fit joints tightly forming a female shiplap joint on the side pieces and a male joint on the top cover to make the top cover removable. Secure insulation to the box with adhesive. Allow clearance for draining and adjustment of pump shaft seal.

3.4 FIELD INSPECTION

Visually inspect to ensure that materials provided conform to specifications. Inspect installations progressively for compliance with requirements.

Tube And Pipe Size (Inches)

Service	Material	1/4-1 1/4	1 1/2-3	3 1/2-5	6-& Larger	Vapor Barrier Required
Domestic Cold Water	Cellular Glass	1.5	1.5	1.5	1.5	Yes
Domestic Hot Water	Mineral Fiber	1	1	1.5	1.5	No
Heating Hot Water	Mineral Fiber	1.5	1.5	2	2	No

TABLE II

Insulation For Equipment

<u>Material</u>	Spec	Type	Class	Vapor Barrier Required
Rigid Mineral Fiber,	ASTM C 612		2	Yes*/No
<u>Equipment</u>	Recommended Wall Thickness			
Air Separators	2"			

^{*}Exact insulation thickness may be determined by proposed condition of use.

SECTION 23 09 23.13

BACnet DIRECT DIGITAL CONTROL SYSTEMS FOR HVAC

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.

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 135

(2008; Addenda q Errata 2009, Addenda l, o, r, s, v 2009; Addenda j Errata 2010; Addenda h, k, n, t, u, w, x, y 2010; Errata 2010) BACnet—A Data Communication Protocol for Building Automation and Control Networks

ASME INTERNATIONAL (ASME)

ASME B16.5 (2009) Pipe Flanges and Flanged Fittings:
NPS 1/2 Through NPS 24 Metric/Inch Standard

ASME B31.1 (2007; Addenda a 2008; Addenda b 2009)
Power Piping

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 126 (2004; R 2009) Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings

ASTM B 117 (2009) Standing Practice for Operating Salt Spray (Fog) Apparatus

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/IEC 8802-3	(2000) Information Technology -
	Telecommunications and Information
	Exchange Between Systems - Local an
	Metropolitan Area Networks - Specif

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) National Electrical Code

UNDERWRITERS LABORATORIES (UL)

UL 1449	(2006; R thru 2009) Surge Protective Devices
UL 506	(2008; R 2010) Specialty Transformers
UL 508A	(2001; R thru 2010) Industrial Control Panels

UL 916 (2007; R 2009) 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 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.

1.2.3 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".

1.2.4 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.

1.2.5 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.

1.2.6 BACnet Segment

One or more physical segments of BACnet devices on a BACnet network, connected at the physical layer by repeaters.

1.2.7 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". BBMD is managed by the Government.

1.2.8 BAS

Building Automation Systems, including DDC (Direct Digital Controls) used for facility automation and energy management.

1.2.9 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.

1.2.10 BI

BACnet International, formerly two organizations: the BACnet Manufacturers Association (BMA) and the BACnet Interest Group - North America (BIG-NA).

1.2.11 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.

1.2.12 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.

1.2.13 Broadcast

A message sent to all devices on a network segment.

1.2.14 DADMS

DON Application and Database Management System, (DADMS) is a listing of digital applications approved for purchase and use.

1.2.15 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".

1.2.16 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.

1.2.17 Device Profile

A collection of BIBBs determining minimum BACnet capabilities of a device, defined in ASHRAE 135, 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 and must be tested and listed by BACnet Testing Laboratory (BTL).

1.2.18 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". There are different levels of controllers, with varying levels or complexity and flexibility.

1.2.18.1 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).

1.2.18.2 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.

1.2.18.3 Plant Controllers

Plant Controllers are typically used to control various equipment in mechanical rooms such as pumps, heat exchangers, and chillers.

1.2.18.4 Supervisory Building Controller (SBC)

The Supervisory Building Controller is used to coordinate all equipment in a building, input scheduling, and is often 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).

1.2.19 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.

1.2.20 DDC System

A distribution 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.

1.2.21 DIACAP

Department of Defense Information Assurance Certification and Accreditation Process (DIACAP). DIACAP is process that approves IP base equipment that is connected and communicates on the base Ethernet network. All devices using TCP/IP or Ethernet connectivity require prior approval to be listed in the DIACAP and XACTA document.

1.2.22 EMCS

Energy Management & Control System. 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 Camp Lejeune EMCS is manufactured by Johnson Controls and incorporates both the Metasys extended architecture system (for use with Johnson Controls NAE & NCE) and the BTL listed open protocol MS/TP system (for use with an MS/TP to IP Router). Both of the systems communicate over the MRAN and either may be used to fulfill the requirements of this specification.

1.2.23 EMCS Owner

The regional or local user responsible for managing all aspects of the BAS operation, including: network connections, workstation management, submittal review, technical support, control parameters, and daily operation. The BAS Owner for this project is Camp Lejeune EMCS Section.

1.2.24 Ethernet

A family of local-area-network technologies providing high-speed networking features over various media. Base Telephone manages all Ethernet connections to the IP networks.

1.2.25 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.

1.2.26 Gateway

Communication hardware 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 (usually proprietary) protocols on the other side.

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 MAC Address

Media Access Control address. The physical node address that identifies a device on a Local Area Network.

1.2.35 Master-Slave/Token-Passing (MS/TP)

ISO/IEC 8802-3. The standard LAN for BACnet. MSTP uses twisted-pair wiring for relatively low speed and low cost communication (up to $4,000~\rm{ft}$ at $76.8 \rm{K}$ bps).

1.2.36 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.

1.2.37 Network

Communication technology for building network data communications. MS/TP topology approved at the building level. BACnet over Internet Protocol is not an approved method for building level controls.

1.2.38 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.

1.2.39 Object

The concept of organizing BACnet information into standard components with various associated properties. Examples include analog input objects and binary output objects.

1.2.40 Object Identifier

An object property used to identify the object, including object type and instance. Object Identifiers must be unique within a device.

1.2.41 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.

1.2.42 Peer-to-Peer

Peer-to-peer refers to devices where any device can initiate and respond to communication with other devices.

1.2.43 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.

1.2.44 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).

1.2.45 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.

1.2.46 Points

Physical and virtual inputs and outputs. See also "Input/Output".

1.2.47 PTP

Point-to-Point protocol connects individual BACnet devices or networks using serial connections.

1.2.48 Repeater

A network component that connects two or more physical segments at the physical layer.

1.2.49 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 MRAN, it must be listed on the approved DIACAP equipment list and must be Marine Corps DADMS listed and approved.

1.2.50 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 will not cause other network devices to fail. 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.

1.2.51 XACTA

Provides Web Certification and Accrediation (C&A) software products, consulting support and enterprise messaging management solutions through its Automated Message Handling System (AMHA) product. The software simplifies C&A and reduces its costs by guiding users through a step-by-step process to determine risk posture and assess system and network configuration compliance with applkicable regulations, standards and industry best practices, in accordance with the DIACAP, NIACAP, NIST, or DCID processes. Xacta's AMHS provides automated, Web-based distribution and management of messaging across the enterprise.

1.2.52 Supervisory Building Controller (SBC)

The Supervisory Building Controller is the upper level controller on the building's MS/TP bus. It provides building wide points, scheduling, and interface with programming tools. The SBC may be used as the point of connection between the Camp Lejeune EMCS network (IP) and the building level control network (MS/TP). Since the EMCS network uses the Marine Air Ground Task Force Regional Network (MRAN) Ethernet network using TCP/IP, if the SBC is used as a point of connection, it must be listed on the approved DIACAP equipment list and must be Marine Corps DADMS listed and approved.

1.3 BACnet DIRECT DIGITAL CONTROL SYSTEMS FOR HVAC DESCRIPTION

- a. modify existing DDC systems including associated equipment and accessories. The existing DDC system is manufactured by Johnson Controls.
- b. Provide a networked DDC system for standalone control in compliance with the latest revision of the ASHRAE 135 BACnet standard. Include all programming, objects, and service required to meet the sequence of control. Provide BACnet communication between the DDC system and the native BACnet devices furnished with HVAC equipment, and plant equipment including boilers, chillers, and variable frequency drives. Devices provided shall be BACnet Testing Laboratories (BTL) product listing certified. Provide a Supervisory Building Controller (SBC) that communicates with the field DDC controllers via the MS/TP bus using BACnet. Provide one of the two means listing in this guide specification to connect the building control system to the EMCS via the Marine Air-Ground Task Force Regional Area Network (MRAN) Ethernet network using TCP/IP.
- c. Authority to Operate/Authority to Connect: Prior approval to communicate on the base MRAN is a requirement on this project. Supervisory Building Controllers (SBC) and any other device communicating on the MRAN without being DADMS listed and approved and approval from the Designated Approving Authority based on DITSCAP or DIACAP efforts will not be permitted.
- d. Only technicians authorized by the Camp Lejeune utilities department are approved to add, manage, or revise data in the EMCS. Authorization shall require a unique username and password managed by the Utilities Department.

1.3.1 Design Requirements

1.3.1.1 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.

1.3.1.2 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. 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.

1.3.1.3 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, and manufacturer part number. 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.

1.3.1.4 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
- 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

1.3.1.5 HVAC Equipment Electrical Ladder Diagrams

Provide HVAC equipment electrical ladder diagrams. Indicate required electrical interlocks.

1.3.1.6 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.

1.3.1.7 Terminal Strip Diagrams

Provide a diagram of each terminal strip. Indicate the terminal strip location, termination numbers, and associated point names.

1.3.1.8 BACnet Communication Architecture Schematic

Provide a schematic showing the project's entire BACnet communication network, including addressing used for LANs, LAN devices including routers and bridges, gateways, controllers, workstations, and field interface devices. If applicable, show connection to existing networks.

1.4 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 according to 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 Electrical Ladder diagrams

Component wiring diagrams

Terminal strip diagrams

BACnet communication architecture schematic

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).

Sensors and Input Hardware

Output Hardware

Surge and transient protection

SD-05 Design Data

Performance Verification Testing Plan

Pre-Performance Verification Testing Checklist

SD-06 Test Reports

Performance Verification Testing Report

SD-07 Certificates

Contractor's Qualifications

SD-09 Manufacturer's Field Reports

Pre-PVT Checklist

SD-10 Operation and Maintenance Data

Comply with requirements for data packages in Section $01\ 78\ 00$ CLOSEOUT SUBMITTALS, except as supplemented and modified in this specification.

BACnet Direct Digital Control Systems, Data Package 4

Controls System Operators Manuals, Data Package 4

SD-11 Closeout Submittals

Training documentation

1.5 QUALITY ASSURANCE

1.5.1 Standard Products

Provide material and equipment that are standard manufacturer's products currently in production and supported by a local service organization.

1.5.2 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.

1.5.3 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.

1.5.4 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 B 117, with acceptance criteria as follows: immediately after completion of the test, the finish shall show no signs of degradation or loss of adhesion beyond 0.125 inch on either side of the scratch mark.

1.5.5 Verification of Dimensions

The contractor shall verify all dimensions in the field, and advise the Contracting Officer of any discrepancy before performing work.

1.5.6 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. Submit the name of the technician proposed to make additions/alterations to the EMCS servers. Submit supporting documentation

demonstrating their qualifications.

1.5.7 Modification of References

The advisory provisions in ASME B31.1 and NFPA 70 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.

1.5.8 Project Sequence

The control system work for this project shall proceed in the following order:

- a. Submit and receive approval on the Shop Drawings, Product Data, and Certificates specified under the paragraph entitled "SUBMITTALS."
- b. Perform the control system installation work, including all field check-outs and tuning.
- c. Provide support to TAB personnel as specified under the paragraph "TEST AND BALANCE SUPPORT."
- d. Submit and receive approval of the Controls System Operators Manual specified under the paragraph "CONTROLS SYSTEM OPERATORS MANUALS."
- e. Submit and receive approval of the Performance Verification Testing Plan and the Pre-PVT Checklist specified under the paragraph "PERFORMANCE VERIFICATION TESTING."
- f. Perform the Performance Verification Testing.
- g. Submit and receive approval on the PVT Report.
- h. Submit and receive approval on the Training Documentation specified under the paragraph "INSTRUCTION TO GOVERNMENT PERSONNEL". Submit at least 30 days before training.
- i. Deliver the final Controls System Operators Manuals.
- j. Conduct the Phase I Training.
- k. Conduct the Phase II Training.
- 1. Submit and receive approval of Closeout Submittals.

PART 2 PRODUCTS

2.1 DDC SYSTEM

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 MSTP communications between the DDC system and native BACnet devices furnished with HVAC equipment, and plant equipment such as boilers, and chillers when provided with BACnet MSTP communications. DDC controllers provided shall be certified in the BACnet Testing Laboratories (BTL) Product Listing. BACnet over IP is not permitted in the building.

2.1.1 Point of Connection to EMCS

The existing centralized Camp Lejeune DDC system is comprised of two separate systems. One utilizes the Johnson controls Metasys system to communicate with a central server and the other utilizes a BACnet MS/TP to IP router to communicate with a NAE 8500 manufactured by Johnson Controls. Both of the systems communicate over the basewide Marine Air-Ground Task Force Regional Area Network (MRAN). These systems provide two different means to connect the building control system to the base wide energy management and control system (EMCS) and either system is acceptable for use. Each system requires a different component to connect to the EMCS; furthermore, any component that is directly connected to the MRAN must be approved and listed through the Department of Defense Information Assurance Certification and Accreditation Process (DIACAP) and must be Department of Navy Application and Database Management System (DADMS) listed and approved. Currently there are two products that are approved for use on Camp Lejeune: a Johnson Controls Metasys NAE or NCE and a LOYTEC LIP-ME201 BACnet IP Router. A Johnson Controls NAE & NCE serves as the building supervisory controller and connects directly to the MRAN, while the LOYTEC Router forms a direct connection between the building's BACnet MS/TP backbone and the MRAN. With the use of the LOYTEC Router, connected to the building MS/TP bus, a BTL listed supervisory building controller may be used, even if it is not listed through DIACAP because in this instance the supervisory building controller does not connect directly to the MRAN. Other routers that connect directly to the MRAN and supervisory building controllers that connect directly to the MRAN may be used if they are approved and listed through the above mentioned process. All IP addresses and network drops shall be furnished by base telephone. One of the two means to connect the building control system to the EMCS shall be provided.

2.1.2 Supervisory Building Controller (SBC)

Provide a SBC that communicates between the DDC system and the Camp Lejeune EMCS server in one of two ways:

- 1) The SBC may connect directly to the MRAN
- 2) It may communicate via a BACnet IP router over the MRAN

Provide all necessary hardware, drivers, software, material and equipment which shall allow communication and control between the SBC and the field DDC controllers using BACnet on the MS/TP bus. When the supervisory controller is disconnected from the enterprise system for maintenance, access to the supervisor controller shall be via a laptop computer. The laptop computer shall be provided with any required propriety licensed software.

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. Place I/O expansion units in the same cabinet as the digital controller.

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 Control

Provide stand-alone digital controllers capable of meeting the complete sequence of operation with and without network connectivity (being connected to the ${\tt EMCS}$).

2.1.3.4 Internal Clock

Provide internal clocks for all BACnet Building Controllers (B-BC) and BACnet Advanced Application Controllers (B-AAC) using BACnet time synchronization services. 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.

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 two state devices.
- 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 have a toggle switch and send a pulsed 24 VDC low-voltage signal for modulation control, or provide a maintained open-closed position for on-off control. For HVAC equipment and plant controllers, provide for manual overrides, either with three-position (on-off-auto) override switches and status lights, or with an adjacent operator display and interface. 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 Cabinet

Provide each digital controller as factory mounted or in a factory fabricated cabinet enclosure. Cabinets located indoors shall protect against dust and have a minimum NEMA 1 rating. 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.

2.1.3.11 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 receptacle.

2.1.3.12 DSL Modems

DSL modems and Rate Adaptive Asymmetric Digital Subscriber Line (RADSL) modems are provided by the government. Telephone modems are not permitted for any other communication with the DDC system.

2.1.3.13 BACnet Gateways

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.

Communication shall be MS/TP. Communication using IP is not permitted. 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.

2.1.4 DDC Software

2.1.4.1 Programming

Provide programming to execute the sequence of operation indicated. Provide all programming, programming software tools, and programming hardware tools to configure and program all controllers. If the laptop computer provided elsewhere is used as a programming tool, provide all necessary accessories for full functionality. 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 sequence of operation 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.

- 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. 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 a non-cumulative adjustable override time for the push of a 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. All alarms/events shall report to the EMCS server. Alarms/events shall be stored within the Supervisory Building Controller (SBC). 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 trend services capable of trending all object present values set points, and other parameters indicated for trending on project schedules. 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 SBC 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. Trends shall be uploaded to the ADX server or NAE 8500.

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.

2.1.4.14 Access Control

Provide at least five levels of password protection for operator interfaces. The lowest level only allowing viewing of 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.

2.1.4.15 Configuration Tool

Provide the software with the manufacturer's installation CDs and licenses. Licenses shall allow unrestricted use and reproduction for use at the Camp Lejeune Complex. Software shall not require the use of software keys or "dongles" Configure the software according to the DDC system manufacturer's specifications and in agreement with BACnet standards found in ASHRAE 135, Annex L.

The software shall permit complete monitoring, modification, and troubleshooting interface with the DDC 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.

2.2 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 (1000 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. Allow an additional 0.5 percent accuracy for averaging sensors.

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 a communication port for a portable operator interface like a notebook computer or PDA.
- 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.

2.2.2 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.

2.2.2.1 Pressure Transmitters

Provide transmitters integral with the pressure transducer.

2.2.3 Current Transducers

Provide current transducers to monitor motor amperage. Current switches may be used to indicate on/off status.

2.2.4 Input Switches

2.2.4.1 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.

2.3 OUTPUT HARDWARE

2.3.1 Control Valves

2.3.1.1 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 300 series 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 A 126 Class B or C.

2.3.1.2 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.

2.3.1.3 Two-Way Valves

Two-way modulating valves shall have an equal percentage characteristic.

2.3.1.4 Three-Way Valves

Three-way valves shall have an equal percentage characteristic.

2.3.1.5 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 300 series stainless steel.
- c. Internal trim for valves controlling water 210 degrees F or less shall be brass or bronze. Valve stems shall be Type 300 series 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 Actuators

Provide direct-drive electric actuators for all control applications, except where indicated otherwise.

2.3.2.1 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. Actuators without spring-return 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.

2.3.3 Output Signal Conversion

2.3.4 Output Switches

2.3.4.1 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 DISTRIBUTION

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 digital controller with surge and transient power protection. 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 controller or grouped terminal controllers. 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.

2.4.3 Wiring

Provide complete electrical wiring for the DDC System, including wiring to transformer primaries. Unless indicated otherwise, provide all normally visible or otherwise exposed wiring in conduit. Where conduit is required, control circuit wiring shall not run in the same conduit as power wiring over 100 volts. Run all circuits over 100 volts in conduit, metallic tubing, covered metal raceways, or armored cable. Use plenum-rated cable for circuits under 100 volts in concealed accessible spaces. Examples of these spaces include HVAC plenums, within walls, above suspended ceilings, in attics, and within ductwork. All wiring in mechanical rooms and mezzanines shall be run in conduit.

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 14 AWG minimum and rated for 600 VAC service.

2.4.3.2 Analog Signal Wiring

Field-installed analog signal wiring shall be in accordance with manufacturer's installation instructions. 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.

PART 3 EXECUTION

3.1 INSTALLATION

Perform the installation under the supervision of competent technicians regularly employed in the installation of DDC systems.

3.1.1 BACnet Naming and Addressing

Coordinate with the EMCS Owner and provide 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 Lejeuene 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 ARCNET or MS/TP, assign from 1 to 128. MAC address must be assigned prior to programming.

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. BACnet allows up to 4,194,302 possible unique devices per internetwork.

Instance numbers are to be obtained from Camp Lejeune Operations to ensure duplicates do not occur. Point of contact:

Bill Schrader Public Works Division/EMCS 1005 Michael Road / Building 1005 MCB, Camp Lejeune, NC 28547 (910) 450-7846

d. Point Name. 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 point name follows the general convention:

Area.Building.location.Equipment.Object Name.

Example: Hadnot Point.HP512.Second Floor.AHU-3.ASTATIC-SP. See Attachments one through four for equipment names, object names, object groupings, and area names.

- e. Object Name. 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: "ASTATIC-SP." See Attachment for the approved Camp Lejeune list.
- 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: "Actual Static Pressure Setpoint."
- g. List of Attachments

Attachment 1 - Equipment Names Attachment 2 - Object Names Attachment 3 - Object Grouping Attachment 4 - Area Names

3.1.2 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 30 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/or 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.

3.1.3 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.

3.1.4 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".

3.1.5 BACnet Routers, Bridges, and Switches

Provide the quantity of BACnet routers, bridges, and switches 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 MS/TP network. Configure each BACnet device and bridge, router, or switch to communicate on its network segment. All switches provided by the contractor shal lbe approved by base telephone.

3.1.6 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. 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.
- c. Provide circuit and wiring protection required by NFPA 70.
- d. Run all wiring located inside mechanical rooms in conduit.
- e. Do not bury aluminum-sheathed cable or aluminum conduit in concrete.
- f. Input/output identification: Permanently label each field-installed wire and cable at each end with descriptive text using a commercial wire marking system that fully encircles the wire or cable. Locate the markers within 2 inches of each termination. 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" in the label. Label all terminal blocks with alpha/numeric labels. All wiring and the wiring methods shall be in accordance with UL 508A.
- g. 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.
- h. 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.
- i. 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.
- j. The Contractor shall be responsible for correcting all associated ground loop problems.
- k. Run wiring in panel enclosures in covered wire track.

3.1.7 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.

3.1.8 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 the controlled equipment.

3.1.9 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.

3.1.9.1 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.

3.1.10 Thermometers and Gages

Mount devices to allow reading while standing on the floor or ground, as applicable.

3.1.11 Pressure Sensors

Locate pressure sensors as indicated.

3.1.12 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.

3.1.13 Network and Telephone Communication Lines

When telephone lines or network connections by the Government are required, provide the Contracting Office at least 90 days advance notice of need. Provide one inch conduit and Cat 6 cable from the point of connection of the building control system to the point of connection to the network (most likely in the telephone equipment room).

3.2 INTERFACE WITH EXISTING EMCS

Interface the new DDC system with Camp Lejeune's existing EMCS. Obtain Government approval before connecting new DDC system to the EMCS. Any device connected directly to the EMCS must be approved by the Designated Approving Authority by following procedures listed in the DIACAP instruction. The servers are located in Building 24: workstations are located at Buildings 1005, 1023, and 1202. Complete installation and programming includes scheduling, alarming, trending, and verification that relevant building points can be read at and written from the EMCS server via the MRAN.

3.3 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 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.
- Control setpoint adjustments for balancing all relevant mechanical systems.
- c. Tuning control loops with setpoints and adjustments determined by TAB personnel.

3.4 CONTROLS SYSTEM OPERATORS MANUALS

Provide five electronic and three 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.
- 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. Test report shall be a 48 hour trend report verifying all temperature setpoints listed in the sequence of operation. The trend report should be printed from the EMCS server. All systems (AHU's, ERV's, CHWS, HWS) should be part of this section.
- e. A copy of the project's approved final TAB Report. (Added by the Mechancical Contractor (Division 23)).
- 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.
- 1. 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 contract 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.

3.4.1 Storage Cabinets

In one project mechanical room, provide a wall-mounted metal storage cabinet with hinged doors. Provide cabinets large enough to hold the entire set of Controls System Operators Manuals, and the HVAC operation and maintenance manuals provided under Division 23 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." Place one of the three hard copies of

the Operators Manual in this cabinet. 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 witnessed and approved 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 EMCS 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. Include the intended test procedure, the expected response, and the pass/fail criteria for every component tested.

The plan shall clearly describe how each item is tested, indicate where assisting personnel are required (like the mechanical contractor), and include what procedures are used to simulate conditions. Include a separate column for each checked item and extra space for comments. Where sequences of operations are checked, insert each corresponding routine from the project's sequence of operation. For each test area, include signature and date lines for the Contractor's PVT administrator, the Contractor's QA representative, the Contracting Officer's representative, and the EMCS Owner to acknowledge successful completion.

3.5.3 PVT Sample Size

Test all central plant equipment, primary air handling unit controllers, and fan coil unit controllers unless otherwise directed. Use the DDC system to verify all VAV boxes are controlling as specified. The Government may require testing of like controllers beyond a statistical sample if sample controllers require retesting or do not have consistent results.

The Government may witness all testing, or random samples of PVT items. When only random samples are witnessed, the Government may choose which ones.

3.5.4 Pre-Performance Verification Testing Checklist

Submit the following as a list with items checked off once verified. Provide a detailed explanation for any items that are not completed or verified.

- a. Verify all required mechanical installation work is successfully completed, and all HVAC equipment is working correctly (or will be by the time the PVT is conducted).
- b. Verify HVAC motors operate below full-load amperage ratings.
- c. Verify all required control system components, wiring, and accessories

are installed.

- d. Verify the installed control system architecture matches approved drawings.
- e. Verify all control circuits operate at the proper voltage and are free from grounds or faults.
- f. Verify all required surge protection is installed.
- g. Verify the A/C Power Table specified in "CONTROLS SYSTEM OPERATORS MANUALS" is accurate.
- h. Verify all DDC network communications with the EMCS function properly, including commanding set points, and load shedding.
- i. Verify air handling unit and VAV box coil performance by commanding all valves 100 percent open in both heating and cooling. Record the entering and leaving air temperatures. Record the entering water temperature. This data shall be printed, stored, and saved for future reference.
- j. Verify each digital controller's programming is backed up.
- k. Verify all wiring, components, and panels are properly labeled.
- 1. Verify all required points are programmed into devices.
- m. Verify all TAB work affecting controls is complete.
- n. Verify all valve and actuator zero and span adjustments are set properly.
- o. Verify all sensor readings are accurate and calibrated.
- p. Verify each control valve and actuator goes to normal position upon loss of power.
- q. Provide 48 hours of trend data to verify all systems are functioning as specified. Trend reports will verify control set point adjustment per the temperature re-set schedules (as required by sequence of operation).

Provide the following Trends:

- (1) Hot Water System: supply temperature (actual), return temperature (actual), supply temperature set point.
- r. Verify each controller works properly in stand-alone mode.
- s. Verify all safety controls and devices function properly, including freeze protection and interfaces with building fire alarm systems.
- t. Verify all electrical interlocks work properly.
- v. Verify the as-built (shop) control drawings are completed.
- w. Verify all required alarms are identified at the EMCS server and proper notification is setup for each alarm condition.

- 3.5.5 Conducting Performance Verification Testing
 - a. Provide trend report for each HVAC system that is part of the buildings DDC system. The trend report shall include a value for each set point listed in the sequence of operation.
 - b. Identify any values that do not meet the sequence of operation requirements, make repairs (re-program) and run a new trend for the system. 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 or other method for values normally read over the network. Building DDC system shall function to the project's specifications if connection to the EMCS server is lost.
- 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 EMCS Server / NAE 8500 Operation
 - a. Show points lists agree with naming conventions.
 - b. Show that points are accessible through the MRAN.
- 3.5.8 BACnet Communications and Interoperability at the EMCS Server

Demonstrate proper interoperability of data sharing, alarm and event management, trending, scheduling, and device and network management. If available or required in this specification, use a BACnet protocol analyzer to assist with identifying devices, viewing network traffic, and verifying interoperability. These requirements must be met even if there is only one manufacturer of equipment installed. Provide 40 hours of assistance to the Government to facilitate interfacing the building control system with the

existing EMCS in addition to the other requirements stated in this specification. Testing includes the following:

- a. Reading of Any Property: Demonstrate the ability to read and display any used readable object property of any device on the network.
- b. Setpoint and Parameter Modifications: Show the ability to modify all setpoints and tuning parameters in the sequence of control or listed on project schedules.
- c. 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.
- d. 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 (TO-OFF NORMAL, TO-NORMAL, etc.).
- e. Schedule Lists: Show that schedules are configured for start/stop, mode change, occupant overrides, and night setback as defined in the sequence of operations.
- f. 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 or notebook by an operator with sufficient privilege.
- g. Modification of Trend Log Object Parameters: Show that an operator with sufficient privilege can change the logged data points, sampling rate, and trend duration.
- h. 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
 - (8) Demonstrate load shed operations if commanded by the EMCS.

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.

3.6 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 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. The training session shall include the following:

- a. Review of O&M Manual
 - 1. Network Drawing
 - 2. Equipment
 - 3. Flow Diagram
 - 4. Sequence of Operation
 - 5. Wiring
 - 6. Valve Schedule
 - 7. Bill of Material

b. Network

- 1. Communication Equipment
- 2. Configuration Setup of Program
- 3. Backup Procedures
- c. Mechanical Equipment
 - 1. Flow Diagram
 - 2. Wiring & Terminations
 - 3. Hardware Interlocks
 - 4. Sequence of Operation
 - 5. Program Decisions and Illustrations of How Program Meets the Sequence of Operation
 - 6. Global Programming Affecting Each Piece of Equipment
- d. Building Data Base
 - 1. Alarm Management
 - 2. Trend Management
 - 3. Building Global Interlocks
- e. System Tools
 - 1. Network Equipment
 - 2. Supervisory Controllers
 - 3. Equipment Controllers
 - 4. Archives

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 (controllers, valves, dampers, surge protection, switches, thermostats, sensors, etc.)
- b. Adding and removing network devices
 - -- End of Section --

EQUIPMENT NAMES

DESCRIPTION	EQUIPMENT
	NAME
air handler 1, air handling unit 1	AH1
Building	BLDG
Boiler 1	BLR1
Chiller 1	CHR1
Condenser 1	COND1
Cooling tower 1	CT1
Cooling tower 1 fan	CT1F
Cooling tower 1 pump	CT1P
condenser water	CW
condenser water pump 1	CWP1
exhaust fan 1	EF1
Evaporator 1	EVAP1
heat exchanger 1	HEX1
high pressure steam	HPS
low pressure steam	LPS
make up air fan 1	MAF1
medium pressure steam	MPS
primary chilled water	PCHW
primary chilled water pump 1	PCHWP1
primary hot water	PHW
primary hot water pump 1	PHWP1
return fan 1	RF1
secondary chilled water	SCHW
secondary chilled water pump 1	SCHWP1
secondary hot water	SHW
secondary hot water pump 1	SHWP1
System	SYS
terminal air blender 1, fan powered	TAB1
tertiary chilled water	TCHW
tertiary chilled water pump 1	TCHWP1
tertiary hot water	THW
tertiary hot water pump 1	THWP1
variable air volume box 1	VAV1
occupied zone 1 thru 999	ZN1
Common zone	ZNT

Point Name	Description	BACnet Command
ACHWS-SP	Actual CHW Temperature Setpoint	Read/Write
ACLG-SP	Actual Cooling Setpoint	Read/Write
ADA-SP	Actual Discharge Setpoint	Read/Write
AHTG-SP	Actual Heating Sepoint	Read/Write
AHWS-SP	Actual HW Supply Temperature Setpoint	Read/Write
ASA-SP	Actual Supply Air Setpoint	Read/Write
ASTATIC-SP	Actual Static Pressure Setpoint	Read/Write
AUTOCAL-C	Autocalibrate Command	Read/Write
AUTOCAL-STATE	Autocalibration Status	Read
AVEMA-T	Average Mixed Air Temperature	Read
AVEZN-T	Average Zone Temperature	Read
AZN-SP	Actual Zone Setpoint	Read/Write
BLDG-P	Building Static Pressure	Read
BLR1-A	Boiler 1 Alarm	Read
BLR1-EN	Boiler 1 Enable	Read/Write
BLR1EW-T	Boiler 1 Entering Water Temperature	Read
BLR1-FS	Boiler 1 Flow Switch	Read
BLR1LW-T	Boiler 1 Leaving Water Temperature	Read
BLR1-S	Boiler 1 Status	Read
BLR1SP-O	Boiler 1 Setpoint Output	Read/Write
BLR2-A	Boiler 2 Alarm	Read
BLR2EW-T	Boiler 2 Entering Water Temperature	Read
BLR2-FS	Boiler 2 Flow Switch	Read
BLR2LW-T	Boiler 2 Leaving Water Temperature	Read
BLR2-S	Boiler 2 Status	Read
BLR3-A	Boiler 3 Alarm	Read
BLR3EW-T	Boiler 3 Entering Water Temperature	Read
BLR3-FS	Boiler 3 Flow Switch	Read
BLR3LW-T	Boiler 3 Leaving Water Temperature	Read
BLR3-S	Boiler 3 Status	Read
BLR4-A	Boiler 4 Alarm	Read
BLR4EW-T	Boiler 4 Entering Water Temperature	Read
BLR4-FS	Boiler 4 Flow Switch	Read
BLR4LW-T	Boiler 4 Leaving Water Temperature	Read
BLR4-S	Boiler 4 Status	Read
BLR-SP	Boiler Setpoint	Read/Write
BLR-SP-O	Boiler Setpoint Output	Read/Write
BOX-LOAD	Box Terminal Load	Read
BOXMODE	Box Mode	Read
BP1-C	Boiler Pump 1 Command	Read/Write
BP1-S	Boiler Pump 1 Status	Read
BYPDMP-O	Bypass Damper Output	Read/Write
CC-T	Cooling Coil Temperature	Read
CD-P	Cold Deck Pressure	Read
CDSD-A	Cold Deck Smoke Detector Alarm	Read
CD-T	Cold Deck Temperature	Read
CH1-A	Chiller 1 Alarm	Read
CH1-C	Chiller 1 Command	Read/Write
CH1CHWE-T	Chiller 1 CHW Entering Temperatrue	Read
CH1CHWL-T	Chiller 1 CHW Leaving Temperature Chiller 1 CHW Leaving Temperature	Read
CH1CL-O	Chiller 1 Current Limit Output	Read
	Omnor I Current Linni Output	11044

CH1CWE-T	Chiller 1 CW Entering Temperature	Read
CH1CWL-T	Chiller 1 CW Leaving Temperature	Read
CH1-E	Chiller 1 Enable	Read/Write
CH1-S	Chiller 1 Status	Read
CH1SP-O	Chiller 1 Setpoint Output	Read/Write
CH1-UNL	Chiller 1 Unloader	Read
CH2-A	Chiller 2 Alarm	Read
CH2-C	Chiller 2 Command	Read
CH2-S	Chiller 2 Status	Read
CH2-UNL	Chiller 2 Unloader	Read
CH-C	Chiller Command	Read
СН-Е	Chiller Enable	Read/Write
CHNGOVER-DIFF	Changeover Differential	Read
CHNGOVER-DLY	Changeover Delay	Read
CH-S	Chiller Status	Read
CH-SP	Chiller Setpoint	Read/Write
CHW-DP	Chilled Water Differential Pressure	Read
CHWDP-SP	Chilled Water Differential Pressure Setpoint	Read/Write
CHWDT-SP	CHW Differential Temperature Setpoint	Read
CHWGPM-F	Chilled Water GPM Flow	Read
CHWGPM-SP	Chilled Water GPM Setpoint	Read/Write
CHWP-C	Chilled Water Pump Command	Read/Write
CHWP-S	Chilled Water Pump Status	Read
CHWR-T	Chilled Water Return Temperature	Read
CHWS-SP	Chilled Water Supply Temperature Setpoint	Read/Write
CHWS-T	Chilled Water Supply Temperature	Read
CHWV-O	Chilled Water Valve Output	Read/Write
CLG1-C	Cooling Stage 1 Comand	Read/Write
CLGDA-SP	Cooling Discharge Air Temperature Setpoint	Read
CLG-O	Cooling Valve Output	Read/Write
CLG-O	Cooling Output	Read/Write
CLGOCC-SP	Occupied Cooling Setpoint	Read/Write
CLGUNOCC-SP	Unoccupied Cooling Setpoint	Read/Write
CMP1-A	Commpressor 1 Alarm	Read
CMP1-C	Commpressor 1 Command	Read/Write
CMP1EVAP-P	Commpressor 1 Evaporation Pressure	Read
CMP2-A	Commpressor 2 Alarm	Read
CMP2-C	Commpressor 2 Command	Read/Write
CMP2EVAP-P	Commpressor 2 Evaporation Pressure	Read
COMMON-SP	Common Setpoint	Read/Write
COND-T	Condensate Temperature	Read
CT1-C	Cooling Tower 1 Command	Read/Write
CT1ISOV-C	Cooling Tower 1 Isolation Valve Command	Read/Write
CT1-S	Cooling Tower 1 Status	Read
CTV-O	Cooling Tower Valve Output	Read/Write
CWP1-C	Condenser Water Pump 1 Command	Read/Write
CWP1-S	Condenser Water Pump 1 Status	Read
CWR-T	Condenser Water Return Temperature	Read
CW-SP	Condenser Water Setpoint	Read/Write
CWS-T	Condenser Water Supply Temperature	Read
DA1-P	Discharge Air Static Pressure 1	Read
DADEHUM-SP	Discharge Air Dehumidification Setpoint	Read/Write

DA-F **Discharge Air Flow** Read DA-H **Discharge Air Humidity** Read **DAMPER-O Damper Output** Read/Write DA-P Discharge Air Static Pressure Read DAPHI-A **Discharge Air High Duct Pressure** Read DAP-SP **Duct Static Pressure Setpoint** Read/Write DA-SD Discharge Air Smoke Detector Read DA-SP Read/Write Discharge Air Setpoint **DA-SP-HL** Discharge Air Setpoint High Limit Read/Write DA-SP-LL **Discharge Air Setpoint Low Limit** Read/Write **DA-STATIC-SP** Discharge Air Static Pressure Setpoint Read/Write DA-T Discharge Air Temperature Read **DATCLGUNOCC-SP Unoccupied Cooling Setpoint** Read/Write **DATHTGUNOCC-SP** Read/Write **Unoccupied Heating Setpoint** DA-VP Discharge Air Velocity Pressure Read DCPL-F **Decouple Loop Flow** Read DCPL-S **Decouple Loop Direction** Read DCPL-T **Decouple Loop Temperature** Read **DEHUM-SP Dehumidification Setpoint** Read/Write DPR-C **Damper Command** Read/Write **DPR-O** Read/Write **Damper Output** DTC-T **Dual Temp Coil Temperature** Read DTP-C **Dual Temp Pump Command** Read/Write DTP-S **Dual Temp Pump Status** Read DTR-T **Dual Temp Return Temperature** Read DTS-T **Dual Temp Supply Temperature** Read DTV-O **Dual Temp Valve Output** Read/Write EAFILTER_S **Exhaust Air Filter Status** Read **ECON-C Economizer Command** Read/Write **ECON-S Economizer Status** Read EF1-C **Exhaust Fan 1 Command** Read/Write EF1-S **Exhaust Fan 1 Status** Read EF2-C **Exhaust Fan 2 Command** Read/Write EF2-S **Exhaust Fan 2 Status** Read EF3-C **Exhaust Fan 3 Command** Read/Write EF3-S **Exhaust Fan 3 Status** Read EF4-C **Exhaust Fan 4 Command** Read/Write EF4-S **Exhaust Fan 4 Status** Read EF-C **Exhaust Fan Command** Read/Write **Exhaust Fan Status** Read EF-S **EFFCLG-SP Effective Cooling Setpoint** Read/Write **EFFHTG-SP Effective Heating Setpoint** Read/Write EF-S **Exhaust Fan Status** Read **EMER-RST Emergency Reset Switch** Read/Write **ERU-E Energy Recovery Unit Enable** Read/Write E-STOP **Emergency Stop Switch** Read/Write FAN-C **Fan Command** Read/Write Fire Alarm Shutdown Read/Write FA-SD FFILTER-A **Final Filter Alarm** Read FFILTER-DP **Final Filter Differential Pressure** Read FILTER-S **Filter Status** Read **FLOERR Average Flow Error** Read

FLOWPID-C	Flow PID Command	Read/Write
FLOWFID-C FLOW-S	Flow Switch Status	Read/Wille
FLOW-SP	Flow Setpoint	Read/Write
FSD1-S	Fire Smoke Damper 1 Status	Read/Wille
FSD2-S	Fire Smoke Damper 2 Status	Read
FSD3-S	Fire Smoke Damper 3 Status	Read
FSD-S	Fire Smoke Damper Status	Read
GAS-MTR	Gas Meter Accumulator	Read
HD-P	Hot Deck Pressure	Read
HD-P HDSD-A	Hot Deck Smoke Detector Alarm	Read
HD-T	Hot Deck Temperature	Read Read
HIDAP-A	High Discharge Air pressure Alarm	Read
HRW-C	Heat Recovery Wheel Command	Read/Write
HRW-S	Heat Recovery Wheel Status	Read Read
HT-A	•	Read Read
HTG1-C	High Temperature Alarm	Read/Write
HTG1-C HTG2-C	Heating Stage 1 Command	
HTGCLG-S	Heating Stage 2 Command	Read/Write Read
	AHU Heating/Cooling Status	210414
HTGDA-SP	Heating Discharge Air Temperature Setpoint	Read/Write
HTG-O	Heating Output	Read/Write
HUMSEN-A	Humidity Sensor Failure	Read
HUM-SP	Humidifier Setpoint	Read/Write
HUMV-O	Humidifier Valve Output	Read/Write
HWB-T	Heating Water Bridge Temperature	Read
HW-DP	Hot Water Differential Pressure	Read
HW-DTS-HL	Hot Water Dual Temp Supply High Limit	Read/Write
HW-DTS-LL	Hot Water Dual Temp Supply Low Limit	Read/Write
HW-OA-HL	Hot Water Outdoor Air Reset High Limit	Read/Write
HW-OA-LL	Hot Water Outdoor Air Reset Low Limit	Read/Write
HWP-C	Hot Water Pump Command	Read/Write
HWP-O	Hot Water Valve Output	Read/Write
HWP-S	Hot Water Pump Status	Read
HWP-S	Hot Water Pump Status	Read
HWR-T	Hot Water Return Temperature	Read
HWS-BTU-h	Hot Water System BTU/h	Read
HWS-HI	Hot Water Supply High (Reset)	Read/Write
HWS-kW-h	Hot Water System kW/h	Read
HWS-LO	Hot Water Supply Low (Reset)	Read/Write
HW-SP-HL	Hot Water Setpoint High Limit	Read/Write
HW-SP-LL	Hot Water Setpoint Low Limit	Read/Write
HWS-SP	Hot Water Supply Setpoint	Read/Write
HWS-T	Hot Water Supply Temperature	Read
HWS-W-h	Hot Water System Watt per Hour	Read
HX-EN	Heat Exchanger Enable	Read/Write
HXMV-O	Heat Exchanger Mixing Valve Output	Read/Write
HXV-O	Heat Exchanger Valve Output	Read/Write
IV-O	Inlet Vane Output	Read/Write
LIFT-STA_AIR-A	Lift Station Air Pressure Alarm	Read
LIFT-STA_LEVEL-A	Lift Station Level Alarm	Read
LIFT-STA_P1-A	Lift Station Pump 1 Alarm	Read
LIFT-STA_P1-S	Lift Station Pump 1 Status	Read
LIFT-STA_POWER-A	Lift Station Power Alarm	Read

LOWVOLTA	Low Voltage Alarm	Read
LL-A	low Limit Alarm	Read
LT-A	Low Temperature Alarm	Read
MAD-O	Mixed Air Damper Output	Read
MANUALOVERRIDE	Manual Override	Read
MA-P	Mixed Air Static Pressure	Read
MA-STATIC-SP	Mixed Air Static Pressure Setpoint	Read/Write
MA-T	Mixed Air Temperature	Read
MINOAD-SP	Minimum Outdoor Air Damper Setpoint	Read/Write
MIX-O	Mixing Valve Output	Read/Write
MOAD-O	Minimum Outdoor Air Damper Output	Read/Write
MOTOROVRLD	Motor Overload	Read
MR-T	Mechanical Room Temperature	Read
OA-CFM	Outdoor Air Cubic Feet per Minute	Read
OACFM-SP	Outdoor Air Cubic Feet per Minute Setpoint	Read/Write
OACHNGOVER-SP	Outdoor Air Cubic Feet per vimute Seepoint Outdoor Air Changeover Setpoint	Read/Write
OACLG-LL	Outdoor Air Cooling Low Limit	Read/Wille
OAD-C	Outdoor Air Cooling Low Ellint Outdoor Air Damper Command	Read/Write
OAD-C OAD-O	Outdoor Air Damper Command Outdoor Air Damper Output	Read/Write
OAD-S	Outdoor Air Damper Status	Read/Wille
OAJ-S OA-F	Outdoor Air Flow	Read Read
OAFILTER-S	Outdoor Air Filter Status	Read
OAF-SP		Read/Write
	Outdoor Air Flow Setpoint	
OA-H	Outdoor Air Minimum Cabia Foot and Minute	Read
OA-MIN	Outdoor Air Minimum Cubic Feet per Minute	Read/Write
OA-P	Outdoor Air Static Pressure	Read
OA-Q	Outdoor Air Quality	Read
OA-SP-HL	Outdoor Air Setpoint High Limit	Read/Write
OA-SP-LL	Outdoor Air Setpoint Low Limit	Read/Write
OA-T	Outdoor Air Temperature	Read
OAT-HI	Outdoor Air Temperature High (Reset)	Read/Write
OA-T-LL	Outdoor Air Temperature Low Limit	Read/Write
OA-T-LL-S	Outdoor Air Temperature Low Limit Status (Enabled)	Read/Write
OAT-LO	Outdoor Air Temperature Low (Reset)	Read/Write
OA-VP	Outdoor Air Velocity Pressure	Read
OCC-C	Occupied Command	Read/Write
OCCCLGBIAS	Occupied Cooling Bias	Read
OCCHTGBIAS	Occupied Heating Bias	Read
OCCHTG-SP	Occupied Heating Setpoint	Read/Write
OCC-OVERRIDE	Occupancy Override	Read/Write
OCC-S	Occupancy Status	Read
OCC-SCHEDULE	Occupancy Schedule	Read
OCLG-SP	Occupied Cooling Setpoint	Read/Write
OHTG-SP	Occupied Heating Setpoint	Read/Write
OVER-TMR	Override Timer	Read
PCHWP1-C	Primary Chilled Water Pump 1 Command	Read/Write
PFILTER-A	Pre-filter Alarm	Read
PFILTER-DP	Pre-filter Differential Pressure	Read
PH-O	Preheat Valve Output	Read/Write
PH-SP	Preheat Setpoint	Read/Write
PH-T	Preheat Temperature	Read
PHWP1-C	Primary Hot Water Pump 1 Command	Read/Write

PHWP1-S	Primary Hot Water Pump 1 Status	Read
PHWP2-S	Primary Hot Water Pump 2 Status	Read
PHWP3-S	Primary Hot Water Pump 3 Status	Read
PHWP4-S	Primary Hot Water Pump 4 Status	Read
PHWP-C	Primary Hot Water Pump Command	Read/Write
PHWP-S	Primary Hot Water Pump Status	Read
PHWR-T	Primary Hot Water Return Temperature	Read
PHWS-T	Primary Hot Water Supply Temperature	Read
Power Fail	Power Failure	Read
RAD-O	Return Air Damper Output	Read/Write
RA-F	Return Airflow Rate	Read
RA-H	Return Air Humidity	Read
RA-P	Return Air Static Pressure	Read
RAPHI-A	Relief Air High Duct Pressure	Read
RAPLO-A	Return Air Low Duct Pressure	Read
RASD-A	Return Air Smoke Detector Alarm	Read
RA-T	Return Air Temperature	Read
RAT-HI-A	High Temperature Alarm	Read
RAT-LO-A	Low Temperature Alarm	Read
RA-VP	Return Air Velocity Pressure	Read
RF-C	Return Fan Command	Read/Write
RF-O	Return Fan Output	Read/Write
RF-S	Return Fan Status	Read
RH-O	Reheat Output	Read/Write
RTU1-C	Rooftop Unit 1 Command	Read/Write
RTU1-S	Rooftop Unit 1 Status	Read
RTU2-C	Rooftop Unit 2 Command	Read/Write
RTU2-S	Rooftop Unit 2 Status	Read
RTU3-C	Rooftop Unit 3 Command	Read/Write
RTU3-S	Rooftop Unit 3 Status	Read
SA-F	Supply Airflow Rate	Read
SAFLOW-SP	Supply Flow Setpoint	Read/Write
SA-P	Supply Air Static Pressure	Read
SASD-A	Supply Air Smoke Detector	Read
SA-T	Supply Air Temperature	Read
SCHW-F	Secondary Chilled Water Flow	Read
SCHWP1-C	Secondary Chilled Water Pump 1 Command	Read/Write
SCHWP1-O	Secondary Chilled Water Pump 1 Output	Read/Write
SCHWP1-S	Secondary Chilled Water Pump 1 Status	Read
SCHWP1-S	Secondary Hot Water Pump 1 Status	Read
SCHWR-T	Secondary CHW Return Temperature	Read
SCHWS-T	Secondary CHW Supply Temperature	Read
SCLG-SP	Standby Cooling Setpoint	Read/Write
SDES-S	Supply Air Damper End Switch Status	Read
SDWN-C	Shutdown Command	Read/Write
SF-A	Supply Fan Alarm	Read
SF-C	Supply Fan Command	Read/Write
SF-FAULT	Supply Fan Fault Cycle	Read
SF-HZ	Supply Fan Output Frequency	Read
SF-KWH	Supply Fan Kilowatt Hours	Read
SF-O	Supply Fan Output	Read/Write
SF-RPM	Supply Fan Motor Speed	Read
	=	

SF-S	Supply Fan Status	Read
SHTG-SP	Standby Heating Setpoint	Read/Write
SHUTDOWN	Shutdown	Read/Write
SHUTDOWN-S	Shutdown Status	Read
SHW-F	Secondary Hot Water Flow	Read
SHWP1-C	Secondary Hot Water Pump 1 Command	Read/Write
SHWP1-O	Secondary Hot Water Pump 1 Output	Read/Write
SHWP1-S	Secondary Hot Water Pump 1 Status	Read
SHWP2-C	Secondary Hot Water Pump 2 Command	Read/Write
SHWP2-O	Secondary Hot Water Pump 2 Output	Read/Write
SHWP2-S	Secondary Hot Water Pump 2 Status	Read
SHWP-ROT	Secondary Hot Water Pump Rotate	Read/Write
SHWR-T	Secondary Hot Water Return Temperature	Read
SHWS-T	Secondary Hot Water Supply Temperature	Read
SMKNEG-A	Smoke Negative Alarm	Read
SMKPOS-A	Smoke Positive Alarm	Read

OBJECT GROUPING

AHU		
Allo		
SYSTEM-E	System Enable	R/W
OCC-C	Occupied Command	R/W
DA-T	Discharge Air Temperature	R
ADA-SP	Actual Discharge Air Setpoint	R/W
RA-T	Return Air Temperature	R
SF-C	Supply Fan Command	R/W
SF-S	Supply Fan Status	R
SF-O	Supply Fan Output	R/W
SF-HZ	Supply Fan Output Frequency	R
SF-RPM	Supply Fan Motor Speed	R
SF-KWH	Supply Fan Kilowatt Hours	R
SF-FAULT	Supply Fan Fault Code	R
DA-P	Discharge Air Static Pressure	R
ASTATIC-SP	Actual Static Pressure Setpoint	R/W
DTV-O	Dual Temperature Valve Output	R/W
SUMDA-SP	Summer Discharge Air Setpoint	R/W
SUMRA-SP-HL	Summer Return Air Setpoint High Limit	
SUMSTATIC-SP-HL	Summer Static Setpoint High Limit	
SUMRA-SP-LL	Summer Return Air Setpoint Low Limit	
SUMSTATIC-SP-LL	Summer Static Setpoint Low Limit	
WINSTATIC-SP	Winter Static Pressure Setpoint	
WINRA-SP-HL	Winter Return Air Setpoint High Limit	
WINDA-SP-LL	Winter Discharge Air Setpoint Low Limit	
WINRA-SP-LL	Winter Return Air Setpoint Low Limit	
WINDA-SP-HL	Winter Discharge Air Setpoint High Limit	
LL-A	Low Limit Alarm	
HIDAP-A	High Discharge Air Pressure Alarm	
SUMWIN-C	Summer/Winter Command	
OA-T	Outdoor Air Temperature	

AHU-VAV	
SYSTEM-E	System Enable
SYSTEM-M	System Mode
OCC-C	Occupied Command
DPR-O	Damper Output
SA-F	Supply Air Flow
FLOW-SP	Flow Setpoint

OBJECT GROUPING

VAV	
SYSTEM-E	System Enable
SYSTEM-M	System Mode
OCC-C	Occupied Command
ZN-T	Zone Temperature
WC-ADJ	Warm/Cool Adjust
SF-C	Supply Fan Command
ACLG-SP	Actual Cooling Setpoint
OCLG-SP	Occupied Cooling Setpoint
AHTG-SP	Actual Heating Setpoint
OHTG-SP	Occupied Heating Setpoint
SA-F	Supply Air Flow
FLOW-SP	Flow Setpoint
DPR-O	Supply Air Damper Output
SUMWIN-C	Summer/Winter Command
FLOWPID-C	Flow PID Command

ERU	
SYSTEM-E	System Enable
OCC-C	Occupied Command
DA-T	Discharge Air Temperature
ADA-SP	Actual Discharge Air Setpoint
ERU-E	Energy Recovery Unit Enable
SF-S	Supply Fan Status
EF-S	Exhaust Fan Status
WHEEL-S	Wheel Status
DTV-O	Dual Temperature Valve Output
SUMDA-SP	Summer Discharge Air Setpoint
WINDA-SP	Winter Discharge Air Setpoint
OACLG-LL	Outdoor Air Cooling Low Limit
LL-A	Low Limit Alarm
OAFILTER-S	Outdoor Air Filter Status
EAFILTER-S	Exhaust Air Filter Status
SUMWIN-C	Summer/Winter Command
OA-T	Outdoor Air Temperature

OBJECT GROUPING

DTWS	
DIVIS	
SYSTEM-E	System Enable
OA-T	Outdoor Air Temperature
SUM-SW	Summer Switch
WIN-SW	Winter Switch
SUMWIN-S	Summer/Winter Status
DTS-T	Dual Temp Supply Temperature
DTR-T	Dual Temp Return Temperature
DTP-C	Dual Temperature Pump Command
DTP-S	Dual Temperature Pump Status
СН-Е	Chiller Enable
CHWP-C	Chiller Water Pump Command
CHWP-S	Chilled Water Pump Status
HWP-C	Hot Water Pump Command
HWP-S	Hot Water Pump Status
HWS-T	Hot Water Supply Temperature
STMVLV-O	Steam Valve Output
AHWS-SP	Actual HW Supply Temperature Setpoint
OA-SP-LL	Outdoor Air Setpoint Low Limit
HW-SP-HL	Hot Water Setpoint High Limit
OA-SP-HL	Outdoor Air Setpoint High Limit
HW-SP-LL	Hot Water Setpoint Low Limit
CHNGOVER-DLY	Change Over Delay

ENERGY MANAGEMENT POINTS	
EMTR	Electric Meter
GMTR	Gas Meter

AREA NAMES

Lejeune Memorial Park **Knox Trailer Park** Camp Geiger Camp Johnson Tarawa Terrace Naval Hospital Midway Park MCASNR (Marine Corps Air Station New River) Training Area B Training Area C Piney Green Gate Berleley Manor Paradise Point Traning Area R Traning Area D Watkins Village Piney Green Camp Devil Dog Training Area M Training Area K Wallace Creek North Wallace Creek South Training Area Q Training Area F **Hospital Point Hadnot Point** Cogdels Creek **MOUT** Frence Creek **Triangle Outpost Gate** Ammo Supply Point G-10 Impact Area Training Area L K-2 Impact Area Greater Sandy Run Rifle Range Training Area J Amphibian Base Courthouse Bay Training Area H Training Area G N1/BT-3 Impact Area **AIWW**

Training Area E-1
Training Area I

Onslow Beach

Mile Hammock Bay

Traning Area E

Rawls Parcel-Greater Sandy Run

SECTION 23 11 25

FACILITY GAS PIPING

11/08

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN GAS ASSOCIATION (AGA)

AGA XR0603	(2006;	8th	Ed)	AGA	Plastic	Pipe	Manual	for
	Gas Se	rvice	∋					

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z21.15/CSA 9.1	(2009) Manually Operated Gas Valves for Appliances, Appliance Connector Valves and Hose End Valves
ANSI Z21.21/CSA 6.5	(2005; Addenda A 2010) Automatic Valves for Gas Appliances
ANSI Z21.78/CSA 6.20	(2010) Standard Specification for Combination Gas Controls for Gas Appliances
ANSI Z21.80/CSA 6.22	(2011) Line Pressure Regulators

AMERICAN PETROLEUM INSTITUTE (API)

API RP 2003	(2008; 7th Ed) Protection Against Ignitions Arising out of Static, Lightning, and Stray Currents
API RP 2009	(2002; R 2007; 7th Ed) Safe Welding, Cutting, and Hot Work Practices in Refineries, Gasoline Plants, and Petrochemical Plants
API Spec 6D	(2008; Errata 1 2008; Errata 2 2008; Errata 3 2009; Addendum 1 2009; Errata 4 2010; Errata 5 2010; Errata 6 2011; Addendum 2 2011) Specification for Pipeline Valves
API Std 598	(2009) Valve Inspecting and Testing
API Std 607	(2010) Testing of Valves: Fire Test for Soft-Seated Quarter-Turn Valves

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 25-06 (2008) Earthquake-Activated Automatic Gas Shutoff Devices

ASME INTERNATIONAL (ASME)

ASME B1.20.1	(1983; R 2006) Pipe Threads, General Purpose (Inch)
ASME B16.11	(2011) 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 B16.33	(2012) Manually Operated Metallic Gas Valves for Use in Gas Piping Systems Up to 125 psi, Sizes NPS 1/2 - NPS 2
ASME B16.39	(2009) Standard for Malleable Iron Threaded Pipe Unions; Classes 150, 250, and 300
ASME B16.5	(2009) Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24 Metric/Inch Standard
ASME B16.9	(2007) Standard for Factory-Made Wrought Steel Buttwelding Fittings
ASME B31.9	(2011) Building Services Piping
ASME B40.100	(2005; R 2010) Pressure Gauges and Gauge Attachments
ASME BPVC SEC IX	(2010) BPVC Section IX-Welding and Brazing Qualifications
ASME BPVC SEC VIII D1	(2010) BPVC Section VIII-Rules for Construction of Pressure Vessels Division 1

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM 01.01	(2012) Steel - Piping, Tubing, Fittings
ASTM A513/A513M	(2012) Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing
ASTM A53/A53M	(2012) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM F2015	(2000; R 2006) Standard Specification for Lap Joint Flange Pipe End Applications

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-25 (2008) Standard Marking System for Valves,

Fittings, Flanges and Unions

MSS SP-58 (2009) Pipe Hangers and Supports -

Materials, Design and Manufacture,

Selection, Application, and Installation

MSS SP-69 (2003; R 2004) Standard for Pipe Hangers and Supports - Selection and Application

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 54 (2012) National Fuel Gas Code

NFPA 70 (2014) National Electrical Code

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

SMACNA 1981 (2008) Seismic Restraint Manual Guidelines

for Mechanical Systems, 3rd Edition

UNDERWRITERS LABORATORIES (UL)

UL FLAMMABLE & COMBUSTIBLE (2012) Flammable and Combustible Liquids and Gases Equipment Directory

1.2 SYSTEM DESCRIPTION

The gas piping system includes natural gas piping and appurtenances from point of connection with supply system, as indicated, to gas operated equipment within the facility. Submit operation and maintenance data in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA, in three separate packages. Section 23 03 00 BASIC MECHANICAL MATERIALS AND METHODS applies to this section, with additions and modifications specified herein. Provide cathodically protected insulating joints connecting aboveground piping from the meter to the building, with zinc grounding cells conforming to API RP 2003.

1.2.1 Gas Facility System and Equipment Operation

Include shop drawings showing piping layout, locations of system valves, gas line markers and cathodic protection system; step-by-step procedures for system start up, operation and shutdown (index system components and equipment to the system drawings); isolation procedures including valve operation to shutdown or isolate each section of the system (index valves to the system maps and provide separate procedures for normal operation and emergency shutdown if required to be different). Submit Data package No. 4.

1.2.2 Gas Facility System Maintenance

Include maintenance procedures and frequency for system and equipment; identification of pipe materials and manufacturer by locations, pipe repair procedures, and jointing procedures at transitions to piping material from a different manufacturer. Submit Data Package No.4.

1.2.3 Gas Facility Equipment Maintenance

Include identification of valves, shut-offs, disconnects, and other equipment by materials, manufacturer, vendor identification and location; maintenance procedures and recommended tool kits for valves and equipment; recommended repair methods (i.e., field repair, factory repair, or replacement) for each valve and piece of equipment; and preventive maintenance procedures, possible failure modes and troubleshooting guide. Submit Data Package No. 3.

1.3 SUBMITTALS

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

```
SD-02 Shop Drawings
    Gas Piping System
SD-03 Product Data
    Pipe and Fittings
    Gas equipment connectors
    Gas Piping System
    Pipe Coating Materials
    Pressure regulators
    Valves
    Warning and identification tape
SD-06 Test Reports
    Testing
    Pressure Tests
    Test With Gas
SD-07 Certificates
    Welders procedures and qualifications
    assigned number, letter, or symbol
SD-08 Manufacturer's Instructions
    pipe coating materials
SD-10 Operation and Maintenance Data
    Gas facility system and equipment operation
    Gas facility system maintenance
```

Gas facility equipment maintenance

1.4 QUALITY ASSURANCE

Submit manufacturer's descriptive data and installation instructions for approval for compression-type mechanical joints used in joining dissimilar materials and for insulating joints. Mark all valves, flanges and fittings in accordance with MSS SP-25.

1.4.1 Welding Qualifications

- a. Weld piping in accordance with qualified procedures using performance qualified welders and welding operators in accordance with API RP 2009, ASME BPVC SEC IX, and ASME B31.9. Welding procedures qualified by others, and welders and welding operators qualified by another employer may be accepted as permitted by ASME B31.9. Notify the Contracting Officer at least 24 hours in advance of tests, and perform at the work site if practicable.
- b. Submit a certified copy of welders procedures and qualifications metal and PE in conformance with ASME B31.9 for each welder and welding operator. Submit the assigned number, letter, or symbol that will be used in identifying the work of each welder to the Contracting Officer.

1.4.2 Shop Drawings

Submit drawings for complete Gas Piping System, within 30 days of contract award, showing location, size and all branches of pipeline; location of all required shutoff valves; and instructions necessary for the installation of gas equipment connectors and supports.

1.5 DELIVERY, STORAGE, AND HANDLING

Handle, transport, and store plastic pipe and fittings carefully. Plug or cap pipe and fittings ends during transportation or storage to minimize dirt and moisture entry. Do not subject piping to abrasion or concentrated external loads. Discard PE pipe sections and fittings that have been damaged.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

Provide materials and equipment which are the standard products of a manufacturer regularly engaged in the manufacture of the products and that essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Asbestos or products containing asbestos are not allowed. Submit catalog data and installation instructions for pipe, valves, all related system components, pipe coating materials and application procedures. Conform to NFPA 54 and with requirements specified herein. Provide supply piping to appliances or equipment at least as large as the inlets thereof.

2.2 GAS PIPING SYSTEM AND FITTINGS

2.2.1 Steel Pipe, Joints, and Fittings

a. Pipe: Black carbon steel in accordance with ASTM A53/A53M, Schedule 40, threaded ends for sizes 2 inches and smaller; otherwise,

plain end beveled for butt welding.

- b. Threaded Fittings: ASME B16.3, black malleable iron.
- c. Socket-Welding Fittings: ASME B16.11, forged steel.
- d. Butt-Welding Fittings: ASME B16.9, with backing rings of compatible material.
- e. Unions: ASME B16.39, black malleable iron.
- f. Flanges and Flanged Fittings: ASME B16.5 steel flanges or convoluted steel flanges conforming to ASME BPVC SEC VIII D1, with flange faces having integral grooves of rectangular cross sections which afford containment for self-energizing gasket material.

2.2.2 Steel Tubing, Joints and Fittings

Provide steel tubing conforming to ASTM 01.01, and ASTM A513/A513M, with tubing joints made up with gas tubing fittings recommended by the tubing manufacturer.

2.2.3 Sealants for Steel Pipe Threaded Joints

Provide joint sealing compound as listed in UL FLAMMABLE & COMBUSTIBLE, Class 20 or less. For taping, use tetrafluoroethylene tape conforming to UL FLAMMABLE & COMBUSTIBLE.

2.2.4 Warning and Identification

Provide pipe flow markings, warning and identification tape, and metal tags as required.

2.2.5 Flange Gaskets

Provide gaskets of nonasbestos compressed material in accordance with ASME B16.21, 1/16 inch thickness, full face or self-centering flat ring type, containing aramid fibers bonded with styrene butadiene rubber (SBR) or nitrile butadiene rubber (NBR) suitable for a maximum 600 degree F service, to be used for hydrocarbon service.

2.2.6 Pipe Threads

Provide pipe threads conforming to ASME B1.20.1.

2.2.7 Escutcheons

Provide chromium-plated steel or chromium-plated brass escutcheons, either one piece or split pattern, held in place by internal spring tension or set screw.

- 2.2.8 Insulating Pipe Joints
- 2.2.8.1 Insulating Joint Material

Provide insulating joint material between flanged or threaded metallic pipe systems where shown to control galvanic or electrical action.

2.2.8.2 Threaded Pipe Joints

Provide threaded pipe joints of steel body nut type dielectric unions with insulating gaskets.

2.2.8.3 Flanged Pipe Joints

Provide joints for flanged pipe consisting of full face sandwich-type flange insulating gasket of the dielectric type, insulating sleeves for flange bolts, and insulating washers for flange nuts. Provide lap joint flange pipe ends conforming to ASTM F2015.

2.3 VALVES

Provide lockable shutoff or service isolation valves as indicated in the drawings conforming to the following:

2.3.1 Valves 2 Inches and Smaller

Provide valves 2 inches and smaller conforming to ASME B16.33 of materials and manufacture compatible with system materials used.

2.3.2 Valves 2-1/2 Inches and Larger

Provide valves 2-1/2 inches and larger of carbon steel conforming to API Spec 6D, Class 150.

2.4 PIPE HANGERS AND SUPPORTS

Provide pipe hangers and supports conforming to MSS SP-58 and MSS SP-69.

2.5 REGULATORS AND SHUTOFF VALVES

Provide pressure gauges and attachments conforming to ASME B40.100. Provide regulators conforming to ANSI Z21.78/CSA 6.20 for combination gas controls for gas appliances, and ANSI Z21.80/CSA 6.22 for line pressure regulators. Provide shutoff valves conforming to ANSI Z21.15/CSA 9.1 for manually controlled gas shutoff valves and ANSI Z21.21/CSA 6.5 for automatic shutoff valves for gas appliances.

2.6 SEISMIC PROVISIONS

Provide earthquake automatic gas shutoff valve conforming to ASCE 25-06, SMACNA 1981, and UL listed or AGA listed or International Association of Plumbing and Mechanical Officials (IAPMO) listed. The valve may be either pendulum or ball construction.

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 or areas of conflict before performing the work.

3.2 GAS PIPING SYSTEM

Provide a gas piping system from the point of delivery, defined as the outlet of the meter set assembly.

3.2.1 Protection and Cleaning of Materials and Components

Protect equipment, pipe, and tube openings by closing with caps or plugs during installation. At the completion of all work, thoroughly clean the entire system.

3.2.2 Workmanship and Defects

Piping, tubing and fittings shall be clear and free of cutting burrs and defects in structure or threading and shall be thoroughly brushed and chip-and scale-blown. Repair of defects in piping, tubing or fittings is not allowed; replace defective items when found.

3.3 PROTECTIVE COVERING

3.3.1 Aboveground Metallic Piping Systems

3.3.1.1 Ferrous Surfaces

Touch up shop primed surfaces with ferrous metal primer. Solvent clean surfaces that have not been shop primed. Mechanically clean surfaces that contain loose rust, loose mill scale and other foreign substances by power wire brushing and prime with ferrous metal primer. Finish primed surfaces with two coats of exterior paint.

3.4 INSTALLATION

Install the gas system in conformance with the manufacturer's recommendations and applicable provisions of NFPA 54, AGA XR0603, and as indicated. Perform all pipe cutting without damage to the pipe, with an approved type of mechanical cutter, unless otherwise authorized. Use wheel cutters where practicable.

3.4.1 Metallic Piping Installation

Make changes in direction of piping with fittings only; mitering or notching pipe to form elbows and tees or other similar type construction is not permitted. Branch connection may be made with either tees or forged branch outlet fittings. Provide branch outlet fittings which are forged, flared for improvement of flow where attached to the run, and reinforced against external strains.

3.4.2 Concealed Piping in Buildings

Do not use combinations of fittings (unions, tubing fittings, running threads, right- and left-hand couplings, bushings, and swing joints) to conceal piping within buildings.

3.4.2.1 Piping in Partitions

Locate concealed piping in hollow, rather than solid, partitions. Protect tubing passing through walls or partitions against physical damage both during and after construction, and provide appropriate safety markings and labels.

3.4.3 Aboveground Piping

Run aboveground piping as straight as practicable along the alignment and

elevation indicated, with a minimum of joints, and separately supported from other piping system and equipment. Install exposed horizontal piping no farther than 6 inches from nearest parallel wall and at an elevation which prevents standing, sitting, or placement of objects on the piping.

3.4.4 Final Gas Connections

Unless otherwise specified, make final connections with rigid metallic pipe and fittings. Provide accessible gas shutoff valve and coupling for each gas equipment item.

3.5 PIPE JOINTS

Design and install pipe joints to effectively sustain the longitudinal pull-out forces caused by contraction of the piping or superimposed loads.

3.5.1 Threaded Metallic Joints

Provide threaded joints in metallic pipe with tapered threads evenly cut and made with UL approved graphite joint sealing compound for gas service or tetrafluoroethylene tape applied to the male threads only. Threaded joints up to 1-1/2 inches in diameter may be made with approved tetrafluoroethylene tape. Threaded joints up to 2 inches in diameter may be made with approved joint sealing compound. After cutting and before threading, ream pipe and remove all burrs. Caulking of threaded joints to stop or prevent leaks is not permitted.

3.5.2 Welded Metallic Joints

Conform beveling, alignment, heat treatment, and inspection of welds to NFPA 54. Remove weld defects and make repairs to the weld, or remove the weld joints entirely and reweld. After filler metal has been removed from its original package, protect and store so that its characteristics or welding properties are not affected adversely. Do not use electrodes that have been wetted or have lost any of their coating.

3.6 PIPE SLEEVES

Provide pipes passing through concrete or masonry walls or concrete floors or roofs with pipe sleeves fitted into place at the time of construction. Do not install sleeves in structural members except where indicated or approved. Make all rectangular and square openings as detailed. Extend each sleeve through its respective wall, floor or roof, and cut flush with each surface, except in mechanical room floors not located on grade where clamping flanges or riser pipe clamps are used. Extend sleeves in mechanical room floors above grade at least 4 inches above finish floor. Unless otherwise indicated, use sleeves large enough to provide a minimum clearance of 1/4 inch all around the pipe. Provide steel pipe for sleeves in bearing walls, waterproofing membrane floors, and wet areas . Provide sleeves in nonbearing walls, floors, or ceilings of steel pipe, galvanized sheet metal with lock-type longitudinal seam, or moisture-resistant fiber or plastic. For penetrations of fire walls, fire partitions and floors which are not on grade, seal the annular space between the pipe and sleeve with fire-stopping material and sealant that meet the requirement of Section 07 84 00 FIRESTOPPING.

3.7 PIPES PENETRATING WATERPROOFING MEMBRANES

Install pipes penetrating waterproofing membranes as specified in Section

22 00 00 PLUMBING, GENERAL PURPOSE.

3.8 FIRE SEAL

Fire seal all penetrations of fire rated partitions, walls and floors in accordance with Section 07 $84\ 00\ \text{FIRESTOPPING}.$

3.9 ESCUTCHEONS

Provide escutcheons for all finished surfaces where gas piping passes through floors, walls, or ceilings except in boiler, utility, or equipment rooms.

3.10 SPECIAL REQUIREMENTS

Provide drips, grading of the lines, freeze protection, and branch outlet locations as shown and conforming to the requirements of NFPA 54.

3.11 BUILDING STRUCTURE

Do not weaken any building structure by the installation of any gas piping. Do not cut or notch beams, joists or columns. Attach piping supports to metal decking. Do not attach supports to the underside of concrete filled floors or concrete roof decks unless approved by the Contracting Officer.

3.12 PIPING SYSTEM SUPPORTS

Support gas piping systems in buildings with pipe hooks, metal pipe straps, bands or hangers suitable for the size of piping or tubing. Do not support any gas piping system by other piping. Conform spacing of supports in gas piping and tubing installations to the requirements of NFPA 54. Conform the selection and application of supports in gas piping and tubing installations to the requirements of MSS SP-69. In the support of multiple pipe runs on a common base member, use a clip or clamp where each pipe crosses the base support member. Spacing of the base support members is not to exceed the hanger and support spacing required for any of the individual pipes in the multiple pipe run. Rigidly connect the clips or clamps to the common base member. Provide a clearance of 1/8 inch between the pipe and clip or clamp for all piping which may be subjected to thermal expansion.

3.13 ELECTRICAL BONDING AND GROUNDING

Provide a gas piping system within the building which is electrically continuous and bonded to a grounding electrode as required by NFPA 70.

3.14 SHUTOFF VALVE

Install the main gas shutoff valve controlling the gas piping system to be easily accessible for operation, as indicated, protected from physical damage, and marked with a metal tag to clearly identify the piping system controlled.

3.15 TESTING

Submit test reports in booklet form tabulating test and measurements performed; dated after award of this contract, and stating the Contractor's name and address, the project name and location, and a list of the specific

requirements which are being certified. Test entire gas piping system to ensure that it is gastight prior to putting into service. Prior to testing, blow out the system, clean, and clear all foreign material. Test each joint with an approved gas detector, soap and water, or an equivalent nonflammable solution. Inspect and test each valve in conformance with API Std 598 and API Std 607. Complete testing before any work is covered, enclosed, or concealed, and perform with due regard for the safety of employees and the public during the test. Install bulkheads, anchorage and bracing suitably designed to resist test pressures if necessary, and as directed and or approved by the Contracting Officer. Do not use oxygen as a testing medium.

3.15.1 Pressure Tests

Submit test reports in booklet form tabulating test and measurements performed; dated after award of this contract, and stating the Contractor's name and address, the project name and location, and a list of the specific requirements which are being certified. Before appliances are connected, test by filling the piping systems with air or an inert gas to withstand a minimum pressure of 3 pounds gauge for a period of not less than 10 minutes as specified in NFPA 54 without showing any drop in pressure. Do not use Oxygen for test. Measure pressure with a mercury manometer, slope gauge, or an equivalent device calibrated to be read in increments of not greater than 0.1 pound. Isolate the source of pressure before the pressure tests are made.

3.15.2 Test With Gas

Before turning on gas under pressure into any piping, close all openings from which gas can escape. Immediately after turning on the gas, check the piping system for leakage by using a laboratory-certified gas meter, an appliance orifice, a manometer, or equivalent device. Conform all testing to the requirements of NFPA 54. If leakage is recorded, shut off the gas supply, repair the leak, and repeat the tests until all leaks have been stopped.

3.15.3 Purging

After testing is completed, and before connecting any appliances, fully purge all gas piping. Do not purge piping into the combustion chamber of an appliance. Do not purge the open end of piping systems into confined spaces or areas where there are ignition sources unless the safety precautions recommended in NFPA 54 are followed.

3.15.4 Labor, Materials and Equipment

Furnish all labor, materials and equipment necessary for conducting the testing and purging.

-- End of Section --

SECTION 23 21 13.00 20

LOW TEMPERATURE WATER (LTW) HEATING SYSTEM

04/06

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)

ASSE 1003	(2009) Performance Requirements for Water Pressure Reducing Valves for Domestic Water Distribution Systems - (ANSI approved 2010)
ASSE 1017	(2009) Performance Requirements for Temperature Actuated Mixing Valves for Hot Water Distribution Systems - (ANSI approved 2010)

AMERICAN WELDING SOCIETY (AWS)

AWS	Z49.1	(2005)	Safety	in	Welding	and	Cutting	and
		Allied	Process	ses				

ASME INTERNATIONAL (ASME)

ASME B1.1	(2003; R 2008) Unified Inch Screw Threads (UN and UNR Thread Form)
ASME B1.20.1	(1983; R 2006) Pipe Threads, General Purpose (Inch)
ASME B16.1	(2010) Gray Iron Pipe Flanges and Flanged Fittings Classes 25, 125, and 250
ASME B16.11	(2011) Forged Fittings, Socket-Welding and Threaded
ASME B16.18	(2012) Cast Copper Alloy Solder Joint Pressure Fittings
ASME B16.21	(2011) Nonmetallic Flat Gaskets for Pipe Flanges
ASME B16.22	(2001; R 2010) Standard for Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
ASME B16.24	(2011) Cast Copper Alloy Pipe Flanges and Flanged Fittings: Classes 150, 300, 600,

	900, 1500, and 2500
ASME B16.3	(2011) Malleable Iron Threaded Fittings, Classes 150 and 300
ASME B16.34	(2009; Supp 2010) Valves - Flanged, Threaded and Welding End
ASME B16.39	(2009) Standard for Malleable Iron Threaded Pipe Unions; Classes 150, 250, and 300
ASME B16.5	(2009) Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24 Metric/Inch Standard
ASME B16.9	(2007) Standard for Factory-Made Wrought Steel Buttwelding Fittings
ASME B18.2.2	(2010) Standard for Square and Hex Nuts
ASME B31.9	(2011) Building Services Piping
ASME B40.100	(2005; R 2010) Pressure Gauges and Gauge Attachments
AMERICAN SOCIETY FOR TH	ESTING AND MATERIALS (ASTM)
ASTM A194/A194M	(2012) Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or Both
ASTM A307	(2010) Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
ASTM A53/A53M	(2012) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM B32	(2008) Standard Specification for Solder Metal
ASTM B88	(2009) Standard Specification for Seamless Copper Water Tube
COPPER DEVELOPMENT ASSO	OCIATION (CDA)
CDA A4015	(1994; R 1995) Copper Tube Handbook
MANUFACTURERS STANDARDI INDUSTRY (MSS)	ZATION SOCIETY OF THE VALVE AND FITTINGS
MSS SP-110	(2010) Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends
MSS SP-58	(2009) Pipe Hangers and Supports - Materials, Design and Manufacture,

	Selection, Application, and Installation
MSS SP-67	(2011) Butterfly Valves
MSS SP-69	(2003; R 2004) Standard for Pipe Hangers and Supports - Selection and Application
MSS SP-70	(2011) Gray Iron Gate Valves, Flanged and Threaded Ends
MSS SP-72	(2010a) Ball Valves with Flanged or Butt-Welding Ends for General Service
MSS SP-80	(2008) Bronze Gate, Globe, Angle and Check Valves
MSS SP-85	(2011) Gray Iron Globe & Angle Valves Flanged and Threaded Ends
NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)	
NEMA ICS 2	(2000; Errata 2006; R 2005; Errata 2008) Standard for Controllers, Contactors, and Overload Relays Rated 600 V
NEMA ICS 6	(1993; R 2011) Enclosures
NEMA MG 1	(2014) Motors and Generators
SHEET METAL & AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)	
SMACNA 1780	(2002) HVAC Systems - Testing, Adjusting and Balancing, 3rd Edition
U.S. DEPARTMENT OF DEFENSE (DOD)	
MIL-V-12003	(1980; Rev F; Am 1; CANC Notice 1) Valves, Plug, Cast-Iron or Steel, Manually Operated
U.S. GENERAL SERVICES ADMINISTRATION (GSA)	
CID A-A-1689	(Rev B) Tape, Pressure-Sensitive Adhesive, (Plastic Film)
CID A-A-50560	(Basic) Pumps, Centrifugal, Water Circulating, Electric-Motor-Driven
CID A-A-59617	(Basic) Unions, Brass or Bronze, Threaded Pipe Connections and Solder-Joint Tube Connections
FS WW-S-2739	(Basic; Notice 1) Strainers, Sediment: Pipeline, Water, Air, Gas, Oil, or Steam
U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)	
29 CFR 1910.144	Safety Color Code for Marking Physical

Hazards

29 CFR 1910.219

Mechanical Power Transmission Apparatus

1.2 RELATED REQUIREMENTS

Section 23 03 00 BASIC MECHANICAL MATERIALS AND METHODS applies to this section with additions and modifications specified herein.

1.3 SYSTEM DESCRIPTION

Except as specified otherwise, equipment and piping components shall be suitable for use in low temperature water heating system. Except as modified herein, the pressure temperature limitations shall be as specified in the referenced standards and specifications. Pressures in this specification are pressures in pounds per square inch above atmospheric pressure, and temperatures are in degrees Fahrenheit (F).

1.3.1 Hot Water Heating System

Submit plan, elevations, dimensions, capacities, and ratings. Include the following:

- a. Pumps
- b. Valves
- c. Boilers

1.4 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 ${\tt SUBMITTAL\ PROCEDURES:}$

SD-02 Shop Drawings

Hot water heating system

SD-03 Product Data

Pumps

Include pump speed and characteristic curve for performance of impeller selected for each pump. Curves shall indicate capacity vs head, efficiency, and brake power for full range, from shut-off to free delivery. Hot water heating pipe

SD-06 Test Reports

Hydrostatic test of piping system

Auxiliary equipment and accessory tests

Submit test reports in accordance with the paragraph entitled "Field Quality Control."

SD-07 Certificates

Welding procedures

Welder's qualifications

1.5 QUALITY ASSURANCE

1.5.1 Standard Commercial Product for Terminal Units

Terminal units provided shall comply with features called out in this specification and shall be the manufacturer's standard commercial product. Additional or better features which are not prohibited by this specification but which are a part of the manufacturer's standard commercial product, shall be included in the terminal units being furnished. A standard commercial product is a product which has been sold or is currently being offered for sale, on the commercial market through advertisements or manufacturer's catalogs, or brochures. Provide Institute of Boiler and Radiator Manufacturer (IBR) or Steel Boiler Institute (SBI) rating for required capacity.

1.5.2 Welding

1.5.2.1 Welding Procedures

Before performing welding, submit three copies of welding procedure specification for all metals to be used in the work, together with proof of welder's qualification as outlines in ASME B31.9.

1.5.2.2 Welder's Qualifications

Before welder or operator performs welding, submit three copies of Welder's Performance Qualification Record in conformance with ASME B31.9showing that the welder was tested under the approved procedure specification submitted by the Contractor. In addition, submit each welder's assigned number, letter, or symbol used to identify the work of the welder.

1.5.2.3 Identification of Welder's Work

Ensure that each welder's assigned number, letter or symbol is affixed immediately upon completion of the weld. To welders making defective welds after passing a qualification test, give a requalification test. Upon failing to pass the test, do not permit welder to work in this contract.

1.5.2.4 Previous Qualifications

Welding procedures, welders, and welding operators previously qualified by test may be accepted for this contract without requalification subject to the approval and provided that all the conditions specified in ASME B31.9 are met before a procedure can be used.

1.5.3 Brazing and Soldering

1.5.3.1 Brazing Procedure

ASME B31.9. Brazing procedure for joints shall be as outlined in CDA A4015.

1.5.3.2 Soldering, Soldering Preparation, and Procedures for Joints

ASME B31.9 and as outlined in CDA A4015.

1.6 SAFETY STANDARDS

1.6.1 Welding

Safety in welding and cutting of pipe shall conform to AWS Z49.1.

1.6.2 Guards

Couplings, motor shafts, gears and other moving parts shall be guarded, in accordance with OSHA 29 CFR 1910.219. Guards shall be cast iron or expanded metal. Guard parts shall be rigid and removable without disassembling the guarded unit.

PART 2 PRODUCTS

2.1 PIPE AND FITTINGS

2.1.1 Hot Water Heating Pipe (Supply and Return)

ASTM A53/A53M electric resistance welded or seamless Schedule 40 steel pipe or ASTM B88 Type K or L hard drawn Copper tubing.

2.1.2 Fittings

Provide fittings compatible with the pipe being provided and shall conform to the following requirements.

2.1.2.1 Steel or Malleable Iron Pipe

Sizes 1/8 to 2 inches. ASME B16.11 steel socket welding or screwed type or ASME B16.3 for screwed type malleable iron fittings.

2.1.2.2 Steel, Cast Iron, or Bronze

Sizes 2 1/2 inches and above. Steel fitting butt welding type ASME B16.9 or ASME B16.5 flanged type. Cast iron fittings flanged type ASME B16.1. Bronze fittings up to 8 inch size flanged type ASME B16.24.

2.1.2.3 Fittings for Copper Tubing

ASME B16.18 cast bronze solder joint type or ASME B16.22wrought copper solder joint type. Fittings may be flared or compression joint type.

2.1.3 Unions

2.1.3.1 Steel Pipe

Provide ASME B16.39, malleable iron unions, threaded connections.

2.1.3.2 Copper Tubing

Provide CID A-A-59617, bronze unions, solder joint end.

2.1.3.3 Dielectric Union

Provide insulated union with galvanized steel female pipe-threaded end and a copper solder joint end conforming with ASME B16.39, Class 1, dimensional, strength and pressure requirements. Union shall have a water-impervious insulation barrier capable of limiting galvanic current to

one percent of the short-circuit current in a corresponding bimetallic joint. When dry, insulation barrier shall be able to withstand a 600-volt breakdown test.

2.1.4 Flanges

Remove raised faces when used with flanges having a flat face.

2.1.4.1 Steel Flanges

ASME B16.5 forged steel, welding type.

2.1.4.2 Cast Iron Screwed Flanges

ASME B16.1.

2.1.4.3 Bronze Screwed Flanges

ASME B16.24.

2.1.5 Drains and Overflows

2.1.5.1 Steel Pipe

ASTM A53/A53M, Electric resistance welded or Seamless Schedule 40, Malleable iron or forged steel fittings, screwed or welded joints.

2.1.5.2 Copper Tubing

ASTM B88, Type K, or L hard drawn, cast brass or wrought copper fittings, Grade Sb5 solder joints.

2.1.6 Valves

Valves shall have rising stems and shall open when turned counterclockwise.

2.1.6.1 Gate Valves

- a. Bronze Gate Valves: MSS SP-80, 2 inches and smaller, wedge disc, inside screw type not less than Class 150. Use solder joint ends with copper tubing.
- b. Cast Iron Gate Valves: MSS SP-70, 2 1/2 inches and larger, open stem and yoke type with bronze trim.

2.1.6.2 Globe and Angle Valves

- a. Bronze Globe and Angle Valves: MSS SP-80, 2 inches and smaller, Class 200, except use Class 125 with solder ends for copper tubing. Valves shall have renewable seat and discs except solder end valves which shall have integral seats.
- b. Cast Iron Globe and Angle Valves: MSS SP-85, 2 1/2 inches and larger, with bronze trim, tapped drains and brass plug.

2.1.6.3 Check Valves

- a. Bronze Check Valves: MSS SP-80, 2 inches and smaller, regrinding swing check type, Class 125.
- b. Cast Iron Check Valves: ASME B16.34, 2 1/2 inches and larger, bronze trim, non-slam, eccentric disc type for centrifugal pump discharge service.

2.1.6.4 Temperature Regulating Valves

Provide ASSE 1017 copper alloy body with adjustable range thermostat.

2.1.6.5 Water Pressure-Reducing Valves

ASSE 1003.

2.1.6.6 Plug Valves

MIL-V-12003, except that a replaceable valve seat will not be required. Type I - lubricated, tapered plug valves.

2.1.6.7 Ball Valves

Flanged end ball valve shall conform to MSS SP-72, bronze. Threaded, socket-welding, solder joint and flared ends shall conform to MSS SP-110.

2.1.6.8 Flow Control Balancing Valves

Copper alloy or cast iron body, copper alloy or stainless internal working parts, and integral pointer that indicates the degree of valve opening. Valves shall be suitable for 125 psig at 190 degrees F hot water. Valve shall function as a service valve when in fully closed position. Valve body shall have factory-installed tappings for differential pressure meter connections for verification of pressure differential across valve orifice. Meter connections shall have positive check valves or shutoff valves. Each valve shall have metal tag showing the gallons per minute flow for each differential pressure reading.

2.1.6.9 Butterfly Valves

Conform with MSS SP-67, Type I - Tight shut off valve. Valve body shall be bubble tight for shutoff at 150 psig. Flanged and flangeless type valves shall have Type 300 series corrosion resistant steel stems and corrosion resistant or bronze discs with molded elastomer disc seals. Flow conditions shall be for the regulation from maximum flow to complete shutoff by way of throttling effect. Valves shall be provided in closed system. Valves smaller than 8 inches shall have throttling handles. Valves 8 inches and larger shall have totally enclosed manual gear operators with adjustable balance return stops and indicators. Valves shall have a minimum of 7 locking positions and shall be suitable for water temperatures up to 200 degrees F.

2.1.6.10 Butterfly Valves 2 Inches and Smaller

Valves shall be one-piece and three-piece design with male or female threaded or soldered end connections and shall be bubble tight for shutoff at 150 psig. Stem and disc assembly shall be of 300 series corrosion resistant steel. Disc seal assembly shall be of 300 series corrosion

resistant steel. Disc seal shall be suitable for the liquid being used in the system in which the valve is to be installed. Valves shall be suitable for water temperature up to 200 degrees F and shall be capable of operating at the rated pressure of 150 psig. Valves shall be designed for throttling service use by valve lever and indicator adjustment.

2.1.6.11 Relief Valves

Bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labelled.

2.1.6.12 Valve Operating Mechanisms

Provide extension stems where as necessary.

a. Extension Stem: Corrosion resisting steel designed for rising and non-rising stems. Provide in length required to connect the valve stem and the operating mechanism and of sufficient cross section to transfer the torque required to operate the valve.

2.1.6.13 Balancing Valves

Balancing valves shall be calibrated bronze body balancing valves with integral ball valve and venturi or valve orifice and valve body pressure taps for flow measurement based on differential pressure readings. Valve pressure taps and meter connections shall have seals and built-in check valves with threaded connections for a portable meter. Meter shall be provided by the same manufacturer and be capable of reading system pressures and shall meet the requirements of the paragraph entitled "Flow Measuring Equipment." Valves shall have internal seals to prevent leakage around rotating element and be suitable for full shut-off rated pressure. Valves shall have an operator with integral pointer and memory stop. Balancing valves shall be selected for the required flows as indicated on the plans.

2.1.7 End Connections

2.1.7.1 Steel Piping

Screwed or socket welded for 2 inches and smaller and flanged or butt welded for 2 1/2 inches and larger.

- a. Screwed Joints With Taper Threads: ASME B1.20.1.
- b. Flanged Joints: Bolting and gaskets shall be as follows:
 - (1) Bolting: Bolt and stud material ASTM A307, Grade B, and nut material ASTM A194/A194M, Grade 2. Bolt, stud, and nut dimensions ASME B18.2.2 threads ASME B1.1coarse type with Class 2A fit for bolts and studs, and Class 2B fit for nuts. Bolts or bolt studs shall extend completely through the nuts and may have reduced shanks of a diameter not less than the diameter at root of threads. Carbon steel bolts shall have American Standard regular square or heavy hexagon heads and shall have American Standard heavy semifinished hexagonal nuts conforming to ASME B18.2.2.
 - (2) Gaskets: ASME B16.21, Nonasbestos compressed material 1/16 inch thickness full face or self-centering flat ring type and suitable for pressure and temperature of the piping system.

- c. Butt Weld Joints: ASME B31.9. Backing rings shall conform to ASME B31.9. Ferrous rings shall not exceed 0.05 percent sulfur; for alloy pipe, backing rings shall be of material compatible with the chemical composition of the parts to be welded and preferably of the same composition. Provide continuous machined or split band backing rings.
- d. Socket Weld Joints: ASME B31.9.

2.1.7.2 Joints for Copper Tubing

- a. Solder conforming to ASTM B32 alloy grade Sb5 or Sn96. Solder and flux shall be lead free (less than 0.2 percent of lead).
- b. Copper Tube Extracted Joint: An extracted mechanical tee joint may be made in copper tube. Make joint with an appropriate tool by drilling a pilot hole and drawing out the tube surface to form a collar having a minimum height of three times the thickness of the tube wall. To prevent the branch tube from being inserted beyond the depth of the extracted joint, provide dimpled depth stops. Notch the branch tube for proper penetration into fitting to assure a free flow joint. Braze extracted joints using a copper phosphorous classification brazing filler metal. Soldered joints shall not be permitted.

2.1.8 Instrumentation

2.1.8.1 Pressure and Vacuum Gauges

Provide ASME B40.100 with restrictor.

2.1.8.2 Indicating Thermometers

Thermometers shall be dial type with an adjustable angle suitable for the service. Provide thermowell sized for each thermometer in accordance with the thermowell specification. Fluid-filled thermometers (mercury is not acceptable) shall have a nominal scale diameter of 5 inches. Construction shall be stainless-steel case with molded glass cover, stainless-steel stem and bulb. Stem shall be straight, length as required to fit well. Bimetal thermometers shall have a scale diameter of 3 1/2 inches. Case shall be hermetic. Case and stem shall be constructed of stainless steel. Bimetal stem shall be straight and of a length as required to fit the well.

2.1.8.3 Pressure/Temperature Test Ports

Pressure/Temperature Test Ports shall have brass body and EPDM and/or Neoprene valve seals. Ports shall be rated for service between 35 and 275 degrees F and up to 500 psig. Ports shall be provided in lengths appropriate for the insulation thickness specified in Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS and installed to allow a minimum of 12 inches of access for probe insertion. Provide with screw-on cap attached with a strap or chain to prevent loss when removed. Ports shall be 1/4 inch NPT and accept 1/8 inch diameter probes.

2.1.9 Miscellaneous Pipeline Components

2.1.9.1 Air Vent

Provide float type air vent in hydronic systems. Vent shall be constructed

of brass or semi-steel body, copper float, and stainless steel valve and valve seat. Design air vent to suit system operating temperature and pressure. Provide isolating valve to permit service without draining the system. Pipe discharge of vent to a drain.

2.1.9.2 Strainers

Strainers for classes 125 and 250 piping in IPS 1/2 to 8 inches, inclusive, FS WW-S-2739 and locate as indicated.

2.1.9.3 Hangers and Supports

Design and fabrication of pipe hangers, supports, and welding attachments shall conform to MSS SP-58 and ASME B31.9. Hanger types and supports for bare and covered pipe shall conform to MSS SP-69 for the temperature range.

2.1.9.4 Pipe Sleeves

Sleeves in masonry and concrete walls, floors, and roof slabs shall be ASTM A53/A53M, Schedule 40 or Standard Weight, hot-dip galvanized steel pipe. Sleeves in partitions shall be zinc-coated sheet steel having a nominal weight of not less than 0.906 pound per square foot.

2.1.9.5 Escutcheon Plates

Provide one piece or split hinge metal plates for piping passing through floors, walls, and ceilings in exposed spaces. Provide polished stainless steel plates or chromium-plated finish on copper alloy plates in finished spaces and paint finish on metal plates in unfinished spaces.

2.2 PIPING SYSTEM EQUIPMENT

2.2.1 Pumps

Provide hot water circulating pumps, CID A-A-50560, Service A. Pump casing and flange shall be made of close-grained cast iron. Shaft shall be carbon or alloy steel with lubricated bearings and impeller shall be bronze. Select pumps so that the operating point on selected impeller-curve will lie at or to the left of shutoff side of, and not more than 5 percent below, point of maximum efficiency for impeller. Provide motors of open-dripproof type conforming to NEMA MG 1 and suitable for electrical characteristic as indicated. Motor starters shall conform to NEMA ICS 2 manual or across the line type with NEMA ICS 6general purpose weather-resistant enclosure.

2.2.2 Expansion Tanks

Reuse existing expansion tank..

2.2.3 External Air Separation Tanks

Reuse existing air separator. Provide with automatic air release device and galvanized steel strainer. Provide a blow down connection with a gate valve and piped to nearest floor drain.

2.3 TERMINAL UNITS

2.4 ELECTRICAL EQUIPMENT

Provide complete with motors, motor starters, thermal overload protection, and controls. Equipment and wiring shall be in accordance with Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

2.5 CONTROLS

Provide controls as specified in Section 23 09 23.13 22 BACnet DIRECT DIGITAL CONTROL SYSTEMS FOR HVAC.

2.6 INSULATION

Provide shop and field applied insulation as specified in Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

2.7 ASBESTOS PROHIBITION

Asbestos and asbestos containing products are prohibited.

PART 3 EXECUTION

3.1 PREPARATION

Provide storage for equipment and material at the project site. All parts shall be readily accessible for inspection, repair, and renewal. Protect material and equipment from the weather.

3.2 INSTALLATION

Piping fabrication, assembly, welding, soldering, and brazing shall conform to ASME B31.9. Piping shall follow the general arrangement shown. Route piping and equipment within buildings out of the way of lighting fixtures and doors, windows, and other openings. Run overhead piping in buildings in inconspicuous positions. Provide adequate clearances from walls, ceilings, and floors to permit welding of joints and application of insulation. Make provision for expansion and contraction of pipe lines. Make changes in size of water lines with reducing fittings. Do not bury, conceal, or insulate until piping has been inspected, tested, and approved. Do not run piping concealed in walls, partitions, underground, or under the floor except as otherwise indicated. Where pipe passes through building structure, locate pipe joints and expansion joints where they may be inspected. Provide flanged joints where necessary for normal maintenance and where required to match valves and equipment. Furnish gaskets, packing, and thread compounds suitable for the service. Provide long radius ells where possible to reduce pressure drops. Pipe bends in lieu of welding fittings may be used where space permits. Pipe bends shall have a uniform radius of at least five times the pipe diameter and shall be free from appreciable flattening, wrinkling, or thinning of the pipe. Do not use mitering of pipe to form elbows, notching straight runs to form full sized tees, or any similar construction. Make branch connections over 2 inches with welding tees except factory made forged welding branch outlets or nozzles having integral reinforcements conforming to ASME B31.9 may be used, provided the nominal diameter of the branch is at least one pipe size less than the nominal diameter of the run. Branch connections 2 inches and under can be threaded or welded. Run vertical piping plumb and straight and parallel to walls. Provide sleeves for lines passing through

building structure. Provide a fire seal where pipes pass through fire wall, fire partitions, fire rated pipe chase walls, or floors above grade. Install piping connected to equipment with flexibility for thermal stresses and for vibration, and support and anchor so that strain from weight and thermal movement of piping is not imposed on the equipment.

3.2.1 Hangers and Supports

Unless otherwise indicated, horizontal and vertical piping attachments shall conform to $\overline{\text{MSS SP-58}}$. Band and secure insulation protection shields without damaging pipe insulation. Continuous inserts and expansion bolts may be used.

3.2.2 Grading of Pipe Lines

Unless otherwise indicated, install horizontal lines of hot water piping to grade down in the direction of flow with a pitch of not less than one inch in 30 feet, except in loop mains and main headers where the flow may be in either direction.

3.2.3 Pipe Sleeves

Provide sleeves where pipes and tubing pass through masonry or concrete walls, floors, roof, and partitions. Annular space between pipe, tubing, or insulation and the sleeve shall not be less than 1/4 inch. Hold sleeves securely in proper position and location before and during construction. Sleeves shall be of sufficient length to pass through entire thickness of walls, partitions, or slabs. Sleeves in floor slabs shall extend 2 inches above finished floor. Firmly pack space between pipe or tubing and sleeve with oakum and caulk on both ends of the sleeve with plastic waterproof cement which will dry to a firm but pliable mass, or provide a segmented elastomeric seal. Seal both ends of penetrations through fire walls and fire floors to maintain fire resistive integrity with UL listed fill, void, or cavity material.

3.2.4 Flashing for Buildings

Provide flashing where pipes pass through building roofs, and make outside walls tight and waterproof.

3.2.5 Unions and Flanges

Provide unions and flanges to permit easy disconnection of piping and apparatus. Each connection having a screwed-end valve shall have a union. Place unions and flanges no farther apart than 100 feet. Install unions downstream of valves and at equipment or apparatus connections. Provide unions on piping under 2 inches in diameter, and provide flanges on piping 2 inches and over in diameter. Provide dielectric unions or flanges between ferrous and non-ferrous piping, equipment, and fittings; except that bronze valves and fittings may be used without dielectric couplings for ferrous-to-ferrous or non-ferrous-to-non-ferrous connections.

3.2.6 Connections for Future Equipment

Locate capped or plugged outlets for connections to future equipment as indicated.

3.2.7 Changes in Pipe Size

Provide reducing fittings for changes in pipe size; reducing bushings are not permitted. In horizontal lines, provide eccentric reducing fittings to maintain the top of the lines in the same plane.

3.2.8 Cleaning of Pipe

Thoroughly clean each section of pipe, fittings, and valves free of foreign matter before erection. Prior to erection, hold each piece of pipe in an inclined position and tap along its full length to loosen sand, mill scale and other foreign matter. For pipe 2 inches and larger, draw wire brush, of a diameter larger than that of the inside of the pipe, several times through the entire length of pipe. Before making final connections to apparatus, wash out interior of piping thoroughly with water. Plug or cap open ends of mains during shutdown periods. Do not leave lines open where foreign matter might enter the pipe.

3.2.9 Valves

Install valves in conformance with ASME B31.9. Provide gate valves unless otherwise directed. Install valves with stems horizontal or above. Locate or equip stop valves to permit operation from floor level, or provide with safe access in the form of walkways or ladders. Install valves in positions accessible for operation and repair.

3.2.9.1 Globe Valves

Install globe valves so that the pressure is below the disk and the stem horizontal.

3.2.9.2 Relief Valves

Provide valves on pressure tanks, low pressure side of reducing valves, heat exchangers, and expansion tanks. Select system relief valve so that capacity is greater than make-up pressure reducing valve capacity. Select equipment relief valve capacity to exceed rating of connected equipment. Pipe relief valve outlet to the nearest floor drain.

3.2.10 Pressure Gage

Provide a shut-off valve or pet cock between pressure gages and the line.

3.2.11 Thermometers

Provide thermometers and thermal sensing elements of control valves with a separable socket. Install separable sockets in pipe lines in such a manner to sense the temperature of flowing the fluid and minimize obstruction to flow.

3.2.12 Strainers

Provide strainers, with meshes suitable for the services, where indicated, or where dirt might interfere with the proper operation of valve parts, orifices, or moving parts of equipment.

3.2.13 Pumps

Select pumps for specified fluid temperatures, are non-overloading in

parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve. Support piping adjacent to pump such that no weight is carried on pump casings. Install close coupled and base mounted pumps on concrete base, with anchor bolts, set and level, and grout in place and provide supports under elbows on pump suction and discharge line sizes 4 inches and over. Lubricate pump before start-up.

3.2.14 Equipment Foundations

Locate equipment foundations as shown on the drawings. Size, weight, and design shall preclude shifting of equipment under operating conditions. Foundations shall meet the requirements of the equipment manufacturer. Concrete shall conform to Section 03 30 00 CAST-IN-PLACE CONCRETE, and grout shall be approved non-shrinking.

3.2.15 Equipment Installation

Install equipment in accordance with installation instructions of the manufacturers. Grout equipment mounted on concrete foundations before installing piping. Install piping in such a manner as not to place a strain on the equipment. Do not bolt flanged joints tight unless they match. Grade, anchor, guide, and support piping without low pockets.

3.2.16 Cleaning of Systems

As installation of the various system components is completed, fill, start, and vent prior to cleaning. Place terminal control valves in open position. Add cleaner to closed system at concentration as recommended by manufacturer. Apply heat while circulating, slowly raising temperature to 160 degrees F and maintain for 12 hours minimum. Remove heat and circulate to 100 degrees F or less; drain systems as quickly as possible and refill with clean water. Circulate for 6 hours at design temperatures, then drain. Refill with clean water and repeat until system cleaner is removed. Use neutralizer agents on recommendation of system cleaner supplier and approval of Contracting Officer. Remove, clean, and replace strainer screens. Inspect, remove sludge, and flush low points with clean water after cleaning process is completed. Include disassembly of components as required. Preliminary or final tests are not permitted until cleaning is approved.

3.2.17 Identification of Piping

Identify piping in accordance with OSHA 29 CFR 1910.144, except that labels or tapes may be used in lieu of painting or stenciling. Spacing of identification marking on runs shall not exceed 50 feet. Materials for labels and tapes shall conform to CID A-A-1689, and shall be general purpose type and color class.

3.3 FIELD QUALITY CONTROL

Perform inspections and tests as specified herein to demonstrate that piping and equipment, as installed, is in compliance with contract requirements. Start up and operate the system. During this time, periodically clean the various strainers until no further accumulation of foreign material occurs. Exercise care so that minimum loss of water occurs when strainers are cleaned. Adjust safety and automatic control instruments to place them in proper operation and sequence.

3.3.1 Hydrostatic Test of Piping System

Test piping system hydrostatically using water not exceeding 100 degrees F. Conduct tests in accordance with the requirements of ASME B31.9 and as follows. Test piping system after all lines have been cleaned and before applying insulation covering. Remove or valve off from the system, gages, and other apparatus which may be damaged by the test before the tests are made. Install calibrated test pressure gage in the system to observe any loss in pressure. Maintain test pressure for a sufficient length of time to enable an inspection of each joint and connection. Perform tests after installation and prior to acceptance.Notify the Contracting Officer in writing 7 days prior to the time scheduled for the tests.

3.3.2 Auxiliary Equipment and Accessory Tests

Observe and check pumps, accessories, and equipment during operational and capacity tests for leakage, malfunctions, defects, noncompliance with referenced standards, or overloading.

3.4 TESTING, ADJUSTING, AND BALANCING

Except as specified herein, perform in accordance with SMACNA 1780, Chapter VIII "Hydronic System TAB Procedures," drawings and specifications; prepare complete report of final test results. Test, adjust, and balance the hydronic system in accordance with Section 23 05 92 TESTING/ADJUSTING/BALANCING: SMALL HEATING/VENTILATING/COOLING SYSTEMS.

3.4.1 Markings of Settings

Following final acceptance of the balancing report, the settings of all valves, splitters, dampers, and other adjustment devices shall be permanently marked so that adjustment can be restored if disturbed at anytime.

-- End of Section --

SECTION 23 24 00

HYDRONIC PIPE CLEANING AND FLUSHING PROCEDURES

08/10

PART 1 GENERAL

1.1 PERFORMANCE REQUIREMENTS

Cleaning and flushing shall remove organic soil, hydrocarbons, flux, pipe mill varnish, pipe compounds, iron oxide, and like deleterious substances. Removal of tightly adherent mill scale is not required.

1.2 DELIVERY, STORAGE, AND HANDLING

Handle and store detergent to protect equipment, environment and persons. Store detergent according to manufacturer's recommendations.

1.3 ENVIRONMENTAL REQUIREMENTS

All chemicals shall be acceptable for discharge into sanitary sewer.

PART 2 PRODUCTS

2.1 MATERIALS

The cleaning compound/detergent shall be an alkaline phosphate or non-phosphate detergent/surfactant/specific to remove organic soil, hydrocarbons, flux, pipe mill varnish, pipe compounds, iron oxide, and like deleterious substances, with or without inhibitor, suitable for system wetted metals without deleterious effects.

PART 3 EXECUTION

3.1 PROTECTION

Do not exceed service factor amperage on pump motor.

3.1.1 Special Techniques

- a. If hydronic system does not have operating heating system, install temporary heating system to maintain a water temperature of 120F.
- b. Close terminal unit service valves and open bypass valve. Flushing bypass should connect upstream of the terminal unit supply service valve and downstream of the return service valve. If necessary, provide temporary piping or hose to bypass terminal unit. Remove any component which may be damaged.
- c. Fill system with water and detergent solution to manufacture's specified water/detergent concentration, heat to 120F.
- d. Operate pump(s) and circulate solution for a minimum of 48 hrs, while maintaining 120 F. From bottom of air/solids separator continuously bleed water while filling system thru standard fill station ensuring to maintain the manufacturer's specified

water/detergent concentration. Modulate drain to maintain system pressure. Do not exceed service factor amperage on pump motor. Throttle discharge valve as necessary. The pump start up strainer shall remain in place. Periodically clean the pump strainer.

- e. Open terminal device service valves and close bypass valves. Flush each terminal device at the device. Ensure to clean all strainers before opening terminal device service valves. Repeat "Step Four" for the terminal devices for a minimum of 48 hour.
- f. Drain system and thoroughly flush with fresh water.
- g. Clean all strainers. Remove pump startup strainer.
- h. Add maintenance chemicals.
- -- End of Section --

SECTION 23 52 43.00 20

LOW PRESSURE WATER HEATING BOILERS

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.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z21.13/CSA 4.9 (2010; Addenda A 2010) Gas-Fired Low Pressure Steam and Hot Water Boilers

ANSI Z83.3 (1971; R 1995) Gas Utilization Equipment in Large Boilers

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 90.1 - IP

(2010; INT 1 2011; Errata 2011, Errata 2011; Errata 2011; INT 2-12 2011, Errata 2011; INT 13 2012; INT 14 2012) Energy Standard for Buildings Except Low-Rise Residential Buildings

ASME INTERNATIONAL (ASME)

ASME BPVC SEC IV (2010) BPVC Section IV-Rules for Construction of Heating Boilers

ASME CSD-1 (2012) Control and Safety Devices for Automatically Fired Boilers

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A53/A53M (2012) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

HYDRONICS INSTITUTE DIVISION OF GAMA (HYI)

HYI-005 (2004) I=B=R Ratings for Boilers,
Baseboard Radiation and Finned Tube
(Commercial)

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1 (2014) Motors and Generators

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-B-18897 (Rev F; CANC Notice 1) Boilers, Steam and

Hot Water, Watertube (Straight Bare and Finned Tube), Cast Iron and Firebox, Packaged Type (40,000 to 35,000,000 BTU/HR Thermal Output Capacity)

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

Energy Star (1992; R 2006) Energy Star Energy Efficiency Labeling System

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS F-B-2910 (Basic) Burners, Single Oil, Gas, and Gas-Oil Combination for Packaged Boilers (320,001 to 125,000,000 BTU/HR Thermal Output Capacity)

FS F-F-2901 (Basic; Notice 1) Feeders, Boiler Water Treatment, By-Pass and Compound Receiver Types

UNDERWRITERS LABORATORIES (UL)

UL 1738	(2010; Reprint May 2011) Venting Systems for Gas-Burning Appliances, Categories II, III and IV
UL 353	(1994; Reprint Nov 2011) Standard for Limit Controls
UL 795	(2011; Reprint Sep 2012) Standard for Commercial-Industrial Gas Heating Equipment

1.2 QUALITY ASSURANCE

Boiler shall be suitable for installation in the space shown with ample room for opening doors and cleaning and removal and replacement of tubes. The boiler shall bear the ASME "H" stamp for 160 psi working pressure and shall be National Board listed. The boiler shall be certified and listed by C.S.A. International under the latest edition of the harmonized ANSI Z21.13/CSA 4.9 test standard for the U.S. and Canada. The boiler shall comply with the energy efficiency requirements of the latest edition of the ASHRAE 90.1 - IP Standard and the minimum efficiency requirements of the latest edition of the BTS2000 Standard. The boiler shall be certified for indoor installation. The boiler's Thermal Efficiency shall be verified through third party testing by the Hydronics Institute Division of AHRI and listed in the AHRI Certification Directory.

1.3 NAMEPLATES

Secure a plate to each major component of equipment containing the manufacturer's name, address, type or style, model or serial number, and catalog number. Also, display an energy star label as applicable. Each pressure vessel shall have an approved ASME stamp.

1.4 SAFETY STANDARDS

Hot water boilers, burners and supplementary control devices, safety interlocks, or limit controls required under this specification, shall meet

requirements of the following standards as applicable:

- a. Gas-Fired Units: ANSI Z83.3, ANSI Z21.13/CSA 4.9 or UL 795.
- b. All Units: ASME BPVC SEC IV and ASME CSD-1.

Controls not covered by the above shall have a UL label, UL listing mark, or shall be listed in the Factory Mutual Approval Guide.

1.5 SUBMITTALS

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

SD-02 Shop Drawings

Fuel train

SD-03 Product Data

Boilers

Provide power output, thermal efficiency, ASME certification, allowable working pressure, model number, documentation for ASHRAE 90.1 - IP Energy Star qualifications or meeting FEMP requirements

Boiler trim and control equipment

Burners and control equipment

Direct Vent

Boiler Circulating Pump

SD-06 Test Reports

Operational tests

SD-07 Certificates

Boilers

Boiler trim and control equipment

Burners and control equipment

Boiler manufacturer's certificate of boiler performance including evidence that the burners provided shall be a make, model, and type certified and approved by the manufacturer of the boiler being provided.

SD-08 Manufacturer's Instructions

Boilers

Feedwater treatment feeder

SD-10 Operation and Maintenance Data

Boilers

SD-11 Closeout Submittals

Posted operating instructions for heating water boilers

PART 2 PRODUCTS

2.1 BOILERS

2.1.1 Manufactures

All boilers shall be provided by a single manufacturer. Provide materials and equipment which are the standard products of a manufacturer regularly engaged in the manufacture of the products and that essentially duplicate items that have been in satisfactory use for at least 10 years prior to bid opening. Equipment shall be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site.

2.1.2 General

MIL-B-18897. Provide hot water heating boiler complete with firing equipment, combustion chamber, insulation with steel jacket, safety and operating controls, integral electrical wiring and other appurtenances, to make the boiler a complete, self-contained, fully-automatic unit, ready for service upon completion of utility connections.

Factory-fabricated, -assembled, and -tested, fin tube condensing boiler with heat exchanger sealed pressure tight, built on a steel base; including insulated jacket; flue-gas vent; combustion-air intake connections; water supply, return, and condensate drain connections; and controls. Heat Exchanger shall be stainless steel. Stainless steel venting shall be UL 1738 prefabricated multi-wall type. Pressure vessel shall be carbon steel with welded heads and tube connections. Burner shall be natural gas with forced draft fan and prepurge and postpurge sequences.

Gas Train shall comply with ASME CSD-1 combination gas valve with manual shutoff and pressure regulator. Provide spark ignition with 100 percent main-valve shutoff with electronic flame supervision.

Each boiler shall conform to the commercial design used by the manufacturer and shall permit free thermal expansion without placing undue stress on any part of the boiler.

Each boiler shall be specifically designed for condensing application. The boiler and its accessories shall be designed and installed to permit ready accessibility for operation, maintenance, and service. The boiler capacity shall be based on the ratings shown in HYI-005 or as certified by the American Boiler Manufacturers Association, or American Gas Association. The boiler shall comply with the energy efficiency requirements of the latest edition of the ASHRAE 90.1 - IP Standard and the minimum efficiency requirements of the latest edition of the BTS-2000 Standard.

The boiler shall operate at a minimum of 94 percent thermal efficiency at full fire.

The boiler shall have an independent laboratory rating for Oxides of

Nitrogen (NOx) of 20 ppm or less corrected to 3 percent O2.

Boilers shall have a gateway device which will allow integration with BacNet (MSTP or IP) protocols. Where there is an existing BACnet building control system, the boilers shall be connected to the system and all required programming performed. In areas that do not have an existing BACnet control system, it will be for future connection when a building control system is installed.

2.2 BURNERS AND CONTROL EQUIPMENT

2.2.1 Gas-Fired Power Burner

Gas-fired power burner. FS F-B-2910. Direct spark (pilotless) type ignition system electrode-ignited natural gas type. Design burner and combustion control equipment for firing natural gas having a specific gravity of 0.6 and a heating value of approximately 1000 BTU per cubic foot and be an integral part of the boiler. Burner controls and safety equipment shall conform to applicable requirements of FS F-B-2910. Mount controls; including operating switches, indicating lights, gages, alarms, motor starters, fuses, and circuit elements of control systems on a single control panel or cabinet designed for separate mounting not on the burner in accordance with FS F-B-2910. Locate flame scanner such that testing and cleaning of scanner can be accomplished without disassembly of burner. Provide fuel train as indicated.

2.3 BOILER TRIM AND CONTROL EQUIPMENT

Provide in accordance with MIL-B-18897 and FS F-B-2910 and additional requirements specified below.

2.3.1 Emergency Disconnect Switch

Provide and locate on wall outside boiler room entrance or just inside door, when boiler room door is on building exterior to allow rapid and complete shutdown of the boiler in the event of an emergency. Emergency switch shall be a fuse-type safety switch. Switch shall be red and furnished with a label indicating function of switch.

2.3.2 Relief Valves

Provide relieving capacity for the full output of boiler installed. Relief-valve piping shall conform to ASTM A53/A53M, schedule 40 steel pipe and be piped full-size to a floor drain.

2.3.3 Pressure and Altitude Gage or Combination Pressure/Altitude Gage

 ${\tt MIL-B-18897.}$ Provide one located on supply water piping and one on return water piping.

2.3.4 Thermometer

Provide thermometer with a scale equivalent to 1.5 times outlet water temperature. Provide one located on supply water piping and one on return water piping.

2.3.5 Drain Tapping

Provide drain valve and piping to a floor drain.

2.3.6 Make-up Water Station

2.3.6.1 Pressure Reducing Station

Provide a water pressure-reducing valve and relief valve, or a combination of the two in the makeup water line to the boiler to maintain a water pressure in the hot water system. Provide a 3/4 inch globe valve by-pass around this valve.

2.3.6.2 Backflow Preventers

Provide strainer and reduced pressure backflow preventer upstream of bypass and pressure reducing valve.

2.3.7 Feedwater Treatment Feeder

Provide in accordance with FS F-F-2901, Type II - Shot-Type Feeder (manual, intermittent feed), Style A - for use with pressures up to 200 psig maximum.

2.3.8 Combustion Regulator

Provide adjustable temperature, thermostatic immersion type that shall limit boiler water temperature to a maximum of 250 degrees F. Control shall actuate burner through an electric relay system to maintain boiler water temperature within normal prescribed limits at loads within rated capacity of boiler.

2.3.9 Air Vent Valve

Provide with screwed connection, stainless steel disk, and stainless steel seats to vent entrapped air.

2.3.10 High Temperature Limit Switch

Provide immersible aquastat type with a temperature setting above that of the combustion regulator and below that of the lowest relief valve setting. Aquastat shall function to cause a safety shutdown by closing fuel valves, and shutting down burner equipment in the event that boiler water temperature rises to the high temperature limit setting. A safety shutdown due to high temperature shall require manual reset before operation can resume and prevent recycling of burner equipment.

2.3.11 Low Water Pressure Control

Provide mercury switch type. Control shall have a main scale, adjusting screws at the top of the case, and have an internal or external bellows. Control shall be the type which will open an electric circuit on a drop in pressure below a set minimum. Control shall be set and installed to cause a safety shutdown by closing fuel valves, and shutting down burner equipment in the event that water pressure in the system drops below setpoint. A safety shutdown due to low water pressure shall require manual reset before operation can resume and prevent recycling of burner equipment.

2.3.12 Low Water Level Cutoff Switch

Provide float actuated type. Low water level cutoff shall cause a safety shutdown by closing fuel valves, and shutting down burner equipment in the event that water level drops below the lowest safe permissible water level

established by the boiler manufacturer and ASME BPVC SEC IV. A safety shutdown due to low water shall require manual reset before operation can resume and prevent recycling of burner equipment.

2.3.13 Boiler Safety Control Circuits

Provide boiler safety control circuits, including control circuits for burner and draft fan, shall be single-phase, two-wire one-side grounded, and not over 120 volts. Provide safety control switching in ungrounded conductors. Provide overcurrent protection. In addition to circuit grounds, ground metal parts which do not carry current to a grounding conductor.

2.3.14 Indicating Lights

Provide indicating lights as follows. Each safety interlock requiring a manual reset shall have an individually-labeled indicating light. Non-recycling controls/interlocks shall have the reset located on control/interlock itself. Indicating lights shall have colors as follows in lieu of those required by FS F-B-2910:

- a. Amber: Ignition on
- b. Green: Main fuel safety shut-off valves open
- c. Red (One for Each): Safety lockout, flame failure, low water pressure, low water level, and high temperature

2.3.15 Post-Combustion Purge

Provide controls and wiring necessary to ensure operation of draft fan for a period of not less than 15 seconds or of sufficient duration to provide four complete air changes in the boiler combustion chamber (whichever is greater) following shutdown of burner upon satisfaction of heat demand. Upon completion of post-combustion purge period, draft fan shall automatically shutdown until next restart.

2.3.16 Draft

Comply with boiler manufacturer's recommendations.

2.3.17 Direct Vent

Refer to individual boiler sizes for requirements

Provide drain and condensate neutralization kit.

2.4 BOILER (399,000 - 800,000 BTUH)

The boiler shall be capable of full modulation firing down to 20 percent of rated input with a turndown ratio of 5:1.

2.4.1 General

The boiler shall bear the ASME "H" stamp for 160 psi working pressure and shall be National Board listed. There shall be no banding material, bolts, gaskets or "O" rings in the header configuration. The 316L stainless steel combustion chamber shall be designed to drain condensation to the bottom of the heat exchanger assembly. A built-in trap shall allow condensation to

drain from the heat exchanger assembly. The complete heat exchanger assembly shall carry a ten (10) year limited warranty.

2.4.2 Efficiency

The boiler shall be certified and listed by C.S.A. International under the latest edition of the harmonized ANSI Z21.13/CSA 4.9 test standard for the U.S. and Canada. The boiler shall comply with the energy efficiency requirements of the latest edition of the ASHRAE 90.1 - IP Standard and the minimum efficiency requirements of the latest edition of the BTS2000 Standard. The boiler shall operate at a minimum of 93 percent thermal efficiency at full fire on 399,999 and 500,000 Btu/hr models and at a minimum 94 percent thermal efficiency at full fire on 600,000, 700,000 and 800,000 Btu/hr models. All models shall operate up to 98 percent thermal efficiency with return water temperatures at 100 degrees F or below. The boiler shall be certified for indoor installation. The boiler's Thermal Efficiency shall be verified through third party testing by the Hydronics Institute Division of AHRI and listed in the AHRI Certification Directory.

2.4.3 Construction

The boiler shall be constructed with a heavy gauge steel jacket assembly, primed and pre-painted on both sides. The combustion chamber shall be sealed and completely enclosed, independent of the outer jacket assembly, so that integrity of the outer jacket does not affect a proper seal. A burner/flame observation port shall be provided. The burner shall be a premix design and constructed of high temperature stainless steel with a woven metal fiber outer covering to provide modulating firing rates. The BOILER shall be supplied with a gas valve designed with negative pressure regulation and be equipped with a variable speed blower system, to precisely control the fuel/air mixture to provide modulating boiler firing rates for maximum efficiency. The boiler shall operate in a safe condition at a derated output with gas supply pressures as low as 4 inches of water column. The BOILER shall be equipped with leveling legs.

2.4.4 Controls

The boiler shall utilize a 24 VAC control circuit and components. The control system shall have an electronic display for boiler set-up, boiler status, and boiler diagnostics. All components shall be easily accessed and serviceable from the front and top of the jacket. The boiler shall be equipped with; a temperature/pressure gauge, high limit temperature control certified to UL 353, ASME certified pressure relief valve, outlet water temperature sensor, return water temperature sensor, a UL 353 certified flue temperature sensor, outdoor air sensor, low water flow protection and built-in adjustable freeze protection.

The boiler shall feature the "Smart System" control with a Multi-Colored Graphic LCD display with Navigation Dial and Soft Keys for, password security, three loop temperature setpoints with individual outdoor air reset curves, pump delay with adjustable freeze protection, pump exercise, domestic hot water prioritization with DHW modulation limiting and USB PC port connection. The boiler shall be capable of controlling a variable speed boiler pump to keep a constant Delta T at all modulation rates. The boiler shall have the capability to accept a 0-10 VDC input connection for BMS control of modulation or setpoint, enable disable of the boiler, variable system pump signal and a 0-10 VDC output of boiler modulation rate. The Boiler shall have a built-in "Cascade" with sequencing options for "lead lag" or "efficiency optimized" modulation logic, with both capable of

rotation while maintaining modulation of up to eight boilers without utilization of an external controller. Supply voltage shall be 120 volt / 60 hertz / single phase.

The boiler shall be equipped with two terminal strips for electrical connection. A low voltage connection board with 42 data points for safety and operating controls, i.e., Auxiliary Relay, Auxiliary Proving Switch, Alarm Contacts, Runtime Contacts, Manual Reset Low Water Cutoff, Flow Switch, High and Low Gas Pressure Switches, Tank Thermostat, Three Wall Thermostat/Zone Controls, System Supply Sensor, Outdoor Sensor, Building Management System Signal, Modbus Control Contacts and Cascade Control Circuit. A high voltage terminal strip shall be provided for supply voltage. The high voltage terminal strip plus integral relays are provided for independent pump control of the System pump and the Boiler pump.

The boiler shall have a gateway device which will allow integration with BacNet (MSTP or IP) protocols. Where there is an existing BACnet building control system, the boilers shall be connected to the system and all required programming performed. In areas that do not have an existing BACnet control system, it will be for future connection when a building control system is installed.

2.4.5 Venting

The boiler shall be installed and vented by one of the following methods:

2.4.5.1 Direct Vent Vertical

Direct Vent Vertical system with a vertical roof top termination of both the vent and combustion air. The flue shall be CPVC or Stainless Steel sealed vent material terminating at the roof top with the manufacturers specified vent termination. Stainless steel venting shall be UL 1738 prefabricated multi-wall type. A separate pipe shall supply combustion air directly to the boiler from the outside. The air inlet pipe may be CPVC, ABS, Dryer Vent, or Stainless Steel sealed pipe. The air inlet must terminate on the roof top with the manufacturer's specified air inlet cap. The boiler's total combined air intake length shall not exceed 100 equivalent feet. The boiler's total combined exhaust venting length shall not exceed 100 equivalent feet.

2.4.5.2 Vertical Vent with Sidewall Air

Vertical Vent with Sidewall Air system with a vertical rooftop termination of the vent with the combustion air being drawn horizontally from a sidewall. The flue shall be CPVC or Stainless Steel sealed vent material terminating at the roof top with the manufacturers specified vent termination. Stainless steel venting shall be UL 1738 prefabricated multi-wall type. A separate pipe shall supply combustion air directly to the boiler from the outside. The air inlet may be CPVC, ABS, Dryer Vent, or Stainless Steel sealed pipe. The air inlet must terminate on a sidewall using the manufacturers specified air inlet cap. The BOILER's total combined air intake length shall not exceed 100 equivalent feet. The boiler's total combined exhaust venting length shall not exceed 100 equivalent feet.

2.4.6 Additional Requirements

The boiler shall have an independent laboratory rating for Oxides of Nitrogen (NOx) of 20 ppm or less corrected to 3 percent O2. The

manufacturer shall verify proper operation of the burner, all controls and the heat exchanger by connection to water and venting for a factory fire test prior to shipping.

The boiler shall operate at altitudes up to 4,500 feet above sea level without additional parts or adjustments.

The boiler shall be suitable for use with polypropelene glycol, up to 50 percent concentration without contingencies.

2.5 ELECTRIC MOTORS

Electric motors shall meet requirements of NEMA MG 1. Motors less than 1 hp shall meet NEMA High Efficiency requirements. Motors 1 hp and larger shall meet NEMA Premium Efficiency requirements. Motors which are an integral part of the packaged boiler system shall be the highest efficiency available by the manufacturer of the packaged boiler.

2.6 BOILER CIRCULATING PUMP

Circulating pumps for hot water shall be electrically driven single-stage centrifugal type. Boiler circulating pumps shall be supported by the piping on which installed and shall be closed-coupled shaft. The pump shaft shall be constructed of corrosion-resistant alloy steel, sleeve bearings and glands of bronze designed to accommodate a mechanical seal, and the housing of close-grained cast iron. Pump seals shall be capable of withstanding 240 degrees F temperature without external cooling. The motor shall have sufficient power for the service required, shall be of a type approved by the manufacturer of the pump and shall be suitable for the available electric service. Each pump suction and discharge connection shall be provided with a pressure gauge.

PART 3 EXECUTION

3.1 EQUIPMENT INSTALLATION

Install equipment in accordance with manufacturer's installation instructions. Grout equipment mounted on concrete foundations before installing piping. Install piping in such a manner as not to place a strain on equipment. Do not bolt flanged joints tight unless they match. Grade, anchor, guide, and support piping without low pockets. Feedwater treatment feeders shall be mounted so that the top of the feeder is no higher than 48 inches above the finished floor.

3.2 EQUIPMENT FOUNDATIONS

Locate equipment foundations as indicated, designed, and made of sufficient size and weight to preclude shifting of equipment under operating conditions or under abnormal conditions that could be imposed upon the equipment. Foundations shall meet requirements of the equipment manufacturer.

3.3 BOILER CLEANING

Before being placed in service, boiler shall be boiled out for a period of 24 hours at a pressure not exceeding 12 psig. Solution to be used in the boiler for the boiling out process shall consist of two pounds of trisodium phosphate per 100 gallons of water. Upon completion of boiling out, flush out boiler with potable water, drain, and charge with chemically treated

water. Protect boiler and appurtenances against internal corrosion until testing is completed and boiler is accepted. Professional services are required for cleaning/treatment process.

3.4 FIELD QUALITY CONTROL

Perform and furnish everything required for inspections and tests as specified herein to demonstrate that boiler and auxiliary equipment, as installed, are in compliance with contract requirements. Start-up and operate the system. During this time, clean strainers until no further accumulation of foreign material occurs. Exercise care to minimize loss of water when strainers are cleaned. Adjust safety and automatic control instruments as necessary to place them in proper operation and sequence. Test instrumentation shall be calibrated and have full scale readings from 1.5 to 2 times test values.

The boilers will require a hydrostatic test performed by the Contractor and witnessed by the Naval Facilities Engineering Command Boiler Inspector.

3.4.1 Operational Tests

Operate each boiler and appurtenances prior to final testing and insure that necessary adjustments have been made. Provide testing equipment required to perform tests. During this testing period, provide operating instructions and training to persons tasked with operation of the boiler. Tests shall be accomplished with both fuels on dual fuel units and include the following:

3.4.1.1 Preliminary Operational Test

Operate the boilers continuously for a period of at least 8 hours to demonstrate proper operability of the combustion control, flame safeguard control, and safety interlocks.

3.4.1.2 Acceptance Operational Test and Inspection

Conduct a preliminary operational test prior to requesting an acceptance operational test and inspection by a Naval Facilities Engineering Command Boiler inspector. The Contracting Officer, upon receipt of the notice from the Contractor, shall request the boiler be inspected by Naval Facilities Engineering Command. Fifteen days advance notice is required for scheduling inspector to conduct acceptance operational test and inspection.

3.4.1.3 TEST OF BACKFLOW PREVENTION ASSEMBLIES

Backflow prevention assemblies shall be tested/certified by the installing contractor. After installation all double check and reduce pressure zone type back flow preventers shall be inspected, tested and certified by a certified tester and a tester certification and Test Data Certification Sheet submitted.

3.5 WASTE MANAGEMENT

Separate waste in accordance with the Waste Management Plan. Close and seal tightly all partly used adhesives and solvents; store protected in a well-ventilated, fire-safe area at moderate temperature.

-- 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

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) National Electrical Code

1.2 RELATED REQUIREMENTS

This section applies to certain sections of Division 23, "Mechanical". 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 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 $78\,$ 00, "Closeout Submittals" 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 Motors and Equipment

Provide motors, controllers, integral disconnects, and contactors with their respective pieces of equipment. Motors, controllers, integral disconnects, and contactors shall conform to Section 26 20 00, "Interior Distribution System". Extended voltage range motors shall not be permitted. Control voltage for controllers and contactors shall not exceed 120 volts nominal. When motors and equipment furnished are larger than sizes indicated, the cost of additional electrical service and related work shall be included under the section that specified that motor or equipment. Where fuse protection is specifically recommended by the equipment manufacturer, provide fused switches in lieu of non-fused switches indicated.

1.10.2 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.

3.4 CABLE TAG INSTALLATION

Install cable tags in each manhole, handhole, and vault as specified, including each splice. Install cable tags over the fireproofing, if any, and locate the tags so that they are clearly visible without disturbing any cabling or wiring in the manholes, handholes, and vaults.

MAXIMO EQUIPMENT INVENTORY UPDATE

Employee: Phone: _	/
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 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 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, Freezer Condensing Unit, Freezer 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:ElecOilLP GasNat	GasSteamWaterAir
Motor Data: HP Volts Phase	RLA RPM Frame
Tons No. of Motors no. of E	Belts Belt size(s) CFM
KW Refrig type Refrig Qty	Filter Size(s)

VAV/TAB Room Number List

Bidg:	Emplyee:	*					Phor	ne:	
100	Bldg:						Date	*	
101 131 161 201 231 261 301 331 361 102 132 162 202 232 262 302 332 362 103 133 163 203 233 263 303 333 363 104 134 164 204 234 264 304 334 364 105 135 166 205 235 265 305 335 365 106 136 166 206 236 266 306 336 366 107 137 167 207 237 267 307 337 367 108 138 168 208 238 268 308 338 368 109 139 169 209 239 269 309 339 369 110 140 170 210 240 270 310 340<	VAV/TAB	VAV/TAB Model Number:							
128 158 228 258 328 358	100	130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 151 152 153 155 156	160	201	231	261	301	331	361
	128 <u> </u>	158 <u> </u>		228 <u> </u>	258 <u> </u>		328 <u> </u>	358 <u> </u>	

<u>Instructions</u>

- (1) Confirm room numbers by visual inspection
- (2) Check the box next to each applicable room number

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
NATIONAL ELECTRICAL MANU	JFACTURERS 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 MG 1	(2014) Motors and Generators
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) National Electrical Code
	UNDERWRITERS LABORATOR	IES (UL)
UL 1		(2000) Flexible Metal Conduit
UL 1242		(2000; R 2001, Bul. 2002) Intermediate Metal Conduit
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 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	(2007; Reprint Nov 2014) Electrical Rigid Metal Conduit-Steel
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 943	(1993; R 2002, Bul. 2002) Ground-Fault Circuit-Interrupters
UL 984	(1996; Bul. 2001) Hermetic Refrigerant Motor-Compressors

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 ${\tt SUBMITTAL\ PROCEDURES:}$

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SD-02 Shop Drawings
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Panelboards

SD-03 Product Data

Receptacles

Circuit breakers

Switches

Enclosed circuit breakers

Motor controllers

Manual motor starters

SD-06 Test Reports

600-volt wiring test

Grounding system test

Ground-fault receptacle test

SD-07 Certificates

Fuses

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.

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 Intermediate Metal Conduit (IMC)

UL 1242, zinc-coated steel only.

2.2.3 Electrical, Zinc-Coated Steel Metallic Tubing (EMT)

UL 797, NEMA C80.3.

2.2.4 Flexible Metal Conduit

UL 1.

2.2.4.1 Liquid-Tight Flexible Metal Conduit, Steel

UL 360.

2.2.5 Fittings for Metal Conduit, EMT, and Flexible Metal Conduit

 ${
m UL}$ 514B. Ferrous fittings shall be cadmium- or zinc-coated in accordance with ${
m UL}$ 514B.

2.2.5.1 Fittings for Rigid Metal Conduit and IMC

Threaded-type. Split couplings unacceptable.

2.2.5.2 Fittings for EMT

Steel compression type.

2.2.6 Liquid-Tight Flexible Nonmetallic Conduit

UL 1660.

2.3 OUTLET BOXES AND COVERS

 $\mathtt{UL}\ 514\mathtt{A},\ \mathtt{cadmium}\text{-}\ \mathtt{or}\ \mathtt{zinc}\text{-}\mathtt{coated},\ \mathtt{if}\ \mathtt{ferrous}\ \mathtt{metal.}\ \mathtt{UL}\ 514\mathtt{C},\ \mathtt{if}\ \mathtt{nonmetallic}.$

2.4 CABINETS, JUNCTION BOXES, AND PULL BOXES

Volume greater than 100 cubic inches, UL 50, hot-dip, zinc-coated, if sheet steel.

2.5 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.

2.5.1 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.

2.5.1.1 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.

2.5.1.2 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.

2.5.2 Color Coding

Provide for service, feeder, branch, control, and signaling circuit conductors. Color shall be green for grounding conductors and white for neutrals; except where neutrals of more than one system are installed in same raceway or box, other neutral shall be white with colored (not green) stripe. Color of ungrounded conductors in different voltage systems shall

be as follows:

- a. 208/120 volt, three-phase
 - (1) Phase A black
 - (2) Phase B red
 - (3) Phase C blue

2.5.3 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.

2.5.4 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.

2.6 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.

2.7 DEVICE PLATES

Provide UL listed, one-piece device plates for outlets to suit the devices installed. For metal outlet boxes, plates on unfinished walls shall be of zinc-coated sheet steel or cast metal having round or beveled edges. For nonmetallic boxes and fittings, other suitable plates may be provided. Plates on finished walls shall be satin finish stainless steel or brushed-finish aluminum, minimum 0.03 inch thick. Screws shall be machine-type with countersunk heads in color to match finish of plate. Sectional type device plates will not be permitted. Plates installed in wet locations shall be gasketed and UL listed for "wet locations."

2.8 SWITCHES

2.8.1 Toggle Switches

NEMA WD 1, UL 20, single pole totally enclosed with bodies of thermoplastic and/or thermoset plastic and mounting strap with grounding screw. Handles shall be ivory 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.

2.8.2 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 enclosure as indicated on drawings per NEMA ICS 6.

2.9 RECEPTACLES

UL 498, hard use, heavy-duty, grounding-type. Ratings and configurations shall be as indicated. Bodies shall be of ivory 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.

2.9.1 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."

2.9.2 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 PANELBOARDS

UL 67 and UL 50 having a short-circuit current rating of 22,000 amperes symmetrical minimum. Panelboards for use as service disconnecting means shall additionally conform to UL 869A. Panelboards shall be circuit breaker-equipped . Design shall be such that individual breakers can be removed without disturbing adjacent units or without loosening or removing supplemental insulation supplied as means of obtaining clearances as required by UL. "Specific breaker placement" is required in panelboards to match the breaker placement indicated in the panelboard schedule on the drawings. Use of "Subfeed Breakers" is not acceptable unless specifically indicated otherwise. Main breaker shall be "separately" mounted "above" branch breakers. Where "space only" is indicated, make provisions for future installation of breakers. Panelboard locks shall be keyed same. Directories shall indicate load served by each circuit in panelboard. Directories shall also indicate source of service to panelboard (e.g., Panel PA served from Panel MDP). Provide new directories for existing panels modified by this project as indicated. Type directories and mount in holder behind transparent protective covering. Panelboards shall be listed and labeled for their intended use.

2.10.1 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.

2.10.2 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 without a self-contained bracket and not secured by a positive locking device requiring mechanical release for removal are unacceptable. Series rated circuit breakers and plug-in circuit breakers are unacceptable.

2.10.2.1 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.

2.10.2.2 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.

2.10.2.3 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.

2.11 ENCLOSED CIRCUIT BREAKERS

UL 489. Individual molded case circuit breakers with voltage and continuous current ratings, number of poles, overload trip setting, and short circuit current interrupting rating as indicated. Enclosure type as indicated. Provide solid neutral.

2.12 MOTOR CIRCUIT PROTECTORS (MCP)

Motor circuit protectors; UL 489. MCPs shall consist of an adjustable instantaneous trip circuit breaker in conjunction with a combination motor controller which provides coordinated motor circuit overload and short circuit protection. MCPs shall be rated in accordance with NFPA 70.

2.13 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.

2.13.1 Cartridge Fuses, Current Limiting Type (Class R)

UL 198E, Class RK-1 and RK-5time-delay type. Associated fuseholders shall

be Class R only.

- 2.13.2 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.
- 2.13.3 Cartridge Fuses, Current Limiting Type (Class T)

 ${\tt UL}$ 198H, Class T for zero to 1,200 amperes, 300 volts; and zero to 800 amperes, 600 volts.

2.14 MOTORS

NEMA MG 1; hermetic-type sealed motor compressors shall also comply with UL 984. Provide the size in terms of HP, or kVA, or full-load current, or a combination of these characteristics, and other characteristics, of each motor as indicated or specified. Determine specific motor characteristics to ensure provision of correctly sized starters and overload heaters. Motors for operation on 208-volt, 3-phase circuits shall have terminal voltage rating of 200 volts, and those for operation on 480-volt, 3-phase circuits shall have terminal voltage rating of 460 volts. Motors shall be designed to operate at full capacity with voltage variation of plus or minus 10 percent of motor voltage rating.

2.14.1 Motor Sizes

Provide size for duty to be performed, not exceeding the full-load nameplate current rating when driven equipment is operated at specified capacity under most severe conditions likely to be encountered. When motor size provided differs from size indicated or specified, make adjustments to wiring, disconnect devices, and branch circuit protection to accommodate equipment actually provided.

2.15 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 For each motor not in sight of controller or where controller disconnecting means is not in sight of motor location and driven machinery location, controller disconnecting means shall be capable of being locked in open position. As an alternative, provide a manually operated, lockable, nonfused switch which disconnects motor from supply source within sight of motor. Overload protective devices shall provide adequate protection to motor windings; be thermal inverse-time-limit type; and

include manual reset-type pushbutton on outside of motor controller case. Cover of combination motor controller and manual switch or circuit breaker shall be interlocked with operating handle of switch or circuit breaker so that cover cannot be opened unless handle of switch or circuit breaker is in "off" position. Minimum short circuit withstand rating of combination motor controller shall be 22,000 rms symmetrical amperes.

2.15.1 Enclosures for Motor Controllers

NEMA ICS 6.

2.15.2 Terminal Blocks

NEMA ICS 4.

2.16 MANUAL MOTOR STARTERS (MOTOR RATED SWITCHES)

Single, Double, and Three pole designed for surface mounting with overload protection. Manual Motor Starters shall be provided with cover or device so that they can be locked in the open position.

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 NAMEPLATES

Provide as specified in Section 26 00 00, "Basic Electrical Materials and Methods."

2.19 FIRESTOPPING MATERIALS

Provide firestopping around electrical penetrations in accordance with Section 07 84 00, "Firestopping."

PART 3 EXECUTION

3.1 INSTALLATION

Electrical installations shall conform to requirements of NFPA 70 and to requirements specified herein.

3.1.1 Service Entrance Identification

Service entrance disconnect devices, switches, and enclosures shall be labeled and identified as such.

3.1.1.1 Labels

Wherever work results in service entrance disconnect devices in more than one enclosure, as permitted by NFPA 70, each enclosure, new and existing, shall be labeled as one of several enclosures containing service entrance disconnect devices. Label, at minimum, shall indicate number of service disconnect devices housed by enclosure and shall indicate total number of enclosures that contain service disconnect devices. Provide laminated plastic labels conforming to paragraph entitled "Nameplates." Use lettering of at least 0.25 in in height, and engrave on black-on-white matte finish. Service entrance disconnect devices in more than one

enclosure, shall be provided only as permitted by NFPA 70.

3.1.2 Wiring Methods

Provide insulated conductors installed in rigid steel conduit, IMC, rigid nonmetallic conduit, or EMT, except where specifically indicated or specified otherwise or required by NFPA 70 to be installed otherwise. Grounding conductor shall be separate from electrical system neutral conductor. Provide insulated green equipment grounding conductor for circuit(s) installed in conduit and raceways. Minimum conduit size shall be 1/2 in in diameter for low voltage lighting and power circuits. Vertical distribution in multiple story buildings shall be made with metal conduit in fire-rated shafts. Metal conduit shall extend through shafts for minimum distance of 6 in. Conduit which penetrates fire-rated walls, fire-rated partitions, or fire-rated floors shall be firestopped in accordance with Section 07 84 00, "Firestopping".

3.1.2.1 Restrictions Applicable to EMT

- a. Do not install underground.
- b. Do not encase in concrete, mortar, grout, or other cementitious materials.
- c. Do not use in areas subject to severe physical damage including but not limited to 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.

3.1.2.2 Restrictions Applicable to Flexible Conduit

Use only as specified in paragraph entitled "Flexible Connections."

3.1.3 Conduit Installation

Unless indicated otherwise, conceal conduit under floor slabs and within finished walls, ceilings, and floors. Keep conduit minimum 6 in away from parallel runs of flues and steam or hot water pipes. Install conduit parallel with or at right angles to ceilings, walls, and structural members where located above accessible ceilings and where conduit will be visible after completion of project.

3.1.3.1 Conduit Support

Support conduit by pipe straps, wall brackets, hangers, or ceiling trapeze. Fasten by wood screws to wood; by toggle bolts on hollow masonry units; by concrete inserts or expansion bolts on concrete or brick; and by machine screws, welded threaded studs, or spring-tension clamps on steel work. Threaded C-clamps may be used on rigid steel conduit only. Do not weld conduits or pipe straps to steel structures. Load applied to fasteners shall not exceed one-fourth proof test load. Fasteners attached to concrete ceiling shall be vibration resistant and shock-resistant. Holes cut to depth of more than 1 1/2 in in reinforced concrete beams or to depth of more than 3/4 in in concrete joints shall not cut main reinforcing

bars. Fill unused holes. In 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.

3.1.3.2 Directional Changes in Conduit Runs

Make changes in direction of runs with symmetrical bends or cast-metal fittings. Make field-made bends and offsets with hickey or conduit-bending machine. Do not install crushed or deformed conduits. Avoid trapped conduits. Prevent plaster, dirt, or trash from lodging in conduits, boxes, fittings, and equipment during construction. Free clogged conduits of obstructions.

3.1.3.3 Pull Wire

Install pull wires in empty conduits. Pull wire shall be plastic having minimum 200-lb tensile strength. Leave minimum 36 in of slack at each end of pull wire.

3.1.3.4 Locknuts and Bushings

Fasten conduits to sheet metal boxes and cabinets with two locknuts where required by NFPA 70, where insulated bushings are used, and where bushings cannot be brought into firm contact with the box; otherwise, use at least minimum single locknut and bushing. Locknuts shall have sharp edges for digging into wall of metal enclosures. Install bushings on ends of conduits, and provide insulating type where required by NFPA 70.

3.1.3.5 Flexible Connections

Provide flexible steel conduit between 3 and 6 ft in length for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for motors. Install flexible conduit to allow 20 percent slack. Minimum flexible steel conduit size shall be 1/2 in diameter. Provide liquidtight flexible nonmetallic conduit in wet and damp locations for equipment subject to vibration, noise transmission, movement or motors. Provide separate ground conductor across flexible connections.

3.1.4 Boxes, Outlets, and Supports

Provide boxes in wiring and raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures. Boxes for metallic raceways shall be cast-metal, hub-type when located in wet locations, when surface mounted on outside of exterior surfaces, when surface mounted on interior walls exposed up to 7 ft above floors and

walkways, 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.

3.1.4.1 Boxes

Boxes for use with raceway systems shall be minimum 1 1/2 in deep, except where shallower boxes required by structural conditions are approved. Boxes for other than lighting fixture outlets shall be minimum 4 in square, except that 4 by 2 in boxes may be used where only one raceway enters outlet. .

3.1.4.2 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.

3.1.5 Mounting Heights

Mount panelboards, enclosed circuit breakers, motor controller and disconnecting switches so height of operating handle at its highest position is maximum 78 in above floor. Mount lighting switches 48 in above finished floor, receptacles 18 in above finished floor unless otherwise indicated, . Measure mounting heights of wiring devices and outlets in non-hazardous areas to center of device or outlet.

3.1.6 Conductor Identification

Provide conductor identification within each enclosure where tap, splice, or termination is made. For conductors No. 6 AWG and smaller diameter, color coding shall be by factory-applied, color-impregnated insulation. For conductors No. 4 AWG and larger diameter, color coding shall be by plastic-coated, self-sticking markers; colored nylon cable ties and plates; or heat shrink-type sleeves.

3.1.7 Splices

Make splices in accessible locations. Make splices in conductors No. 10 AWG and smaller diameter with insulated, pressure-type connector. Make splices in conductors No. 8 AWG and larger diameter with solderless connector, and cover with insulation material equivalent to conductor insulation.

3.1.8 Covers and Device Plates

Install with edges in continuous contact with finished wall surfaces without use of mats or similar devices. Plaster fillings are not permitted. Install plates with alignment tolerance of 1/16 in. Use of sectional-type device plates are not permitted. Provide gasket for plates installed in wet locations.

3.1.9 Electrical Penetrations

Seal openings around electrical penetrations through fire resistance-rated walls, partitions, floors, or ceilings in accordance with Section 07 84 00, "Firestopping."

3.1.10 Grounding and Bonding

In accordance with NFPA 70. Ground exposed, non-current-carrying metallic parts of electrical equipment, metallic raceway systems, grounding conductor in metallic and nonmetallic raceways, telephone system grounds, and neutral conductor of wiring systems. Where ground fault protection is employed, ensure that connection of ground and neutral does not interfere with correct operation of fault protection.

3.1.10.1 Resistance

Maximum resistance-to-ground of grounding system shall not exceed 5 ohms under dry conditions. Where resistance obtained exceeds 5 ohms, contact Contracting Officer for further instructions.

3.1.11 Equipment Connections

Provide power wiring for the connection of motors and control equipment under this section of the specification. Except as otherwise specifically noted or specified, automatic control wiring, control devices, and protective devices within the control circuitry are not included in this section of the specifications but shall be provided under the section specifying the associated equipment.

3.1.12 Government-Furnished Equipment

Contractor shall make connections to Government-furnished equipment to make equipment operate as intended, including providing miscellaneous items such as plugs, receptacles, wire, cable, conduit, flexible conduit, and outlet boxes or fittings.

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.

3.1.13.4 Continuation of Service

Maintain continuity of existing circuits of equipment to remain. Existing circuits of equipment shall remain energized. Circuits which are to remain but were disturbed during demolition shall have circuits wiring and power restored back to original condition.

3.2 FIELD QUALITY CONTROL

Furnish test equipment and personnel and submit written copies of test results. Give Contracting Officer 5 working days notice prior to each test.

3.2.1 Devices Subject to Manual Operation

Each device subject to manual operation shall be operated at least five times, demonstrating satisfactory operation each time.

3.2.2 600-Volt Wiring Test

Test wiring rated 600 volt and less to verify that no short circuits or accidental grounds exist. Perform insulation resistance tests on wiring No. 6 AWG and larger diameter using instrument which applies voltage of approximately 500 volts to provide direct reading of resistance. Minimum resistance shall be 250,000 ohms.

3.2.3 Ground-Fault Receptacle Test

Test ground-fault receptacles with a "load" (such as a plug in light) to verify that the "line" and "load" leads are not reversed.

3.2.4 Grounding System Test

Test grounding system to ensure continuity, and that resistance to ground is not excessive. Test each ground rod for resistance to ground before making connections to rod; tie grounding system together and test for resistance to ground. Make resistance measurements in dry weather, not earlier than 48 hours after rainfall. Submit written results of each test to Contracting Officer, and indicate location of rods as well as resistance and soil conditions at time measurements were made.

SECTION 28 31 76

INTERIOR FIRE ALARM AND FUTURE MASS NOTIFICATION SYSTEM

08/11

PART 1 GENERAL

1.1 RELATED SECTIONS

Division 26 applies to this section for basic electrical materials and methods, with the additions and modifications specified herein. In addition, refer to the following sections for related work and coordination:

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) Method for Measuring the
		Intelligibility of Speech Over
		Communication Systems (ASA 85)

FACTORY MUTUAL ENGINEERING AND RESEARCH (FM)

FM APP GUIDE	(updated on-line)	Approval Guide
	http://www.approv	/alquide.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
TPPP 060 41 0	(2002) B

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) Sound System Equipment - Part 16:
	Objective Rating Of Speech Intelligibility
	By Speech Transmission Index; Ed 3.0

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	(2012) Standard for Fire Safety and Emergency Symbols	
NFPA 70	(2014) National Electrical Code	
NFPA 72	(2013) National Fire Alarm and Signaling Code	
NFPA 90A	(2012) Standard for the Installation of Air Conditioning and Ventilating Systems	
NFPA 720	(2012) Standard for the Installation of Carbon Monoxide (CO) Detection and Warning Equipment	
U.S. DEPARTMENT OF DEFE	ENSE (DOD)	
UFC 3-601-02	(2010) Operations and Maintenance: Inspection, Testing, and Maintenance of Fire Protection Systems	
UFC 4-021-01	(2008; Change 1 2010) Design and O&M: Mass Notification Systems	
UNDERWRITERS LABORATORIES (UL)		
UL 1480	(2003; Reprint Jun 2010) Standard for Speakers for Fire Alarm, Emergency, and Commercial and Professional Use	
UL 1971	(2002; Reprint Oct 2008) Signaling Devices for the Hearing Impaired	
UL 2017	(2008; Reprint May 2011) General-Purpose Signaling Devices and Systems	
UL 2034	(2008; Reprint Feb 2009) Single and Multiple Station Carbon Monoxide Alarms	
UL 268	(2009) Smoke Detectors for Fire Alarm Systems	
UL 464	(2009; Reprint Jan 2011) Standard for Audible Signal Appliances	
UL 864	(2003; Reprint Jan 20110) Standard for Control Units and Accessories for Fire Alarm Systems	
UL Electrical Constructn	(Current) 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.
- b. Fire Alarm and Mass Notification Autonomous Control Unit (FMCP): A master control panel having the features of a fire alarm and mass notification control unit that are interconnected. The panel has central processing, memory, and input and output terminals, and LCD, LED Display units.
- d. Local Operating Console (LOC): A unit designed to allow emergency responders and/or building occupants to operate the MNS including delivery or recorded and/or live messages, initiate strobe and textural visible appliance operation and other relayed functions.
- d. Terminal Cabinet: A steel cabinet with locking, hinge-mounted door that terminal strips are securely mounted.
- e. Documentation Cabinet: A steel cabinet with locking, hinge-mounted door prominently labeled " SYSTEM RECORD DOCUMENTS" that stores As-Built drawings and NFPA 72 Record of Completion in paper format and a CD/DVD of site specific software stored in a CD jewel case. Cabinet to be sized to handle the contents listed in Section 3.1.1.
- f. Parts Box: A steel cabinet with locking, hinge-mounted door where parts are securely stored.

1.4 SYSTEM DESCRIPTION

1.4.1 Scope

a. This work includes completion of design and modifying the existingaddressable fire alarm system and providing capability for a future mass notification system as described herein and on the contract drawings for Building AS710. 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 operation. The existing wiring, raceways, pull boxes, outlet and mounting boxes, and alarm signal initiating devices may be re-used if compatible with the new FMCP and new MNS notification appliances.

- 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.
- c. A lockout code shall not be installed in the hardware, firmware, or software of any fire protection system; in addition, the installer and operator codes shall remain as the factory default setting.

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 (O&M) Instructions

1.4.3 Keys

Keys and locks for equipment shall be identical. Provide not less than eight keys of each type required. Master all keys and locks to a single key as required by the Installation Fire Department. LOC is not permitted to be locked or lockable.

1.5 SUBMITTALS

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

SD-02 Shop Drawings

Annotated catalog data, in table format on the drawings, showing manufacturer's name, model, voltage, and catalog numbers for equipment and components. Submitted shop drawings shall not be smaller than 24 inches by 36 inches.

Nameplates Wiring Diagrams System Layout System Operation Notification Appliances Amplifiers

SD-03 Product Data

Technical Data And Computer Software
Fire Alarm and Mass Notification Control Unit (FMCP)
Terminal cabinets
Transmitters (including housing)
Batteries
Battery chargers
Remote Fire Alarm Annunciator (RA)
Smoke sensors
Notification appliances
Addressable interface devices
Amplifiers
Tone generators
Digitalized voice generators
Digital alarm communicator transmitter (DACT)
Local Operating Console (LOC)

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, and mass notification systemor fire suppression 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/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/mass notification devices, cabinets and panels. The Fire Alarm technicians installing the equipment shall be factory trained in the installation, adjustment, testing, and operation of the equipment specified herein and on the drawings.

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 IV)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 IV) 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/mass notification system, complete, conforming to NFPA 72 and NFPA 70, 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

Install 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, Maintenance, and Programming Instructions, indexed and in booklet form. The Operation, Maintenance, and Programming 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 in addition to the list of Contact ID Point Description.
- 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 ${\tt CD/DVD}$ 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

Install a spare parts cabinet with a cylinder key locking hinge-mounted door, adjacent to the FMCP. Cabinet should be keyed to match the FMCP and be sized to accommodate the spare parts and special tools listed below. Furnish the following spare parts and accessories:

- a. Four of each type of notification appliance in the system (e.g. speaker, FA strobe, speaker/strobe, MNS strobe, etc.)
- b. Two of each type of initiating device included in the system (e.g. smoke detector, heat detector, manual station, etc.)
- c. Four fuses for each fused circuit for each FMCP. Mount spare fuses in the FMCP.

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

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. Software, connecting cables and proprietary equipment, necessary for the maintenance, testing, and reprogramming of the equipment shall be furnished to the Contracting Officer. Software required to maintain the system that is provided as part of this contract shall continue to operate for the entire lifetime of the installed equipment and not require any additional cost or renewal fees to the government.

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 24 inches by 36 inches. 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 FMCP that is visible without opening the enclosure. Major components include, but are not limited to, the following:

- a. FMCPs
- b. Automatic transmitter/transceiver
- 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 and mass notification equipment shall be listed for use under the applicable reference standards. Interfacing of Listed UL 864 or similar approved industry listing with Mass Notification Panels listed to UL 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 the same or a different brand, the manufacturer shall provide detailed modification instructions/diagrams to the installing contractor for review and confirmation by the installing contractor. This information must be provided as part of the submittal documents.

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, 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 initiating device circuits (IDC) Class "B" and install in accordance with NFPA 72. Label all IDC

devices with their address using a typed printed label.

- b. Connect alarm notification appliances and speakers to notification appliance circuits (NAC) "Class "B". Label all NAC devices with their address using a typed printed label.
- c. The system shall operate in the alarm mode upon actuation of any alarm initiating device or a mass notification signal. The system shall remain in the alarm mode until initiating device(s) or 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. The LOC shall incorporate a push button to initiate air handler shutdown.
- c. Provide signaling line circuits for each floor.
- d. Provide notification appliance circuits. The visual alarm notification appliances shall have the flash rates synchronized as required by NFPA 72.
- e. Provide electrical supervision of the primary power (AC) supply, presence of the battery, battery voltage, and placement of system modules within the control panel.
- f. 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/heat sensor in the process of being verified for the actual presence of smoke shall not initiate a trouble condition.
- g. Provide program capability via switches in a locked portion of the FMCP to bypass the automatic notification appliance circuits, fire reporting system and air handler shutdown features. Operation of this programming shall indicate this action on the FMCP display and printer output.
- h. Provide alarm verification capability for smoke sensors. Alarm verification shall initially be set for 20 seconds.
- i. Alarm, supervisory, and/or trouble signals shall be automatically transmitted to the supervising station.

- j. Alarm functions shall override trouble or supervisory functions. Supervisory functions shall override trouble functions.
- k. The system shall be capable of being programmed from the panels keyboard. Programmed information shall be stored in non-volatile memory.
- The system shall be capable of operating, supervising, and/or monitoring both addressable and non-addressable alarm and supervisory devices.
- m. There shall be no limit, other than maximum system capacity, as to the number of addressable devices, that may be in alarm simultaneously.
- n. 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 or releasing panel, the addressable fire alarm relay shall be in the vicinity of the emergency control device.
- o. 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 on Remote Fire Alarm Annunciator (RA) 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.
- p. A supervisory signal shall automatically initiate the following functions:
 - (1) Visual indication of the device operated on the FMCP, and on the remote annunciator (RA), 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.
- q. A trouble condition shall automatically initiate the following functions:
 - (1) Visual indication of the system trouble on the FMCP, and on the remote annunciator (RA), 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.

- r. The maximum permissible elapsed time between the actuation of an initiating device and its indication at the FMCP is 10 seconds.
- s. The maximum elapsed time between the occurrence of the trouble condition and its indication at the FMCP is 200 seconds.
- t. Activation of a LOC pushbutton shall activate the audible and visual alarms in the facility. The audible message shall be the one associated with the pushbutton activated.

2.4 SYSTEM MONITORING

2.4.1 Independent Fire Detection System

Each existing independent smoke detection subsystem and kitchen fire extinguishing system shall be monitored both for the presence of an alarm condition and for a trouble condition. Provide each monitored condition with a separate address. Re-use existing interface devices if they are compatible with the new FMCP.

2.5 MASS NOTIFICATION SYSTEM FUNCTIONS

2.5.1 Notification Appliance Network

The audible notification appliance network consists of speakers located to provide intelligible instructions at all locations in the building. The 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 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.

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 independent smoke detection systems, relays for output function actuation, 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 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, and to control door holders or initiate elevator fire service. 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 ISOLATION MODULES

Provide isolation modules to subdivide each signaling line circuit into groups of not more than 20 addressable devices between adjacent isolation modules.

2.10 SMOKE SENSORS

2.10.1 Photoelectric Smoke Sensors

Provide addressable photoelectric smoke sensors as follows:

- a. Provide analog/addressable photoelectric smoke sensors utilizing the photoelectric light scattering principle for operation in accordance with UL 268. Smoke sensors shall be listed for use with the fire alarm control panel.
- b. Provide self-restoring type sensors that do not require any readjustment after actuation at the FMCP 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. Label each base with its address utilizing a typed printed label.
- 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.)2.10.2 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.

2.10.3 Carbon Monoxide Detector

UL 2034, Multiple station detector wall mounted. Combination smoke/CO detectors are not permitted. Detectors are to be tamper resistant. Operational requirements shall be as follows:

- a. Electrical: 24 Volt DC powered from FMCP.
- 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 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. 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 which prevents the entrance of insects or airborne materials. The screen shall not inhibit the movement of smoke particles into the chamber.
- f. 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. Label each base with its address utilizing typed, printed label.
- g. 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.

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, maintenance-free (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 the greater of the following two capacities:

- a. Sufficient capacity to operate the system under supervisory conditions, including audible signal devices for 48 hours and audible and visual signal devices under alarm conditions for an additional 15 minutes.
- b. Sufficient capacity to operate the mass notification for 60 minutes in alarm immediately after initial loss of AC power.

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. The calculations shall include a 20% safety margin on the ampere-hour.
 - (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 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 meansThe mass notification control unit shall have the capability of temporarily deactivate the fire alarm audible notification appliances while delivering voice message. At least two lines of information with a minimum of 20 characters per line displayed. The total number of characters shall be 80 minimum. The LCD text display size shall meet the requirements of Chapter 24 of NFPA 72.
- c. The 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 FMCP. 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 FMCP. 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 two-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 but not in stairs or elevator cabs. A live voice message shall override the automatic audible output through use of a microphone input at the control panel or the LOC.

- a. When using the microphone, live messages shall be broadcast throughout a selected floor or floors or all call. 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 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. 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 functions 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
 - "May I have your attention please. May I have your attention
 please. An fire emergency has been reported in the building.
 Please leave the building by the nearest exit or exit stairway. ."
 (Provide a 2 second pause.) "May I have your attention please,
 (repeat the message)."

b. Carbon Monoxide Alarm

- (1) "May I have your attention please. May I have your attention please. A carbon monoxide emergency has been reported in the building. Please leave the building by the nearest exit or exit stairway." (Provide a 2 second pause.) "May I have your attention please...(repeat the message)."
- c. Include ALL installation specific messages in this section. Pre-recorded messages shall address at least these subjects:
 - (1) Bomb threat or actual bomb within/around the building.
 - (2) Intruder/hostile person sighted within/around the building.
 - (3) Directions to occupants to take cover within the building.
 - (4) Evacuation of the building using exits other than the normal main

entrance/exit (since the front entrance/exit is often a location targeted by terrorists.

- (5) Emergency weather conditions appropriate for the local area.
- (6) "All Clear" message.
- (7) A test message intended for verifying functionality of the system.
- c. The LOC shall incorporate a Push-To-Talk (PTT) microphone, redundant controls and system status indicators of/for the system. The unit shall incorporate microphone override of any tone generation or prerecorded messages. The unit shall be fully supervised from the control panel. The housing shall contain a latch (not lock).
- d. Auxiliary Input Module shall be designed to be an outboard expansion module to either expand the number of optional LOC's, or allow a telephone interface.
- e. LOC shall incorporate a Push-To-Talk (PTT) microphone, and controls to allow Public Address paging in the facility (if provided). The Public Address paging function shall not override any alarm or notification functions and shall be disabled by such signals. The microphone shall be handheld style. All wiring to the LOC shall be supervised in accordance with UFC 4-021-01. Systems that require field modification or are not supervised for multiple LOC's shall not be approved.

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 FMCP 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 Generator

The tone generator shall be of the modular, plug-in type with securely attached labels to identify the component as a tone generator and to identify the specific tone it produces. The tone generator shall produce a code 3 temporal tone and 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 CO Tone Generator

The tone generator shall be of the modular, plug-in type with securely attached labels to identify the component as a tone generator and to identify the specific tone it produces. The tone generator shall produce a single tone pattern consisting of 4 cycles of 100 milliseconds "on" and 100 milliseconds "off" followed by 5 seconds "off", and shall be constantly repeated until interrupted by either the digitalized voice message, the microphone input, or the alarm silence mode as specified. Each cycle shall last approximately 4 seconds. The tone generator shall be single channel with an automatic backup generator per channel such that failure of the primary tone generator causes the backup generator to automatically take over the functions of the failed unit and also causes transfer of the common trouble relay.

2.14.6 Protection Circuits

Each amplifier shall be constantly supervised for any condition that could render the amplifier inoperable at its maximum output. Failure of any component shall cause automatic transfer to a designated backup amplifier, illumination of a visual "amplifier trouble" indicator on the control panel, appropriate logging of the condition on the system printer, and other actions for trouble conditions as specified.

2.15 ANNUNCIATOR

2.15.1 Remote Fire Alarm Annunciator (RA)

Provide an annunciator that includes an LCD display. The display shall indicate the device in trouble/alarm or any supervisory device. Display the device name, address, and actual building location.

A building floor plan shall be provided mounted (behind plexiglass or similar protective material) at the annunciator location. The floor plan shall indicate all rooms by name and number including the locations of stairs and elevators. The floor plan shall show all devices and their programmed address to facilitate their physical location from the LCD display information.

2.15.2 Programming

Where programming for the operation of the annunciator is accomplished by a separate software program than the software for the FMCP, the software program shall not require reprogramming after loss of power. The software shall be reprogrammable in the field.

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 white. Recessed

audible appliances shall be installed with a grill that is painted white.

- 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 wall mounted 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.
- d. Exterior supervised horn loud speakers shall be a STH-15S. The horn shall be weather resistant and constructed of heavy gauge, treated aluminum. The horn shall be able to operate within any ambient temperature environment ranging from 150 degrees F. to -30 degrees F. The horn shall be a double reentrant type with a 15 watt RMS audio power rated compression driver producing a UL rated 102 dB measured at 15 watts at 10 feet. The horn shall have an impedance selection via a 7 position switch of 5000, 2500, 1300, 666, 333, 89 & 45. Power taps shall be available at 2.0, 4.0, 7.5, and 15 watts for the 100 volt line, .9, 1.8, 3.8, 7.5, and 15 watts for the 70 volt line and .48, .94, 1.8, 7.5, and 15 watts for the 25 volt line. Each power tap shall have a 3dB incremental rating. The frequency response range shall be 400 -4000 Hz. The horn shall have a dispersion of 70 degrees. The horn assembly shall be furnished with a mounting bracket that allows adjustment on either a vertical or horizontal plane with a single locking pin and include provisions for mounting, banding or strapping. Wiring terminals shall be fully enclosed and a vandal-resistant adapter cover shall provide connection protection for cable or conduit. The horn shall be 7.875 inches W x 8.75 inches H x 9.313 inches D. The horn shall be finished in gray baked epoxy.

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). Fire Alarm/Mass Notification Appliances shall have clear high intensity optic lens, xenon flash tubes, and output white light and be marked "ALERT" in red letters. The light pattern shall be disbursed so that it is visible above and below the strobe and from a 90 degree angle on both sides of the strobe. Strobe flash rate shall be 1 flash per second and a minimum of 15 candela (actual output after derating for tinted lens) based on the UL 1971 test. Strobe shall be 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 KNOX BOX

The Knox Box must be in accordance with the Base Fire Department's specifications and be keyed per the Fire Department's requirements.

2.18 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.

2.19 INTERFACE TO THE BASE WIDE MASS NOTIFICATION NETWORK

2.19.1 Secure Radio System

2.19.1.1 Communications Network

The communications network provides two-way signals between central control units and autonomous control units (in individual building systems), and should include redundant (primary and backup) communication links. The system shall incorporate technology to prevent easy interruption of the radio traffic for MNS Alerting.

2.19.1.2 Radio Frequency Communications

Use of radio frequency-type communications systems shall comply with National Telecommunications and Information Administration (NTIA) requirements. The systems shall be designed to minimize the potential for interference, jamming, eavesdropping, and spoofing.

2.20 AUTOMATIC FIRE TRANSMITTERS

2.20.1 Digital Alarm Communicator Transmitter (DACT)

Provide DACT that is compatible with the existing supervising station fire alarm system. Provide a point 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.
- 2.20.2 Signals to Be Transmitted to the Base Receiving Station

The following signals shall be sent to the base receiving station:

- a. Manual pull stations
- b. Smoke detectors
- c. Duct smoke detectors
- d. Heat detectors
- e. Fire Extinguishing System
- f. Carbon Monoxide Detector
- g. All other signals as required elsewhere in this specification

2.21 WIRING

Provide wiring materials under this section as specified in Division 26 with the additions and modifications specified herein. NFPA 70 accepted fire alarm cables that do not require the use of raceways except as modified herein are permitted. All fire alarm cables are to be installed in metallic conduit.

2.21.1 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. 14 AWG size twisted and shielded solid conductors at a minimum. Visual notification appliance circuit conductors, that contain audible alarm appliances, shall be solid copper No. 14 AWG size conductors at a minimum. Speaker circuits shall be copper No. 16 AWG size twisted and shielded 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. Recess the enclosure with

the top of the cabinet 6 feet above the finished floor or center the cabinet at 4 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 a Documentation Cabinet. Documentation Cabinet shall be prominently labeled "System Record Documents" with a cylinder key locking hinge-mounted door keyed identical to the FMCP. Items to be stored within cabinet are completed record of inspection and testing, cd/dvd of site specific software stored in a cd jewel case, as-built drawings, NFPA 72 Record of Completion and installer business card. Locate Documentation Cabinet adjacent to 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 44 inches 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. 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 Heat Sensors

Locate sensors as required by NFPA 72, their listings, and as indicated on a 4 inch mounting box. Locate smoke and heat sensors on the ceiling. Install heat sensors not less than 4 inches from a side wall to the near edge. Heat sensors located on the wall shall have the top of the sensor at least 4 inches below the ceiling, but not more than 12 inches below the ceiling. 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.

3.1.5 Remote Annunciator (RA)

Locate the remote annunciator as shown on the drawings. Flush mount the panel, with the top of the panel 6 feet above the finished floor or center the panel at 5 feet, whichever is lower.

3.1.6 Carbon Monoxide Detectors

Locate detectors as required by NFPA 720 and their listings and as shown on the drawings on a 4 inch mounting box. Sensors located on the ceiling shall be installed not less than 12 inches from a side wall to the near edge. Those located on the wall shall have the top of the sensor at least 4 inches below the ceiling, but not more than 12 inches below the ceiling. Install detectors no closer than 10 feet from fuel fired appliances.

3.1.7 Local Operating Console (LOC)

Locate the LOC as required by NFPA 72and as indicated. Mount the console so that the top message button is no higher than 44 inches above the floor.

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. Permanently label each conductor. 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 FMCP 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 or tubing (rigid, IMC, EMT, FMC, etc. as permitted by NFPA 72 and NFPA 70). Conceal conduit in finished areas of new construction and wherever practicable in existing construction. The use of flexible conduit not exceeding a 6 foot length shall be permitted in initiating device or notification appliance circuits. All wiring must be solid copper, except for speaker circuits or circuits requiring shielding.

Use of cables that do not require a raceway as stated hereinbefore are permitted; install them in accordance with NFPA 70. Protect any exposed (as defined in NFPA 70) cables against physical damage by the use of magnetic raceways which shall also be red colored. Utilize shielded wiring where recommended by the manufacturer. For shielded wiring, ground the shield at only one point, that is in or adjacent to the FMCP. Pigtail or T-tap connections to signal line circuits, initiating device circuits, supervisory alarm circuits, and notification appliance circuits are prohibited. T-tapping using screw terminal blocks is allowed for Class "B" signaling line circuits. Color coding is required for circuits and shall be maintained throughout the circuit. Conductors used for the same functions

shall be similarly color coded. Conform wiring to NFPA 70.

3.2.4 Conductor Terminations

Labeling of conductors at terminal blocks in terminal cabinets, FMCP, remote annunciator, and the LOC 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, FMCP, and remote annunciator shall contain a laminated drawing that indicates each conductor, its label, circuit, and terminal. The laminated drawing shall be neat, using 12 point lettering minimum size, and mounted within each cabinet, panel, or unit so that it does not interfere with the wiring or terminals. Maintain existing color code scheme where connecting to existing equipment.

3.3 DISCONNECTION AND PARTIAL REMOVAL OF EXISTING SYSTEM

Maintain fire alarm system fully operational. Phase the work such that the system is operational at the end of the work day. If returning the system to normal at the end of the day is not possible, A fire watch must be provided.

- b. Disconnect and partially remove the existing fire alarm and smoke detection system where indicated on the drawings and described elsewhere in this 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 FIRESTOPPING

Provide firestopping for holes at conduit penetrations through floor slabs and fire rated walls and shafts in accordance with Section 07 84 00 FIRESTOPPING.

3.5 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.

3.6 FIELD QUALITY CONTROL

3.6.1 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.

3.6.2 Tests Stages

3.6.2.1 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.

3.6.2.2 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.

3.6.2.3 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 Contracting Offices Designated Representative (COR). At this time, any and all required tests shall be repeated at their discretion.

3.6.2.4 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.
- d. Include a list of contact ID point descriptions.

In existing buildings, the transfer of devices from the existing system to the new system and the permission to begin demolition of the old fire alarm system will not be permitted until the as-built drawings and O&M and programming manuals are received.

3.6.3 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 FMCP. Hard copy records of the software shall be provided to the Contracting Officer.
- 1. 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.

3.6.3.1 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.

3.7 INSTRUCTION OF GOVERNMENT EMPLOYEES

Equipment manufacturer or experienced training representative shall provide $2\ \text{days}$ on-site instruction to the government.

3.7.1 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 and fire detection 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.

3.7.2 Required Instruction Time

Provide 2 days (16 hours) of on-site 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.

3.7.2.1 Technical Training

Equipment manufacturer or a factory representative shall provide 3 days of technical training for three government employees at the manufacturing facility. Training shall allow for classroom instruction as well as individual hands on programming, troubleshooting and diagnostics exercises. Transportation, room, and board shall be included for three government personnel. Training shall occur within 6 months of system acceptance.

3.8 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 qualified technicians to implement future changes to the fire alarm system shall be provided as part of this contract.

Maintenance software 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. 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 --

Asbestos Survey –R2

At: | Camp Lejeune

Building AS-710 - Boiler

Prepared for: | CBHF Engineers, PLLC

3808 Park Ave.

Wilmington, NC 28403

PEI Project No.: | 5195-15-0005-2AL

Date: July 24, 2015

Inspector: Jonathan Guetta

NC Asbestos Inspector 11936

Prepared by:



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July 24, 2015

CBHF Engineers, PLLC Attn: Allen Cribb, PE 3808 Park Avenue Wilmington, NC 28403

Re: Limited Asbestos Survey - R2:

Camp Lejeune Building AS 710 Boiler Replacement

Precision Project No.: 5195-15-0004-2AL

On June 3, 2015, Jonathan Guetta and Michael Krupa (NC Asbestos Inspector Accreditation #11936 and #12880, respectively) of Precision Environmental Inc. (Precision) conducted a limited asbestos survey within the above referenced building. The sampling was limited to suspect asbestos-containing materials that will be affected by the upcoming boiler replacement renovations. The inspection took place within the boiler room and kitchen area that will be affected by the renovations.

The purpose of the survey was to verify the presence or absence of asbestos containing materials (ACM) associated with the renovation area prior to renovation procedures.

Prior to sample collection, a visual inspection was conducted in order to determine homogeneous materials/areas and sample locations. Homogeneous Areas (HGA) are determined by the materials' color and texture. Asbestos containing materials are defined by the following descriptions: surfacing material (SM), thermal system insulation (TSI) and miscellaneous materials (Misc.). Both friable and non-friable materials were included in the inspection. Friable materials are defined as those that can be pulverized by hand pressure.

Sample locations were selected at random.

As a result, a total of thirteen (13) bulk samples were collected from six (6) different suspect asbestos-containing materials. A listing of identified suspect ACM materials and the number of samples collected from each homogeneous area (HGA) is provided in Table 1 below:

 Table 1: Identified Suspect Asbestos Materials

Suspect material (HGA)	Descripti on	Friable/N on-friable	Sample Location	No. of Samples Collected
Boiler flue packing	M	F	At east chimney penetration	2
2. TSI Large diameter pipe under metal				
wrap	TSI	F	At rear of boiler	3
3. Boiler flue packing	M	F	At rear of boiler	2
4. Door caulk	M	NF	Exterior double doors, Ground Floor	2
5. Boiler breeching (rectangular)	TSI	F	At rear of boiler	2
6. White HVAC duct mastic	M	NF	Kitchen Storage	2

SM=Surfacing material/TSI=Thermal system insulation/M= Miscellaneous material/F=Friable/NF=Non-friable

Page 2 of 4

Collected samples were given a unique identification number, which included the date, the building number (710) and sample number, logged onto a chain of custody form and shipped to an accredited laboratory for analysis. All samples were analyzed by Polarized Light Microscopy (PLM) via EPA method 600/M4/82/020. Multi layered samples were separated prior to analysis and analyzed separately per EPA protocol. In an effort to reduce cost, Precision instructed the laboratory to STOP analysis at the first positive sample for each suspect material HGA and not to analyze the remaining samples from the same HGA. As a result, a total of thirteen (13) samples were analyzed.

Results

Laboratory analysis of bulk samples collected revealed that <u>none</u> of the suspect materials sampled contain greater than 1% asbestos via PLM analysis and may be treated as non-asbestos containing materials.

Listing of identified NON-ACM materials is provided in Table 2 below:

Table 2: Identified NON-ACM Materials

Material	Descripti on	Friable/ Non- friable	Location	Laboratory Result	Approx. Quantity
1. Boiler flue packing	M	F	At east chimney penetration	None-detected	N/A
2. TSI Large diameter pipe under metal wrap	TSI	F	At rear of boiler	None-detected	N/A
3. Boiler flue packing	M	F	At rear of boiler	None-detected	N/A
4. Door caulk	M	NF	Exterior double doors on Ground Floor and rooftop level door to Mechanical Room	0.5% Chrysotile asbestos	N/A
5. Boiler breeching (rectangular)	TSI	F	At rear of boiler	None-detected	N/A
6. White HVAC duct mastic	M	NF	Kitchen Area near dishwasher	None-detected	N/A

N/A = Not Applicable

A physical/visual inspection revealed the following:

- Walls in the boiler room are non-suspect cinderblock
- Floors in the boiler room are non-suspect concrete
- Remaining TSI within boiler room and on the mezzanine is non-suspect fiberglass or foam block
- HVAC duct insulation within the boiler room is non-suspect fiberglass
- No HVAC duct mastic was noted on HVAC duct within the boiler room
- Walls in the kitchen are non-suspect cinderblock and ceramic tile
- Floors in the kitchen are non-suspect ceramic tile
- TSI within the kitchen is non-suspect fiberglass
- HVAC duct insulation within the kitchen is non-suspect fiberglass

Page 3 of 4

As per the Scope of Work, this inspection is to be compared to the base survey findings for building AS 710 (attached) provided prior to Precision's on site survey. While the Precision inspection conducted on June 3, 2015 found no materials contained asbestos in quantities greater than 1% via PLM analysis, the base survey findings listed the following materials as asbestos containing:

- Gasket material on boiler flue
- Caulking material on mechanical room doors
- Gasket material on the side of the boiler
- Mudded fittings within the boiler room
- Pipe insulation within the boiler room
- Pipe insulation debris within the boiler room
- Boiler flue capping within the boiler room

Note: Base survey findings do not list accredited laboratory, or inspector information. In addition, no information was proved on previous renovations/abatement projects within the space.

Based on the base survey, the following materials will be assumed to be asbestos containing in regards to the upcoming renovation project:

- Gasket material on boiler flue: approx.8 square feet.
- Gasket material on the side of the boiler: Approx. 2 square feet
- Mudded fittings within the boiler room: Approx. 4 linear feet
- Pipe insulation within the boiler room: Approx. 8 linear feet
- Pipe insulation debris within the boiler room
- Boiler flue capping within the boiler room: Approx. 2 square feet

Based on the assumed materials listed above, the following procedures will be utilized during abatement procedures:

- A. Asbestos abatement procedures involving all asbestos containing materials listed above shall take place utilizing regulated removal procedures (OSHA Class I).
- B. The asbestos abatement project will consist of furnishing all labor, material, equipment, licenses and permits required to perform abatement procedures of above listed materials within the mechanical room of Building AS-710 (mechanical room).
- C. All Work shall be performed in strict accordance with all governing Federal, State and Local Codes, rules and regulations. Where conflicts occur between written specifications and applicable Federal, State and Local Codes, rules and regulations, the more stringent shall apply.
- D. Abatement procedures shall take place within a single negative pressure enclosure (NPE). The NPE shall be constructed within the mechanical room and encompass all areas located on the ground floor of the mechanical room. (The mezzanine area is not included in the NPE.)
- E. Barricade tape and appropriate warning signs shall be placed at all entrances to the work areas prior to the start of removal procedures.
- F. The NPE shall have an attached decontamination unit (DECON) and waste load out. The DECON and Waste Load Outs shall be constructed in accordance with OSHA 1926.1101.
- G. The NPEs shall be constructed of critical barriers covering all penetrations leading out of the work area (i.e. doors, windows, electrical outlets) and sufficient negative air machines in order to achieve four (4) air changes per hour and -0.02 inches of water pressure differential as compared to areas outside of the NPE. Critical barriers shall be constructed of at least one layer of 6-mil poly sheeting. Floor poly shall by 6-mil poly sheeting. Wall poly shall be 4-mil or 6 mil poly sheeting.

- H. All removed material shall be placed into 6-mil plastic disposal bags or other suitable container upon detachment from the substrate or whenever there is enough accumulating to fill a single bag or container. The contractor must maintain the surfaces of the work area free of accumulation of asbestos debris.
- I. All double bagged, labeled waste must be removed from within the structure at the conclusion or each shift.
- J. Negative air exhaust locations must be secured with plywood panels or equivalent. Entryways at the DECON must be secured at the end of each shift.
- K. All asbestos containing materials shall be removed from their substrate utilizing wet methods.
- L. All suspect debris located within the work area shall be wetted and bagged prior to the application of floor poly.
- M. Engineering controls including wall and floor poly shall remain in place until receipt of acceptable final clearance air monitoring results. (The contractor may elect to install 2 layers of floor poly and remove the top layer in order to expedite cleaning procedures.)
- N. All poly sheeting/critical barriers shall be disposed of as asbestos containing waste.
- O. The asbestos waste chain of custody shall be submitted to the owner's qualified representative within 35 days of delivery of the waste to the landfill. (Original(s) only, photocopies or scanned copies shall not be accepted.)
- P. When completing the waste disposal chain of custody, please refer to the following: (1) Generator/Owner name and address (; (2) Generator/Owner telephone number; (3) Generator/Owner representative; (4) The specific location of where the asbestos containing material was removed as well as approximate quantities.
- Q. All asbestos waste shall be stored, transported and disposed of in accordance with the following regulations as a minimum:
 - 1. US EPA NESHAPS 40 CFR 61
 - 2. US EPA Asbestos Waste Management Guidance EPA/530-SW85

All efforts were made to discover/sample all suspect asbestos containing materials. If additional materials not addressed during this inspection are to be disturbed, Precision strongly recommends that those materials either be assumed to be asbestos containing, or that bulk samples be collected to determine the materials asbestos content prior to their disturbance.

All bulk samples analytical results as well sample locations are outlined in detail on the attached "BULK SAMPLE DATA AND CHAIN OF CUSTODY" form and laboratory's "BULK ASBESTOS ANALYSIS RESULTS" form.

Attached please find the following:

- Bulk Asbestos Analysis Sheet
- Bulk Sample Data And Chain Of Custody Form
- Laboratory and Personnel Certificates

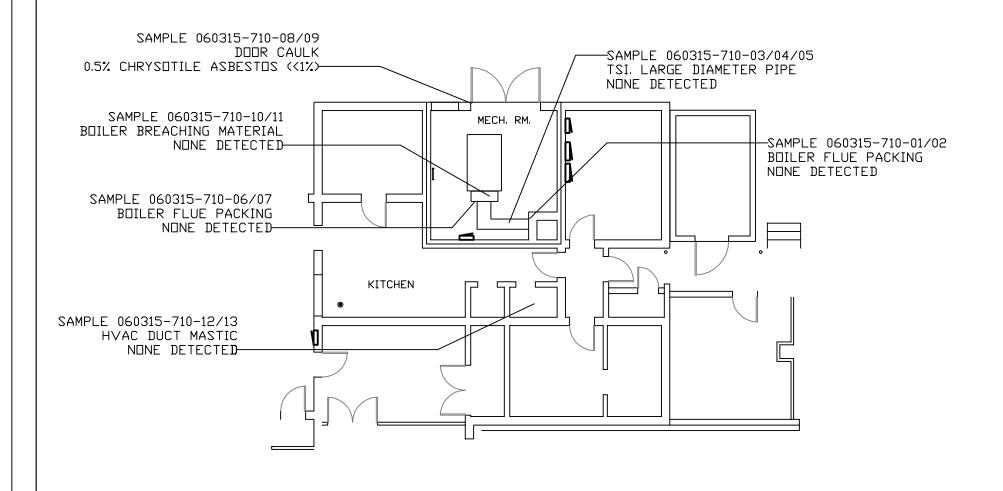
If you have any questions or require additional information please do not hesitate to contact me at (910) 763-3445.

Sincerely,

Precision Environmental Inc.

Jonathan Guetta

NC Asbestos Inspector Accreditation # 11936



CAMP LEJEUNE, NC - BLDG AS 710

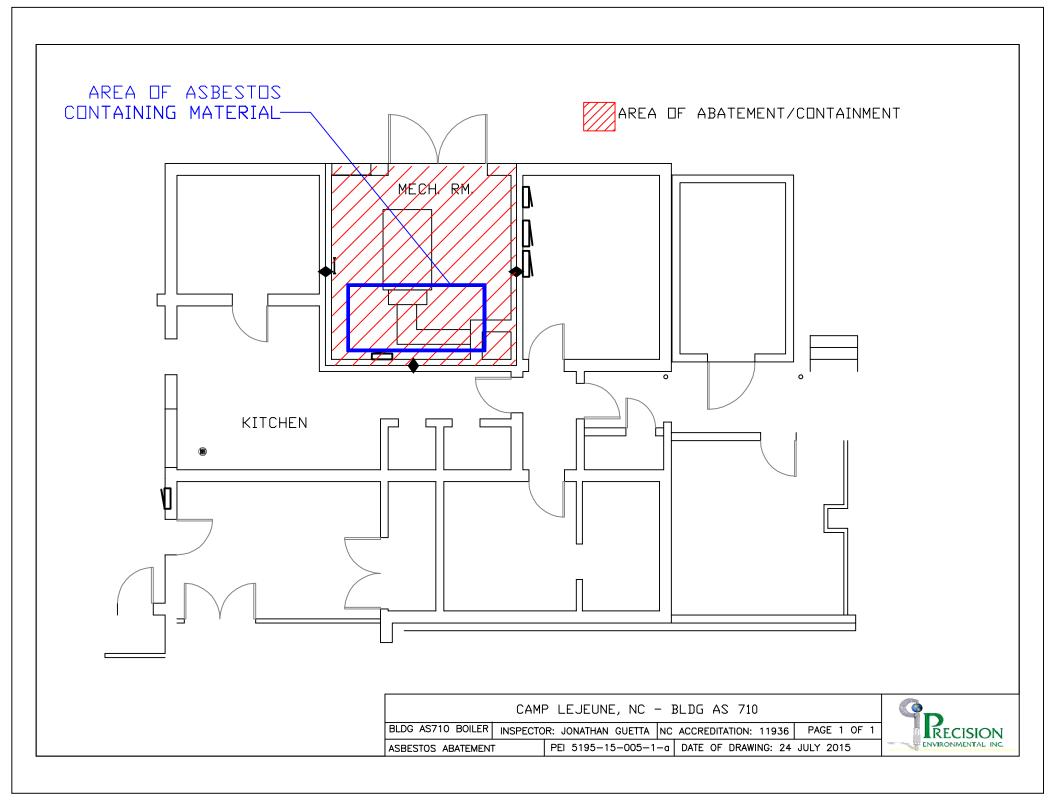
BLDG AS710 BOILER INSPECTOR: JONATHAN GUETTA NC ACCREDITATION: 11936 PAGE 1 OF 1

ASBESTOS SAMPLE LOCATION

PEI 5195-15-005-1

DATE OF DRAWING: 2 JULY 2015







BULK ASBESTOS ANALYSIS RESULTS

36-15A 23rd Street, LIC, NY 11106 Tel: 718.383.2626, Fax: 718.383.7780 Accredited by NVLAP #200640-0, NY State ELAP #11764

Client: CBHF Engineers, PLLC

3808 Park Avenue Wilmington, NC 28403 Sampling Date: 6/3/2015

Date Received: 6/4/2015 11:02:00 AM

Date Analyzed: 6/4/2015

Precision Batch # 15-2913

Methods: EPA 600/M4/82/020

ELAP 198.1

Project: Camp Lejeune, Bldg AS 710

Bldg. 3768 MCAS Cherry Pt.

Wilmington, NC

Sample #	Location	Type of Material	Method	Color	Asbestos % Type by NOB PLM/TEM	Asbestos % Type by PLM	Non-Asbestos % Fibrous	Non-Asbestos % Non-Fibrous
060315- 710-01 15-2913 -1	At east chimney penetration	Boiler flue packing	PLM	Grey		NONE DETECTED	40% FiberGlass	60% Mineral Filler
0 60315- 7 10-02 15-2913 -2	At east chimney penetration	Boiler flue packing	PLM	Grey		NONE DETECTED	40% FiberGlass	60% Mineral Filler
060315- 710-03 15-2913 -3	At rear of boiler	TSI, Large diameter pipe, under metal wrap	PLM	Tan		NONE DETECTED	10% Synthetic	90% Mineral Filler
60315- 10-04 5-2913 -4	At rear of boiler	TSI. Large diameter pipe, under metal wrap	PLM	White		NONE DETECTED	10% Synthetic	90% Mineral Filler
060315- 710-05 75-2913 -5	At rear of boiler	TSI. Large diameter pipe, under flue packing	PLM	White		NONE DETECTED	10% Synthetic	90% Mineral Filler
60315- 10-06 5-2913 -6	At rear of boiler	Boiler flue packing	PLM	Grey		NONE DETECTED	40% FiberGlass	60% Mineral Filler
0 60315- 7 10-07 75-2913-7	At rear of boiler	Boiler flue packing	PLM	Grey		NONE DETECTED	40% FiberGlass	60% Mineral Filler
0 60315- 7 10-08 15-2913 <i>-</i> 8	Exterior double doors, ground floor	Door caulk	PLM	Tan		NONE DETECTED		30% Mineral Filler 70% Organic Binde



BULK ASBESTOS ANALYSIS RESULTS

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Precision Batch # 15-2913

Methods: EPA 600/M4/82/020

ELAP 198.1

Project: Camp Lejeune, Bldg AS 710

Bldg. 3768 MCAS Cherry Pt.

Wilmington, NC

Location: Mech room / Kitchen

Sample #	Location	Type of Material	Method	Color	Asbestos % Type by NOB PLM/TEM	Asbestos % Type by PLM	Non-Asbestos % Fibrous	Non-Asbestos % Non-Fibrous
060315- 710-09 15-2913 -9	Exterior double doors, ground floor	Door caulk	PLM	Tan		0.5% Chrysotile		30% Mineral Filler 69.5% Organic Bind
06031 5- 710-10 15-2913 -10	At rear of boiler	Boiler breaching (rectangular)	PLM	Grey		NONE DETECTED	30% FiberGlass	70% Mineral Filler
060315- 710-11 15-2913-11	At rear of boiler	Boiler breaching (rectangular)	PLM	Grey	3	NONE DETECTED	30% FiberGlass	70% Mineral Filler
060315- 710-12 15-2913 -12	Kitchen storage	White HVAC duct mastic	PLM	White		NONE DETECTED	50% Cellulose 30% FiberGlass	10% Organic Binder
060315- 710-13 15-2913 -13	Kitchen storage	White HVAC duct mastic	PLM	White		NONE DETECTED	50% Cellulose 30% FiberGlass	10% Organic Binde



BULK ASBESTOS ANALYSIS RESULTS

36-15A 23rd Street, LIC, NY 11106 Tel: 718.383.2626, Fax: 718.383.7780 Accredited by NVLAP #200640-0, NY State ELAP #11764

Client: CBHF Engineers, PLLC

3808 Park Avenue Wilmington, NC 28403 Sampling Date: 6/3/2015

Date Received: 6/4/2015 11:02:00 AM

Date Analyzed: 6/4/2015

Precision Batch # 15-2913

Asbestos %

Type by NOB

PLM/TEM

Methods: EPA 600/M4/82/020

Asbestos %

Type by PLM

ELAP 198.1

Non-Asbestos

% Fibrous

Non-Asbestos %

Non-Fibrous

Project: Camp Lejeune, Bldg AS 710

Bldg. 3768 MCAS Cherry Pt.

Wilmington, NC

Location: Mech room / Kitchen

Location

Sample

Legend: TRACE = LESS THAN LIMIT OF QUANTITATION (<0.25%); ND = NONE DETECTED

Type of Material

Note 1: For point counts the limit of quantization of 0.25% is based on one asbestos point counted over 400 non-empty points.

Note 2: >1% asbestos by weight is considered an ACM (Asbestos Containing Material).

Note 3: The condition of all samples was acceptable upon receipt.

Note 4: This report must not be used by the client to claim product endorsement by NVLAP or any agency of the US Government;

Method

Note 5: This test report relates only to the items tested.

Note 6: The laboratory is not responsible for samples collected by commercial clients.

Note 7: The laboratory is not responsible for procedures requested by clients that are deviant from the EPA and ELAP protocols.

Note 8: This sample was sent to an outside laboratory for NOB-PLM and NOB-TEM analysis. See outside laboratory's Bulk Asbestos Analysis Result report. PLM is not consistently reliable in detecting asbestos in NOB materials. Quantitative TEM is currently the only method that can be used to determine if NOB material can be considered or treated as NON-ACM.

Color

Note 9: Supplement to test report Batch # _ Amendment(s) #: Amendment Date(s): By: Note 10: All bulk samples are tested for vermiculite and the amount of vermiculite calculated is reported. If no vermiculite is reported indicates that no vermiculite

is detected. If vermiculite is calculated to be 10% or more (>) the material is reported as asbestos containing materials (ACM).

The laboratory is not responsible for sample collection. This report may not be reproduced, except in full, without written approval by Precision Environmental Inc. This report may not be used to claim product endorsement by NVLAP or any other agency of the US Government. This report relates only to the samples reported above. Quality control data is available upon request.

The document(s) contained herein are confidential and privileged information, intended for the exclusive use of the individual or entity named above. Precision Environmental Inc. and its personnel shall not be liable for any misinformation provided to us by the client regarding these samples. This report relates only to samples submitted and analyzed. This report is accompanied by the PLM Analysis Letter.

Caidong Shi	1	Michael Parpounas
Analyzed by:	CS	Approved by: Cardong Stri for





BULK SAMPLE DATA AND CHAIN OF CUSTODY

TURNAROUND TIME

COMMENTS (LAB)

6hr	12 hr.	<u>x</u>	_ 24hı
48 hr	72 hr		other

161 Arlington Dr. Wilmington, NC 28401 Tel: 910-763-3445,Fax: 910-763-3415 Email: jguetta@precision-enviro.com

ANALYZED BY (FULL NAME)

Q.C. BY:

CLIENT I	NFORMATION				PRO	JECT INFOR	MATION		
						PROJECT NAME: Camp Lejeune. Bldg AS 710 Replace Boiler			
CLIENT PR						P.E. PROJECT #: Number of samples 13			
BUILDING	NAMF:			·		ECTOR(S) NAM		15	
	MCAS Cherry Pt. NC				l l	THAN GUETT			
	ADDRESS:				SAM	PLING AREAS:		DATE:	
Bldg 3768 I	MCAS Cherry Pt. NC				Mech	room/Kitchen		06	/03/15
	NSTRUCTIONS:								
report separ	ately. Separate layers of wal	a (HGA) List positive stops on san lboard/joint compound. If analysis results to: jguetta@precision-env	s of joi	nt comp	forms. Separate all cound is reveals greater	layers prior to a eater than 1% as	nalysis and bestos, comp	osite	
sample and	Te-analyze composite. Eman	results to. jguetta@precision-env	T	SAM	PLE LOCATION		<u></u>		
HOMOGENEOU S AREA (HGA)			SYSTEM	FLOOR/SPACE ID #:	SAMPLE	APPROX.			
JOF A.R.	BULK SAMPLE ID/#:	MATERIAL DESCRIPTION	SXS	# C	COORDINATES	QUANTITY	PLM	NOB-PLM	NOB-TEM
77 02	200000000000000000000000000000000000000	Boiler flue packing	1		At east chimney				
1	060315-710-01		na	na	penetration		X		
		Boiler flue packing			At east chimney	•			
1	060315-710-02		na	na	penetration		X		
		TSI. Large diameter pipe			At rear of boiler				
2	060315-710-03	Under metal wrap	na	na	At rear of boiler	<u> </u>	X		
2	060315-710-04	TSI. Large diameter pipe Under metal wrap	na	na	At leaf of bones		X		
<u> </u>	000313-710-04	TSI. Large diameter pipe		1	At rear of boiler				
2	060315-710-05	Under metal wrap	na	na			X		
3	060315-710-06	Boiler flue packing	na	na	At rear of boiler		x		
		Boiler flue packing		······································	At rear of boiler				
3	060315-710-07		na	na			X		
		Door caulk			Exterior double				
4	060315-710-08	Door caulk	na	na	doors. Ground floor Exterior double		X		
4	060315-710-09	Door cattik	na	na	doors. Ground floor	,	Х		
		Boiler breaching (rectangular)			At rear of boiler		1		-
5	060315-710-10		na	na			X		
_	060215 730 31	Boiler breaching (rectangular)			At rear of boiler		x		
5	060315-710-11	White HVAC duct mastic	na	па	Kitchen storage				
6	060315-710-12	William II VII S duct musuc	na	na	12207	į	х	-	
		White HVAC duct mastic			Kitchen storage				
6	060315-710-13		na	na			X		
			na	na			X	<u> </u>	
CHAIN OF	CUSTODY		1	1	1				I
CHAINOF	COSTODI		Ţ						T
RELINQUIS	HED BY (FULL NAME & SIG	NATURE)	REC	EIVED I	BY: (FULL NAME &	t SIGNATURE)	DATE	TIME	METHOD OF SUBMITTAL
1.Jonathan	Guetta		***	Tran	7 Hug Bro.	- 200	06/03/15	11565	Overnight mail
2.	The state of the s						6/4/15		
3.	- No.								
<u> </u>			<u> </u>					········	
I AR INTO	DNAATION								

SIGNATURE:

DATE

TIME



National Voluntary Laboratory Accreditation Program



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

Precision Environmental Inc.

36-15A 23rd Street Long Island City, NY 11106 Mr. Michael Parpounas

Phone: 718-383-2626 Fax: 718-383-7780 E-Mail: michael@precision-enviro.com URL: www.precision-enviro.com

BULK ASBESTOS FIBER ANALYSIS (PLM)

NVLAP LAB CODE 200640-0

NVLAP Code Designation / Description

EPA 600/M4-82-020: Interim Method for the Determination of Asbestos in Bulk Insulation

Samples

18/A01

2014-07-01 through 2015-06-30

Effective dates

For the National Institute of Standards and Technology

NVLAP-01S (REV. 2005-05-19)



North Carolina Department of Health and Human Services Division of Public Health

Pat McCrory Governor Aldona Z. Wos, M.D.
Ambassador (Ret.)
Secretary DHHS
Daniel Staley
Acting Division Director

June 17, 2015

Michael J Krupa 3031 Country Club Dr Hampstead, NC 28443

Dear Mr. Krupa:

Based upon the review of your accreditation application, the Health Hazards Control Unit (HHCU) has determined that you have fulfilled the requirements and are eligible for asbestos accreditation as a(n) INSPECTOR. Your assigned North Carolina accreditation number is 12880, which is reflected on your enclosed North Carolina Accreditation card. Please be sure to take this card with you to any asbestos work site where you are employed. The State requires that all persons conducting asbestos abatement or asbestos management activities be accredited and have their identification card on site.

Your North Carolina Inspector accreditation will expire on MAY 31, 2016. It is NOT the policy of the HHCU to issue renewal notices. If you wish to continue working as a(n) Inspector after this expiration date, you must successfully complete the required training and submit a completed application to this office prior to May 31, 2016. If you should continue to perform asbestos management activities as a(n) Inspector without a valid North Carolina accreditation, you will be in violation of State regulations and may be cited for noncompliance.

Sincerely,

Ed Norman

Program Manager

Health Hazards Control Unit

Enclosure







North Carolina Department of Health and Human Services Division of Public Health

Pat McCrory Governor

Aldona Z. Wos, M.D.
Ambassador (Ret.)
Secretary DHHS
Daniel Staley
Acting Division Director

March 25, 2015

Jonathan A Guetta 161 Arlington Dr Wilmington, NC 28401

Dear Mr. Guetta:

Based upon the review of your accreditation application, the Health Hazards Control Unit (HHCU) has determined that you have fulfilled the requirements and are eligible for asbestos accreditation as a(n) INSPECTOR. Your assigned North Carolina accreditation number is 11936, which is reflected on your enclosed North Carolina Accreditation card. Please be sure to take this card with you to any asbestos work site where you are employed. The State requires that all persons conducting asbestos abatement or asbestos management activities be accredited and have their identification card on site.

Your North Carolina Inspector accreditation will expire on FEBRUARY 29, 2016. It is NOT the policy of the HHCU to issue renewal notices. If you wish to continue working as a(n) Inspector after this expiration date, you must successfully complete the required training and submit a completed application to this office prior to February 29, 2016. If you should continue to perform asbestos management activities as a(n) Inspector without a valid North Carolina accreditation, you will be in violation of State regulations and may be cited for noncompliance.

Sincerely,

Ed Norman

Program Manager

Health Hazards Control Unit

Enclosure





BASE SURVEY BUILDING AS-710

SURVEY FINDINGS

Building: AS710

Friable ACM identified

DESCRIPTION LOCATION Date Quantity

No friable ACM records found in database

Non-friable ACM identified

DESCRIPTION	LOCATION	Date	Qua	ntity
GASKET MATERIAL	NORTH CENTER MECHANICAL/ BOILER ROOM ON BOILER FLUE	5/1/1996	8	SF
CAULKING MATERIAL	MECHANICAL ROOM DOORS; LOWER NORTH DOUBLE, AND SECOND LEVEL ROOF ACCESS	7/15/2010	18	LF
GASKET MATERIAL	NORTH CENTER MECHANICAL/ BOILER ROOM ON BOILER FLUE	2/6/2014	8	SF
12" LT. BLUE FLOOR TILE AND ADHESIVE	STORAGE ROOM BY WALK-IN FREEZER/ LOADING DOCK CENTER	2/6/2014	12	SF
CAULKING MATERIAL	MECHANICAL ROOM DOORS; LOWER NORTH DOUBLE, AND SECOND LEVEL ROOF ACCESS	2/6/2014	18	LF
12" CREAM FLOOR TILE AND ADHESIVE	WESTSIDE, WEST CENTER STORAGE ROOMS/ STAFF AREAS UNDER COMPUTER SERVER	2/6/2014	8	SF
GASKET MATERIAL	NORTH CENTER MECHANICAL/ BOILER ROOM ON BOILER FLUE	1/16/2004	8	SF
GASKET MATERIAL	NORTH CENTER MECHANICAL/ BOILER ROOM ON BOILER FLUE	7/15/2010	8	SF
GASKET MATERIAL	NORTH CENTER MECHANICAL/ BOILER ROOM ON BOILER FLUE	10/31/2007	8	SF
12" CREAM FLOOR TILE AND ADHESIVE	WESTSIDE, WEST CENTER STORAGE ROOMS/ STAFF AREAS	7/15/2010	648	SF
GASKET MATERIAL	NORTH CENTER MECHANICAL/ BOILER ROOM ON BOILER FLUE	9/14/2000	8	SF
GASKET MATERIAL	NORTH CENTER MECHANICAL/ BOILER ROOM ON BOILER FLUE	2/22/2012	8	SF
CAULKING MATERIAL	MECHANICAL ROOM DOORS; LOWER NORTH DOUBLE, AND SECOND LEVEL ROOF ACCESS	2/22/2012	18	LF

Tested Non ACM or REMOVED Materials

DESCRIPTION	LOCATION	Date	Quantity
RESIDUAL MASTIC	MAIN ROOMS/ COMMON AREAS THROUGHOUT, UNDER CARPET (SEE ALSO HM27)	10/31/2007	
GASKET MATERIAL	NORTH CENTER BOILER ROOM, SIDE OF BOILER	5/1/1996	
PIPE INSULATION	NORTH CENTER MECHANICAL/ BOILER ROOM	5/1/1996	
GASKET MATERIAL	NORTH CENTER MECHANICAL/ BOILER ROOM	5/1/1996	
CARPET ADHESIVE	DINING AND BALLROOMS THROUGHOUT OVER CONCRETE (SEE ALSO HM26, 27)	10/31/2007	
12" CREAM FLOOR TILE AND ADHESIVE	WESTSIDE, WEST CENTER STORAGE ROOMS/ STAFF AREAS	10/31/2007	
MUDDED FITTING(S)	NORTH CENTRAL MECHANICAL/ BOILER ROOM	10/31/2007	
PIPE INSULATION DEBRIS	NORTH CENTER MECHANICAL/ BOILER ROOM	10/31/2007	
PLASTER MATERIAL	ORIGINAL STRUCTURE WALLS AND CEILINGS THROUGHOUT	1/6/2004	
OINT MATERIAL	INTERIOR PARTITION WALLS (SEE ALSO HM20)	10/31/2007	
'x2' CEILING TILE,	BANQUET ROOM	5/1/1996	
2" LT. BLUE FLOOR TILE AND ADHESIVE	DRY STORAGE ROOM BY WALK-IN FREEZER	5/1/1996	
NTERIOR CAULKING,	NORTHEAST AND NORTHEST RESTROOMS; VANITIES, TOILETS	10/31/2007	
'x2' CEILING TILE,	DINING ROOM, LOBBY, OFFICES, STORAGE, RESTROOMS, BALLROOM	5/1/1996	
2" WHITE FLOOR TILE AND ADHESIVE	NORTHWEST STORAGE ROOMS	5/1/1996	
ÍNYL FLOOR TILE	BEHIND SOUTHWEST BAR AREA	5/1/1996	
'x2' CEILING TILE,	NORTH CENTRAL KITCHEN AREA	5/1/1996	
ROOFING FELT DEBRIS	NORTH KITCHEN AREA STORAGE ROOMS, ABOVE CEILINGS	5/1/1996	
DRYWALL AND JOINT MATERIAL	INTERIOR PARTITION WALLS (SEE ALSO HM24)	10/31/2007	
GRAY VINYL BASE AND ADHESIVE, 4"	TILED AND CARPETED THROUGHOUT	10/31/2007	
2" BLACK FLOOR TILE AND ADHESIVE	SOUTH CENTER ROOM FOYER/ HALL	10/31/2007	
NSULATION	NORTHEAST MAIN MECHANICAL ROOM, BOILER FLUE CAPPING MUDD	2/22/2012	

12" TAN FLOOR TILE AND ADHESIVE	SOUTHWEST HALL AT OLD GRILL STATION (MATL PREVIOUSLY UNDER FIXED EQUIPMENT	2/22/2012
MISCELLANEOUS SEALANT	NORTH MECHANICAL/ BOILER ROOM, ON FLUE AND TANKS	7/15/2010
GASKET MATERIAL	NORTH CENTER MECHANICAL/ BOILER ROOM, HEAT EXCHANGER	7/15/2010
FIBERGLASS INSULATION SEALANT	NORTH CENTER MECHANICAL/ BOILER ROOM PIPING SYSTEMS	7/15/2010
WINDOW GLAZING MATERIAL	NORTH CENTER KITCHEN AREA, CENTRAL STORAGE WEST METAL WINDOW	7/15/2010
RESIDUAL MASTIC	MAIN ROOMS/ COMMON AREAS THROUGHOUT, UNDER CARPET (SEE ALSO HM27)	2/6/2014
WINDOW GLAZING MATERIAL	NORTH CENTER KITCHEN AREA, CENTRAL STORAGE WEST METAL WINDOW	2/6/2014
PLASTER MATERIAL	WALLS AND CEILINGS THROUGHOUT	1/6/2004
PLASTER CEILING	CEILING	1/6/2004
PLASTER MATERIAL	ORIGINAL STRUCTURE WALLS AND CEILINGS THROUGHOUT	7/15/2010
PIPE INSULATION	NORTH CENTER MECHANICAL/ BOILER ROOM	7/15/2010
GASKET MATERIAL	NORTH CENTER MECHANICAL/ BOILER ROOM	7/15/2010
CARPET ADHESIVE	DINING AND BALLROOMS THROUGHOUT OVER CONCRETE (SEE ALSO HM26, 27)	7/15/2010
DRYWALL AND JOINT MATERIAL	INTERIOR PARTITION WALLS (SEE ALSO HM24)	7/15/2010
12" BLACK FLOOR TILE AND ADHESIVE	SOUTH CENTER ROOM FOYER/ HALL	7/15/2010
JOINT MATERIAL	INTERIOR PARTITION WALLS (SEE ALSO HM20)	7/15/2010
12" LT. BLUE FLOOR TILE AND ADHESIVE	DRY STORAGE ROOM BY WALK-IN FREEZER	7/15/2010
PIPE INSULATION DEBRIS	NORTH CENTER MECHANICAL/ BOILER ROOM	7/15/2010
RESIDUAL MASTIC	MAIN ROOMS/ COMMON AREAS THROUGHOUT, UNDER CARPET (SEE ALSO HM27)	7/15/2010
RESIDUAL MASTIC	MAIN ROOMS/ COMMON AREAS THROUGHOUT, UNDER CARPET (SEE ALSO HM27)	2/22/2012

