



DEPARTMENT OF VETERANS AFFAIRS
SPECIFICATIONS

For
MONITOR STEAM TRAPS

At
WILLIAM S. MIDDLETON MEMORIAL VETERANS
HOSPITAL
MADISON, WISCONSIN

VOLUME 1 of 1
DIVISIONS 00-26

100% CONSTRUCTION DOCUMENTS

VA Project No: 607-13-163

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**DEPARTMENT OF VETERANS AFFAIRS
VHA MASTER SPECIFICATIONS**

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**SECTION 00 01 15
LIST OF DRAWING SHEETS**

The drawings listed below accompanying this specification form a part of
the contract.

<u>Drawing No.</u>	<u>Title</u>
GENERAL	
G100	TITLE SHEET - PROJECT INFORMATION AND SHEET INDEX
HEATING, VENTILATING, AIR CONDITIONING AND REFRIGERATION	
M000	COVER SHEET - MECHANICAL
M100	BASEMENT FLOOR PLAN - BUILDING 1 - MECHANICAL
M101	GROUND FLOOR PLAN - BUILDING 1 - MECHANICAL
M102	FIRST FLOOR PLAN - BUILDING 1 - MECHANICAL
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M105	FOURTH FLOOR PLAN - BUILDING 1 - MECHANICAL
M106	FIFTH FLOOR PLAN - BUILDING 1 - MECHANICAL
M107	SIXTH FLOOR PLAN - BUILDING 1 - MECHANICAL
M108	EIGHTH FLOOR AND ROOF PLAN - BUILDING 1 - MECHANICAL
M109	LAUNDRY AND BOILER PLANT - BUILDING 2 - MECHANICAL
M110	BUILDING 5 - MECHANICAL
M111	MENTAL HEALTH CLINIC - BUILDING 7 - MECHANICAL
M112	ANIMAL LAB - BUILDING 12 - MECHANICAL
M500	SCHEDULES - MECHANICAL

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SECTION 00 01 16
SUBMITTALS

<u>Section No.</u>	<u>Title</u>
GENERAL	
01 57 19	Environmental protection plan
01 74 19	Final summary of construction and demolition debris diversion and disposal
THERMAL AND MOISTURE PROTECTION	
07 84 00	Manufacturers literature, data, and installation instructions
07 84 00	List of FM, UL, or WH classification number of systems installed
07 84 00	Certified laboratory test reports for ASTM E814 tests for systems not listed by FM, UL, or WH
MECHANICAL	
23 05 11	HVAC maintenance data and operating manuals
23 07 11	Insulation literature and product data
23 22 13	Manufacturer's Literature and Data on pipe and equipment supports, pipe and tubing, pipe fittings, steam system components, gages, thermometers, and test wells
23 22 13	One wall mounted stick file for prints of as-built piping diagrams and one set of reproducible drawings
23 22 13.10	Manufacturer's literature and data on steam trap monitoring systems. Provide system layout drawings including all component locations.
23 22 13.10	Design documents that include the following: <ul style="list-style-type: none">a. Floor plan showing the location of repeaters and the electrical panel/circuit that the repeaters will draw power from.b. Floor plan showing the location of the gateway and the electrical panel/circuit that the gateway draws power from.
23 22 13.10	Product literature for all components
23 22 13.10	Radio frequency survey
23 22 13.10	Operation and maintenance manuals
23 22 13.10	As-built drawings

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**SECTION 01 00 00
GENERAL REQUIREMENTS**

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**SECTION 01 00 00
GENERAL REQUIREMENTS**

1.1 GENERAL INTENTION

- A. Contractor shall completely prepare site for building operations, including demolition and removal of existing structures, and furnish labor and materials and perform work for Monitor Steam Traps as required by drawings and specifications.
- B. Visits to the site by Bidders may be made only by appointment with the Medical Center Engineering Officer.
- C. Offices of KJWW Engineering Consultants, as Architect-Engineers, will render certain technical services during construction. Such services shall be considered as advisory to the Government and shall not be construed as expressing or implying a contractual act of the Government without affirmations by Contracting Officer or his duly authorized representative.
- D. All employees of general contractor and subcontractors shall comply with VA security management program and obtain permission of the VA police, be identified by project and employer, and restricted from unauthorized access.
- E. Prior to commencing work, general contractor shall provide proof that a OSHA designated "competent person" (CP) (29 CFR 1926.20(b)(2)) will maintain a presence at the work site whenever the general or subcontractors are present.
- F. Training:
 - 1. All employees of general contractor or subcontractors shall have the 10-hour or 30-hour OSHA Construction Safety course and other relevant competency training, as determined by RE/COR acting as the Construction Safety Officer with input from the facility Construction Safety Committee.
 - 2. Submit training records of all such employees for approval before the start of work.
- G. VHA Directive 2011-36, Safety and Health during Construction, dated 9/22/2011 in its entirety is made a part of this section

1.2 STATEMENT OF BID ITEM(S)

- A. ITEM I, GENERAL CONSTRUCTION: Work includes general construction, alterations, mechanical and electrical work, utility systems, necessary removal of existing structures and construction and certain other items.
- B. DEDUCT ALTERNATE NO.1: Remove the radiator trap replacement from base bid. Refer to drawings for quantities of traps.
- C. DEDUCT ALTERNATE NO. 2: Remove monitoring of traps associated with heat exchangers, heating coils, and humidifiers from base bid. Refer to drawings for details.

1.3 SPECIFICATIONS AND DRAWINGS FOR CONTRACTOR

- A. AFTER AWARD OF CONTRACT, 2 sets of specifications and drawings will be furnished.
- B. Additional sets of drawings may be made by the Contractor, at Contractor's expense.

1.4 CONSTRUCTION SECURITY REQUIREMENTS

- A. Security Plan:
 - 1. The security plan defines both physical and administrative security procedures that will remain effective for the entire duration of the project.
 - 2. The General Contractor is responsible for assuring that all sub-contractors working on the project and their employees also comply with these regulations.
- B. Security Procedures:
 - 1. General Contractor's employees shall not enter the project site without appropriate badge. They may also be subject to inspection of their personal effects when entering or leaving the project site.
 - 2. For working outside the "regular hours" as defined in the contract, The General Contractor shall give 3 days' notice to the COR arrangements can be provided for the employees. This notice is separate from any notices required for utility shutdown described later in this section.
 - 3. No photography of VA premises is allowed without written permission of the Contracting Officer.

4. VA reserves the right to close down or shut down the project site and order General Contractor's employees off the premises in the event of a national emergency. The General Contractor may return to the site only with the written approval of the Contracting Officer.

C. Document Control:

1. Before starting any work, the General Contractor/Sub Contractors shall submit an electronic security memorandum describing the approach to following goals and maintaining confidentiality of "sensitive information".
2. The General Contractor is responsible for safekeeping of all drawings, project manual and other project information. This information shall be shared only with those with a specific need to accomplish the project.
3. Certain documents, sketches, videos or photographs and drawings may be marked "Law Enforcement Sensitive" or "Sensitive Unclassified". Secure such information in separate containers and limit the access to only those who will need it for the project. Return the information to the Contracting Officer upon request.
4. These security documents shall not be removed or transmitted from the project site without the written approval of Contracting Officer.
5. All paper waste or electronic media such as CD's and diskettes shall be shredded and destroyed in a manner acceptable to the VA.
6. Notify Contracting Officer and Site Security Officer immediately when there is a loss or compromise of "sensitive information".
7. All electronic information shall be stored in specified location following VA standards and procedures using an Engineering Document Management Software (EDMS).
 - a. Security, access and maintenance of all project drawings, both scanned and electronic shall be performed and tracked through the EDMS system.
 - b. "Sensitive information" including drawings and other documents may be attached to e-mail provided all VA encryption procedures are followed.

D. Motor Vehicle Restrictions

1. Vehicle authorization request shall be required for any vehicle entering the site and such request shall be submitted 24 hours before the date and time of access. Access shall be restricted to picking up and dropping off materials and supplies.
2. Separate permits shall be issued for General Contractor and its employees for parking in designated areas only.

1.5 FIRE SAFETY

A. Applicable Publications: Publications listed below form part of this Article to extent referenced. Publications are referenced in text by basic designations only.

1. American Society for Testing and Materials (ASTM):

E84-2009.....Surface Burning Characteristics of Building
Materials

2. National Fire Protection Association (NFPA):

10-2010.....Standard for Portable Fire Extinguishers

30-2008.....Flammable and Combustible Liquids Code

51B-2009.....Standard for Fire Prevention During Welding,
Cutting and Other Hot Work

70-2011.....National Electrical Code

101-2012.....Life Safety Code

241-2009.....Standard for Safeguarding Construction,
Alteration, and Demolition Operations

3. Occupational Safety and Health Administration (OSHA):

29 CFR 1926.....Safety and Health Regulations for Construction

4. VHA Directive 2005-007

B. Fire Safety Plan: Establish and maintain a fire protection program in accordance with 29 CFR 1926. Prior to start of work, prepare a plan detailing project-specific fire safety measures, including periodic status reports, and submit to COR for review for compliance with VHA

Directive 2005-007, NFPA 101 and NFPA 241. Prior to beginning work, all employees of the contractor and/or any subcontractors shall undergo a safety briefing provided by the general contractor's competent person per OSHA requirements. This briefing shall include information on the construction limits, VAMC safety guidelines, means of egress, break areas, work hours, locations of restrooms, use of VAMC equipment, etc. Provide documentation to the COR that all construction workers have undergone contractor's safety briefing.

- C. Site and Building Access: Maintain free and unobstructed access to facility emergency services and for fire, police and other emergency response forces in accordance with NFPA 241.
- D. Separate temporary facilities, such as trailers, storage sheds, and dumpsters, from existing buildings and new construction by distances in accordance with NFPA 241. For small facilities with less than 6 m (20 feet) exposing overall length, separate by 3m (10 feet).
- E. Temporary Heating and Electrical: Install, use and maintain installations in accordance with 29 CFR 1926, NFPA 241 and NFPA 70.
- F. Means of Egress: Do not block exiting for occupied buildings, including paths from exits to roads. Minimize disruptions and coordinate with COR.
- G. Egress Routes for Construction Workers: Maintain free and unobstructed egress. Inspect daily. Report findings and corrective actions weekly to COR.
- H. Fire Extinguishers: Provide and maintain extinguishers in construction areas and temporary storage areas in accordance with 29 CFR 1926, NFPA 241 and NFPA 10.
- I. Flammable and Combustible Liquids: Store, dispense and use liquids in accordance with 29 CFR 1926, NFPA 241 and NFPA 30.
- J. Existing Fire Protection: Do not impair automatic sprinklers, smoke and heat detection, and fire alarm systems, except for portions immediately under construction, and temporarily for connections. Provide fire watch for impairments more than 4 hours in a 24-hour period. Request interruptions in accordance with Article, OPERATIONS AND STORAGE AREAS, and coordinate with COR. All existing or temporary fire protection systems (fire alarms, sprinklers) located in construction areas shall be tested as coordinated with the medical center. Parameters for the

testing and results of any tests performed shall be recorded by the medical center and copies provided to the COR.

- K. Smoke Detectors: Prevent accidental operation. Remove temporary covers at end of work operations each day. Coordinate with COR.
- L. Hot Work: Perform and safeguard hot work operations in accordance with NFPA 241 and NFPA 51B. Coordinate with COR. Obtain permits from COR at least 1 day in advance. Designate contractor's responsible project-site fire prevention program manager to permit hot work.
- M. Fire Hazard Prevention and Safety Inspections: Inspect entire construction areas weekly. Coordinate with, and report findings and corrective actions weekly to COR.
- N. Smoking: The William S. Middleton VA Hospital and Campus is a smoke-free environment. Smoking is prohibited in all spaces, except two designated smoking shelters. Smoking is prohibited in and adjacent to construction areas inside existing buildings and additions under construction.
- O. Dispose of waste and debris in accordance with NFPA 241. Remove from buildings daily.
- P. Perform other construction, alteration and demolition operations in accordance with 29 CFR 1926.

1.6 OPERATIONS AND STORAGE AREAS

- A. The Contractor shall confine all operations (including storage of materials) on Government premises to areas authorized or approved by the COR. The Contractor shall hold and save the Government, its officers and agents, free and harmless from liability of any nature occasioned by the Contractor's performance.
- B. The Contractor shall, under regulations prescribed by the Contracting Officer, use only established roadways, or use temporary roadways constructed by the Contractor when and as authorized by the Contracting Officer. When materials are transported in prosecuting the work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any Federal, State, or local law or regulation. When it is necessary to cross curbs or sidewalks, the Contractor shall protect them from damage. The Contractor shall repair or pay for the repair of any damaged curbs, sidewalks, or roads.

- C. Working space and space available for storing materials shall be as determined by the COR.
- D. Workmen are subject to rules of Medical Center applicable to their conduct.
- E. Execute work so as to interfere as little as possible with normal functioning of Medical Center as a whole, including operations of utility services, fire protection systems and any existing equipment, and with work being done by others. Use of equipment and tools that transmit vibrations and noises through the building structure, are not permitted in buildings that are occupied, during construction, jointly by patients or medical personnel, and Contractor's personnel, except as permitted by COR where required by limited working space.
 - 1. Do not store materials and equipment in other than assigned areas.
 - 2. Schedule delivery of materials and equipment to immediate construction working areas within buildings in use by Department of Veterans Affairs in quantities sufficient for not more than two work days. Provide unobstructed access to Medical Center areas required to remain in operation.
 - 3. Where access by Medical Center personnel to vacated portions of buildings is not required, storage of Contractor's materials and equipment will be permitted subject to fire and safety requirements.
- F. Utilities Services: Where necessary to cut existing pipes, electrical wires, conduits, cables, etc., of utility services, or of fire protection systems or communications systems (except telephone), they shall be cut and capped at suitable places where shown; or, in absence of such indication, where directed by COR.
- G. Building(s) will be occupied during performance of work.
- H. Utilities Services: Maintain existing utility services for Medical Center at all times. Provide temporary facilities, labor, materials, equipment, connections, and utilities to assure uninterrupted services. Where necessary to cut existing water, steam, gases, sewer or air pipes, or conduits, wires, cables, etc. of utility services or of fire protection systems and communications systems (including telephone), they shall be cut and capped at suitable places where shown; or, in absence of such indication, where directed by COR.

1. No utility service such as water, gas, steam, sewers or electricity, or fire protection systems and communications systems may be interrupted without prior approval of COR. Electrical work shall be accomplished with all affected circuits or equipment de-energized. When an electrical outage cannot be accomplished, work on any energized circuits or equipment shall not commence without the Medical Center Director's prior knowledge and written approval.
 2. Contractor shall submit a request to interrupt any such services to COR, in writing, 48 hours in advance of proposed interruption. Request shall state reason, date, exact time of, and approximate duration of such interruption.
 3. Contractor will be advised (in writing) of approval of request, or of which other date and/or time such interruption will cause least inconvenience to operations of Medical Center. Interruption time approved by Medical Center may occur at other than Contractor's normal working hours.
 4. Major interruptions of any system must be requested, in writing, at least 15 calendar days prior to the desired time and shall be performed as directed by the COR.
 5. In case of a contract construction emergency, service will be interrupted on approval of COR. Such approval will be confirmed in writing as soon as practical.
- I. Abandoned Lines: All service lines such as wires, cables, conduits, ducts, pipes and the like, and their hangers or supports, which are to be abandoned but are not required to be entirely removed, shall be sealed, capped or plugged. The lines shall not be capped in finished areas, but shall be removed and sealed, capped or plugged in ceilings, within furred spaces, in unfinished areas, or within walls or partitions; so that they are completely behind the finished surfaces.
- J. To minimize interference of construction activities with flow of Medical Center traffic, comply with the following:
1. Keep roads, walks and entrances to grounds, to parking and to occupied areas of buildings clear of construction materials, debris and standing construction equipment and vehicles.

- K. Coordinate the work for this contract with other construction operations as directed by COR. This includes the scheduling of traffic and the use of roadways, as specified in Article, USE OF ROADWAYS.

1.7 ALTERATIONS

- A. Any items required by drawings to be either reused or relocated or both, found during this survey to be nonexistent, or in opinion of COR, to be in such condition that their use is impossible or impractical, shall be furnished and/or replaced by Contractor with new items in accordance with specifications which will be furnished by Government. Provided the contract work is changed by reason of this subparagraph B, the contract will be modified accordingly, under provisions of clause entitled "DIFFERING SITE CONDITIONS" (FAR 52.236-2) and "CHANGES" (FAR 52.243-4 and VAAR 852.236-88).
- B. Protection: Provide the following protective measures:
 - 1. Temporary protection against damage for portions of existing structures and grounds where work is to be done, materials handled and equipment moved and/or relocated.
 - 2. Protection of interior of existing structures at all times, from damage, dust and weather inclemency. Wherever work is performed, floor surfaces that are to remain in place shall be adequately protected prior to starting work, and this protection shall be maintained intact until all work in the area is completed.

1.8 INFECTION PREVENTION MEASURES

- A. Implement the requirements of VAMC's Infection Control Risk Assessment (ICRA) team. ICRA Group may monitor dust in the vicinity of the construction work and require the Contractor to take corrective action immediately if the safe levels are exceeded.
- B. Establish and maintain a dust control program as part of the contractor's infection preventive measures in accordance with the guidelines provided by ICRA Group. Prior to start of work, a plan must be agreed to and signed detailing project-specific dust protection measures.
 - 1. All personnel involved in the construction or renovation activity shall be educated and trained in infection prevention measures established by the medical center. All personnel are required to

attend the facility provided infection control class prior to doing any work.

C. Final Cleanup:

1. Upon completion of project, or as work progresses, remove all construction debris from above ceiling, vertical shafts and utility chases that have been part of the construction.

1.9 DISPOSAL AND RETENTION

A. Materials and equipment accruing from work removed and from demolition of buildings or structures, or parts thereof, shall be disposed of as follows:

1. Items not reserved shall become property of the Contractor and be removed by Contractor from Medical Center.
2. Items of portable equipment and furnishings located in rooms and spaces in which work is to be done under this contract shall remain the property of the Government. When rooms and spaces are vacated by the Department of Veterans Affairs during the alteration period, such items which are NOT required by drawings and specifications to be either relocated or reused will be removed by the Government in advance of work to avoid interfering with Contractor's operation.

1.10 PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS

- A. The Contractor shall preserve and protect all structures, equipment, and vegetation (such as trees, shrubs, and grass) on or adjacent to the work site, which is not to be removed and which does not unreasonably interfere with the work required under this contract. The Contractor shall only remove trees when specifically authorized to do so, and shall avoid damaging vegetation that will remain in place. If any limbs or branches of trees are broken during contract performance, or by the careless operation of equipment, or by workmen, the Contractor shall trim those limbs or branches with a clean cut and paint the cut with a tree-pruning compound as directed by the COR.
- B. The Contractor shall protect from damage all existing improvements and utilities at or near the work site and on adjacent property of a third party, the locations of which are made known to or should be known by the Contractor. The Contractor shall repair any damage to those

facilities, including those that are the property of a third party, resulting from failure to comply with the requirements of this contract or failure to exercise reasonable care in performing the work. If the Contractor fails or refuses to repair the damage promptly, the Contracting Officer may have the necessary work performed and charge the cost to the Contractor.

1.11 RESTORATION

- A. Remove, cut, alter, replace, patch and repair existing work as necessary to install new work. Except as otherwise shown or specified, do not cut, alter or remove any structural work, and do not disturb any ducts, plumbing, steam, gas, or electric work without approval of the COR. Existing work to be altered or extended and that is found to be defective in any way, shall be reported to the COR before it is disturbed. Materials and workmanship used in restoring work, shall conform in type and quality to that of original existing construction, except as otherwise shown or specified.
- B. Upon completion of contract, deliver work complete and undamaged. Existing work (walls, ceilings, partitions, floors, mechanical and electrical work, lawns, paving, roads, walks, etc.) disturbed or removed as a result of performing required new work, shall be patched, repaired, reinstalled, or replaced with new work, and refinished and left in as good condition as existed before commencing work.
- C. At Contractor's own expense, Contractor shall immediately restore to service and repair any damage caused by Contractor's workmen to existing piping and conduits, wires, cables, etc., of utility services or of fire protection systems and communications systems (including telephone) which are indicated on drawings and which are not scheduled for discontinuance or abandonment.
- D. Expense of repairs to such utilities and systems not shown on drawings or locations of which are unknown will be covered by adjustment to contract time and price in accordance with clause entitled "CHANGES" (FAR 52.243-4 and VAAR 852.236-88) and "DIFFERING SITE CONDITIONS" (FAR 52.236-2).

1.15 AS-BUILT DRAWINGS

- A. The contractor shall maintain two full size sets of as-built drawings which will be kept current during construction of the project, to include all contract changes, modifications and clarifications.

- B. All variations shall be shown in the same general detail as used in the contract drawings. To insure compliance, as-built drawings shall be made available for the COR's review, as often as requested.
- C. Contractor shall deliver two approved completed sets of as-built drawings to the COR within 15 calendar days after each completed phase and after the acceptance of the project by the COR.
- D. Paragraphs A, B, & C shall also apply to all shop drawings.

1.16 USE OF ROADWAYS

- A. For hauling, use only established public roads and roads on Medical Center property.

1.18 TEMPORARY USE OF MECHANICAL AND ELECTRICAL EQUIPMENT

- A. Use of new installed mechanical and electrical equipment to provide heat, ventilation, plumbing, light and power will be permitted subject to compliance with the following provisions:
 - 1. Permission to use each unit or system must be given by COR. If the equipment is not installed and maintained in accordance with the following provisions, the COR will withdraw permission for use of the equipment.
 - 2. Electrical installations used by the equipment shall be completed in accordance with the drawings and specifications to prevent damage to the equipment and the electrical systems, i.e. transformers, relays, circuit breakers, fuses, conductors, motor controllers and their overload elements shall be properly sized, coordinated and adjusted. Voltage supplied to each item of equipment shall be verified to be correct and it shall be determined that motors are not overloaded. The electrical equipment shall be thoroughly cleaned before using it and again immediately before final inspection including vacuum cleaning and wiping clean interior and exterior surfaces.
 - 3. Units shall be properly lubricated, balanced, and aligned. Vibrations must be eliminated.
 - 4. The air filtering system utilized shall be that which is designed for the system when complete, and all filter elements shall be replaced at completion of construction and prior to testing and balancing of system.

5. All components of heat production and distribution system, metering equipment, condensate returns, and other auxiliary facilities used in temporary service shall be cleaned prior to use; maintained to prevent corrosion internally and externally during use; and cleaned, maintained and inspected prior to acceptance by the Government.
- B. Prior to final inspection, the equipment or parts used which show wear and tear beyond normal, shall be replaced with identical replacements, at no additional cost to the Government.
- C. This paragraph shall not reduce the requirements of the mechanical and electrical specifications sections.

1.19 TEMPORARY USE OF EXISTING ELEVATORS

- A. Use of existing elevators for handling building materials and Contractor's personnel will be permitted subject to following provisions:
 1. Contractor may use elevator No. 5 in Building No. 1 for daily use between the hours of 7:00 - 4:30 and for special nonrecurring time intervals when permission is granted. Personnel for operating elevators will not be provided by the Department of Veterans Affairs.
 2. Contractor covers and provides maximum protection of following elevator components:
 - a. Entrance jambs, heads soffits and threshold plates.
 - b. Entrance columns, canopy, return panels and inside surfaces of car enclosure walls.
 - c. Finish flooring.
 3. Place elevator in condition equal, less normal wear, to that existing at time it was placed in service of Contractor as approved by Contracting Officer Representative (COR).

1.21 TEMPORARY TOILETS

- A. Contractor may have for use of Contractor's workmen, such toilet accommodations as may be assigned to Contractor by Medical Center. Contractor shall keep such places clean and be responsible for any damage done thereto by Contractor's workmen. Failure to maintain

satisfactory condition in toilets will deprive Contractor of the privilege to use such toilets.

1.22 AVAILABILITY AND USE OF UTILITY SERVICES

- A. The Government shall make all reasonably required amounts of utilities available to the Contractor from existing outlets and supplies, as specified in the contract.

1.24 TESTS

- A. Pre-test mechanical and electrical equipment and systems and make corrections required for proper operation of such systems before requesting final tests. Final test will not be conducted unless pre-tested.
- B. Conduct final tests required in various sections of specifications in presence of an authorized representative of the Contracting Officer. Contractor shall furnish all labor, materials, equipment, instruments, and forms, to conduct and record such tests.
- C. Mechanical and electrical systems shall be balanced, controlled and coordinated. A system is defined as the entire complex which must be coordinated to work together during normal operation to produce results for which the system is designed. For example, air conditioning supply air is only one part of entire system which provides comfort conditions for a building.
- D. All related components as defined above shall be functioning when any system component is tested. Tests shall be completed within a reasonably short period of time during which operating and environmental conditions remain reasonably constant.
- E. Individual test result of any component, where required, will only be accepted when submitted with the test results of related components and of the entire system.

1.25 INSTRUCTIONS

- A. Contractor shall furnish Maintenance and Operating manuals (hard copies and electronic) and verbal instructions when required by the various sections of the specifications and as hereinafter specified.
- B. Manuals: Maintenance and operating manuals and one compact disc (two hard copies and one electronic copy each) for each separate piece of

equipment shall be delivered to the COR coincidental with the delivery of the equipment to the job site. Manuals shall be complete, detailed guides for the maintenance and operation of equipment. They shall include complete information necessary for starting, adjusting, maintaining in continuous operation for long periods of time and dismantling and reassembling of the complete units and sub-assembly components. Manuals shall include an index covering all component parts clearly cross-referenced to diagrams and illustrations. Illustrations shall include "exploded" views showing and identifying each separate item. Emphasis shall be placed on the use of special tools and instruments. The function of each piece of equipment, component, accessory and control shall be clearly and thoroughly explained. All necessary precautions for the operation of the equipment and the reason for each precaution shall be clearly set forth. Manuals must reference the exact model, style and size of the piece of equipment and system being furnished. Manuals referencing equipment similar to but of a different model, style, and size than that furnished will not be accepted.

- C. Instructions: Contractor shall provide qualified, factory-trained manufacturers' representatives to give detailed instructions to assigned Department of Veterans Affairs personnel in the operation and complete maintenance for each piece of equipment. All such training will be at the job site. These requirements are more specifically detailed in the various technical sections. Instructions for different items of equipment that are component parts of a complete system shall be given in an integrated, progressive manner. All instructors for every piece of component equipment in a system shall be available until instructions for all items included in the system have been completed. This is to assure proper instruction in the operation of inter-related systems. All instruction periods shall be at such times as scheduled by the COR and shall be considered concluded only when the COR is satisfied in regard to complete and thorough coverage. The Department of Veterans Affairs reserves the right to request the removal of, and substitution for, any instructor who, in the opinion of the COR, does not demonstrate sufficient qualifications in accordance with requirements for instructors above.

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SECTION 01 32 16.15
PROJECT SCHEDULES
(SMALL PROJECTS - DESIGN/BID/BUILD)

PART 1- GENERAL

1.1 DESCRIPTION:

- A. The Contractor shall develop a Critical Path Method (CPM) plan and schedule demonstrating fulfillment of the contract requirements (Project Schedule), and shall keep the Project Schedule up-to-date in accordance with the requirements of this section and shall utilize the plan for scheduling, coordinating and monitoring work under this contract (including all activities of subcontractors, equipment vendors and suppliers). Conventional Critical Path Method (CPM) technique shall be utilized to satisfy both time and cost applications.

1.2 CONTRACTOR'S REPRESENTATIVE:

- A. The Contractor shall designate an authorized representative responsible for the Project Schedule including preparation, review and progress reporting with and to the Contracting Officer's Representative (COR).
- B. The Contractor's representative shall have direct project control and complete authority to act on behalf of the Contractor in fulfilling the requirements of this specification section.
- C. The Contractor's representative shall have the option of developing the project schedule within their organization or to engage the services of an outside consultant. If an outside scheduling consultant is utilized, Section 1.3 of this specification will apply.

1.3 CONTRACTOR'S CONSULTANT:

- A. The Contractor shall submit a qualification proposal to the COR, within 10 days of bid acceptance. The qualification proposal shall include:
1. The name and address of the proposed consultant.
 2. Information to show that the proposed consultant has the qualifications to meet the requirements specified in the preceding paragraph.
 3. A representative sample of prior construction projects, which the proposed consultant has performed complete project scheduling services. These representative samples shall be of similar size and scope.
- B. The Contracting Officer has the right to approve or disapprove the proposed consultant, and will notify the Contractor of the VA decision within seven calendar days from receipt of the qualification proposal. In case of disapproval, the Contractor shall resubmit another consultant within 10 calendar days for renewed consideration. The Contractor shall

have their scheduling consultant approved prior to submitting any schedule for approval.

1.4 COMPUTER PRODUCED SCHEDULES

- A. The contractor shall provide monthly, to the Department of Veterans Affairs (VA), all computer-produced time/cost schedules and reports generated from monthly project updates.
- B. The contractor shall be responsible for the correctness and timeliness of the computer-produced reports. The Contractor shall also be responsible for the accurate and timely submittal of the updated project schedule and all CPM data necessary to produce the computer reports and payment request that is specified.
- C. The VA will report errors in computer-produced reports to the Contractor's representative within ten calendar days from receipt of reports. The Contractor shall reprocess the computer-produced reports and associated diskette(s), when requested by the Contracting Officer's representative, to correct errors which affect the payment and schedule for the project.

1.5 THE COMPLETE PROJECT SCHEDULE SUBMITTAL

- A. Within 45 calendar days after receipt of Notice to Proceed, the Contractor shall submit for the COR's review; and an electronic file in the previously approved CPM schedule program. The submittal shall also include three copies of a computer-produced activity/event ID schedule showing project duration; phase completion dates; and other data, including event cost. Each activity/event on the computer-produced schedule shall contain as a minimum, but not limited to, activity/event ID, activity/event description, duration, budget amount, start date, finish date. Work activity/event relationships shall be restricted to finish-to-start or start-to-start without lead or lag constraints. Activity/event date constraints, not required by the contract, will not be accepted unless submitted to and approved by the COR. Logic events (non-work) will be permitted where necessary to reflect proper logic among work events, but must have zero duration. The complete working schedule shall reflect the Contractor's approach to scheduling the complete project. **The final Project Schedule in its original form shall contain no contract changes or delays which may have been incurred during the final network diagram development period and shall reflect the entire contract duration as defined in the bid documents.** These changes/delays shall be entered at the first update after the final Project Schedule has been approved by the COR. The Contractor should provide their requests for time and supporting time extension analysis

for contract time as a result of contract changes/delays, after this update, and in accordance with Article, ADJUSTMENT OF CONTRACT COMPLETION.

- B. Within 30 calendar days after receipt of the complete project interim Project Schedule and the complete final Project Schedule, the Contracting Officer or his representative, will do one or both of the following:
 - 1. Notify the Contractor concerning his actions, opinions, and objections.
 - 2. A meeting with the Contractor at or near the job site for joint review, correction or adjustment of the proposed plan will be scheduled if required. Within 14 calendar days after the joint review, the Contractor shall revise and shall submit three blue line copies of the revised Project Schedule, three copies of the revised computer-produced activity/event ID schedule and a revised electronic file as specified by the Contracting Officer. The revised submission will be reviewed by the Contracting Officer and, if found to be as previously agreed upon, will be approved.
- C. The approved baseline schedule and the computer-produced schedule(s) generated there from shall constitute the approved baseline schedule until subsequently revised in accordance with the requirements of this section.
- D. The Complete Project Schedule shall contain approximately 20 work activities/events.

1.6 WORK ACTIVITY/EVENT COST DATA

- A. The Contractor shall cost load all work activities/events except procurement activities. The cumulative amount of all cost loaded work activities/events (including alternates) shall equal the total contract price. Prorate overhead, profit and general conditions on all work activities/events for the entire project length. The contractor shall generate from this information cash flow curves indicating graphically the total percentage of work activity/event dollar value scheduled to be in place on early finish, late finish. These cash flow curves will be used by the Contracting Officer to assist him in determining approval or disapproval of the cost loading. Negative work activity/event cost data will not be acceptable, except on VA issued contract changes.

- C. In accordance with FAR 52.236 - 1 (PERFORMANCE OF WORK BY THE CONTRACTOR) and VAAR 852.236 - 72 (PERFORMANCE OF WORK BY THE CONTRACTOR), the Contractor shall submit, simultaneously with the cost per work activity/event of the construction schedule required by this Section, a responsibility code for all activities/events of the project for which the Contractor's forces will perform the work.
- D. The Contractor shall cost load work activities/events for all BID ITEMS including ASBESTOS ABATEMENT. The sum of each BID ITEM work shall equal the value of the bid item in the Contractors' bid.

1.7 PROJECT SCHEDULE REQUIREMENTS

- A. Show on the project schedule the sequence of work activities/events required for complete performance of all items of work. The Contractor Shall:
 - 1. Show activities/events as:
 - a. Contractor's time required for submittal of shop drawings, templates, fabrication, delivery and similar pre-construction work.
 - b. Contracting Officer's and Architect-Engineer's review and approval of shop drawings, equipment schedules, samples, template, or similar items.
 - c. Interruption of VA Facilities utilities, delivery of Government furnished equipment, and rough-in drawings, project phasing and any other specification requirements.
 - d. Test, balance and adjust various systems and pieces of equipment, maintenance and operation manuals, instructions and preventive maintenance tasks.
 - e. VA inspection and acceptance activity/event with a minimum duration of five work days at the end of each phase and immediately preceding any VA move activity/event required by the contract phasing for that phase.
 - 2. Show not only the activities/events for actual construction work for each trade category of the project, but also trade relationships to indicate the movement of trades from one area, floor, or building, to another area, floor, or building, for at least five trades who are performing major work under this contract.
 - 3. Break up the work into activities/events of a duration no longer than 20 work days each or one reporting period, except as to non-construction activities/events (i.e., procurement of materials,

- delivery of equipment, concrete and asphalt curing) and any other activities/events for which the COR may approve the showing of a longer duration. The duration for VA approval of any required submittal, shop drawing, or other submittals will not be less than 20 work days.
4. Describe work activities/events clearly, so the work is readily identifiable for assessment of completion. Activities/events labeled "start," "continue," or "completion," are not specific and will not be allowed. Lead and lag time activities will not be acceptable.
 5. The schedule shall be generally numbered in such a way to reflect either discipline, phase or location of the work.
- B. The Contractor shall submit the following supporting data in addition to the project schedule:
1. The appropriate project calendar including working days and holidays.
 2. The planned number of shifts per day.
 3. The number of hours per shift.
- Failure of the Contractor to include this data shall delay the review of the submittal until the Contracting Officer is in receipt of the missing data.
- C. To the extent that the Project Schedule or any revised Project Schedule shows anything not jointly agreed upon, it shall not be deemed to have been approved by the COR. Failure to include any element of work required for the performance of this contract shall not excuse the Contractor from completing all work required within any applicable completion date of each phase regardless of the COR's approval of the Project Schedule.
- D. Compact Disk Requirements and CPM Activity/Event Record Specifications: Submit to the VA an electronic file(s) containing one file of the data required to produce a schedule, reflecting all the activities/events of the complete project schedule being submitted.

1.8 PAYMENT TO THE CONTRACTOR:

- A. Monthly, the contractor shall submit the AIA application and certificate for payment documents G702 & G703 reflecting updated schedule activities and cost data in accordance with the provisions of the following Article, PAYMENT AND PROGRESS REPORTING, as the basis upon which progress payments will be made pursuant to Article, FAR 52.232 - 5 (PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS) and VAAR 852.236 - 83 (PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS). The Contractor shall be entitled to a monthly progress payment upon approval of estimates as determined from the currently approved updated project schedule. Monthly

payment requests shall include: a listing of all agreed upon project schedule changes and associated data; and an electronic file (s) of the resulting monthly updated schedule.

- B. Approval of the Contractor's monthly Application for Payment shall be contingent, among other factors, on the submittal of a satisfactory monthly update of the project schedule.

1.9 RESPONSIBILITY FOR COMPLETION

- A. If it becomes apparent from the current revised monthly progress schedule that phasing or contract completion dates will not be met, the Contractor shall execute some or all of the following remedial actions:
 1. Increase construction manpower in such quantities and crafts as necessary to eliminate the backlog of work.
 2. Increase the number of working hours per shift, shifts per working day, working days per week, the amount of construction equipment, or any combination of the foregoing to eliminate the backlog of work.
 3. Reschedule the work in conformance with the specification requirements.
- B. Prior to proceeding with any of the above actions, the Contractor shall notify and obtain approval from the COR for the proposed schedule changes. If such actions are approved, the representative schedule revisions shall be incorporated by the Contractor into the Project Schedule before the next update, at no additional cost to the Government.

1.10 CHANGES TO THE SCHEDULE

- A. Within 30 calendar days after VA acceptance and approval of any updated project schedule, the Contractor shall submit a revised electronic file (s) and a list of any activity/event changes including predecessors and successors for any of the following reasons:
 1. Delay in completion of any activity/event or group of activities/events, which may be involved with contract changes, strikes, unusual weather, and other delays will not relieve the Contractor from the requirements specified unless the conditions are shown on the CPM as the direct cause for delaying the project beyond the acceptable limits.
 2. Delays in submittals, or deliveries, or work stoppage are encountered which make rescheduling of the work necessary.
 3. The schedule does not represent the actual prosecution and progress of the project.
 4. When there is, or has been, a substantial revision to the activity/event costs regardless of the cause for these revisions.

- B. CPM revisions made under this paragraph which affect the previously approved computer-produced schedules for Government furnished equipment, vacating of areas by the VA Facility, contract phase(s) and sub phase(s), utilities furnished by the Government to the Contractor, or any other previously contracted item, shall be furnished in writing to the Contracting Officer for approval.
- C. Contracting Officer's approval for the revised project schedule and all relevant data is contingent upon compliance with all other paragraphs of this section and any other previous agreements by the Contracting Officer or the VA representative.
- D. The cost of revisions to the project schedule resulting from contract changes will be included in the proposal for changes in work as specified in FAR 52.243 - 4 (Changes) and VAAR 852.236 - 88 (Changes - Supplemental), and will be based on the complexity of the revision or contract change, man hours expended in analyzing the change, and the total cost of the change.
- E. The cost of revisions to the Project Schedule not resulting from contract changes is the responsibility of the Contractor.

1.11 ADJUSTMENT OF CONTRACT COMPLETION

- A. The contract completion time will be adjusted only for causes specified in this contract. Request for an extension of the contract completion date by the Contractor shall be supported with a justification, CPM data and supporting evidence as the COR may deem necessary for determination as to whether or not the Contractor is entitled to an extension of time under the provisions of the contract. Submission of proof based on revised activity/event logic, durations (in work days) and costs is obligatory to any approvals. The schedule must clearly display that the Contractor has used, in full, all the float time available for the work involved in this request. The Contracting Officer's determination as to the total number of days of contract extension will be based upon the current computer-produced calendar-dated schedule for the time period in question and all other relevant information.
- B. Actual delays in activities/events which, according to the computer-produced calendar-dated schedule, do not affect the extended and predicted contract completion dates shown by the critical path in the network, will not be the basis for a change to the contract completion date. The Contracting Officer will within a reasonable time after receipt of such justification and supporting evidence, review the facts and advise the Contractor in writing of the Contracting Officer's decision.

- C. The Contractor shall submit each request for a change in the contract completion date to the Contracting Officer in accordance with the provisions specified under FAR 52.243 - 4 (Changes) and VAAR 852.236 - 88 (Changes - Supplemental). The Contractor shall include, as a part of each change order proposal, a sketch showing all CPM logic revisions, duration (in work days) changes, and cost changes, for work in question and its relationship to other activities on the approved network diagram.
- D. All delays due to non-work activities/events such as RFI's, WEATHER, STRIKES, and similar non-work activities/events shall be analyzed on a month by month basis.

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SECTION 01 33 23
SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

- 1-1. Refer to Articles titled SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION (FAR 52.236-21) and, SPECIAL NOTES (VAAR 852.236-91), in GENERAL CONDITIONS.
- 1-2. Refer to section 00 01 16 for submittal requirements.
- 1-3. For the purposes of this contract, samples (including laboratory samples to be tested), test reports, certificates, and manufacturers' literature and data shall also be subject to the previously referenced requirements. The following text refers to all items collectively as SUBMITTALS.
- 1-4. Submit for approval, all of the items specifically mentioned under the separate sections of the specification, with information sufficient to evidence full compliance with contract requirements. Materials, fabricated articles and the like to be installed in permanent work shall equal those of approved submittals. After an item has been approved, no change in brand or make will be permitted unless:
 - A. Satisfactory written evidence is presented to, and approved by Contracting Officer, that manufacturer cannot make scheduled delivery of approved item or;
 - B. Item delivered has been rejected and substitution of a suitable item is an urgent necessity or;
 - C. Other conditions become apparent which indicates approval of such substitute item to be in best interest of the Government.
- 1-5. Forward submittals in sufficient time to permit proper consideration and approval action by Government. Time submission to assure adequate lead time for procurement of contract - required items. Delays attributable to untimely and rejected submittals will not serve as a basis for extending contract time for completion.
- 1-6. Submittals will be reviewed for compliance with contract requirements by Architect-Engineer, and action thereon will be taken by COR.
- 1-7. Upon receipt of submittals, Architect-Engineer will assign a file number thereto. Contractor, in any subsequent correspondence, shall refer to this file and identification number to expedite replies relative to previously approved or disapproved submittals.
- 1-8. The Government reserves the right to require additional submittals, whether or not particularly mentioned in this contract. If additional

submittals beyond those required by the contract are furnished pursuant to request therefor by Contracting Officer, adjustment in contract price and time will be made in accordance with Articles titled CHANGES (FAR 52.243-4) and CHANGES - SUPPLEMENT (VAAR 852.236-88) of the GENERAL CONDITIONS.

- 1-9. Schedules called for in specifications and shown on shop drawings shall be submitted for use and information of Department of Veterans Affairs and Architect-Engineer. However, the Contractor shall assume responsibility for coordinating and verifying schedules. The Contracting Officer and Architect- Engineer assumes no responsibility for checking schedules or layout drawings for exact sizes, exact numbers and detailed positioning of items.
- 1-10. Submittals must be submitted by Contractor only and shipped prepaid. Contracting Officer assumes no responsibility for checking quantities or exact numbers included in such submittals.
 - A. Submittals will receive consideration only when covered by a transmittal letter signed by Contractor. Letter shall be sent via first class mail and shall contain the list of items, name of Medical Center, name of Contractor, contract number, applicable specification paragraph numbers, applicable drawing numbers (and other information required for exact identification of location for each item), manufacturer and brand, ASTM or Federal Specification Number (if any) and such additional information as may be required by specifications for particular item being furnished. In addition, catalogs shall be marked to indicate specific items submitted for approval.
 1. A copy of letter must be enclosed with items, and any items received without identification letter will be considered "unclaimed goods" and held for a limited time only.
 2. Each sample, certificate, manufacturers' literature and data shall be labeled to indicate the name and location of the Medical Center , name of Contractor, manufacturer, brand, contract number and ASTM or Federal Specification Number as applicable and location(s) on project.
 3. Required certificates shall be signed by an authorized representative of manufacturer or supplier of material, and by Contractor.
 - B. Submittal drawings (shop, erection or setting drawings) and schedules, required for work of various trades, shall be checked before submission by technically qualified employees of Contractor for accuracy, completeness and compliance with contract requirements. These drawings

and schedules shall be stamped and signed by Contractor certifying to such check.

1. For each drawing required, submit one legible photographic paper.
 2. Reproducible shall be full size.
 3. Each drawing shall have marked thereon, proper descriptive title, including Medical Center location, project number, manufacturer's number, reference to contract drawing number, detail Section Number, and Specification Section Number.
 4. A space 120 mm by 125 mm (4-3/4 by 5 inches) shall be reserved on each drawing to accommodate approval or disapproval stamp.
 5. Submit drawings, ROLLED WITHIN A MAILING TUBE, fully protected for shipment.
 6. One reproducible print of approved or disapproved shop drawings will be forwarded to Contractor.
 7. When work is directly related and involves more than one trade, shop drawings shall be submitted to Architect-Engineer under one cover.
- 1-11. Shop drawings, test reports, certificates and manufacturers' literature and data, shall be submitted for approval to

KJWW Engineering Consultants

802 West Broadway, Suite 312

Madison, Wisconsin 53713

- 1-12. At the time of transmittal to the Architect-Engineer, the Contractor shall also send a copy of the complete submittal directly to the COR.

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**SECTION 01 42 19
REFERENCE STANDARDS**

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies the availability and source of references and standards specified in the project manual under paragraphs APPLICABLE PUBLICATIONS and/or shown on the drawings.

1.2 AVAILABILITY OF SPECIFICATIONS LISTED IN THE GSA INDEX OF FEDERAL SPECIFICATIONS, STANDARDS AND COMMERCIAL ITEM DESCRIPTIONS FPMR PART 101-29 (FAR 52.211-1) (AUG 1998)

- A. The GSA Index of Federal Specifications, Standards and Commercial Item Descriptions, FPMR Part 101-29 and copies of specifications, standards, and commercial item descriptions cited in the solicitation may be obtained for a fee by submitting a request to - GSA Federal Supply Service, Specifications Section, Suite 8100, 470 East L'Enfant Plaza, SW, Washington, DC 20407, Telephone (202) 619-8925, Facsimile (202) 619-8978.
- B. If the General Services Administration, Department of Agriculture, or Department of Veterans Affairs issued this solicitation, a single copy of specifications, standards, and commercial item descriptions cited in this solicitation may be obtained free of charge by submitting a request to the addressee in paragraph (a) of this provision. Additional copies will be issued for a fee.

1.3 AVAILABILITY FOR EXAMINATION OF SPECIFICATIONS NOT LISTED IN THE GSA INDEX OF FEDERAL SPECIFICATIONS, STANDARDS AND COMMERCIAL ITEM DESCRIPTIONS (FAR 52.211-4) (JUN 1988)

The specifications and standards cited in this solicitation can be examined at the following location:

DEPARTMENT OF VETERANS AFFAIRS

Office of Construction & Facilities Management

Facilities Quality Service (00CFM1A)

425 Eye Street N.W, (sixth floor)

Washington, DC 20001

Telephone Numbers: (202) 632-5249 or (202) 632-5178

Between 9:00 AM - 3:00 PM

1.4 AVAILABILITY OF SPECIFICATIONS NOT LISTED IN THE GSA INDEX OF FEDERAL SPECIFICATIONS, STANDARDS AND COMMERCIAL ITEM DESCRIPTIONS (FAR 52.211-3) (JUN 1988)

The specifications cited in this solicitation may be obtained from the associations or organizations listed below.

AA Aluminum Association Inc.
<http://www.aluminum.org>

AABC Associated Air Balance Council
<http://www.aabchg.com>

AAMA American Architectural Manufacturer's Association
<http://www.aamanet.org>

AAN American Nursery and Landscape Association
<http://www.anla.org>

AASHTO American Association of State Highway and Transportation Officials
<http://www.aashto.org>

AATCC American Association of Textile Chemists and Colorists
<http://www.aatcc.org>

ACGIH American Conference of Governmental Industrial Hygienists
<http://www.acgih.org>

ACI American Concrete Institute
<http://www.aci-int.net>

ACPA American Concrete Pipe Association
<http://www.concrete-pipe.org>

ACPPA American Concrete Pressure Pipe Association
<http://www.acppa.org>

ADC Air Diffusion Council
<http://flexibleduct.org>

AGA American Gas Association
<http://www.aga.org>

AGC Associated General Contractors of America
<http://www.agc.org>

AGMA American Gear Manufacturers Association, Inc.
<http://www.agma.org>

AHAM Association of Home Appliance Manufacturers
<http://www.aham.org>

AISC American Institute of Steel Construction
<http://www.aisc.org>

AISI American Iron and Steel Institute
<http://www.steel.org>

AITC American Institute of Timber Construction
<http://www.aitc-glulam.org>

AMCA Air Movement and Control Association, Inc.
<http://www.amca.org>

ANLA American Nursery & Landscape Association
<http://www.anla.org>

ANSI	American National Standards Institute, Inc. http://www.ansi.org
APA	The Engineered Wood Association http://www.apawood.org
ARI	Air-Conditioning and Refrigeration Institute http://www.ari.org
ASAE	American Society of Agricultural Engineers http://www.asae.org
ASCE	American Society of Civil Engineers http://www.asce.org
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers http://www.ashrae.org
ASME	American Society of Mechanical Engineers http://www.asme.org
ASSE	American Society of Sanitary Engineering http://www.asse-plumbing.org
ASTM	American Society for Testing and Materials http://www.astm.org
AWI	Architectural Woodwork Institute http://www.awinet.org
AWS	American Welding Society http://www.aws.org
AWWA	American Water Works Association http://www.awwa.org
BHMA	Builders Hardware Manufacturers Association http://www.buildershardware.com
BIA	Brick Institute of America http://www.bia.org
CAGI	Compressed Air and Gas Institute http://www.cagi.org
CGA	Compressed Gas Association, Inc. http://www.cganet.com
CI	The Chlorine Institute, Inc. http://www.chlorineinstitute.org
CISCA	Ceilings and Interior Systems Construction Association http://www.cisca.org
CISPI	Cast Iron Soil Pipe Institute http://www.cispi.org

CLFMI	Chain Link Fence Manufacturers Institute http://www.chainlinkinfo.org
CPMB	Concrete Plant Manufacturers Bureau http://www.cpm.org
CRA	California Redwood Association http://www.calredwood.org
CRSI	Concrete Reinforcing Steel Institute http://www.crsi.org
CTI	Cooling Technology Institute http://www.cti.org
DHI	Door and Hardware Institute http://www.dhi.org
EGSA	Electrical Generating Systems Association http://www.egsa.org
EEI	Edison Electric Institute http://www.eei.org
EPA	Environmental Protection Agency http://www.epa.gov
ETL	ETL Testing Laboratories, Inc. http://www.etl.com
FAA	Federal Aviation Administration http://www.faa.gov
FCC	Federal Communications Commission http://www.fcc.gov
FPS	The Forest Products Society http://www.forestprod.org
GANA	Glass Association of North America http://www.cssinfo.com/info/gana.html/
FM	Factory Mutual Insurance http://www.fmglobal.com
GA	Gypsum Association http://www.gypsum.org
GSA	General Services Administration http://www.gsa.gov
HI	Hydraulic Institute http://www.pumps.org
HPVA	Hardwood Plywood & Veneer Association http://www.hpva.org
ICBO	International Conference of Building Officials http://www.icbo.org

ICEA Insulated Cable Engineers Association Inc.
<http://www.icea.net>

\ICAC Institute of Clean Air Companies
<http://www.icac.com>

IEEE Institute of Electrical and Electronics Engineers
<http://www.ieee.org/>

IMSA International Municipal Signal Association
<http://www.imsasafety.org>

IPCEA Insulated Power Cable Engineers Association

NBMA Metal Buildings Manufacturers Association
<http://www.mbma.com>

MSS Manufacturers Standardization Society of the Valve and Fittings Industry Inc.
<http://www.mss-hq.com>

NAAMM National Association of Architectural Metal Manufacturers
<http://www.naamm.org>

NAPHCC Plumbing-Heating-Cooling Contractors Association
<http://www.phccweb.org.org>

NBS National Bureau of Standards
 See - NIST

NBBPVI National Board of Boiler and Pressure Vessel Inspectors
<http://www.nationboard.org>

NEC National Electric Code
 See - NFPA National Fire Protection Association

NEMA National Electrical Manufacturers Association
<http://www.nema.org>

NFPA National Fire Protection Association
<http://www.nfpa.org>

NHLA National Hardwood Lumber Association
<http://www.natlhardwood.org>

NIH National Institute of Health
<http://www.nih.gov>

NIST National Institute of Standards and Technology
<http://www.nist.gov>

NLMA Northeastern Lumber Manufacturers Association, Inc.
<http://www.nelma.org>

NPA National Particleboard Association
 18928 Premiere Court
 Gaithersburg, MD 20879
 (301) 670-0604

NSF National Sanitation Foundation
<http://www.nsf.org>

NWWDA Window and Door Manufacturers Association
<http://www.nwwda.org>

OSHA Occupational Safety and Health Administration
 Department of Labor
<http://www.osha.gov>

PCA Portland Cement Association
<http://www.portcement.org>

PCI Precast Prestressed Concrete Institute
<http://www.pci.org>

PPI The Plastic Pipe Institute
<http://www.plasticpipe.org>

PEI Porcelain Enamel Institute, Inc.
<http://www.porcelainenamel.com>

PTI Post-Tensioning Institute
<http://www.post-tensioning.org>

RFCI The Resilient Floor Covering Institute
<http://www.rfci.com>

RIS Redwood Inspection Service
 See - CRA

RMA Rubber Manufacturers Association, Inc.
<http://www.rma.org>

SCMA Southern Cypress Manufacturers Association
<http://www.cypressinfo.org>

SDI Steel Door Institute
<http://www.steeldoor.org>

IGMA Insulating Glass Manufacturers Alliance
<http://www.igmaonline.org>

SJI Steel Joist Institute
<http://www.steeljoist.org>

SMACNA Sheet Metal and Air-Conditioning Contractors
 National Association, Inc.
<http://www.smacna.org>

SSPC The Society for Protective Coatings
<http://www.sspc.org>

STI Steel Tank Institute
<http://www.steeltank.com>

SWI Steel Window Institute
<http://www.steelwindows.com>

TCA Tile Council of America, Inc.
<http://www.tileusa.com>

TEMA Tubular Exchange Manufacturers Association
<http://www.tema.org>

TPI Truss Plate Institute, Inc.
 583 D'Onofrio Drive; Suite 200
 Madison, WI 53719
 (608) 833-5900

UBC The Uniform Building Code
 See ICBO

UL Underwriters' Laboratories Incorporated
<http://www.ul.com>

ULC Underwriters' Laboratories of Canada
<http://www.ulc.ca>

WCLIB West Coast Lumber Inspection Bureau
 6980 SW Varns Road, P.O. Box 23145
 Portland, OR 97223
 (503) 639-0651

WRCLA Western Red Cedar Lumber Association
 P.O. Box 120786
 New Brighton, MN 55112
 (612) 633-4334

WWPA Western Wood Products Association
<http://www.wwpa.org>

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SECTION 01 57 19
TEMPORARY ENVIRONMENTAL CONTROLS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the control of environmental pollution and damage that the Contractor must consider for air, water, and land resources. It includes management of visual aesthetics, noise, solid waste, radiant energy, and radioactive materials, as well as other pollutants and resources encountered or generated by the Contractor. The Contractor is obligated to consider specified control measures with the costs included within the various contract items of work.
- B. Environmental pollution and damage is defined as the presence of chemical, physical, or biological elements or agents which:
1. Adversely effect human health or welfare,
 2. Unfavorably alter ecological balances of importance to human life,
 3. Effect other species of importance to humankind, or;
 4. Degrade the utility of the environment for aesthetic, cultural, and historical purposes.
- C. Definitions of Pollutants:
1. Chemical Waste: Petroleum products, bituminous materials, salts, acids, alkalis, herbicides, pesticides, organic chemicals, and inorganic wastes.
 2. Debris: Combustible and noncombustible wastes, such as leaves, tree trimmings, ashes, and waste materials resulting from construction or maintenance and repair work.
 3. Sediment: Soil and other debris that has been eroded and transported by runoff water.
 4. Solid Waste: Rubbish, debris, garbage, and other discarded solid materials resulting from industrial, commercial, and agricultural operations and from community activities.
 5. Surface Discharge: The term "Surface Discharge" implies that the water is discharged with possible sheeting action and subsequent soil erosion may occur. Waters that are surface discharged may terminate in drainage ditches, storm sewers, creeks, and/or "water of the United States" and would require a permit to discharge water from the governing agency.
 6. Rubbish: Combustible and noncombustible wastes such as paper, boxes, glass and crockery, metal and lumber scrap, tin cans, and bones.
 7. Sanitary Wastes:
 - a. Sewage: Domestic sanitary sewage and human and animal waste.

- b. Garbage: Refuse and scraps resulting from preparation, cooking, dispensing, and consumption of food.

1.2 QUALITY CONTROL

- A. Establish and maintain quality control for the environmental protection of all items set forth herein.
- B. Record on daily reports any problems in complying with laws, regulations, and ordinances. Note any corrective action taken.

1.3 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.
- B. U.S. National Archives and Records Administration (NARA):
33 CFR 328.....Definitions

1.4 SUBMITTALS

- A. In accordance with Section, 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, furnish the following:
 - 1. Environmental Protection Plan: After the contract is awarded and prior to the commencement of the work, the Contractor shall meet with the COR to discuss the proposed Environmental Protection Plan and to develop mutual understanding relative to details of environmental protection. Not more than 20 days after the meeting, the Contractor shall prepare and submit to the COR for approval, a written and/or graphic Environmental Protection Plan including, but not limited to, the following:
 - a. Name(s) of person(s) within the Contractor's organization who is (are) responsible for ensuring adherence to the Environmental Protection Plan.
 - b. Name(s) and qualifications of person(s) responsible for manifesting hazardous waste to be removed from the site.
 - c. Name(s) and qualifications of person(s) responsible for training the Contractor's environmental protection personnel.
 - d. Description of the Contractor's environmental protection personnel training program.
 - e. A list of Federal, State, and local laws, regulations, and permits concerning environmental protection, pollution control, noise control and abatement that are applicable to the Contractor's proposed operations and the requirements imposed by those laws, regulations, and permits.
 - f. Methods for protection of features to be preserved within authorized work areas including trees, shrubs, vines, grasses,

ground cover, landscape features, air and water quality, fish and wildlife, soil, historical, and archeological and cultural resources.

- g. Procedures to provide the environmental protection that comply with the applicable laws and regulations. Describe the procedures to correct pollution of the environment due to accident, natural causes, or failure to follow the procedures as described in the Environmental Protection Plan.
 - h. Permits, licenses, and the location of the solid waste disposal area.
 - i. Drawings showing locations of any proposed temporary excavations or embankments for haul roads, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials. Include as part of an Erosion Control Plan approved by the District Office of the U.S. Soil Conservation Service and the Department of Veterans Affairs.
 - j. Environmental Monitoring Plans for the job site including land, water, air, and noise.
 - k. Work Area Plan showing the proposed activity in each portion of the area and identifying the areas of limited use or nonuse. Plan should include measures for marking the limits of use areas. This plan may be incorporated within the Erosion Control Plan.
- B. Approval of the Contractor's Environmental Protection Plan will not relieve the Contractor of responsibility for adequate and continued control of pollutants and other environmental protection measures.

1.5 PROTECTION OF ENVIRONMENTAL RESOURCES

- A. Protect environmental resources within the project boundaries and those affected outside the limits of permanent work during the entire period of this contract. Confine activities to areas defined by the specifications and drawings.
 - 1. Store chemical waste away from the work areas in corrosion resistant containers and dispose of waste in accordance with Federal, State, and local regulations.
 - 2. Handle discarded materials other than those included in the solid waste category as directed by the COR.
- B. Protection of Air Resources: Keep construction activities under surveillance, management, and control to minimize pollution of air resources. Burning is not permitted on the job site. Keep activities, equipment, processes, and work operated or performed, in strict accordance with the State of Wisconsin and Federal emission and

performance laws and standards. Maintain ambient air quality standards set by the Environmental Protection Agency, for those construction operations and activities specified.

1. Particulates: Control dust particles, aerosols, and gaseous by-products from all construction activities, processing, and preparation of materials (such as from asphaltic batch plants) at all times, including weekends, holidays, and hours when work is not in progress.
 2. Particulates Control: Maintain all excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and all other work areas within or outside the project boundaries free from particulates which would cause a hazard or a nuisance. Sprinklering, chemical treatment of an approved type, light bituminous treatment, baghouse, scrubbers, electrostatic precipitators, or other methods are permitted to control particulates in the work area.
 3. Hydrocarbons and Carbon Monoxide: Control monoxide emissions from equipment to Federal and State allowable limits.
 4. Odors: Control odors of construction activities and prevent obnoxious odors from occurring.
- C. Reduction of Noise: Minimize noise using every action possible. Perform noise-producing work in less sensitive hours of the day or week as directed by the Resident Engineer. Maintain noise-produced work at or below the decibel levels and within the time periods specified.
1. Perform construction activities involving repetitive, high-level impact noise only between 8:00 a.m. and 6:00 p.m. unless otherwise permitted by local ordinance or the COR. Repetitive impact noise on the property shall not exceed the following dB limitations:

Time Duration of Impact Noise	Sound Level in dB
More than 12 minutes in any hour	70
Less than 30 seconds of any hour	85
Less than three minutes of any hour	80
Less than 12 minutes of any hour	75

2. Provide sound-deadening devices on equipment and take noise abatement measures that are necessary to comply with the requirements of this contract, consisting of, but not limited to, the following:
 - a. Maintain maximum permissible construction equipment noise levels at 15 m (50 feet) (dBA):

EARTHMOVING		MATERIALS HANDLING	
FRONT LOADERS	75	CONCRETE MIXERS	75
BACKHOES	75	CONCRETE PUMPS	75
DOZERS	75	CRANES	75
TRACTORS	75	DERRICKS IMPACT	75
SCAPERS	80	PILE DRIVERS	95
GRADERS	75	JACK HAMMERS	75
TRUCKS	75	ROCK DRILLS	80
PAVERS, STATIONARY	80	PNEUMATIC TOOLS	80
PUMPS	75		
GENERATORS	75	SAWS	75
COMPRESSORS	75	VIBRATORS	75

- b. Use shields or other physical barriers to restrict noise transmission.
 - c. Provide soundproof housings or enclosures for noise-producing machinery.
 - d. Use efficient silencers on equipment air intakes.
 - e. Use efficient intake and exhaust mufflers on internal combustion engines that are maintained so equipment performs below noise levels specified.
 - f. Line hoppers and storage bins with sound deadening material.
 - g. Conduct truck loading, unloading, and hauling operations so that noise is kept to a minimum.
- D. Restoration of Damaged Property: If any direct or indirect damage is done to public or private property resulting from any act, omission, neglect, or misconduct, the Contractor shall restore the damaged property to a condition equal to that existing before the damage at no additional cost to the Government. Repair, rebuild, or restore property as directed or make good such damage in an acceptable manner.
- E. Final Clean-up: On completion of project and after removal of all debris, rubbish, and temporary construction, Contractor shall leave the construction area in a clean condition satisfactory to the Resident Engineer. Cleaning shall include off the station disposal of all items and materials not required to be salvaged, as well as all debris and rubbish resulting from demolition and new work operations.

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SECTION 01 58 16
TEMPORARY INTERIOR SIGNAGE

PART 1 GENERAL**DESCRIPTION**

This section specifies temporary interior signs.

PART 2 PRODUCTS**2.1 TEMPORARY SIGNS**

- A. Fabricate from 50 Kg (110 pound) mat finish white paper.
- B. Cut to 100 mm (4-inch) wide by 300 mm (12 inch) long size tag.
- C. Punch 3 mm (1/8-inch) diameter hole centered on 100 mm (4-inch) dimension of tag. Edge of Hole spaced approximately 13 mm (1/2-inch) from one end on tag.
- D. Reinforce hole on both sides with gummed cloth washer or other suitable material capable of preventing tie pulling through paper edge.
- E. Ties: Steel wire 0.3 mm (0.0120-inch) thick, attach to tag with twist tie, leaving 150 mm (6-inch) long free ends.

PART 3 EXECUTION**3.1 INSTALLATION**

- A. Install temporary signs attached to room door frame or room door knob, lever, or pull for doors on corridor openings.
- B. Mark on signs with felt tip marker having approximately 3 mm (1/8-inch) wide stroke for clearly legible numbers or letters.
- C. Identify room with numbers as designated on floor plans.

3.2 LOCATION

- A. Install on doors that have room, corridor, and space numbers shown.
- B. Doors that do not require signs are as follows:
 - 1. Corridor barrier doors (cross-corridor) in corridor with same number.
 - 2. Folding doors or partitions.
 - 3. Toilet or bathroom doors within and between rooms.
 - 4. Communicating doors in partitions between rooms with corridor entrance doors.
 - 5. Closet doors within rooms.
- C. Replace missing, damaged, or illegible signs.

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SECTION 01 74 19
CONSTRUCTION WASTE MANAGEMENT

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the requirements for the management of non-hazardous building construction and demolition waste.
- B. Waste disposal in landfills shall be minimized to the greatest extent possible. Of the inevitable waste that is generated, as much of the waste material as economically feasible shall be salvaged, recycled or reused.
- C. Contractor shall use all reasonable means to divert construction and demolition waste from landfills and incinerators, and facilitate their salvage and recycle not limited to the following:
 - 1. Waste Management Plan development and implementation.
 - 2. Techniques to minimize waste generation.
 - 3. Sorting and separating of waste materials.
 - 4. Salvage of existing materials and items for reuse or resale.
 - 5. Recycling of materials that cannot be reused or sold.
- D. At a minimum the following waste categories shall be diverted from landfills:
 - 1. Soil.
 - 2. Inerts (eg, concrete, masonry and asphalt).
 - 3. Clean dimensional wood and palette wood.
 - 4. Green waste (biodegradable landscaping materials).
 - 5. Engineered wood products (plywood, particle board and I-joists, etc).
 - 6. Metal products (eg, steel, wire, beverage containers, copper, etc).
 - 7. Cardboard, paper and packaging.
 - 8. Bitumen roofing materials.
 - 9. Plastics (eg, ABS, PVC).
 - 10. Carpet and/or pad.
 - 11. Gypsum board.
 - 12. Insulation.
 - 13. Paint.
 - 14. Fluorescent lamps.

1.2 RELATED WORK

- A. Section 01 00 00, GENERAL REQUIREMENTS.

1.3 QUALITY ASSURANCE

- A. Contractor shall practice efficient waste management when sizing, cutting and installing building products. Processes shall be employed to ensure the generation of as little waste as possible. Construction /Demolition waste includes products of the following:
1. Excess or unusable construction materials.
 2. Packaging used for construction products.
 3. Poor planning and/or layout.
 4. Construction error.
 5. Over ordering.
 6. Weather damage.
 7. Contamination.
 8. Mishandling.
 9. Breakage.
- B. Establish and maintain the management of non-hazardous building construction and demolition waste set forth herein. Conduct a site assessment to estimate the types of materials that will be generated by demolition and construction.
- C. Contractor shall develop and implement procedures to recycle construction and demolition waste to a minimum of 50 percent.
- D. Contractor shall be responsible for implementation of any special programs involving rebates or similar incentives related to recycling. Any revenues or savings obtained from salvage or recycling shall accrue to the contractor.
- E. Contractor shall provide all demolition, removal and legal disposal of materials. Contractor shall ensure that facilities used for recycling, reuse and disposal shall be permitted for the intended use to the extent required by local, state, federal regulations. The Whole Building Design Guide website <http://www.wbdg.org/tools/cwm.php> provides a Construction Waste Management Database that contains information on companies that haul, collect, and process recyclable debris from construction projects.
- F. Contractor shall assign a specific area to facilitate separation of materials for reuse, salvage, recycling, and return. Such areas are to be kept neat and clean and clearly marked in order to avoid contamination or mixing of materials.

- G. Contractor shall provide on-site instructions and supervision of separation, handling, salvaging, recycling, reuse and return methods to be used by all parties during waste generating stages.
- H. Record on daily reports any problems in complying with laws, regulations and ordinances with corrective action taken.

1.4 TERMINOLOGY

- A. Class III Landfill: A landfill that accepts non-hazardous resources such as household, commercial and industrial waste resulting from construction, remodeling, repair and demolition operations.
- B. Clean: Untreated and unpainted; uncontaminated with adhesives, oils, solvents, mastics and like products.
- C. Construction and Demolition Waste: Includes all non-hazardous resources resulting from construction, remodeling, alterations, repair and demolition operations.
- D. Dismantle: The process of parting out a building in such a way as to preserve the usefulness of its materials and components.
- E. Disposal: Acceptance of solid wastes at a legally operating facility for the purpose of land filling (includes Class III landfills and inert fills).
- F. Inert Backfill Site: A location, other than inert fill or other disposal facility, to which inert materials are taken for the purpose of filling an excavation, shoring or other soil engineering operation.
- G. Inert Fill: A facility that can legally accept inert waste, such as asphalt and concrete exclusively for the purpose of disposal.
- H. Inert Solids/Inert Waste: Non-liquid solid resources including, but not limited to, soil and concrete that does not contain hazardous waste or soluble pollutants at concentrations in excess of water-quality objectives established by a regional water board, and does not contain significant quantities of decomposable solid resources.
- I. Mixed Debris: Loads that include commingled recyclable and non-recyclable materials generated at the construction site.
- J. Mixed Debris Recycling Facility: A solid resource processing facility that accepts loads of mixed construction and demolition debris for the purpose of recovering re-usable and recyclable materials and disposing non-recyclable materials.
- K. Permitted Waste Hauler: A company that holds a valid permit to collect and transport solid wastes from individuals or businesses for the purpose of recycling or disposal.

- L. Recycling: The process of sorting, cleansing, treating, and reconstituting materials for the purpose of using the altered form in the manufacture of a new product. Recycling does not include burning, incinerating or thermally destroying solid waste.
 - 1. On-site Recycling - Materials that are sorted and processed on site for use in an altered state in the work, i.e. concrete crushed for use as a sub-base in paving.
 - 2. Off-site Recycling - Materials hauled to a location and used in an altered form in the manufacture of new products.
- M. Recycling Facility: An operation that can legally accept materials for the purpose of processing the materials into an altered form for the manufacture of new products. Depending on the types of materials accepted and operating procedures, a recycling facility may or may not be required to have a solid waste facilities permit or be regulated by the local enforcement agency.
- N. Reuse: Materials that are recovered for use in the same form, on-site or off-site.
- O. Return: To give back reusable items or unused products to vendors for credit.
- P. Salvage: To remove waste materials from the site for resale or re-use by a third party.
- Q. Source-Separated Materials: Materials that are sorted by type at the site for the purpose of reuse and recycling.
- R. Solid Waste: Materials that have been designated as non-recyclable and are discarded for the purposes of disposal.
- S. Transfer Station: A facility that can legally accept solid waste for the purpose of temporarily storing the materials for re-loading onto other trucks and transporting them to a landfill for disposal, or recovering some materials for re-use or recycling.

1.5 SUBMITTALS

- A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES, furnish the following:
- B. Designated Manager responsible for instructing personnel, supervising, documenting and administer over meetings relevant to the Waste Management Plan.
- C. Final summary of construction and demolition debris diversion and disposal, quantifying all materials generated at the work site and disposed of or diverted from disposal through recycling.

1.6 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced by the basic designation only. In the event that criteria requirements conflict, the most stringent requirements shall be met.
- B. U.S. Green Building Council (USGBC):
LEED Green Building Rating System for New Construction

1.7 RECORDS

- A. Maintain records to document the quantity of waste generated; the quantity of waste diverted through sale, reuse, or recycling; and the quantity of waste disposed by landfill or incineration. Records shall be kept in accordance with the LEED Reference Guide and LEED Template.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. List of each material and quantity to be salvaged, recycled, reused.
- B. List of each material and quantity proposed to be taken to a landfill.
- C. Material tracking data: Receiving parties, dates removed, transportation costs, weight tickets, tipping fees, manifests, invoices, net total costs or savings.

PART 3 - EXECUTION

3.1 COLLECTION

- A. Provide all necessary containers, bins and storage areas to facilitate effective waste management.
- B. Clearly identify containers, bins and storage areas so that recyclable materials are separated from trash and can be transported to respective recycling facility for processing.
- C. Hazardous wastes shall be separated, stored, disposed of according to local, state, federal regulations.

3.2 DISPOSAL

- A. Contractor shall be responsible for transporting and disposing of materials that cannot be delivered to a source-separated or mixed materials recycling facility to a transfer station or disposal facility that can accept the materials in accordance with state and federal regulations.
- B. Construction or demolition materials with no practical reuse or that cannot be salvaged or recycled shall be disposed of at a landfill or incinerator.

3.3 REPORT

- A. With the application of the final progress payment, submit a summary of construction and demolition debris diversion and disposal including beginning and ending dates of period covered.
- B. Quantify all materials diverted from landfill disposal through salvage or recycling during the period with the receiving parties, dates removed, transportation costs, weight tickets, manifests, invoices. Include the net total costs or savings for each salvaged or recycled material.
- C. Quantify all materials disposed of during the period with the receiving parties, dates removed, transportation costs, weight tickets, tipping fees, manifests, invoices. Include the net total costs for each disposal.

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**SECTION 07 84 00
FIRESTOPPING**

PART 1 GENERAL

1.1 DESCRIPTION

- A. Closures of openings in walls, floors, and roof decks against penetration of flame, heat, and smoke or gases in fire resistant rated construction.
- B. Closure of openings in walls against penetration of gases or smoke in smoke partitions.

1.2 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturers literature, data, and installation instructions for types of firestopping and smoke stopping used.
- C. List of FM, UL, or WH classification number of systems installed.
- D. Certified laboratory test reports for ASTM E814 tests for systems not listed by FM, UL, or WH proposed for use.

1.3 DELIVERY AND STORAGE

- A. Deliver materials in their original unopened containers with manufacturer's name and product identification.
- B. Store in a location providing protection from damage and exposure to the elements.

1.4 WARRANTY

- A. Firestopping work subject to the terms of the Article "Warranty of Construction", FAR clause 52.246-21, except extend the warranty period to five years.

1.5 QUALITY ASSURANCE

- A. FM, UL, or WH or other approved laboratory tested products will be acceptable.

1.6 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):
 - E84-10.....Surface Burning Characteristics of Building Materials
 - E814-11.....Fire Tests of Through-Penetration Fire Stops

- C. Factory Mutual Engineering and Research Corporation (FM):
Annual Issue Approval Guide Building Materials
- D. Underwriters Laboratories, Inc. (UL):
Annual Issue Building Materials Directory
Annual Issue Fire Resistance Directory
1479-10.....Fire Tests of Through-Penetration Firestops
- E. Warnock Hersey (WH):
Annual Issue Certification Listings

PART 2 - PRODUCTS

2.1 FIRESTOP SYSTEMS

- A. Use either factory built (Firestop Devices) or field erected (through-Penetration Firestop Systems) to form a specific building system maintaining required integrity of the fire barrier and stop the passage of gases or smoke.
- B. Through-penetration firestop systems and firestop devices tested in accordance with ASTM E814 or UL 1479 using the "F" or "T" rating to maintain the same rating and integrity as the fire barrier being sealed. "T" ratings are not required for penetrations smaller than or equal to 100 mm (4 in) nominal pipe or 0.01 m² (16 sq. in.) in overall cross sectional area.
- C. Products requiring heat activation to seal an opening by its intumescence shall exhibit a demonstrated ability to function as designed to maintain the fire barrier.
- D. Firestop sealants used for firestopping or smoke sealing shall have following properties:
 - 1. Contain no flammable or toxic solvents.
 - 2. Have no dangerous or flammable out gassing during the drying or curing of products.
 - 3. Water-resistant after drying or curing and unaffected by high humidity, condensation or transient water exposure.
 - 4. When used in exposed areas, shall be capable of being sanded and finished with similar surface treatments as used on the surrounding wall or floor surface.
- E. Firestopping system or devices used for penetrations by glass pipe, plastic pipe or conduits, unenclosed cables, or other non-metallic materials shall have following properties:
 - 1. Classified for use with the particular type of penetrating material used.

2. Penetrations containing loose electrical cables, computer data cables, and communications cables protected using firestopping systems that allow unrestricted cable changes without damage to the seal.
 3. Intumescent products which would expand to seal the opening and act as fire, smoke, toxic fumes, and, water sealant.
- F. Maximum flame spread of 25 and smoke development of 50 when tested in accordance with ASTM E84.
- G. FM, UL, or WH rated or tested by an approved laboratory in accordance with ASTM E814.
- H. Materials to be asbestos free.

2.2 SMOKE STOPPING IN SMOKE PARTITIONS

- A. Use silicone sealant in smoke partitions as specified in Section 07 92 00, JOINT SEALANTS.
- B. Use mineral fiber filler and bond breaker behind sealant.
- C. Sealants shall have a maximum flame spread of 25 and smoke developed of 50 when tested in accordance with E84.
- D. When used in exposed areas capable of being sanded and finished with similar surface treatments as used on the surrounding wall or floor surface.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Submit product data and installation instructions, as required by article, submittals, after an on site examination of areas to receive firestopping.

3.2 PREPARATION

- A. Remove dirt, grease, oil, loose materials, or other substances that prevent adherence and bonding or application of the firestopping or smoke stopping materials.
- B. Remove insulation on insulated pipe for a distance of 150 mm (six inches) on either side of the fire rated assembly prior to applying the firestopping materials unless the firestopping materials are tested and approved for use on insulated pipes.

3.3 INSTALLATION

- A. Do not begin work until the specified material data and installation instructions of the proposed firestopping systems have been submitted and approved.

- B. Install firestopping systems with smoke stopping in accordance with FM, UL, WH, or other approved system details and installation instructions.
- C. Install smoke stopping seals in smoke partitions.

3.4 CLEAN-UP AND ACCEPTANCE OF WORK

- A. As work on each floor is completed, remove materials, litter, and debris.
- B. Do not move materials and equipment to the next-scheduled work area until completed work is inspected and accepted by the Resident Engineer.
- C. Clean up spills of liquid type materials.

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**SECTION 23 05 11
COMMON WORK RESULTS FOR HVAC**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The requirements of this Section apply to all sections of Division 23.
- B. Definitions:
 - 1. Exposed: Piping, ductwork, and equipment exposed to view in finished rooms.
 - 2. Option or optional: Contractor's choice of an alternate material or method.
 - 3. COR: Contracting Officer's Representative.

1.2 RELATED WORK

- A. Section 01 00 00, GENERAL REQUIREMENTS
- B. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES
- C. Section 07 84 00, FIRESTOPPING
- D. Section 23 07 11, HVAC, PLUMBING, and Boiler Plant Insulation
- E. Section 23 22 13, STEAM and CONDENSATE HEATING PIPING

1.3 QUALITY ASSURANCE

- A. Mechanical, electrical and associated systems shall be safe, reliable, efficient, durable, easily and safely operable and maintainable, easily and safely accessible, and in compliance with applicable codes as specified. The systems shall be comprised of high quality institutional-class and industrial-class products of manufacturers that are experienced specialists in the required product lines. All construction firms and personnel shall be experienced and qualified specialists in industrial and institutional HVAC
- B. Products Criteria:
 - 1. Standard Products: Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products for at least 3 years (or longer as specified elsewhere). The design, model and size of each item shall have been in satisfactory and efficient operation on at least three installations for approximately three years. However, digital electronics devices, software and systems such as controls, instruments, computer work station, shall be the current generation of technology and basic design that has a proven satisfactory service record of at least three years. See other specification sections for any exceptions and/or additional requirements.

2. All items furnished shall be free from defects that would adversely affect the performance, maintainability and appearance of individual components and overall assembly.
3. Conform to codes and standards as required by the specifications. Conform to local codes, if required by local authorities such as the natural gas supplier, if the local codes are more stringent than those specified. Refer any conflicts to the COR.
4. Multiple Units: When two or more units of materials or equipment of the same type or class are required, these units shall be products of one manufacturer.
5. Assembled Units: Manufacturers of equipment assemblies, which use components made by others, assume complete responsibility for the final assembled product.
6. Nameplates: Nameplate bearing manufacturer's name or identifiable trademark shall be securely affixed in a conspicuous place on equipment, or name or trademark cast integrally with equipment, stamped or otherwise permanently marked on each item of equipment.
7. Asbestos products or equipment or materials containing asbestos shall not be used.

C. Equipment Service Organizations:

1. HVAC: Products and systems shall be supported by service organizations that maintain a complete inventory of repair parts and are located within 50 miles to the site.

D. HVAC Mechanical Systems Welding: Before any welding is performed, contractor shall submit a certificate certifying that welders comply with the following requirements:

1. Qualify welding processes and operators for piping according to ASME "Boiler and Pressure Vessel Code", Section IX, "Welding and Brazing Qualifications".
2. Comply with provisions of ASME B31 series "Code for Pressure Piping".
3. Certify that each welder has passed American Welding Society (AWS) qualification tests for the welding processes involved, and that certification is current.

E. Execution (Installation, Construction) Quality:

1. Apply and install all items in accordance with manufacturer's written instructions. Refer conflicts between the manufacturer's instructions and the contract drawings and specifications to the COR for resolution. Provide written hard copies or computer files of manufacturer's installation instructions to the COR at least two weeks prior to commencing installation of any item. Installation of

the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations is a cause for rejection of the material.

2. Provide complete layout drawings required by Paragraph, SUBMITTALS. Do not commence construction work on any system until the layout drawings have been approved.

- F. Upon request by Government, provide lists of previous installations for selected items of equipment. Include contact persons who will serve as references, with telephone numbers and e-mail addresses.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, and with requirements in the individual specification sections.
- B. Contractor shall make all necessary field measurements and investigations to assure that the equipment and assemblies will meet contract requirements.
- C. If equipment is submitted which differs in arrangement from that shown, provide drawings that show the rearrangement of all associated systems. Approval will be given only if all features of the equipment and associated systems, including accessibility, are equivalent to that required by the contract.
- D. Prior to submitting shop drawings for approval, contractor shall certify in writing that manufacturers of all major items of equipment have each reviewed drawings and specifications, and have jointly coordinated and properly integrated their equipment and controls to provide a complete and efficient installation.
- E. Submittals and shop drawings for interdependent items, containing applicable descriptive information, shall be furnished together and complete in a group. Coordinate and properly integrate materials and equipment in each group to provide a completely compatible and efficient.
- F. HVAC Maintenance Data and Operating Instructions:
 1. Maintenance and operating manuals in accordance with Section 01 00 00, GENERAL REQUIREMENTS, Article, INSTRUCTIONS, for systems and equipment.
 2. Provide a listing of recommended replacement parts for keeping in stock supply, including sources of supply, for equipment.

1.5 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. Air Conditioning, Heating and Refrigeration Institute (AHRI):
430-2009.....Central Station Air-Handling Units
- C. American National Standard Institute (ANSI):
B31.1-2007.....Power Piping
- D. Rubber Manufacturers Association (ANSI/RMA):
IP-20-2007.....Specifications for Drives Using Classical
V-Belts and Sheaves
IP-21-2009.....Specifications for Drives Using Double-V
(Hexagonal) Belts
IP-22-2007.....Specifications for Drives Using Narrow V-Belts
and Sheaves
- E. Air Movement and Control Association (AMCA):
410-96.....Recommended Safety Practices for Air Moving
Devices
- F. American Society of Mechanical Engineers (ASME):
Boiler and Pressure Vessel Code (BPVC):
Section I-2007.....Power Boilers
Section IX-2007.....Welding and Brazing Qualifications
Code for Pressure Piping:
B31.1-2007.....Power Piping
- G. American Society for Testing and Materials (ASTM):
A36/A36M-08.....Standard Specification for Carbon Structural
Steel
A575-96(2007).....Standard Specification for Steel Bars, Carbon,
Merchant Quality, M-Grades
E84-10.....Standard Test Method for Surface Burning
Characteristics of Building Materials
E119-09c.....Standard Test Methods for Fire Tests of Building
Construction and Materials
- H. Manufacturers Standardization Society (MSS) of the Valve and Fittings
Industry, Inc:
SP-58-2009.....Pipe Hangers and Supports-Materials, Design and
Manufacture, Selection, Application, and
Installation
SP 69-2003.....Pipe Hangers and Supports-Selection and
Application

SP 127-2001.....Bracing for Piping Systems, Seismic - Wind -
Dynamic, Design, Selection, Application

I. National Electrical Manufacturers Association (NEMA):

MG-1-2009.....Motors and Generators

J. National Fire Protection Association (NFPA):

31-06.....Standard for Installation of Oil-Burning
Equipment

54-09.....National Fuel Gas Code

70-08.....National Electrical Code

85-07.....Boiler and Combustion Systems Hazards Code

90A-09.....Standard for the Installation of Air
Conditioning and Ventilating Systems

101-09.....Life Safety Code

1.6 DELIVERY, STORAGE AND HANDLING

A. Protection of Equipment:

1. Equipment and material placed on the job site shall remain in the custody of the Contractor until phased acceptance, whether or not the Government has reimbursed the Contractor for the equipment and material. The Contractor is solely responsible for the protection of such equipment and material against any damage.
2. Place damaged equipment in first class, new operating condition; or, replace same as determined and directed by the COR. Such repair or replacement shall be at no additional cost to the Government.
3. Protect interiors of new equipment and piping systems against entry of foreign matter. Clean both inside and outside before painting or placing equipment in operation.
4. Existing equipment and piping being worked on by the Contractor shall be under the custody and responsibility of the Contractor and shall be protected as required for new work.

B. Cleanliness of Piping and Equipment Systems:

1. Exercise care in storage and handling of equipment and piping material to be incorporated in the work. Remove debris arising from cutting, threading and welding of piping.
2. Piping systems shall be flushed, blown or pigged as necessary to deliver clean systems.
3. Contractor shall be fully responsible for all costs, damage, and delay arising from failure to provide clean systems.

1.7 JOB CONDITIONS - WORK IN EXISTING BUILDING

- A. Building Operation: Government employees will be continuously operating and managing all facilities, including temporary facilities, that serve the medical center.
- B. Maintenance of Service: Schedule all work to permit continuous service as required by the medical center.
- C. Steam and Condensate Service Interruptions: Limited steam and condensate service interruptions, as required for interconnections of new and existing systems, will be permitted by the COR during periods when the demands are not critical to the operation of the medical center. These non-critical periods are limited to between 8 pm and 5 am in the appropriate off-season (if applicable). Provide at least one week advance notice to the COR.
- D. Building Working Environment: Maintain the architectural and structural integrity of the building and the working environment at all times. Maintain the interior of building at 18 degrees C (65 degrees F) minimum. Limit the opening of doors, windows or other access openings to brief periods as necessary for rigging purposes. No storm water or ground water leakage permitted. Provide daily clean-up of construction and demolition debris on all floor surfaces and on all equipment being operated by VA.
- E. Acceptance of Work for Government Operation: As new facilities are made available for operation and these facilities are of beneficial use to the Government, inspections will be made and tests will be performed. Based on the inspections, a list of contract deficiencies will be issued to the Contractor. After correction of deficiencies as necessary for beneficial use, the Contracting Officer will process necessary acceptance and the equipment will then be under the control and operation of Government personnel.

PART 2 - PRODUCTS

2.1 FACTORY-ASSEMBLED PRODUCTS

- A. Provide maximum standardization of components to reduce spare part requirements.
- B. Manufacturers of equipment assemblies that include components made by others shall assume complete responsibility for final assembled unit.
 - 1. All components of an assembled unit need not be products of same manufacturer.
 - 2. Constituent parts that are alike shall be products of a single manufacturer.

3. Components shall be compatible with each other and with the total assembly for intended service.
 4. Contractor shall guarantee performance of assemblies of components, and shall repair or replace elements of the assemblies as required to deliver specified performance of the complete assembly.
- C. Components of equipment shall bear manufacturer's name and trademark, model number, serial number and performance data on a name plate securely affixed in a conspicuous place, or cast integral with, stamped or otherwise permanently marked upon the components of the equipment.
- D. Major items of equipment, which serve the same function, must be the same make and model. Exceptions will be permitted if performance requirements cannot be met.

2.2 COMPATIBILITY OF RELATED EQUIPMENT

- A. Equipment and materials installed shall be compatible in all respects with other items being furnished and with existing items so that the result will be a complete and fully operational plant that conforms to contract requirements.

2.3 EQUIPMENT AND MATERIALS IDENTIFICATION

- A. Use symbols, nomenclature and equipment numbers specified, shown on the drawings and shown in the maintenance manuals.
- B. Interior (Indoor) Equipment: Engraved nameplates, with letters not less than 48 mm (3/16-inch) high of brass with black-filled letters, or rigid black plastic with white letters permanently fastened to the equipment. Identify unit components such as coils, filters, fans, etc.
- C. Control Items: Label all temperature and humidity sensors, controllers and control dampers. Identify and label each item as they appear on the control diagrams.

2.4 FIRESTOPPING

- A. Section 07 84 00, FIRESTOPPING specifies an effective barrier against the spread of fire, smoke and gases where penetrations occur for piping and ductwork. Refer to Section 23 07 11, HVAC, PLUMBING, AND BOILER PLANT INSULATION, for firestop pipe and duct insulation.

2.5 HVAC PIPE AND EQUIPMENT SUPPORTS AND RESTRAINTS

- A. Pipe Supports: Comply with MSS SP-58. Type Numbers specified refer to this standard. For selection and application comply with MSS SP-69.
- B. Attachment to Concrete Building Construction:
1. Concrete insert: MSS SP-58, Type 18.
 2. Self-drilling expansion shields and machine bolt expansion anchors: Permitted in concrete not less than 102 mm (four inches) thick when approved by the COR for each job condition.

3. Power-driven fasteners: Permitted in existing concrete or masonry not less than 102 mm (four inches) thick when approved by the COR for each job condition.
- C. Attachment to Steel Building Construction:
1. Welded attachment: MSS SP-58, Type 22.
 2. Beam clamps: MSS SP-58, Types 20, 21, 28 or 29. Type 23 C-clamp may be used for individual copper tubing up to 23mm (7/8-inch) outside diameter.
- D. Attachment to existing structure: Support from existing floor/roof frame.
- E. Attachment to Wood Construction: Wood screws or lag bolts.
- F. Hanger Rods: Hot-rolled steel, ASTM A36 or A575 for allowable load listed in MSS SP-58. For piping, provide adjustment means for controlling level or slope. Types 13 or 15 turn-buckles shall provide 38 mm (1-1/2 inches) minimum of adjustment and incorporate locknuts. All-thread rods are acceptable.
- G. Hangers Supporting Multiple Pipes (Trapeze Hangers): Galvanized, cold formed, lipped steel channel horizontal member, not less than 41 mm by 41 mm (1-5/8 inches by 1-5/8 inches), 2.7 mm (No. 12 gage), designed to accept special spring held, hardened steel nuts. Not permitted for steam supply and condensate piping.
1. Allowable hanger load: Manufacturers rating less 91kg (200 pounds).
 2. Guide individual pipes on the horizontal member of every other trapeze hanger with 6 mm (1/4-inch) U-bolt fabricated from steel rod. Provide Type 40 insulation shield, secured by two 13mm (1/2-inch) galvanized steel bands, or preinsulated calcium silicate shield for insulated piping at each hanger.
- H. Supports for Piping Systems:
1. Select hangers sized to encircle insulation on insulated piping. Refer to Section 23 07 11, HVAC, PLUMBING, AND BOILER PLANT INSULATION for insulation thickness. To protect insulation, provide Type 39 saddles for roller type supports or preinsulated calcium silicate shields. Provide Type 40 insulation shield or preinsulated calcium silicate shield at all other types of supports and hangers including those for preinsulated piping.
 2. Piping Systems except High and Medium Pressure Steam (MSS SP-58):
 - a. Standard clevis hanger: Type 1; provide locknut.
 - b. Riser clamps: Type 8.
 - c. Wall brackets: Types 31, 32 or 33.
 - d. Roller supports: Type 41, 43, 44 and 46.

- e. Saddle support: Type 36, 37 or 38.
 - f. Turnbuckle: Types 13 or 15. Preinsulate.
 - g. U-bolt clamp: Type 24.
 - h. Copper Tube:
 - 1) Hangers, clamps and other support material in contact with tubing shall be painted with copper colored epoxy paint, plastic coated or taped with non-adhesive isolation tape to prevent electrolysis.
 - 2) For vertical runs use epoxy painted or plastic coated riser clamps.
 - 3) For supporting tube to strut: Provide epoxy painted pipe straps for copper tube or plastic inserted vibration isolation clamps.
 - 4) Insulated Lines: Provide pre-insulated calcium silicate shields sized for copper tube.
 - i. Supports for plastic or glass piping: As recommended by the pipe manufacturer with black rubber tape extending one inch beyond steel support or clamp.
3. High and Medium Pressure Steam (MSS SP-58):
- a. Provide eye rod or Type 17 eye nut near the upper attachment.
 - b. Piping 50 mm (2 inches) and larger: Type 43 roller hanger. For roller hangers requiring seismic bracing provide a Type 1 clevis hanger with Type 41 roller attached by flat side bars.
 - c. Piping with Vertical Expansion and Contraction:
 - 1) Movement up to 20 mm (3/4-inch): Type 51 or 52 variable spring unit with integral turn buckle and load indicator.
 - 2) Movement more than 20 mm (3/4-inch): Type 54 or 55 constant support unit with integral adjusting nut, turn buckle and travel position indicator.
- I. Pre-insulated Calcium Silicate Shields:
- 1. Provide 360 degree water resistant high density 965 kPa (140 psi) compressive strength calcium silicate shields encased in galvanized metal.
 - 2. Pre-insulated calcium silicate shields to be installed at the point of support during erection.
 - 3. Shield thickness shall match the pipe insulation.
 - 4. The type of shield is selected by the temperature of the pipe, the load it must carry, and the type of support it will be used with.
 - a. The pre-insulated calcium silicate shield shall support the maximum allowable water filled span as indicated in MSS-SP 69. To support the load, the shields may have one or more of the

following features: structural inserts 4138 kPa (600 psi) compressive strength, an extra bottom metal shield, or formed structural steel (ASTM A36) wear plates welded to the bottom sheet metal jacket.

5. Shields may be used on steel clevis hanger type supports, roller supports or flat surfaces.

2.6 SPECIAL TOOLS AND LUBRICANTS

- A. Furnish, and turn over to the COR, tools not readily available commercially, that are required for disassembly or adjustment of equipment and machinery furnished.
- B. Tool Containers: Hardwood or metal, permanently identified for intended service and mounted, or located, where directed by the COR.

2.7 ASBESTOS

- A. Materials containing asbestos are not permitted.

PART 3 - EXECUTION

3.1 ARRANGEMENT AND INSTALLATION OF EQUIPMENT AND PIPING

- A. Coordinate location of piping, sleeves, inserts, hangers, ductwork and equipment. Locate piping, sleeves, inserts, hangers, ductwork and equipment clear of windows, doors, openings, light outlets, and other services and utilities. Prepare equipment layout drawings to coordinate proper location and personnel access of all facilities. Submit the drawings for review as required by Part 1. Follow manufacturer's published recommendations for installation methods not otherwise specified.
- B. Operating Personnel Access and Observation Provisions: Select and arrange all equipment and systems to provide clear view and easy access, without use of portable ladders, for maintenance and operation of all devices including, but not limited to: all equipment items, valves, filters, strainers, transmitters, sensors, control devices. All gages and indicators shall be clearly visible by personnel standing on the floor or on permanent platforms. Do not reduce or change maintenance and operating space and access provisions that are shown on the drawings.
- C. Equipment and Piping Support: Coordinate structural systems necessary for pipe and equipment support with pipe and equipment locations to permit proper installation.
- D. Cutting Holes:
 1. Cut holes through concrete and masonry by rotary core drill. Pneumatic hammer, impact electric, and hand or manual hammer type drill will not be allowed, except as permitted by COR where working area space is limited.

2. Locate holes to avoid interference with structural members such as beams or grade beams. Holes shall be laid out in advance and drilling done only after approval by COR. If the Contractor considers it necessary to drill through structural members, this matter shall be referred to COR for approval.
 3. Do not penetrate membrane waterproofing.
- E. Interconnection of Instrumentation or Control Devices: Generally, electrical interconnections are not shown but must be provided.
- F. Protection and Cleaning:
1. Equipment and materials shall be carefully handled, properly stored, and adequately protected to prevent damage before and during installation, in accordance with the manufacturer's recommendations and as approved by the COR. Damaged or defective items in the opinion of the COR, shall be replaced.
 2. Protect all finished parts of equipment, such as shafts and bearings where accessible, from rust prior to operation by means of protective grease coating and wrapping. Close pipe openings with caps or plugs during installation. Tightly cover and protect fixtures and equipment against dirt, water chemical or mechanical injury. At completion of all work thoroughly clean fixtures, exposed materials and equipment.
- G. Install traps and other devices with due regard for ease in operating and maintaining said devices. Locate and position all equipment to be easily read by operator or staff standing on floor or walkway provided. Servicing shall not require dismantling adjacent equipment or pipe work.
- H. Work in Existing Building:
1. Perform as specified in Article, OPERATIONS AND STORAGE AREAS, Article, ALTERATIONS, and Article, RESTORATION of the Section 01 00 00, GENERAL REQUIREMENTS for relocation of existing equipment, alterations and restoration of existing building(s).
 2. As specified in Section 01 00 00, GENERAL REQUIREMENTS, Article, OPERATIONS AND STORAGE AREAS, make alterations to existing service piping at times that will least interfere with normal operation of the facility.
 3. Cut required openings through existing masonry and reinforced concrete using diamond core drills. Use of pneumatic hammer type drills, impact type electric drills, and hand or manual hammer type drills, will be permitted only with approval of the COR. Locate openings that will least effect structural slabs, columns, ribs or beams. Refer to the COR for determination of proper design for openings through structural sections and opening layouts approval,

- prior to cutting or drilling into structure. After COR's approval, carefully cut opening through construction no larger than absolutely necessary for the required installation.
- I. Work in Animal Research Areas: Seal all pipe and duct penetrations with silicone sealant to prevent entrance of insects.
 - J. Switchgear/Electrical Equipment Drip Protection: Every effort shall be made to eliminate the installation of pipe above electrical and telephone switchgear. If this is not possible, encase pipe in a second pipe with a minimum of joints. Installation of piping, ductwork, leak protection apparatus or other installations foreign to the electrical installation shall be located in the space equal to the width and depth of the equipment and extending from to a height of 1.8 m (6 ft.) above the equipment or to ceiling structure, whichever is lower (NFPA 70).
 - K. Inaccessible Equipment:
 - 1. Where the Government determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, equipment shall be removed and reinstalled or remedial action performed as directed at no additional cost to the Government.
 - 2. The term "conveniently accessible" is defined as capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as motors, fans, pumps, belt guards, transformers, high voltage lines, piping, and ductwork.

3.2 PIPE AND EQUIPMENT SUPPORTS

- A. Where hanger spacing does not correspond with joist or rib spacing, use structural steel channels secured directly to joist and rib structure that will correspond to the required hanger spacing, and then suspend the equipment and piping from the channels. Drill or burn holes in structural steel only with the prior approval of the COR.
- B. Use of chain, wire or strap hangers; wood for blocking, stays and bracing; or, hangers suspended from piping above will not be permitted. Replace or thoroughly clean rusty products and paint with zinc primer.
- C. Use hanger rods that are straight and vertical. Turnbuckles for vertical adjustments may be omitted where limited space prevents use. Provide a minimum of 15 mm (1/2-inch) clearance between pipe or piping covering and adjacent work.
- D. HVAC Horizontal Pipe Support Spacing: Refer to MSS SP-69. Provide additional supports at valves, strainers, in-line pumps and other heavy components. Provide a support within one foot of each elbow.

3.3 MECHANICAL DEMOLITION

- A. Rigging access, other than indicated on the drawings, shall be provided by the Contractor after approval for structural integrity by the COR. Such access shall be provided without additional cost or time to the Government. Where work is in an operating plant, provide approved protection from dust and debris at all times for the safety of plant personnel and maintenance of plant operation and environment of the plant.
- B. In an operating facility, maintain the operation, cleanliness and safety. Government personnel will be carrying on their normal duties of operating, cleaning and maintaining equipment and plant operation. Confine the work to the immediate area concerned; maintain cleanliness and wet down demolished materials to eliminate dust. Do not permit debris to accumulate in the area to the detriment of plant operation. Perform all flame cutting to maintain the fire safety integrity of this plant. Adequate fire extinguishing facilities shall be available at all times. Perform all work in accordance with recognized fire protection standards. Inspection will be made by personnel of the VA Medical Center, and Contractor shall follow all directives of the RE or COTR with regard to rigging, safety, fire safety, and maintenance of operations.
- C. Completely remove all piping, wiring, conduit, and other devices associated with the equipment not to be re-used in the new work. This includes all pipe, valves, fittings, insulation, and all hangers including the top connection and any fastenings to building structural systems. Seal all openings, after removal of equipment, pipes, ducts, and other penetrations in roof, walls, floors, in an approved manner and in accordance with plans and specifications where specifically covered. Structural integrity of the building system shall be maintained. Reference shall also be made to the drawings and specifications of the other disciplines in the project for additional facilities to be demolished or handled.
- D. All valves including gate, globe, ball, butterfly and check, all pressure gages and thermometers with wells shall remain Government property and shall be removed and delivered to COR and stored as directed. The Contractor shall remove all other material and equipment, devices and demolition debris under these plans and specifications. Such material shall be removed from Government property expeditiously and shall not be allowed to accumulate.

3.4 CLEANING AND PAINTING

- A. Prior to final inspection and acceptance of the plant and facilities for beneficial use by the Government, the plant facilities, equipment and systems shall be thoroughly cleaned and painted.
- B. In addition, the following special conditions apply:
 - 1. Cleaning shall be thorough. Use solvents, cleaning materials and methods recommended by the manufacturers for the specific tasks. Remove all rust prior to painting and from surfaces to remain unpainted. Repair scratches, scuffs, and abrasions prior to applying prime and finish coats.
 - 2. Material And Equipment Not To Be Painted Includes:
 - a. Motors, controllers, control switches, and safety switches.
 - b. Control and interlock devices.
 - c. Regulators.
 - d. Pressure reducing valves.
 - e. Control valves and thermostatic elements.
 - f. Lubrication devices and grease fittings.
 - g. Copper, brass, aluminum, stainless steel and bronze surfaces.
 - h. Valve stems and rotating shafts.
 - i. Pressure gauges and thermometers.
 - j. Glass.
 - k. Name plates.
 - 3. Control and instrument panels shall be cleaned, damaged surfaces repaired, and shall be touched-up with matching paint obtained from panel manufacturer.
 - 4. Paint shall withstand the following temperatures without peeling or discoloration:
 - a. Condensate and feedwater -- 38 degrees C (100 degrees F) on insulation jacket surface and 120 degrees C (250 degrees F) on metal pipe surface.
 - b. Steam -- 52 degrees C (125 degrees F) on insulation jacket surface and 190 degrees C (375 degrees F) on metal pipe surface.
 - 5. Final result shall be smooth, even-colored, even-textured factory finish on all items. Completely repaint the entire piece of equipment if necessary to achieve this.

3.5 IDENTIFICATION SIGNS

- A. Provide laminated plastic signs, with engraved lettering not less than 5 mm (3/16-inch) high, designating functions, for all equipment, switches, motor controllers, relays, meters, control devices, including automatic control valves. Nomenclature and identification symbols shall

correspond to that used in maintenance manual, and in diagrams specified elsewhere. Attach by chain, adhesive, or screws.

- B. Factory Built Equipment: Metal plate, securely attached, with name and address of manufacturer, serial number, model number, size, performance.

3.6 STARTUP AND TEMPORARY OPERATION

- A. Startup equipment as described in equipment specifications. Verify that vibration is within specified tolerance prior to extended operation. Temporary use of equipment is specified in Section 01 00 00, GENERAL REQUIREMENTS, Article, TEMPORARY USE OF MECHANICAL AND ELECTRICAL EQUIPMENT.

3.7 OPERATING AND PERFORMANCE TESTS

- A. Prior to the final inspection, perform required tests as specified in Section 01 00 00, GENERAL REQUIREMENTS and submit the test reports and records to the COR.
- B. Should evidence of malfunction in any tested system, or piece of equipment or component part thereof, occur during or as a result of tests, make proper corrections, repairs or replacements, and repeat tests at no additional cost to the Government.
- C. When completion of certain work or system occurs at a time when final control settings and adjustments cannot be properly made to make performance tests, then make performance tests for heating systems and for cooling systems respectively during first actual seasonal use of respective systems following completion of work.

3.8 INSTRUCTIONS TO VA PERSONNEL

- A. Provide in accordance with Article, INSTRUCTIONS, of Section 01 00 00, GENERAL REQUIREMENTS.

- - - E N D - - -

SECTION 23 07 11
HVAC AND BOILER PLANT INSULATION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Field applied insulation for thermal efficiency and condensation control for
1. HVAC piping, ductwork and equipment.
 2. Re-insulation of HVAC piping, ductwork and equipment, plumbing piping and equipment and boiler plant piping, breeching and stacks and equipment after asbestos abatement.
- B. Definitions
1. ASJ: All service jacket, white finish facing or jacket.
 2. Air conditioned space: Space having air temperature and/or humidity controlled by mechanical equipment.
 3. Cold: Equipment, ductwork or piping handling media at design temperature of 16 degrees C (60 degrees F) or below.
 4. Concealed: Ductwork and piping above ceilings and in chases, and pipe spaces.
 5. Exposed: Piping, ductwork, and equipment exposed to view in finished areas including mechanical, Boiler Plant and electrical equipment rooms or exposed to outdoor weather. Attics and crawl spaces where air handling units are located are considered to be mechanical rooms. Shafts, chases, unfinished attics, crawl spaces and pipe basements are not considered finished areas.
 6. FSK: Foil-scrim-kraft facing.
 7. Hot: HVAC Ductwork handling air at design temperature above 16 degrees C (60 degrees F); HVAC equipment or piping handling media above 41 degrees C (105 degrees F); Boiler Plant breechings and stack temperature range 150-370 degrees C (300-700 degrees F) and piping media and equipment 32 to 230 degrees C (90 to 450 degrees F).
 8. Density: kg/m^3 - kilograms per cubic meter (Pcf - pounds per cubic foot).
 9. Runouts: Branch pipe connections up to 25-mm (one-inch) nominal size to fan coil units or reheat coils for terminal units.
 10. Thermal conductance: Heat flow rate through materials.
 - a. Flat surface: Watt per square meter (BTU per hour per square foot).

- b. Pipe or Cylinder: Watt per square meter (BTU per hour per linear foot).
11. Thermal Conductivity (k): Watt per meter, per degree C (BTU per inch thickness, per hour, per square foot, per degree F temperature difference).
 12. Vapor Retarder (Vapor Barrier): A material which retards the transmission (migration) of water vapor. Performance of the vapor retarder is rated in terms of permeance (perms). For the purpose of this specification, vapor retarders shall have a maximum published permeance of 0.1 perms and vapor barriers shall have a maximum published permeance of 0.001 perms.
 13. HPS: High pressure steam (415 kPa [60 psig] and above).
 14. HPR: High pressure steam condensate return.
 15. MPS: Medium pressure steam (110 kPa [16 psig] thru 414 kPa [59 psig]).
 16. MPR: Medium pressure steam condensate return.
 17. LPS: Low pressure steam (103 kPa [15 psig] and below).
 18. LPR: Low pressure steam condensate gravity return.
 19. PC: Pumped condensate.
 20. HWH: Hot water heating supply.
 21. HWHR: Hot water heating return.
 22. GH: Hot glycol-water heating supply.
 23. GHR: Hot glycol-water heating return.
 24. FWPD: Feedwater pump discharge.
 25. FWPS: Feedwater pump suction.
 26. CTPD: Condensate transfer pump discharge.
 27. CTPS: Condensate transfer pump suction.
 28. VR: Vacuum condensate return.
 29. CPD: Condensate pump discharge.
 30. R: Pump recirculation.
 31. FOS: Fuel oil supply.
 32. FOR: Fuel oil return.
 33. CW: Cold water.
 34. SW: Soft water.
 35. HW: Hot water.
 36. CH: Chilled water supply.
 37. CHR: Chilled water return.
 38. GC: Chilled glycol-water supply.

- 39. GCR: Chilled glycol-water return.
- 40. RS: Refrigerant suction.
- 41. PVDC: Polyvinylidene chloride vapor retarder jacketing, white.

1.2 RELATED WORK

- A. Section 07 84 00, FIRESTOPPING: Mineral fiber and bond breaker behind sealant.
- B. Section 23 05 11, COMMON WORK RESULTS FOR HVAC: General mechanical requirements and items, which are common to more than one section of Division 23.
- C. Section 23 22 13, STEAM and CONDENSATE HEATING PIPING

1.3 QUALITY ASSURANCE

- A. Refer to article QUALITY ASSURANCE, in Section 23 05 11, COMMON WORK RESULTS FOR HVAC.

B. Criteria:

- 1. Comply with NFPA 90A, particularly paragraphs 4.3.3.1 through 4.3.3.6, 4.3.10.2.6, and 5.4.6.4, parts of which are quoted as follows:

4.3.3.1 Pipe insulation and coverings, duct coverings, duct linings, vapor retarder facings, adhesives, fasteners, tapes, and supplementary materials added to air ducts, plenums, panels, and duct silencers used in duct systems, unless otherwise provided for in 4.3.3.1.1 or 4.3.3.1.2, shall have, in the form in which they are used, a maximum flame spread index of 25 without evidence of continued progressive combustion and a maximum smoke developed index of 50 when tested in accordance with NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*.

4.3.3.1.1 Where these products are to be applied with adhesives, they shall be tested with such adhesives applied, or the adhesives used shall have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when in the final dry state. (See 4.2.4.2.)

4.3.3.1.2 The flame spread and smoke developed index requirements of 4.3.3.1.1 shall not apply to air duct weatherproof coverings where they are located entirely outside of a building, do not penetrate a wall or roof, and do not create an exposure hazard.

4.3.3.2 Closure systems for use with rigid and flexible air ducts tested in accordance with UL 181, Standard for Safety Factory-Made Air Ducts and Air Connectors, shall have been tested, listed, and used in accordance with the conditions of their listings, in accordance with one of the following:

- (1) UL 181A, Standard for Safety Closure Systems for Use with Rigid Air Ducts and Air Connectors
- (2) UL 181B, Standard for Safety Closure Systems for Use with Flexible Air Ducts and Air Connectors

4.3.3.3 Air duct, panel, and plenum coverings and linings, and pipe insulation and coverings shall not flame, glow, smolder, or smoke when tested in accordance with a similar test for pipe covering, ASTM C 411, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation, at the temperature to which they are exposed in service.

4.3.3.3.1 In no case shall the test temperature be below 121°C (250°F).

4.3.3.4 Air duct coverings shall not extend through walls or floors that are required to be fire stopped or required to have a fire resistance rating, unless such coverings meet the requirements of 5.4.6.4.

4.3.3.5* Air duct linings shall be interrupted at fire dampers to prevent interference with the operation of devices.

4.3.3.6 Air duct coverings shall not be installed so as to conceal or prevent the use of any service opening.

4.3.10.2.6 Materials exposed to the airflow shall be noncombustible or limited combustible and have a maximum smoke developed index of 50 or comply with the following.

4.3.10.2.6.1 Electrical wires and cables and optical fiber cables shall be listed as noncombustible or limited combustible and have a maximum smoke developed index of 50 or shall be listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with NFPA 262, Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.

4.3.10.2.6.4 Optical-fiber and communication raceways shall be listed as having a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.5 m (5 ft) or less when tested in accordance with UL 2024, Standard for Safety Optical-Fiber Cable Raceway.

4.3.10.2.6.6 Supplementary materials for air distribution systems shall be permitted when complying with the provisions of 4.3.3.

5.4.6.4 Where air ducts pass through walls, floors, or partitions that are required to have a fire resistance rating and where fire dampers are not required, the opening in the construction around the air duct shall be as follows:

(1) Not exceeding a 25.4 mm (1 in.) average clearance on all sides

(2) Filled solid with an approved material capable of preventing the passage of flame and hot gases sufficient to ignite cotton waste when subjected to the time-temperature fire conditions required for fire barrier penetration as specified in NFPA 251, *Standard Methods of Tests of Fire Endurance of Building Construction and Materials*

2. Test methods: ASTM E84, UL 723, or NFPA 255.

3. Specified k factors are at 24 degrees C (75 degrees F) mean temperature unless stated otherwise. Where optional thermal

- insulation material is used, select thickness to provide thermal conductance no greater than that for the specified material. For pipe, use insulation manufacturer's published heat flow tables. For domestic hot water supply and return, run out insulation and condensation control insulation, no thickness adjustment need be made.
4. All materials shall be compatible and suitable for service temperature, and shall not contribute to corrosion or otherwise attack surface to which applied in either the wet or dry state.
- C. Every package or standard container of insulation or accessories delivered to the job site for use must have a manufacturer's stamp or label giving the name of the manufacturer and description of the material.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES.
- B. Shop Drawings:
 1. All information, clearly presented, shall be included to determine compliance with drawings and specifications and ASTM, federal and military specifications.
 - a. Insulation materials: Specify each type used and state surface burning characteristics.
 - b. Insulation facings and jackets: Each type used. Make it clear that white finish will be furnished for exposed ductwork, casings and equipment.
 - c. Insulation accessory materials: Each type used.
 - d. Manufacturer's installation and fitting fabrication instructions for flexible unicellular insulation.
 - e. Make reference to applicable specification paragraph numbers for coordination.

1.5 STORAGE AND HANDLING OF MATERIAL

- A. Store materials in clean and dry environment, pipe covering jackets shall be clean and unmarred. Place adhesives in original containers. Maintain ambient temperatures and conditions as required by printed instructions of manufacturers of adhesives, mastics and finishing cements.

1.6 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation only.
- B. Federal Specifications (Fed. Spec.):
- L-P-535E (2)- 99.....Plastic Sheet (Sheeting): Plastic Strip; Poly (Vinyl Chloride) and Poly (Vinyl Chloride - Vinyl Acetate), Rigid.
- C. Military Specifications (Mil. Spec.):
- MIL-A-3316C (2)-90.....Adhesives, Fire-Resistant, Thermal Insulation
- MIL-A-24179A (1)-87.....Adhesive, Flexible Unicellular-Plastic Thermal Insulation
- MIL-C-19565C (1)-88.....Coating Compounds, Thermal Insulation, Fire-and Water-Resistant, Vapor-Barrier
- MIL-C-20079H-87.....Cloth, Glass; Tape, Textile Glass; and Thread, Glass and Wire-Reinforced Glass
- D. American Society for Testing and Materials (ASTM):
- A167-99(2004).....Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
- B209-07.....Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
- C411-05.....Standard test method for Hot-Surface Performance of High-Temperature Thermal Insulation
- C449-07.....Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement
- C533-09.....Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation
- C534-08.....Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form
- C547-07.....Standard Specification for Mineral Fiber pipe Insulation
- C552-07.....Standard Specification for Cellular Glass Thermal Insulation

- C553-08.....Standard Specification for Mineral Fiber
Blanket Thermal Insulation for Commercial and
Industrial Applications
- C585-09.....Standard Practice for Inner and Outer Diameters
of Rigid Thermal Insulation for Nominal Sizes
of Pipe and Tubing (NPS System) R (1998)
- C612-10.....Standard Specification for Mineral Fiber Block
and Board Thermal Insulation
- C1126-04.....Standard Specification for Faced or Unfaced
Rigid Cellular Phenolic Thermal Insulation
- C1136-10.....Standard Specification for Flexible, Low
Permeance Vapor Retarders for Thermal
Insulation
- D1668-97a (2006).....Standard Specification for Glass Fabrics (Woven
and Treated) for Roofing and Waterproofing
- E84-10.....Standard Test Method for Surface Burning
Characteristics of Building
Materials
- E119-09c.....Standard Test Method for Fire Tests of Building
Construction and Materials
- E136-09b.....Standard Test Methods for Behavior of Materials
in a Vertical Tube Furnace at 750 degrees C
(1380 F)
- E. National Fire Protection Association (NFPA):
- 90A-09.....Standard for the Installation of Air
Conditioning and Ventilating Systems
- 96-08.....Standards for Ventilation Control and Fire
Protection of Commercial Cooking Operations
- 101-09.....Life Safety Code
- 251-06.....Standard methods of Tests of Fire Endurance of
Building Construction Materials
- 255-06.....Standard Method of tests of Surface Burning
Characteristics of Building Materials
- F. Underwriters Laboratories, Inc (UL):
- 723.....UL Standard for Safety Test for Surface Burning
Characteristics of Building Materials with
Revision of 09/08

- G. Manufacturer's Standardization Society of the Valve and Fitting Industry (MSS):
 SP58-2009.....Pipe Hangers and Supports Materials, Design,
 and Manufacture

PART 2 - PRODUCTS

2.1 MINERAL FIBER OR FIBER GLASS

- A. ASTM C547 (Pipe Fitting Insulation and Preformed Pipe Insulation), Class 1, $k = 0.037$ (0.26) at 24 degrees C (75 degrees F), for use at temperatures up to 230 degrees C (450 degrees F) with an all service vapor retarder jacket with polyvinyl chloride premolded fitting covering.

2.2 RIGID CELLULAR PHENOLIC FOAM

- A. Preformed (molded) pipe insulation, ASTM C1126, type III, grade 1, $k = 0.021$ (0.15) at 10 degrees C (50 degrees F), for use at temperatures up to 121 degrees C (250 degrees F) with all service vapor retarder jacket with polyvinyl chloride premolded fitting covering.

2.3 CALCIUM SILICATE

- A. Preformed pipe Insulation: ASTM C533, Type I and Type II with indicator denoting asbestos-free material.
 B. Premolded Pipe Fitting Insulation: ASTM C533, Type I and Type II with indicator denoting asbestos-free material.
 C. Equipment Insulation: ASTM C533, Type I and Type II
 D. Characteristics:

Insulation Characteristics		
ITEMS	TYPE I	TYPE II
Temperature, maximum degrees C (degrees F)	649 (1200)	927 (1700)
Density (dry), Kg/m ³ (lb/ ft ³)	232 (14.5)	288 (18)
Thermal conductivity: Min W/ m K (Btu in/h ft ² degrees F)@ mean temperature of 93 degrees C (200 degrees F)	0.059 (0.41)	0.078 (0.540)
Surface burning characteristics: Flame spread Index, Maximum	0	0
Smoke Density index, Maximum	0	0

2.4 INSULATION FACINGS AND JACKETS

- A. Vapor Retarder, higher strength with low water permeance ≤ 0.02 or less perm rating, Beach puncture 50 units for insulation facing on exposed ductwork, casings and equipment, and for pipe insulation jackets. Facings and jackets shall be all service type (ASJ) or PVDC Vapor Retarder jacketing.
- B. ASJ jacket shall be white kraft bonded to 0.025 mm (1 mil) thick aluminum foil, fiberglass reinforced, with pressure sensitive adhesive closure. Comply with ASTM C1136. Beach puncture 50 units, Suitable for painting without sizing. Jackets shall have minimum 40 mm (1-1/2 inch) lap on longitudinal joints and minimum 75 mm (3 inch) butt strip on end joints. Butt strip material shall be same as the jacket. Lap and butt strips shall be self-sealing type with factory-applied pressure sensitive adhesive.
- C. Vapor Retarder medium strength with low water vapor permeance of 0.02 or less perm rating), Beach puncture 25 units: Foil-Scrim-Kraft (FSK) or PVDC vapor retarder jacketing type for concealed ductwork and equipment.
- D. Factory composite materials may be used provided that they have been tested and certified by the manufacturer.
- E. Pipe fitting insulation covering (jackets): Fitting covering shall be premolded to match shape of fitting and shall be polyvinyl chloride (PVC) conforming to Fed Spec L-P-335, composition A, Type II Grade GU, and Type III, minimum thickness 0.7 mm (0.03 inches). Provide color matching vapor retarder pressure sensitive tape.

2.5 PIPE COVERING PROTECTION SADDLES

Nominal Pipe Size and Accessories Material (Insert Blocks)	
Nominal Pipe Size mm (inches)	Insert Blocks mm (inches)
Up through 125 (5)	150 (6) long
150 (6)	150 (6) long
200 (8), 250 (10), 300 (12)	225 (9) long
350 (14), 400 (16)	300 (12) long
450 through 600 (18 through 24)	350 (14) long

- B. Warm or hot pipe supports: Premolded pipe insulation (180 degree half-shells) on bottom half of pipe at supports. Material shall be high

density Polyisocyanurate (for temperatures up to 149 degrees C [300 degrees F]), cellular glass or calcium silicate. Insulation at supports shall have same thickness as adjacent insulation. Density of Polyisocyanurate insulation shall be a minimum of 48 kg/m³ (3.0 pcf).

2.6 ADHESIVE, MASTIC, CEMENT

- A. Mil. Spec. MIL-A-3316, Class 1: Jacket and lap adhesive and protective finish coating for insulation.
- B. Mil. Spec. MIL-A-3316, Class 2: Adhesive for laps and for adhering insulation to metal surfaces.
- C. Mil. Spec. MIL-A-24179, Type II Class 1: Adhesive for installing flexible unicellular insulation and for laps and general use.
- D. Mil. Spec. MIL-C-19565, Type I: Protective finish for outdoor use.
- E. Mil. Spec. MIL-C-19565, Type I or Type II: Vapor barrier compound for indoor use.
- F. ASTM C449: Mineral fiber hydraulic-setting thermal insulating and finishing cement.
- G. Other: Insulation manufacturers' published recommendations.

2.7 MECHANICAL FASTENERS

- A. Pins, anchors: Welded pins, or metal or nylon anchors with galvanized steel-coated or fiber washer, or clips. Pin diameter shall be as recommended by the insulation manufacturer.
- B. Staples: Outward clinching galvanized steel.
- C. Wire: 1.3 mm thick (18 gage) soft annealed galvanized or 1.9 mm (14 gage) copper clad steel or nickel copper alloy.
- D. Bands: 13 mm (0.5 inch) nominal width, brass, galvanized steel, aluminum or stainless steel.

2.8 REINFORCEMENT AND FINISHES

- A. Glass fiber fitting tape: Mil. Spec MIL-C-20079, Type II, Class 1.
- B. Hexagonal wire netting: 25 mm (one inch) mesh, 0.85 mm thick (22 gage) galvanized steel.
- C. Corner beads: 50 mm (2 inch) by 50 mm (2 inch), 0.55 mm thick (26 gage) galvanized steel; or, 25 mm (1 inch) by 25 mm (1 inch), 0.47 mm thick (28 gage) aluminum angle adhered to 50 mm (2 inch) by 50 mm (2 inch) Kraft paper.
- D. PVC fitting cover: Fed. Spec L-P-535, Composition A, 11-86 Type II, Grade GU, with Form B Mineral Fiber insert, for media temperature 4 degrees C (40 degrees F) to 121 degrees C (250 degrees F). Below 4 degrees C (40 degrees F) and above 121 degrees C (250 degrees F).

Provide double layer insert. Provide color matching vapor barrier pressure sensitive tape.

2.9 FIRESTOPPING MATERIAL

- A. Other than pipe and duct insulation, refer to Section 07 84 00 FIRESTOPPING.

2.10 FLAME AND SMOKE

- A. Unless shown otherwise all assembled systems shall meet flame spread 25 and smoke developed 50 rating as developed under ASTM, NFPA and UL standards and specifications. See paragraph 1.3 "Quality Assurance".

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Required pressure tests of duct and piping joints and connections shall be completed and the work approved by the COR for application of insulation. Surface shall be clean and dry with all foreign materials, such as dirt, oil, loose scale and rust removed.
- B. Except for specific exceptions, insulate entire specified equipment, piping (pipe, fittings, valves, accessories), and duct systems. Insulate each pipe and duct individually. Do not use scrap pieces of insulation where a full length section will fit.
- C. Insulation materials shall be installed in a first class manner with smooth and even surfaces, with jackets and facings drawn tight and smoothly cemented down at all laps. Insulation shall be continuous through all sleeves and openings, except at fire dampers and duct heaters (NFPA 90A). Vapor retarders shall be continuous and uninterrupted throughout systems with operating temperature 16 degrees C (60 degrees F) and below. Lap and seal vapor retarder over ends and exposed edges of insulation. Anchors, supports and other metal projections through insulation on cold surfaces shall be insulated and vapor sealed for a minimum length of 150 mm (6 inches).
- D. Install vapor stops at all insulation terminations on either side of valves, pumps and equipment and particularly in straight lengths of pipe insulation.
- E. Insulation on hot piping and equipment shall be terminated square at items not to be insulated, access openings and nameplates. Cover all exposed raw insulation with white sealer or jacket material.
- F. Insulate steam traps.

- G. Apply insulation materials subject to the manufacturer's recommended temperature limits. Apply adhesives, mastic and coatings at the manufacturer's recommended minimum coverage.
- H. Elbows, flanges and other fittings shall be insulated with the same material as is used on the pipe straights.
- I. Firestop Pipe insulation:
 - 1. Provide firestopping insulation at fire and smoke barriers through penetrations. Fire stopping insulation shall be UL listed as defines in Section 07 84 00, FIRESTOPPING.
 - 2. Pipe penetrations requiring fire stop insulation including, but not limited to the following:
 - a. Pipe risers through floors
 - b. Pipe or duct chase walls and floors
 - c. Smoke partitions
 - d. Fire partitions
- J. Provide vapor barrier jackets over insulation as follows:
 - 1. All piping exposed to outdoor weather.
 - 2. All interior piping conveying fluids below ambient air temperature.

3.2 INSULATION INSTALLATION

- A. Molded Mineral Fiber Pipe and Tubing Covering:
 - 1. Fit insulation to pipe or duct, aligning longitudinal joints. Seal longitudinal joint laps and circumferential butt strips by rubbing hard with a nylon sealing tool to assure a positive seal. Staples may be used to assist in securing insulation. Seal all vapor retarder penetrations on cold piping with a generous application of vapor barrier mastic. Provide inserts and install with metal insulation shields at outside pipe supports. Install freeze protection insulation over heating cable.
 - 2. Contractor's options for fitting, flange and valve insulation:
 - a. Factory premolded, one piece PVC covers with mineral fiber, (Form B), inserts. Provide two insert layers for pipe temperatures below 4 degrees C (40 degrees F), or above 121 degrees C (250 degrees F). Secure first layer of insulation with twine. Seal seam edges with vapor barrier mastic and secure with fitting tape.
 - b. Factory molded, ASTM C547 or field mitered sections, joined with adhesive or wired in place. For hot piping finish with a smoothing coat of finishing cement. For cold fittings, 16 degrees

C (60 degrees F) or less, vapor seal with a layer of glass fitting tape imbedded between two 2 mm (1/16 inch) coats of vapor barrier mastic.

c. Fitting tape shall extend over the adjacent pipe insulation and overlap on itself at least 50 mm (2 inches).

3. Nominal thickness in millimeters and inches specified in the schedule at the end of this section.

B. Calcium Silicate:

1. Minimum thickness in millimeter (inches) specified in the schedule at the end of this section for piping other than in boiler plant.

3.3 APPLICATION -BOILER PLANT, PIPE, VALVES, STRAINERS AND FITTINGS:

A. Temperature range 120 to 230 degrees C (251 to 450 degrees F);

1. Application; Steam service 110 kpa (16 psig nominal) and higher, high pressure condensate to trap assembly, boiler bottom blowoff from boiler to blowoff valve closest to boiler.

2. Insulation and Jacket:

a. Calcium silicate for piping from zero to 1800 mm (6 feet) above boiler room floor, feedwater heater mezzanine floor or access platform and any floors or platforms on which tanks or pumps are located.

b. Mineral fiber for remaining locations.

c. ASJ with PVC premolded fitting coverings.

d. Aluminum jacket from zero to 1800 mm (6 feet) above floor on atomizing steam and condensate lines at boilers and burners.

3. Thickness:

Nominal Thickness Of Calcium Silicate Insulation (Boiler Plant)	
Pipe Diameter mm (in)	Insulation Thickness mm (in)
25 (1 and below)	125 (5)
25 to 38 (1-1/4 to 1-1/2)	125 (5)
38 (1-1/2) and above	150 (6)

B. Temperature range 100 to 121 degrees C (211 to 250 degrees F):

1. Application: Steam service 103 kpa (15 psig) and below, trap assembly discharge piping, boiler feedwater from feedwater heater to boiler feed pump recirculation, feedwater heater overflow, heated oil from oil heater to burners.

2. Insulation and Jacket:

- a. Calcium silicate for piping from zero to 1800 mm (0 to 6 feet) above boiler room floor, feedwater heater mezzanine floor and access platform, and any floors or access platforms on which tanks or pumps are located.
- b. Mineral Fiber or rigid closed cell phenolic foam for remaining locations.
- c. ASJ with PVC premolded fitting coverings.
- d. Aluminum jacket from zero to 1800 mm (6 feet) above floor on condensate lines at boilers and burners.

3. Thickness-calcium silicate and mineral fiber insulation:

Nominal Thickness Of Insulation	
Pipe Diameter mm (in)	Insulation Thickness mm (in)
25 (1 and below)	50 (2)
25 to 38 (1-1/4 to 1-1/2)	50 (2)
38 (1-1/2) and above	75 (3)

4. Thickness-rigid closed-cell phenolic foam insulation:

Nominal Thickness Of Insulation	
Pipe Diameter mm (in)	Insulation Thickness mm (in)
25 (1 and below)	38 (1.5)
25 to 38 (1-1/4 to 1-1/2)	38 (1.5)
38 (1-1/2) and above	75(3)

C. Temperature range 32 to 99 degrees C (90 to 211 degrees F):

1. Application: Pumped condensate, vacuum heating return, gravity and pumped heating returns, condensate transfer, condensate transfer pump recirculation, heated oil system to heaters and returns from burners, condensate return from convertors and heated water storage tanks.
2. Insulation Jacket:
 - a. Calcium silicate for piping from zero to 1800 mm (six feet above boiler room floor, feedwater heater mezzanine floor and access platform and any floor or access platform on which tanks or pumps are located.
 - b. Mineral fiber or rigid closed-cell phenolic foam for remaining locations.

c. ASJ with PVC premolded fitting coverings.

3. Thickness-calcium silicate and mineral fiber insulation:

Nominal Thickness Of Insulation	
Pipe Diameter mm (in)	Insulation Thickness mm (in)
25 (1 and below)	38 (1.5)
25 to 38 (1-1/4 to 1-1/2)	50 (2)
38 (1-1/2) and above	75 (3)

4. Thickness-rigid closed-cell phenolic foam insulation:

Nominal Thickness Of Insulation	
Pipe Diameter mm (in)	Insulation Thickness mm (in)
25 (1 and below)	19 (0.75)
25 to 38 (1-1/4 to 1-1/2)	19 (0.75)
38 (1-1/2) and above	25 (1)

D. Installation:

1. At pipe supports, weld pipe covering protection saddles to pipe, except where MS-SP58, type 3 pipe clamps are utilized.
2. Insulation shall be firmly applied, joints butted tightly, mechanically fastened by stainless steel wires on 300 mm (12 inch) centers.
3. At support points, fill and thoroughly pack space between pipe covering protective saddle bearing area.
4. Terminate insulation and jacket hard and tight at anchor points.
5. Terminate insulation at piping facilities not insulated with a 45 degree chamfered section of insulating and finishing cement covered with jacket.
6. On calcium silicate, mineral fiber and rigid closed-cell phenolic foam systems, insulated flanged fittings, strainers and valves with sections of pipe insulation cut, fitted and arranged neatly and firmly wired in place. Fill all cracks, voids and coat outer surface with insulating cement. Install jacket. Provide similar construction on welded and threaded fittings on calcium silicate systems or use premolded fitting insulation.

7. On mineral fiber systems, insulate welded and threaded fittings more than 50 mm (2 inches) in diameter with compressed blanket insulation (minimum 2/1) and finish with jacket or PVC cover.
8. Insulate fittings 50 mm (2 inches) and smaller with mastic finishing material and cover with jacket.
9. Insulate valve bonnet up to valve side of bonnet flange to permit bonnet flange removal without disturbing insulation.
10. Install jacket smooth, tight and neatly finish all edges. Over wrap ASJ butt strips by 50 percent. Secure aluminum jacket with stainless steel bands 300 mm (12 inches) on center or aluminum screws on 200 mm (4 inch) centers.

3.4 PIPE INSULATION SCHEDULE

A. Provide insulation for piping systems as scheduled below:

Insulation Thickness Millimeters (Inches)					
		Nominal Pipe Size Millimeters (Inches)			
Operating Temperature Range/Service	Insulation Material	Less than 25 (1)	25 - 32 (1 - 1½)	38 - 75 (1½ - 3)	100 (4) and Above
122-177 degrees C (251-350 degrees F) (HPS, MPS)	Mineral Fiber (Above ground piping only)	75 (3)	100 (4)	113 (4.5)	113 (4.5)
93-260 degrees C (200-500 degrees F) (HPS, HPR)	Calcium Silicate	100 (4)	125 (5)	150 (6)	150 (6)
100-121 degrees C (212-250 degrees F) (HPR, MPR, LPS, vent piping from PRV Safety Valves, Condensate receivers and flash tanks)	Mineral Fiber (Above ground piping only)	62 (2.5)	62 (2.5)	75 (3.0)	75 (3.0)
100-121 degrees C (212-250 degrees F) (HPR, MPR, LPS, LPR, vent piping from PRV Safety Valves, Condensate receivers and flash tanks)	Rigid Cellular Phenolic Foam	50 (2.0)	50 (2.0)	75 (3.0)	75 (3.0)

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SECTION 23 22 13
STEAM AND CONDENSATE HEATING PIPING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Steam, condensate and vent piping inside buildings.

1.2 RELATED WORK

- A. General mechanical requirements and items, which are common to more than one section of Division 23: Section 23 05 11, COMMON WORK RESULTS FOR HVAC AND STEAM GENERATION.
- B. Piping insulation: Section 23 07 11, HVAC, PLUMBING, AND BOILER PLANT INSULATION.

1.3 QUALITY ASSURANCE

- A. Section 23 05 11, COMMON WORK RESULTS FOR HVAC AND STEAM GENERATION, which includes welding qualifications.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES.
- B. Manufacturer's Literature and Data:
 - 1. Pipe and equipment supports.
 - 2. Pipe and tubing, with specification, class or type, and schedule.
 - 3. Pipe fittings, including miscellaneous adapters and special fittings.
 - 4. All specified steam system components.
- C. As-Built Piping Diagrams: Provide drawing as follows for steam and steam condensate piping and other central plant equipment.
 - 1. One wall-mounted stick file for prints. Mount stick file in the chiller plant or adjacent control room along with control diagram stick file.
 - 2. One set of reproducible drawings.

1.5 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society of Mechanical Engineers/American National Standards Institute (ASME/ANSI):
 - B1.20.1-83(R2006).....Pipe Threads, General Purpose (Inch)
 - B16.4-2006.....Gray Iron Threaded Fittings
- C. American Society of Mechanical Engineers (ASME):
 - B16.1-2005.....Gray Iron Pipe Flanges and Flanged Fittings
 - B16.3-2006.....Malleable Iron Threaded Fittings

- B16.9-2007.....Factory-Made Wrought Buttwelding Fittings
 B16.11-2005.....Forged Fittings, Socket-Welding and Threaded
 B16.14-91.....Ferrous Pipe Plugs, Bushings, and Locknuts with
 Pipe Threads
 B16.22-2001.....Wrought Copper and Copper Alloy Solder-Joint
 Pressure Fittings
 B16.23-2002.....Cast Copper Alloy Solder Joint Drainage Fittings
 B16.24-2006.....Cast Copper Alloy Pipe Flanges and Flanged
 Fittings, Class 150, 300, 400, 600, 900, 1500
 and 2500
 B16.39-98.....Malleable Iron Threaded Pipe Unions, Classes
 150, 250, and 300
 B31.1-2007.....Power Piping
 B31.9-2008.....Building Services Piping
 B40.100-2005.....Pressure Gauges and Gauge Attachments
 Boiler and Pressure Vessel Code: SEC VIII D1-2001, Pressure Vessels,
 Division 1
 D. American Society for Testing and Materials (ASTM):
 A47-99.....Ferritic Malleable Iron Castings
 A53-2007.....Pipe, Steel, Black and Hot-Dipped, Zinc-Coated,
 Welded and Seamless
 A106-2008.....Seamless Carbon Steel Pipe for High-Temperature
 Service
 A126-2004.....Standard Specification for Gray Iron Castings
 for Valves, Flanges, and Pipe Fittings
 A181-2006.....Carbon Steel Forgings, for General-Purpose
 Piping
 A183-2003 Carbon Steel Track Bolts and Nuts
 A216-2008 Standard Specification for Steel Castings,
 Carbon, Suitable for Fusion Welding, for High
 Temperature Service
 A285-01 Pressure Vessel Plates, Carbon Steel, Low-and-
 Intermediate-Tensile Strength
 A307-2007 Carbon Steel Bolts and Studs, 60,000 PSI Tensile
 Strength
 A516-2006 Pressure Vessel Plates, Carbon Steel, for
 Moderate-and- Lower Temperature Service
 A536-84(2004)e1 Standard Specification for Ductile Iron Castings
 B32-2008 Solder Metal
 B61-2008 Steam or Valve Bronze Castings

- B62-2009 Composition Bronze or Ounce Metal Castings
- B88-2003 Seamless Copper Water Tube
- F439-06 Socket-Type Chlorinated Poly (Vinyl Chloride)
(CPVC) Plastic Pipe Fittings, Schedule 80
- F441-02(2008) Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic
Pipe, Schedules 40 and 80
- E. American Welding Society (AWS):
- A5.8-2004.....Filler Metals for Brazing and Braze Welding
- B2.1-00.....Welding Procedure and Performance Qualifications
- F. Manufacturers Standardization Society (MSS) of the Valve and Fitting
Industry, Inc.:
- SP-67-95.....Butterfly Valves
- SP-70-98.....Cast Iron Gate Valves, Flanged and Threaded Ends
- SP-71-97.....Gray Iron Swing Check Valves, Flanged and
Threaded Ends
- SP-72-99.....Ball Valves with Flanged or Butt-Welding Ends
for General Service
- SP-78-98.....Cast Iron Plug Valves, Flanged and Threaded Ends
- SP-80-97.....Bronze Gate, Globe, Angle and Check Valves
- SP-85-94.....Cast Iron Globe and Angle Valves, Flanged and
Threaded Ends
- G. Military Specifications (Mil. Spec.):
- MIL-S-901D-1989.....Shock Tests, H.I. (High Impact) Shipboard
Machinery, Equipment, and Systems
- H. National Board of Boiler and Pressure Vessel Inspectors (NB): Relieving
Capacities of Safety Valves and Relief Valves
- I. Tubular Exchanger Manufacturers Association: TEMA 18th Edition, 2000

PART 2 - PRODUCTS

2.1 PIPE AND EQUIPMENT SUPPORTS, PIPE SLEEVES, AND WALL AND CEILING PLATES

- A. Provide in accordance with Section 23 05 11, COMMON WORK RESULTS FOR
HVAC AND STEAM GENERATION.

2.2 PIPE AND TUBING

- A. Steam Piping: Steel, ASTM A53, Grade B, seamless or ERW; A106 Grade B,
Seamless; Schedule 40.
- B. Steam Condensate and Pumped Condensate Piping:
1. Concealed above ceiling, in wall or chase: Copper water tube ASTM
B88, Type K, hard drawn.
 2. All other locations: Copper water tube ASTM B88, Type K, hard drawn;
or steel, ASTM A53, Grade B, Seamless or ERW, or A106 Grade B
Seamless, Schedule 80.

- C. Vent Piping: Steel, ASTM A53, Grade B, seamless or ERW; A106 Grade B, Seamless; Schedule 40, galvanized.

2.3 FITTINGS FOR STEEL PIPE

- A. 50 mm (2 inches) and Smaller: Screwed or welded.
1. Butt welding: ASME B16.9 with same wall thickness as connecting piping.
 2. Forged steel, socket welding or threaded: ASME B16.11.
 3. Screwed: 150 pound malleable iron, ASME B16.3. 125 pound cast iron, ASME B16.4, may be used in lieu of malleable iron, except for steam and steam condensate piping. Provide 300 pound malleable iron, ASME B16.3 for steam and steam condensate piping. Cast iron fittings or piping is not acceptable for steam and steam condensate piping. Bushing reduction of a single pipe size, or use of close nipples, is not acceptable.
 4. Unions: ASME B16.39.
 5. Steam line drip station and strainer quick-couple blowdown hose connection: Straight through, plug and socket, screw or cam locking type for 15 mm (1/2 inch) ID hose. No integral shut-off is required.
- B. 65 mm (2-1/2 inches) and Larger: Welded or flanged joints.
1. Butt welding fittings: ASME B16.9 with same wall thickness as connecting piping. Elbows shall be long radius type, unless otherwise noted.
 2. Welding flanges and bolting: ASME B16.5:
 - a. Steam service: Weld neck or slip-on, raised face, with non-asbestos gasket. Non-asbestos gasket shall either be stainless steel spiral wound strip with flexible graphite filler or compressed inorganic fiber with nitrile binder rated for saturated and superheated steam service 750 degrees F and 1500 psi.
 - b. Flange bolting: Carbon steel machine bolts or studs and nuts, ASTM A307, Grade B.
- C. Welded Branch and Tap Connections: Forged steel weldolets, or branchlets and threadolets may be used for branch connections up to one pipe size smaller than the main. Forged steel half-couplings, ASME B16.11 may be used for drain, vent and gage connections.

2.4 DIELECTRIC FITTINGS

- A. Provide where copper tubing and ferrous metal pipe are joined.
- B. 50 mm (2 inches) and Smaller: Threaded dielectric union, ASME B16.39.
- C. 65 mm (2 1/2 inches) and Larger: Flange union with dielectric gasket and bolt sleeves, ASME B16.42.

- D. Temperature Rating, 121 degrees C (250 degrees F) for steam condensate and as required for steam service.
- E. Contractor's option: On pipe sizes 2" and smaller, screwed end brass gate valves may be used in lieu of dielectric unions.

2.5 SCREWED JOINTS

- A. Pipe Thread: ANSI B1.20.
- B. Lubricant or Sealant: Oil and graphite or other compound approved for the intended service.

2.6 PIPE ALIGNMENT

- A. Guides: Provide factory-built guides along the pipe line to permit axial movement only and to restrain lateral and angular movement. Guides must be designed to withstand a minimum of 15 percent of the axial force which will be imposed on the expansion joints and anchors. Field-built guides may be used if detailed on the contract drawings.

2.7 STEAM SYSTEM COMPONENTS

- A. Steam Trap: Each type of trap shall be the product of a single manufacturer. Provide trap sets at all low points and at 61 m (200 feet) intervals on the horizontal main lines.
 - 1. Floats and linkages shall provide sufficient force to open trap valve over full operating pressure range available to the system. Unless otherwise indicated on the drawings, traps shall be sized for capacities indicated at minimum pressure drop as follows:
 - a. For equipment with modulating control valve: 1.7 kPa (1/4 psig), based on a condensate leg of 300 mm (12 inches) at the trap inlet and gravity flow to the receiver.
 - b. For main line drip trap sets and other trap sets at steam pressure: Up to 70 percent of design differential pressure. Condensate may be lifted to the return line.
 - 2. Trap bodies: Bronze, cast iron, or semi-steel, constructed to permit ease of removal and servicing working parts without disturbing connecting piping. For systems without relief valve traps shall be 5. Mechanism: Brass, stainless steel or corrosion resistant alloy. rated for the pressure upstream of the PRV supplying the system.
 - 3. Balanced pressure thermostatic elements: Phosphor bronze, stainless steel or monel metal.
 - 4. Valves and seats: Suitable hardened corrosion resistant alloy.
 - 5. Floats: Stainless steel.
 - 6. Inverted bucket traps: Provide bi-metallic thermostatic element for rapid release of non-condensables.

2.8 FIRESTOPPING MATERIAL

- A. Refer to Section 23 05 11, COMMON WORK RESULTS FOR HVAC AND STEAM GENERATION.

PART 3 - EXECUTION

3.1 GENERAL

- A. The drawings show the general arrangement of pipe and equipment but do not show all required fittings and offsets that may be necessary to connect pipes to steam traps and to coordinate with other trades. Provide all necessary fittings, offsets and pipe runs based on field measurements and at no additional cost to the government. Coordinate with other trades for space available and relative location of HVAC equipment and accessories to be connected on ceiling grid. Pipe location on the drawings shall be altered by contractor where necessary to avoid interferences and clearance difficulties.
- B. Store materials to avoid excessive exposure to weather or foreign materials. Keep inside of piping relatively clean during installation and protect open ends when work is not in progress.
- C. Support piping securely. Refer to PART 3, Section 23 05 11, COMMON WORK RESULTS FOR HVAC AND STEAM GENERATION.
- D. Install piping generally parallel to walls and column center lines, unless shown otherwise on the drawings. Space piping, including insulation, to provide 25 mm (one inch) minimum clearance between adjacent piping or other surface. Unless shown otherwise, slope steam, condensate and drain piping down in the direction of flow not less than 25 mm (one inch) in 12 m (40 feet). Provide eccentric reducers to keep bottom of sloped piping flat.
- E. Firestopping: Fill openings around uninsulated piping penetrating floors or fire walls, with firestop material. For firestopping insulated piping refer to Section 23 07 11, HVAC, PLUMBING, and BOILER PLANT INSULATION.

3.2 STEAM TRAP PIPING

- A. Install to permit gravity flow to the trap. Provide gravity flow (avoid lifting condensate) from the trap where modulating control valves are used. Support traps weighing over 11 kg (25 pounds) independently of connecting piping.

3.3 LEAK TESTING

- A. Inspect all joints and connections for leaks and workmanship and make corrections as necessary, to the satisfaction of the COR in accordance with the specified requirements. Testing shall be performed in accordance with the specification requirements.

- B. An operating test at design pressure, and for hot systems, design maximum temperature.
- C. A hydrostatic test at 1.5 times design pressure. For water systems the design maximum pressure would usually be the static head, or expansion tank maximum pressure, plus pump head. Factory tested equipment (convertors, exchangers, coils, etc.) need not be field tested. Avoid excessive pressure on mechanical seals and safety devices.

3.4 FLUSHING AND CLEANING PIPING SYSTEMS

- A. Steam, Condensate and Vent Piping: No flushing or chemical cleaning required. Accomplish cleaning by pulling all strainer screens and cleaning all scale/dirt legs during start-up operation.

3.5 OPERATING AND PERFORMANCE TEST AND INSTRUCTION

- A. Refer to PART 3, Section 23 05 11, COMMON WORK RESULTS FOR HVAC and STEAM GENERATION.

- - - E N D - - -

SECTION 23 22 13.10

STEAM TRAP WIRELESS MONITORING SYSTEM

PART 1 - GENERAL

1.1 RELATED WORK

- A. Section 01 00 00, GENERAL REQUIREMENTS
- B. Section 01 33 23, SHOP DRAWINGS< PRODUCT DATA, and SAMPLES
- C. Section 07 84 00, FIRESTOPPING
- D. Section 23 05 11, COMMON WORK RESULTS FOR HVAC
- E. Section 23 07 11, HVAC, PLUMBING, and Boiler Plant Insulation
- F. Section 23 22 13, STEAM and CONDENSATE HEATING PIPING

1.2 SUBMITTALS

- A. Design documents that include the following
 - a. Floor plan showing the location of repeaters and the electrical panel/circuit that the repeaters will draw power from.
 - b. Floor plan showing the location of the gateway and the electrical panel/circuit that the gateway draws power from.
- B. Product literature for all components.
- C. Radio Frequency Survey Results.
- D. Operation and maintenance manuals.
- E. As-built drawings.

1.3 GENERAL REQUIREMENTS

- A. Contractor shall provide a fully operational steam trap monitoring system for traps indicated on drawings. The manufacturer will provide qualified technicians to perform the following:
 - 1. Contractor shall reference existing steam trap survey attached to the end of this specification section.
 - 2. Radio Frequency survey to determine location of additional electronic equipment to amplify and increase signal range of individual monitors. Base bid to include installation of 40 hard-wired repeaters (number to be verified upon completion of radio frequency survey). Repeater type must be narrow-band spread spectrum, have a power consumption of 70 mA, a frequency of 902-928MHz, and a bandwidth of 100 KHz. The repeater also must produce an output power of 250 mW. A report of this survey must be submitted to the VA for documentation.
 - 3. Application survey to select proper transmitter for the specific application of the monitor. This is based on pressure, location,

and the equipment being serviced. This also will determine the necessity/ability of monitoring the trap.

4. Monitoring of high pressure steam traps, which includes the following:
 - a. A wireless, radio frequency steam trap monitoring system indicating the owner when the trap fails.
 - b. Transmitters that measure a blow through condition ultrasonically.
 - c. All necessary hardware to mount transmitter at trap.
 - d. Externally mounted transmitters that do not require external chambers for sensing.
 - e. 902-928 MHz frequency range to transmit radio frequency
 - f. Transmitters have the ability to be mounted anywhere on the exterior of the pipe.
 - g. Transmitters to be powered by a standard lithium battery with a 5 year lifespan.
 - h. Pressure switch as required for on/off application traps.
 - i. Additional electrical equipment such as wireless repeaters shall be mounted where 120 V power is readily available. Coordinate all requirements with electrical contractor.
 - j. The monitoring system is to be factory programed and adjusted. It will also have transmitter mounting hardware.
5. Monitoring of low pressure steam traps, which include the following:
 - a. A wireless, radio frequency steam trap monitoring system indicating the owner when the trap fails.
 - b. All necessary hardware to mount transmitter at trap.
 - c. 902-928 MHz frequency range to transmit radio frequency
 - d. Transmitters to be powered by a standard lithium battery with a 5 year lifespan.
 - e. Pressure switch as required for on/off application traps.
 - f. Additional electrical equipment such as wireless repeaters shall be mounted where 120 V power is readily available. Coordinate all requirements with electrical contractor.
 - g. The monitoring system is to be factory programed and adjusted. It will also have transmitter mounting hardware.

6. Wireless Steam Trap Monitor Receiver/Gateway that includes the following:
 - a. Web enabled receiver to have the ability to be compatible with the already existing VA network. The receiver/gateway will need to be wired to a smart router approved by the VA's IT department for access to the existing VA network. This will allow steam trap monitoring information to be accessible from any network computer via web browser. Coordinate with COR for VA network access and integration. The web-based receiver shall automatically update steam trap monitoring and data management software. The web-based software shall provide steam loss calculations, annual dollar loss calculations, and fuel loss calculations. The receiver/gateway shall have software and create a user interface that displays at a minimum trap tag #, location, trap type, model number, status, battery life, etc. The software shall automatically send alarms when trap has failed.
 - b. Available Modbus ports from potential integration into the VA's Building Automation System.
 - c. The ability to utilize manufacturer provided steam trap monitoring system to communicate steam trap conditions that include but are not limited to the following:
 - 1) Trap tag
 - 2) Trap manufacturer model number
 - 3) Trap location
 - 4) Trap status
 - d. Solid state electronic components used in the construction of the receiver.
7. Electrical information:
 - a. Add circuit breakers for each repeater. Label circuit to match existing panel labeling scheme. Coordinate with COR. Update panel schedules.
 - b. Coordinate cabling and power wiring requirements with the latest VA standards and with the COR. Cabling shall be a minimum of CAT6
8. On Site Contractor training, installation, and commissioning support. Include a minimum of five days on site commissioning and

training by factory personnel. Operation and maintenance manuals and as-built drawings need to be submitted upon completion of construction.

9. Contractor shall provide a minimum of 16 hours of training.

Training is to include but is not limited to the following:

- a. Web interface and navigation
- b. Trap monitor replacements
- c. Battery replacements
- d. Addition of trap monitors to the system

10. Contractor to provide all equipment and software necessary to the VA for the potential replacement/addition of monitors. This does not include the monitors themselves.

11. Manufacturers: Armstrong or equal.

Bidding on:

Manufacturer Name: _____

Brand: _____

No: _____

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Trap	Location	Location Detail	Height	Model	Connection Size	Connection Type	Universal	Orifice Size	Application	Pressure	Condition
2901	BLDG 2	Laundry Basement East Mid Trap	7'	FT-125	3/4" (20mm)	Screwed	No	0.125" (3.18mm)	Drip	120	OK
2902	BLDG 2	West End by Storage Tank	7'	FT-15	3/4" (20mm)	Screwed	No	0.218" (5.54mm)	Drip	15	Failed Closed
2903	D Wing	Mechanical Room Wall PRV by duct work	1'	J3X-10	3/4" (20mm)	Screwed	No	0.157" (3.99mm)	Drip	120	OK
2904	C-Wing 4th Floor	Sterile Storage C4111	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2905	C-Wing 4th Floor	Room C 4112	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	OK
2906	C-Wing 4th Floor	RM c 4113	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2907	C-Wing 4th Floor	RM C 4113C	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	OK
2908	C-Wing 4th Floor	RM 4150 A	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2909	C-Wing 4th Floor	RM 4150 B	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2910	C-Wing 4th Floor	RM 4150 C	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2911	C-Wing 4th Floor	RM 4150 D	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2912	C-Wing 3RD Floor	C 3112 WOMEN'S RESTROOM	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2913	C-Wing 3RD Floor	C 3113 Men's Rest Room	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2914	C-Wing 3RD Floor	3116 Nutrition	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2915	C-Wing 3RD Floor	3116 Nutrition	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2916	C-Wing 3RD Floor	31186Nutrition	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2917	C-Wing 3RD Floor	3116 Nutrition	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2918	C-Wing 3RD Floor	C 3120	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2919	C-Wing 3RD Floor	C3120	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2920	C-Wing 3RD Floor	C3120 A	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2921	C-Wing 3RD Floor	C 3120 B	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2922	C-Wing 3RD Floor	C 3120 C	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2923	C-Wing 3RD Floor	C3120 D	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2924	C-Wing 3RD Floor	C 3120 E	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Failed Closed
2925	C-Wing 3RD Floor	C3120 F	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	OK
2926	C-Wing 3RD Floor	C 3125	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2927	C-Wing 3RD Floor	C 3129	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2928	C-Wing 3RD Floor	C 3129 E. Wall	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2929	C-Wing 3RD Floor	Middle Office	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2930	C-Wing 3RD Floor	Middle Office	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2931	C-Wing 3RD Floor	Middle Office	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2932	C-Wing 3RD Floor	SW Corner	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2933	C-Wing 3RD Floor	SW Corner	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2934	C-Wing 3RD Floor	West Wall	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2935	C-Wing 3RD Floor	West Wall Middle Office	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2936	C-Wing 3RD Floor	West Wall N. Office	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2937	C-Wing 3RD Floor	SE OFFICE	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2938	C-Wing 3RD Floor	SE OFFICE WALL	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2939	C-Wing 3RD Floor	SE OFFICE Mid	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested

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Trap	Location	Location Detail	Height	Model	Connection Size	Connection Type	Universal	Orifice Size	Application	Pressure	Condition
2940	C-Wing 3RD Floor	SE OFFICE North	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2941	C-Wing 3RD Floor	Mech Room	2'	800-20	1/2" (15mm)	Screwed	No	0.18" (4.5mm)	Drip	15	Not Tested
2942	C-Wing 3RD Floor	Mech Room	2'	30A3	3/4" (20mm)	Screwed	No	0.250" (6.35mm)	Coil	15	Not Tested
2943	C-Wing 3RD Floor	Wall Unit	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2944	C-Wing 3RD Floor	C 3135	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2945	C-Wing 3RD Floor	C 3136	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2946	C-Wing 3RD Floor	C 3136	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2947	C-Wing 3RD Floor	C 3136	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2948	C-Wing 3RD Floor	C 3137	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2949	C-Wing 3RD Floor	C 3137	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2950	C-Wing 3RD Floor	C 3137	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2951	C-Wing 3RD Floor	C 3138 A	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2952	C-Wing 3RD Floor	C 3140	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Failed Open
2953	C-Wing 3RD Floor	C3142	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2954	C-Wing 3RD Floor	C 3143 RIGHT	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2955	C-Wing 3RD Floor	C 3143 MID	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2956	C-Wing 3RD Floor	C 3143 LEFT	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2957	C-Wing 3RD Floor	B 3107	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2958	C-Wing 2ND Floor	Rack Storage	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2959	C-Wing 2ND Floor	Rack Storage	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2960	C-Wing 2ND Floor	Kitchen Dish storage	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2961	C-Wing 2ND Floor	W. Wall Across from 2134	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2962	C-Wing 2ND Floor	C 2139	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2963	C-Wing 2ND Floor	C 2134	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2964	C-Wing 2ND Floor	W. Wall North Unit C2118	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2965	C-Wing 2ND Floor	W Wall North Mid Unit C2118	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2966	C-Wing 2ND Floor	W Wall Mid Unit C2118	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2967	C-Wing 2ND Floor	W Wall Mid Unit C2118	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2968	C-Wing 2ND Floor	W Wall South Mid Unit C2118	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2969	C-Wing 2ND Floor	W Wall South Unit C2118	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2970	C-Wing 2ND Floor	E Wall South Unit C2118	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2971	C-Wing 2ND Floor	E wall South mid Unit C2118	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2972	C-Wing 2ND Floor	E Wall Mid Unit C2118	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2973	C-Wing 2ND Floor	E Wall N Mid Unit C2118	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2974	C-Wing 2ND Floor	E Wall North Unit C2118	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2981	C-Wing 1ST Floor	Pharmacy E. Wall north	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2982	C-Wing 1ST Floor	Pharmacy E. Wall north Mid	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2983	C-Wing 1ST Floor	Pharmacy E. Wall Mid Unit	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2984	C-Wing 1ST Floor	Pharmacy E. Wall South Mid	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2985	C-Wing 1ST Floor	Pharmacy E. Wall South Mid	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested

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Trap	Location	Location Detail	Height	Model	Connection Size	Connection Type	Universal	Orifice Size	Application	Pressure	Condition
2986	C-Wing 1ST Floor	PHARMACY EAST WALL	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2987	C-Wing 1ST Floor	1142 F	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Failed Open
2988	C-Wing 1ST Floor	C 1142 E	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2989	C-Wing 1ST Floor	C 1142 D	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2990	C-Wing 1ST Floor	C1142 C	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Failed Closed
2991	C-Wing 1ST Floor	C1142 B	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	OK
2992	C-Wing 1ST Floor	C 1125	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2993	C-Wing 1ST Floor	Credit Union	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2994	C-Wing 1ST Floor	Credit Union	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2995	C-Wing 1ST Floor	C1123 B	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2996	C-Wing 1ST Floor	C 1123A	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2997	C-Wing 1ST Floor	B1566 A	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	OK
2998	C-Wing 1ST Floor	B1566 A	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
2999	C-Wing 1ST Floor	North East Wall Unit	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
3000	C-Wing 1ST Floor	E Wall Mid Unit	2'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
7751	C-Wing 4th Floor	C4109	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not In Use
7752	C-Wing 4th Floor	C4109	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not In Use
7753	C-Wing 2ND Floor	C2117 WEST SIDE OF COOLER	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
7754	C-Wing 2ND Floor	C2121	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
7755	C-Wing 2ND Floor	C2121	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
7756	C-Wing 2ND Floor	C2121	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
7757	C-Wing 2ND Floor	C2121	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
7758	C-Wing 2ND Floor	C2121	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
7759	C-Wing 2ND Floor	C2121	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
7760	C-Wing 1ST Floor	C1123 C&D	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
7761	C-WING GROUND FLOOR	EAST WALL MID UNIT C166A	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
7762	C-WING GROUND FLOOR	C166A EAST WALL SOUTH UNIT	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
7763	C-WING GROUND FLOOR	C131B	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Failed Open
7764	C-WING GROUND FLOOR	C131A	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
7765	C-WING GROUND FLOOR	C130A	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
7766	C-WING GROUND FLOOR	C130A	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
7767	C-WING GROUND FLOOR	C129	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
7768	C-WING GROUND FLOOR	C129	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
7769	C-WING GROUND FLOOR	C121A	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
7770	C-WING GROUND FLOOR	C120	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
7771	C-WING GROUND FLOOR	C120	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
7772	C-WING GROUND FLOOR	C120	1'	VAC-25	1/2" (15mm)	Screwed	No	0.20" (5mm)	Radiator	15	Not Tested
7773	C-WING BASEMENT	BB1-06 BY TUNNEL	7'	J3X-2	3/4" (20mm)	Screwed	No	0.218" (5.54mm)	Drip	15	OK
7774	C-WING BASEMENT	BB1-06 NEXT TO COND. PMP	6'	J3X-10	3/4" (20mm)	Screwed	No	0.157" (3.99mm)	Drip	120	Failed Open
7775	C-WING BASEMENT	BB1-06 BY DOOR BB1-05	8'	J3X-2	3/4" (20mm)	Screwed	No	0.218" (5.54mm)	Drip	15	Cold

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7776	C-WING BASEMENT	BB1-06 NORTH WALL	8'	J3X-2	3/4" (20mm)	Screwed	No	0.218" (5.54mm)	Drip	15	Cold
7777	C-WING BASEMENT	BB1-06 NORTH WALL	8'	J3X-2	3/4" (20mm)	Screwed	No	0.218" (5.54mm)	Drip	15	Not Tested
7778	C-WING BASEMENT	CB1-030	5'	J3X-2	1/2" (15mm)	Screwed	No	0.218" (5.54mm)	Drip	15	OK
7779	C-WING BASEMENT	#6 STAIR WELL	8'	J3X-2	3/4" (20mm)	Screwed	No	0.218" (5.54mm)	Radiator	15	Failed Closed
7780	C-WING BASEMENT	C016	8'	J3X-2	3/4" (20mm)	Screwed	No	0.218" (5.54mm)	Drip	15	OK
7781	C-WING BASEMENT	CB1-07	8'	J3X-2	3/4" (20mm)	Screwed	No	0.218" (5.54mm)	Drip	15	OK
7782	C-WING BASEMENT	CB1-026A	6'	J3X-2	3/4" (20mm)	Screwed	No	0.218" (5.54mm)	Unit Heater	15	OK
7783	C-WING BASEMENT	CB027 BY RESTROOM	8'	No 12	1" (25mm)	Screwed	No	0.125" (3.18mm)	Drip	15	OK
7784	C-WING BASEMENT	CB1-024	7'	J3X-2	3/4" (20mm)	Screwed	No	0.218" (5.54mm)	Unit Heater	15	OK
7785	C-WING BASEMENT	GB1-01A BREAK AREA	8'	FTI-15	3/4" (20mm)	Screwed	No	0.218" (5.54mm)	Unit Heater	15	OK
7786	C-WING BASEMENT	GB1-05	8'	J3X-2	3/4" (20mm)	Screwed	No	0.218" (5.54mm)	Unit Heater	15	OK
7787	C-WING BASEMENT	24B BREAK ROOM	2'	VAC-25	3/4" (20mm)	Screwed	No	0.20" (5.2mm)	Radiator	15	Failed Closed
7788	C-WING BASEMENT	CB1-012	2'	FT015H	1" (25mm)	Screwed	No	0.250" (6.35mm)	Coil	15	Cold
		CB1-010 FRONT OF LS-1 BREAKER									
7789	C-WING BASEMENT	BOX	7'	J3X-2	3/4" (20mm)	Screwed	No	0.218" (5.54mm)	Radiator	15	OK
7790	C-WING BASEMENT	CB1-010 S/E CORNER	7'	P46SR	1/2" (15mm)	Screwed	No	.145" (3.68mm)	Radiator	15	OK
7791	C-WING BASEMENT	CB1-013	8'	J3X-2	3/4" (20mm)	Screwed	No	0.218" (5.54mm)	Drip	15	OK
17001	BLDG 2	OLD BLR PLANT AT EMER GEN DOOR	8'	J3N-1.0	3/4" (20mm)	Screwed	No	.181" (4.59mm)	Drip	15	Cold
		OLD BLR PLANT ABOVE EMER GEN									
17002	BLDG 2	DOOR	8'	J3N-1.0	3/4" (20mm)	Screwed	No	.181" (4.59mm)	Drip	15	Cold
		OLD BLR PLANT ABOVE EMER GEN									
17003	BLDG 2	DOOR	7'	15B3	3/4" (20mm)	Screwed	No	0.219" (5.56mm)	Unit Heater	15	Cold
17004	BLDG 2	OLD BLR PLANT IN GEN ROOM	8'	800-20	3/4" (20mm)	Screwed	No	0.18" (4.5mm)	Unit Heater	15	Cold
		OLD BLR PLANT AT CONDENSATE									
17005	BLDG 2	TANK	3'	J3N-1.0	3/4" (20mm)	Screwed	No	.181" (4.59mm)	Drip	15	OK
17006	BLDG 2	OLD BLR PLANT PRV STATION	2'	216-125	1 1/2" (40mm)	Screwed	No	0.500" (12.7mm)	Drip	120	OK
		OLD BLR PLANT DISTRIBUTION									
17007	BLDG 2	HEADER\	3'	J3X-10	1" (25mm)	Screwed	No	0.157" (3.99mm)	Drip	120	OK
17008	BLDG 2	OLD BLR PLANT CENTER OF ROOM	20'	J3N-1.0	3/4" (20mm)	Screwed	No	.181" (4.59mm)	Unit Heater	15	Cold
17009	BLDG 2	OLD BLR PLANT AT GARAGE DOOR	20'	J3N-1.0	3/4" (20mm)	Screwed	No	.181" (4.59mm)	Unit Heater	15	Cold
17010	BLDG 2	OLD BLR PLANT ABOVE DEEP SINK	8'	721	3/4" (20mm)	Screwed	No	0.096" (2.44mm)	Drip	15	OK
17011	BLDG 2	OLD BLR PLANT MEZZ UH	1'	15B3	3/4" (20mm)	Screwed	No	0.219" (5.56mm)	Unit Heater	15	Cold
17012	BLDG 2	OLD BLR PLANT MEZZ UH	1'	15B3	3/4" (20mm)	Screwed	No	0.219" (5.56mm)	Unit Heater	15	Cold
17013	BLDG 2	OLD BLR PLANT 2ND FLOOR PRV	2'	FT-15	3/4" (20mm)	Screwed	No	0.218" (5.54mm)	Drip	15	Cold
17014	BLDG 2	OLD BLR PLANT 2ND FLOOR PRV	3'	800-125	3/4" (20mm)	Screwed	No	0.11" (2.7mm)	Drip	120	OK

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17015	BLDG 2	LAUNDRY BASEMENT RM 109	8'	812-125	3/4" (20mm)	Screwed	No	0.156" (3.97mm)	Drip	120	OK
17016	BLDG 2	LAUNDRY 1ST FLOOR OUTSIDE RM 106	7'	FT-125	3/4" (20mm)	Screwed	No	0.125" (3.18mm)	Drip	120	OK
17017	BLDG 2	LAUNDRY 1ST FLOOR ABOVE RE-USE HWH RM 106	7'	811-125	3/4" (20mm)	Screwed	No	0.125" (3.18mm)	Drip	120	OK
17018	BLDG 2	LAUNDRY 1ST FLOOR BESIDE RE-USE HWH RM 106	1'	FT-75	1 1/2" (40mm)	Screwed	No	0.312" (7.92mm)	Heat Exchanger	120	Cold
17019	BLDG 2	LAUNDRY 1ST FLOOR BESIDE HOT WATER HEATER RM 106	1'	75A6	1 1/2" (40mm)	Screwed	No	0.297" (7.54mm)	Heat Exchanger	120	Cold
17020	BLDG 2	LAUNDRY 1ST FLOOR BESIDE AHU RM 106	7'	FT-15	3/4" (20mm)	Screwed	No	0.218" (5.54mm)	Drip	15	OK
17021	BLDG 2	LAUNDRY 1ST FLOOR AHU RM 106	5'	FT-15	3/4" (20mm)	Screwed	No	0.218" (5.54mm)	Coil	15	Cold
17022	BLDG 2	LAUNDRY 1ST FLOOR AHU RM 106	5'	Unknown FT 15	3/4" (20mm)	Screwed	No	0.218" (5.54mm)	Drip	15	Cold
17023	BLDG 2	LAUNDRY 1ST FLOOR RM 106 BESIDE AHU	8'	800-20	3/4" (20mm)	Screwed	No	0.18" (4.5mm)	Drip	15	OK
17024	BLDG 2	LAUNDRY 1ST FLOOR RM 106 BESIDE AHU	8'	FT-15	3/4" (20mm)	Screwed	No	0.218" (5.54mm)	Drip	15	OK
17025	BLDG 1	8TH FLOOR D8207 AHU 143	2'	FT-75	3/4" (20mm)	Screwed	No	0.166" (4.22mm)	Drip	15	OK
17026	BLDG 1	8TH FLOOR D8207 AHU 143	2'	FT-75	3/4" (20mm)	Screwed	No	0.166" (4.22mm)	Humidifier	15	OK
17027	BLDG 1	8TH FLOOR D8207 AHU 143	1'	15B4	1" (25mm)	Screwed	No	0.313" (7.94mm)	Coil	15	Failed Open
17028	BLDG 1	8TH FLOOR D8207 AHU 143	1'	15B4	1" (25mm)	Screwed	No	0.313" (7.94mm)	Coil	15	Failed Open
17029	BLDG 1	8TH FLOOR D8207 AHU 140	1'	40-215A	3/4" (20mm)	Screwed	No	0.313" (7.94mm)	Humidifier	15	Cold
17030	BLDG 1	8TH FLOOR D8207 AHU 140	1'	40-215A	3/4" (20mm)	Screwed	No	0.313" (7.94mm)	Drip	15	Cold
17031	BLDG 1	8TH FLOOR D8207 AHU 140	1'	15B5	1 1/4" (32mm)	Screwed	No	0.344" (8.73mm)	Coil	15	Failed Open
17032	BLDG 1	8TH FLOOR D8207 AHU 141	1'	15B5	1 1/4" (32mm)	Screwed	No	0.344" (8.73mm)	Coil	15	OK
17033	BLDG 1	8TH FLOOR D8207 AHU 141	1'	15B5	1 1/4" (32mm)	Screwed	No	0.344" (8.73mm)	Coil	15	OK
17034	BLDG 1	8TH FLOOR D8207 AHU 141	1'	FT-75	3/4" (20mm)	Screwed	No	0.166" (4.22mm)	Drip	15	OK
17035	BLDG 1	8TH FLOOR D8207 AHU 141	2'	FT-75	3/4" (20mm)	Screwed	No	0.166" (4.22mm)	Humidifier	15	OK
17036	BLDG 1	8TH FLOOR B8058 AHU 127	1'	FT-15	2" (50mm)	Screwed	No	0.500" (12.7mm)	Coil	15	OK
17037	BLDG 1	8TH FLOOR B8058 AHU 127	1'	40-215A	3/4" (20mm)	Screwed	No	0.313" (7.94mm)	Drip	15	OK
17038	BLDG 1	8TH FLOOR B8058 AHU 127	8'	811-15	3/4" (20mm)	Screwed	No	0.250" (6.35mm)	Drip	15	OK
17039	BLDG 1	8TH FLOOR B8058 AHU 127	7'	40-215	3/4" (20mm)	Screwed	No	0.250" (6.35mm)	Drip	15	Cold
17040	BLDG 1	8TH FLOOR B8058 AHU 125	7'	40-215	3/4" (20mm)	Screwed	No	0.250" (6.35mm)	Humidifier	15	Cold
17041	BLDG 1	6TH FLOOR A6048 AHU 125	1'	30B8	2" (50mm)	Screwed	No	0.500" (12.7mm)	Coil	40	OK
17042	BLDG 1	6TH FLOOR A6048 AHU 125	1'	30B8	2" (50mm)	Screwed	No	0.500" (12.7mm)	Coil	40	OK



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17043	BLDG 1	6TH FLOOR A6048 AHU 125	7'	800-80	3/4" (20mm)	Screwed	No	0.125" (3.18mm)	Drip	40	OK
17044	BLDG 1	6TH FLOOR A6048 AHU 125	7'	800-80	3/4" (20mm)	Screwed	No	0.125" (3.18mm)	Drip	40	OK
17045	BLDG 1	6TH FLOOR A6048 AHU 125	7'	601A-75	3/4" (20mm)	Screwed	No	.150" (3.81mm)	Humidifier	40	Cold
17046	BLDG 1	6TH FLOOR A6002 AHU 126	7'	601A-75	3/4" (20mm)	Screwed	No	.150" (3.81mm)	Humidifier	40	Cold
17047	BLDG 1	6TH FLOOR A6002 AHU 126	6'	800-80	3/4" (20mm)	Screwed	No	0.125" (3.18mm)	Drip	40	Cold
17048	BLDG 1	6TH FLOOR A6002 AHU 126	1'	30B8	2" (50mm)	Screwed	No	0.500" (12.7mm)	Coil	40	OK
17049	BLDG 1	6TH FLOOR A6002 AHU 126	1'	30B8	2" (50mm)	Screwed	No	0.500" (12.7mm)	Coil	40	OK
17050	BLDG 1	5TH FLOOR B-5060 AHU 117	6'	601A-75	3/4" (20mm)	Screwed	No	.150" (3.81mm)	Humidifier	40	Cold
17051	BLDG 1	5TH FLOOR B-5060 AHU 117	6'	800-80	3/4" (20mm)	Screwed	No	0.125" (3.18mm)	Drip	40	OK
17052	BLDG 1	5TH FLOOR B-5060 AHU 117	1'	30B8	2" (50mm)	Screwed	No	0.500" (12.7mm)	Coil	40	Failed Open
17053	BLDG 1	5TH FLOOR B-5060 AHU 117	1'	FT-75	2" (50mm)	Screwed	No	.421" (10.6mm)	Coil	40	OK
17054	BLDG 1	5TH FLOOR B-5106 AHU 118	7'	601A-75	3/4" (20mm)	Screwed	No	.150" (3.81mm)	H	40	Cold
17055	BLDG 1	5TH FLOOR B-5106 AHU 118	6'	800-80	3/4" (20mm)	Screwed	No	0.125" (3.18mm)	Drip	40	OK
17056	BLDG 1	5TH FLOOR B-5106 AHU 118	1'	30B8	2" (50mm)	Screwed	No	0.500" (12.7mm)	Coil	40	OK
17057	BLDG 1	5TH FLOOR B-5106 AHU 118	1'	30B8	2" (50mm)	Screwed	No	0.500" (12.7mm)	Coil	40	OK
17058	BLDG 1	5TH FLOOR B-5080 AHU 119	8'	800-80	3/4" (20mm)	Screwed	No	0.125" (3.18mm)	Drip	40	OK
17059	BLDG 1	5TH FLOOR B-5080 AHU 119	2'	601A-75	3/4" (20mm)	Screwed	No	.150" (3.81mm)	Humidifier	40	Cold
17060	BLDG 1	5TH FLOOR B-5080 AHU 119	1'	30B3	3/4" (20mm)	Screwed	No	0.172" (4.37mm)	Coil	40	OK
17061	BLDG 1	5TH FLOOR B-5080 AHU 119	1'	30B3	3/4" (20mm)	Screwed	No	0.172" (4.37mm)	Coil	40	OK
17062	BLDG 1	2ND FLOOR B-2142 AHU 114	6'	800-80	3/4" (20mm)	Screwed	No	0.125" (3.18mm)	Drip	40	Failed Open
17063	BLDG 1	2ND FLOOR B-2142 AHU 114	1'	30B6	1 1/2" (40mm)	Screwed	No	0.375" (9.53mm)	Coil	40	OK
17064	BLDG 1	2ND FLOOR B-2142 AHU 114	1'	30B6	1 1/2" (40mm)	Screwed	No	0.375" (9.53mm)	Coil	40	OK
17065	BLDG 1	2ND FLOOR B-2142 AHU 114	7'	601A-75	3/4" (20mm)	Screwed	No	.150" (3.81mm)	Humidifier	40	OK
17066	BLDG 1	2ND FLOOR B-2104 AHU 113	5'	800-80	3/4" (20mm)	Screwed	No	0.125" (3.18mm)	Drip	40	OK
17067	BLDG 1	2ND FLOOR B-2104 AHU 113	8'	601A-75	3/4" (20mm)	Screwed	No	.150" (3.81mm)	Humidifier	40	Cold
17068	BLDG 1	2ND FLOOR B-2104 AHU 113	7'	601A-75	3/4" (20mm)	Screwed	No	.150" (3.81mm)	Humidifier	40	Cold
17069	BLDG 1	2ND FLOOR B-2104 AHU 113	1'	30B6	1 1/2" (40mm)	Screwed	No	0.375" (9.53mm)	Coil	40	Failed Open
17070	BLDG 1	2ND FLOOR B-2104 AHU 113	1'	30B6	1 1/2" (40mm)	Screwed	No	0.375" (9.53mm)	Coil	40	OK
17071	BLDG 1	2ND FLOOR A-2024 AHU 112	6'	800-80	3/4" (20mm)	Screwed	No	0.125" (3.18mm)	Drip	40	OK
17072	BLDG 1	2ND FLOOR A-2024 AHU 112	7'	601A-75	3/4" (20mm)	Screwed	No	.150" (3.81mm)	Humidifier	40	Cold
17073	BLDG 1	2ND FLOOR A-2024 AHU 112	1'	30B8	2" (50mm)	Screwed	No	0.500" (12.7mm)	Coil	40	OK
17074	BLDG 1	2ND FLOOR A-2024 AHU 112	1'	30B8	2" (50mm)	Screwed	No	0.500" (12.7mm)	Coil	40	OK
17075	BLDG 1	2ND FLOOR D-2206 103 AC	3'	JS7X-5	1 1/2" (40mm)	Screwed	No	0.500" (12.7mm)	Coil	40	OK
17076	BLDG 1	2ND FLOOR D-2206 103 AC	3'	JS7X-5	1 1/2" (40mm)	Screwed	No	0.500" (12.7mm)	Coil	40	OK



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17077	BLDG 1	2ND FLOOR D-2206 103 AC	3'	JS7X-5	1 1/2" (40mm)	Screwed	No	0.500" (12.7mm)	Coil	40	OK
17078	BLDG 1	2ND FLOOR D-2206 103 AC	3'	JS7X-5	1 1/2" (40mm)	Screwed	No	0.500" (12.7mm)	Coil	40	OK
17079	BLDG 1	2ND FLOOR D-2206 102 AC	2'	SJ7-5	2" (50mm)	Screwed	No	0.500" (12.7mm)	Coil	40	OK
17080	BLDG 1	2ND FLOOR D-2206 102 AC	2'	SJ7-5	2" (50mm)	Screwed	No	0.500" (12.7mm)	Coil	40	OK
17081	BLDG 1	2ND FLOOR D-2206 101 AC	3'	Unknown FT 75	3/4" (20mm)	Screwed	No	0.166" (4.22mm)	Humidifier	40	Cold
17082	BLDG 1	2ND FLOOR D-2206 101 AC	3'	Unknown FT 75	3/4" (20mm)	Screwed	No	0.166" (4.22mm)	Drip	40	OK
17083	BLDG 1	2ND FLOOR D-2206 101 AC	1'	30B8	2" (50mm)	Screwed	No	0.500" (12.7mm)	Coil	40	OK
17084	BLDG 1	2ND FLOOR D-2206 101 AC	1'	30B8	2" (50mm)	Screwed	No	0.500" (12.7mm)	Coil	40	OK
17085	BLDG 1	2ND FLOOR D-2206 101 AC	3'	Unknown FT 75	3/4" (20mm)	Screwed	No	0.166" (4.22mm)	Humidifier	40	Cold
17086	BLDG 1	2ND FLOOR D-2206 101 AC	3'	75	3/4" (20mm)	Screwed	No	0.166" (4.22mm)	Drip	40	OK
17087	BLDG 1	2ND FLOOR D-2206 101 AC	1'	30B8	2" (50mm)	Screwed	No	0.500" (12.7mm)	Coil	40	OK
17088	BLDG 1	2ND FLOOR D-2206 101 AC	1'	30B8	2" (50mm)	Screwed	No	0.500" (12.7mm)	Coil	40	OK
17089	BLDG 1	1ST FLOOR D-1217 AHU 110	8'	800-80	3/4" (20mm)	Screwed	No	0.125" (3.18mm)	Drip	40	OK
17090	BLDG 1	1ST FLOOR D-1217 AHU 110	6'	601A-75	3/4" (20mm)	Screwed	No	.150" (3.81mm)	Humidifier	40	Cold
17091	BLDG 1	1ST FLOOR D-1217 AHU 110	7'	800-80	3/4" (20mm)	Screwed	No	0.125" (3.18mm)	Drip	40	OK
17092	BLDG 1	1ST FLOOR D-1217 AHU 110	8'	800-80	3/4" (20mm)	Screwed	No	0.125" (3.18mm)	Drip	40	OK
17093	BLDG 1	1ST FLOOR D-1217 AHU 110	1'	30B8	2" (50mm)	Screwed	No	0.500" (12.7mm)	Coil	40	OK
17094	BLDG 1	1ST FLOOR D-1217 AHU 110	1'	30B8	2" (50mm)	Screwed	No	0.500" (12.7mm)	Coil	40	OK
17095	BLDG 1	G FLOOR A14 AHU 108	6'	601A-75	3/4" (20mm)	Screwed	No	.150" (3.81mm)	Humidifier	40	Cold
17096	BLDG 1	G FLOOR A14 AHU 108	1'	30B8	2" (50mm)	Screwed	No	0.500" (12.7mm)	Coil	40	OK
17097	BLDG 1	G FLOOR A14 AHU 108	1'	FT-75	2" (50mm)	Screwed	No	.421" (10.6mm)	Coil	40	OK
17098	BLDG 1	G FLOOR A14A AHU 109	3'	800-80	3/4" (20mm)	Screwed	No	0.125" (3.18mm)	Drip	40	OK
17099	BLDG 1	G FLOOR A14A AHU 109	1'	601A-75	3/4" (20mm)	Screwed	No	.150" (3.81mm)	Humidifier	40	Cold
17100	BLDG 1	G FLOOR A14A AHU 109	1'	30B8	2" (50mm)	Screwed	No	0.500" (12.7mm)	Coil	40	OK
17101	BLDG 1	G FLOOR A14A AHU 109	1'	30B8	2" (50mm)	Screwed	No	0.500" (12.7mm)	Coil	40	OK
17102	BLDG 1	G FLOOR CB1-026C AC 147	8'	55AL	3/4" (20mm)	Screwed	No	0.218" (5.54mm)	Drip	40	OK
17103	BLDG 1	G FLOOR CB1-026C AC 147	2'	55AL	1" (25mm)	Screwed	No	0.218" (5.54mm)	Coil	40	Failed Open
17104	BLDG 1	5TH FLOOR C-5002 AC 116	3'	800-20	3/4" (20mm)	Screwed	No	0.18" (4.5mm)	Drip	15	OK
17105	BLDG 1	5TH FLOOR C-5002 AC 116	3'	FT-15	1 1/2" (40mm)	Screwed	No	0.500" (12.7mm)	Coil	15	OK
17106	BLDG 1	5TH FLOOR C-5002 AC 116	3'	FT-15	3/4" (20mm)	Screwed	No	0.218" (5.54mm)	Drip	15	OK
17107	BLDG 1	5TH FLOOR C-5002 AC 116	8'	800-20	3/4" (20mm)	Screwed	No	0.18" (4.5mm)	Drip	15	OK
17108	BLDG 1	5TH FLOOR C-5002 AC 116	4'	FT-15	3/4" (20mm)	Screwed	No	0.218" (5.54mm)	Drip	15	OK
17109	BLDG 1	5TH FLOOR C-5002 AC 116	2'	800-20	3/4" (20mm)	Screwed	No	0.18" (4.5mm)	Humidifier	15	OK



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Trap	Location	Location Detail	Height	Model	Connection Size	Connection Type	Universal	Orifice Size	Application	Pressure	Condition
17110	BLDG 1	5TH FLOOR C-5002 AC 122	2'	FT-15	1" (25mm)	Screwed	No	0.218" (5.54mm)	Coil	15	OK
17111	BLDG 1	5TH FLOOR C-5002 AC 122	7'	811-15	3/4" (20mm)	Screwed	No	0.250" (6.35mm)	Drip	15	OK
17112	BLDG 1	5TH FLOOR C-5002 AC 122	7'	811-15	3/4" (20mm)	Screwed	No	0.250" (6.35mm)	Drip	15	OK
17113	BLDG 1	5TH FLOOR C-5002 AC 122	8'	FT-15	3/4" (20mm)	Screwed	No	0.218" (5.54mm)	Coil	15	OK
17114	BLDG 1	5TH FLOOR C-5002 AC 122	8'	FT-15	3/4" (20mm)	Screwed	No	0.218" (5.54mm)	Coil	15	OK
17115	BLDG 1	5TH FLOOR C-5002 AC 145	1'	FT-15	1 1/2" (40mm)	Screwed	No	0.500" (12.7mm)	Coil	15	Cold
17116	BLDG 1	5TH FLOOR C-5002 AC 145	2'	FT-15	3/4" (20mm)	Screwed	No	0.218" (5.54mm)	Humidifier	15	Cold
17117	BLDG 1	5TH FLOOR C-5002 AC 145	2'	FT-15	3/4" (20mm)	Screwed	No	0.218" (5.54mm)	Drip	15	Cold
17118	BLDG 1	5TH FLOOR C-5002 AC 145	8'	811-15	3/4" (20mm)	Screwed	No	0.250" (6.35mm)	Drip	15	OK
17119	BLDG 1	5TH FLOOR C-5002 UH BESIDE AC 116 5TH FLOOR C-5002 UH GARAGE	7'	FT-15	3/4" (20mm)	Screwed	No	0.218" (5.54mm)	Unit Heater	15	OK
17120	BLDG 1	DOOR 5TH FLOOR C-5002 UH AT GARAGE	7'	FT-15	3/4" (20mm)	Screwed	No	0.218" (5.54mm)	Unit Heater	15	OK
17121	BLDG 1	DOOR	9'	FT-15	3/4" (20mm)	Screwed	No	0.218" (5.54mm)	Unit Heater	15	OK
17122	BLDG 1	SOLAR PIT AC 107	1'	40-215	3/4" (20mm)	Screwed	No	0.250" (6.35mm)	Humidifier	15	Cold
17123	BLDG 1	SOLAR PIT AC 107	-2'	30B6	1 1/2" (40mm)	Screwed	No	0.375" (9.53mm)	Coil	15	Cold
17124	BLDG 1	SOLAR PIT AC 107	6'	FT-3	3/4" (20mm)	Screwed	No	0.281" (7.14mm)	Unit Heater	15	Cold
17125	BLDG 1	SOLAR PIT AC 107	1'	40-215	3/4" (20mm)	Screwed	No	0.250" (6.35mm)	Drip	15	Cold
17126	BLDG 1	GROUND FLOOR B302 AHU 148	6'	Unknown FT 15	3/4" (20mm)	Screwed	No	0.218" (5.54mm)	Drip	15	OK
17127	BLDG 1	GROUND FLOOR B302 AHU 148	2'	FT125H Unknown FT	3/4" (20mm)	Screwed	No	0.125" (3.18mm)	Humidifier	15	Cold
17128	BLDG 1	GROUND FLOOR B302 AHU 148	7'	15	3/4" (20mm)	Screwed	No	0.218" (5.54mm)	Drip	15	OK
17129	BLDG 1	GROUND FLOOR B78 AHU	1'	FT-30	1 1/2" (40mm)	Screwed	No	0.390" (9.91mm)	Coil	15	OK
17130	BLDG 1	GROUND FLOOR B78 AHU	1'	FT-30	1 1/2" (40mm)	Screwed	No	0.390" (9.91mm)	Coil	15	OK
17131	BLDG 1	GROUND FLOOR B78 AHU	5'	FT125H	3/4" (20mm)	Screwed	No	0.125" (3.18mm)	Humidifier	15	OK
17132	BLDG 3	BLDG 3 ROOF AHU 105	5'	40-215	3/4" (20mm)	Screwed	No	0.250" (6.35mm)	Humidifier	40	OK
17133	BLDG 3	BLDG 3 ROOF AHU 105	1'	FT-15	1 1/2" (40mm)	Screwed	No	0.500" (12.7mm)	Unit Heater	40	Failed Open
17134	BLDG 3	BLDG 3 ROOF AHU 105	4'	811-70 Unknown FT	3/4" (20mm)	Screwed	No	0.156" (3.97mm)	Unit Heater	40	Cold
17135	BLDG 2	BESIDE AHU RM 106	8'	15	1" (25mm)	Screwed	No	0.218" (5.54mm)	Drip	15	Failed Open
17136	BLDG 2	GROUND CB1-010 AHU 131	2'	FT-75	1" (25mm)	Screwed	No	0.166" (4.22mm)	Coil	40	OK
17137	BLDG 12	32 MER PRV STATION	5'	75A3	3/4" (20mm)	Screwed	No	0.172" (4.37mm)	Drip	120	OK
17138	BLDG 12	32 MER PRV STATION	3'	FT53-15	3/4" (20mm)	Screwed	No	0.218" (5.54mm)	Drip	15	Failed Open



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17139	BLDG 12	32 MER PRV STATION	1'	811-15	3/4" (20mm)	Screwed	No	0.250" (6.35mm)	Drip	15	OK
17140	BLDG 12	32 MER ABOVE PRV STATION	8'	J3N-1.0	3/4" (20mm)	Screwed	No	.181" (4.59mm)	Unit Heater	15	Cold
17141	BLDG 12	32 MER ABOVE HWH	7'	FT-3	3/4" (20mm)	Screwed	No	0.281" (7.14mm)	Drip	15	OK
17142	BLDG 12	32 MER HWH	1'	J7N-2.5	1 1/2" (40mm)	Screwed	No	0.26" (6.7mm)	HWH	15	OK
17143	BLDG 12	32 MER ABOVE PIT	6'	811-125	3/4" (20mm)	Screwed	No	0.125" (3.18mm)	Drip	120	OK
17144	BLDG 12	32 MER IN COND PIT	2'	FTI-125	1" (25mm)	Screwed	No	0.125" (3.18mm)	Drip	120	OK
17145	BLDG 12	32 MER IN COND PIT	1'	TD52	1" (25mm)	Screwed	No	.215" (5.46mm)	Drip	120	OK
17146	BLDG 12	33 MER G. FLOOR	8'	FT015H	1 1/2" (40mm)	Screwed	No	0.500" (12.7mm)	Heat Exchanger	15	OK
17147	BLDG 12	33 MER G. FLOOR	8'	FT015H	3/4" (20mm)	Screwed	No	0.250" (6.35mm)	Unit Heater	15	Cold
17148	BLDG 12	33 MER 2ND FLOOR TOP OF STAIRS	6'	FT-15	3/4" (20mm)	Screwed	No	0.218" (5.54mm)	Unit Heater	15	Cold
17149	BLDG 12	33 MER 2ND FLOOR BESIDE AC 120	6'	FT-15	3/4" (20mm)	Screwed	No	0.218" (5.54mm)	Unit Heater	15	Cold
17150	BLDG 12	33 MER 2ND FLOOR AC 120	1'	40-215	3/4" (20mm)	Screwed	No	0.250" (6.35mm)	Humidifier	15	Cold
17151	BLDG 12	33 MER 2ND FLOOR AC 120	7'	811-15	3/4" (20mm)	Screwed	No	0.250" (6.35mm)	Drip	15	Cold
17152	BLDG 12	33 MER 2ND FLOOR AC 120	0'	FT10-4.5	2" (50mm)	Screwed	No	0.500" (12.7mm)	Coil	15	Cold
17153	BLDG 7	MER 111 PRV	4'	FT-30	3/4" (20mm)	Screwed	No	0.218" (5.54mm)	Heat Exchanger	7	OK
17154	BLDG 7	MER 111 HX	2'	FT-15	1" (25mm)	Screwed	No	0.218" (5.54mm)	Drip	7	OK
17155	BLDG 7	MER 111 PRV	2'	811-125	3/4" (20mm)	Screwed	No	0.125" (3.18mm)	Drip	120	Failed Open
17156	BLDG 5	002 MER PRV	3'	J3X-10	3/4" (20mm)	Screwed	No	0.157" (3.99mm)	Drip	120	OK
17157	BLDG 5	002 MER HX	2'	J5X-2	1 1/2" (40mm)	Screwed	No	0.28" (7mm)	Heat Exchanger	10	OK
17158	BLDG 2	202 LAUNDRY 1ST FLOOR GARMENT TUNNEL 1	10'	800-125	1/2" (15mm)	Screwed	No	0.11" (2.7mm)	Drip	120	Failed Open
17159	BLDG 2	202 LAUNDRY ABOVE BLANKET FEEDER CATWALK	22'	811-15	3/4" (20mm)	Screwed	No	0.250" (6.35mm)	Drip	15	Cold
17160	BLDG 1	BASEMENT BB1-07 PRV STATION	1'	800-125	3/4" (20mm)	Screwed	No	0.11" (2.7mm)	Drip	120	Failed Open
17161	BLDG 1	BASEMENT BB1-07 PRV STATION	1'	812-15	3/4" (20mm)	Screwed	No	0.312" (7.92mm)	Drip	15	OK
17162	BLDG 1	BASEMENT BB1-07 PRV STATION	1'	800-125	3/4" (20mm)	Screwed	No	0.11" (2.7mm)	Drip	120	OK
17163	BLDG 1	BASEMENT BB1-07 PRV STATION	1'	FTI-75	3/4" (20mm)	Screwed	No	0.166" (4.22mm)	Drip	40	OK
17164	BLDG 1	BASEMENT BB1-07 HX NORTH OF PRV	3'	Unknown FT 75	2" (50mm)	Screwed	No	.421" (10.6mm)	Heat Exchanger	40	OK
17165	BLDG 1	BASEMENT BB1-07 ABOVE HX NORTH OF PRV	10'	J3N-4	3/4" (20mm)	Screwed	No	.106" (2.69mm)	Drip	40	OK
17166	BLDG 1	BASEMENT BB1-07 HX AT 4A 4B COND PUMPS	2'	50K10	2 1/2" (65mm)	Screwed	No	0.500" (12.7mm)	Heat Exchanger	40	OK

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17167	BLDG 1	BASEMENT BB1-07 HX AT 4A 4B COND PUMPS	2'	Unknown FT 75	2 1/2" (65mm)	Screwed	No	0.500" (12.7mm)	Heat Exchanger	40	OK
17168	BLDG 1	BASEMENT BB1-07 HX AT 4A 4B COND PUMPS	2'	50K10	2 1/2" (65mm)	Screwed	No	0.500" (12.7mm)	Heat Exchanger	40	OK
17169	BLDG 1	BASEMENT BB1-07 HX AT 4A 4B COND PUMPS	2'	50K10	2 1/2" (65mm)	Screwed	No	0.500" (12.7mm)	Heat Exchanger	40	OK
17170	BLDG 1	BASEMENT BB1-07 CORNER BY HX BASEMENT BB1-07 IN CORNER	5'	FTI-75	3/4" (20mm)	Screwed	No	0.166" (4.22mm)	Drip	40	OK
17171	BLDG 1	ABOVE CW PUMP 3	10'	J3X-2	3/4" (20mm)	Screwed	No	0.218" (5.54mm)	Drip	15	Cold
17172	BLDG 1	BASEMENT BB1-07 BESIDE 1 HWH	8'	310-70	3/4" (20mm)	Screwed	No	0.156" (3.97mm)	Drip	40	OK
17173	BLDG 1	BASEMENT BB1-07 1 HWH	2'	JS7N-4	2" (50mm)	Screwed	No	0.22" (5.5mm)	Heat Exchanger	40	Failed Open
17174	BLDG 1	BASEMENT BB1-07 DOMESTIC HWH A	3'	FTN-125	1 1/2" (40mm)	Screwed	No	0.246" (6.25mm)	Heat Exchanger	15	Cold
17175	BLDG 1	BASEMENT BB1-07 DOMESTIC HWH B	3'	FTN-125	1 1/2" (40mm)	Screwed	No	0.246" (6.25mm)	Heat Exchanger	15	Cold
17176	BLDG 1	BASEMENT BB1-07 HWH A	3'	NTD600	1/2" (15mm)	Screwed	No	.145" (3.68mm)	Drip	15	Cold
17177	BLDG 1	BASEMENT BB1-07 HWH B	3'	NTD600	1/2" (15mm)	Screwed	No	.145" (3.68mm)	Drip	15	Cold
17178	BLDG 1	BASEMENT BB1-07 SUPPLY STM TO HWH A AND B	2'	FT-15	3/4" (20mm)	Screwed	No	0.218" (5.54mm)	Drip	15	OK
17179	BLDG 1	BASEMENT BB1-07 G-FLOOR A-14 HX BASEMENT BB1-07 G-FLOOR A-14A	3'	J5N-1.5	3/4" (20mm)	Screwed	No	0.228" (5.79mm)	Heat Exchanger	15	OK
17180	BLDG 1	BESIDE AC-1	4'	800-80	3/4" (20mm)	Screwed	No	0.125" (3.18mm)	Drip	40	OK
17181	BLDG 1	8TH FLOOR D8207 PRV AT WALL	4'	1032-70	3/4" (20mm)	Screwed	No	0.156" (3.97mm)	Drip	40	OK
17182	BLDG 1	8TH FLOOR D8207 PRV AT WALL	2'	FT-15	3/4" (20mm)	Screwed	No	0.218" (5.54mm)	Drip	15	OK
17183	BLDG 1	8TH FLOOR D8207 PRV AT WALL	2'	FTI-125	3/4" (20mm)	Screwed	No	0.125" (3.18mm)	Drip	120	OK
17184	BLDG 1	8TH FLOOR D8207 PRV BESIDE AHU 141	6'	15B5	1 1/4" (32mm)	Screwed	No	0.344" (8.73mm)	Heat Exchanger	15	OK
17185	BLDG 1	8TH FLOOR D8207 PRV BESIDE AHU 141	4'	15B5	1 1/4" (32mm)	Screwed	No	0.344" (8.73mm)	Heat Exchanger	15	Cold
17186	BLDG 1	8TH FLOOR D8207 PRV BESIDE AHU 141	2'	Unknown FT 75	1 1/2" (40mm)	Screwed	No	0.312" (7.92mm)	Heat Exchanger	15	Cold
17187	BLDG 1	8TH FLOOR D8207 PRV BESIDE AHU 141	3'	FT-15	3/4" (20mm)	Screwed	No	0.218" (5.54mm)	Drip	15	OK
17188	BLDG 1	8TH FLOOR D8207 BESIDE H-146 HUMIDIFIER	5'	FT-15	3/4" (20mm)	Screwed	No	0.218" (5.54mm)	Unit Heater	15	OK
17189	BLDG 1	8TH FLOOR D8207 H-146 HUMIDIFIER	3'	FT015H	3/4" (20mm)	Screwed	No	0.250" (6.35mm)	Humidifier	15	Cold
17190	BLDG 1	8TH FLOOR D8207 DH-185 AHU	5'	FT-75	3/4" (20mm)	Screwed	No	0.166" (4.22mm)	Humidifier	40	OK



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17191	BLDG 1	8TH FLOOR D8207 DH-185 AHU	4'	FT-75	3/4" (20mm)	Screwed	No	0.166" (4.22mm)	Humidifier	40	OK
17192	BLDG 1	8TH FLOOR D8207 DH-185 AHU	3'	FT-75	1 1/2" (40mm)	Screwed	No	0.312" (7.92mm)	Humidifier	40	OK
17193	BLDG 1	8TH FLOOR D8207 DH-185 AHU	1'	75	1 1/2" (40mm)	Screwed	No	0.312" (7.92mm)	Coil	40	Cold
17194	BLDG 1	8TH FLOOR D8207 DH-185 AHU	5'	1042-70	3/4" (20mm)	Screwed	No	0.156" (3.97mm)	Drip	40	OK
17195	BLDG 1	8TH FLOOR D8207 DH-185 AHU	6'	FT-75	1" (25mm)	Screwed	No	0.166" (4.22mm)	Coil	40	Cold
17196	BLDG 1	DH-185 AHU 5TH FLOOR D8207	12'	FT-75	1" (25mm)	Screwed	No	0.166" (4.22mm)	Drip	40	OK
17197	BLDG 1	6TH FLOOR A6002 BESIDE AC-126	6'	J3N-1.0	3/4" (20mm)	Screwed	No	.181" (4.59mm)	Drip	15	OK
17198	BLDG 1	6TH FLOOR A6002 BESIDE AC-126	2'	FT-15	3/4" (20mm)	Screwed	No	0.218" (5.54mm)	Heat Exchanger	15	OK
17199	BLDG 1	9TH FLOOR PENTHOUSE PRV STATION	2'	FTI-125	3/4" (20mm)	Screwed	No	0.125" (3.18mm)	Drip	120	Failed Open
17200	BLDG 1	9TH FLOOR PENTHOUSE PRV STATION	2'	FTI-125	1/2" (15mm)	Screwed	No	0.125" (3.18mm)	Drip	15	OK
17201	BLDG 1	9TH FLOOR PENTHOUSE PRV STATION	1'	J3N-1.0	3/4" (20mm)	Screwed	No	.181" (4.59mm)	Drip	15	Failed Closed
17202	BLDG 1	ABOVE PRV	12'	J3N-1.0	3/4" (20mm)	Screwed	No	.181" (4.59mm)	Heat Exchanger	15	OK
17203	BLDG 1	2ND FLOOR KITCHEN STEAMER	1'	J3N-4	1/2" (15mm)	Screwed	No	.106" (2.69mm)	Process	50	OK
17204	BLDG 1	2ND FLOOR KITCHEN LARGE STEAM KETTLE	2'	800-80	3/4" (20mm)	Screwed	No	0.125" (3.18mm)	Process	50	OK
17205	BLDG 1	2ND FLOOR KITCHEN SMALL STEAM KETTLE	2'	Unknown	1/2" (15mm)	Screwed	No	.145" (3.68mm)	Process	50	OK
17206	BLDG 1	2ND FLOOR KITCHEN SMALL STEAM KETTLE	2'	Unknown	1/2" (15mm)	Screwed	No	.145" (3.68mm)	Process	50	OK
17207	BLDG 1	2ND FLOOR KITCHEN LARGE STEAM KETTLE	2'	800-80	1/2" (15mm)	Screwed	No	0.125" (3.18mm)	Process	50	OK
17208	BLDG 1	2ND FLOOR KITCHEN DISHWASHER	1'	800-80	3/4" (20mm)	Screwed	No	0.125" (3.18mm)	Process	50	OK
17209	BLDG 1	2ND FLOOR KITCHEN DISHWASHER	1'	800-80	3/4" (20mm)	Screwed	No	0.125" (3.18mm)	Process	50	OK
17210	BLDG 1	2ND FLOOR KITCHEN DISHWASHER	1'	800-80	3/4" (20mm)	Screwed	No	0.125" (3.18mm)	Process	50	OK
17211	BLDG 1	G FLOOR DG-265 AHU 149	3'	40-215A	3/4" (20mm)	Screwed	No	0.313" (7.94mm)	Drip	15	OK
17212	BLDG 1	G FLOOR DG-265 AHU 149	1'	FT015H	3/4" (20mm)	Screwed	No	0.250" (6.35mm)	Coil	15	Cold
17213	BLDG 1	G FLOOR DG-265 AHU 149	1'	40-215A	3/4" (20mm)	Screwed	No	0.313" (7.94mm)	Humidifier	15	Cold
17214	BLDG 1	G FLOOR DG-265 AHU 149	2'	40-215A	3/4" (20mm)	Screwed	No	0.313" (7.94mm)	Drip	15	Cold
17215	BLDG 1	2ND FLOOR D-2206 1-C-102 HX	3'	JS7N-2.5	2" (50mm)	Screwed	No	0.26" (6.7mm)	Heat Exchanger	15	OK

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Trap	Location	Location Detail	Height	Model	Connection Size	Connection Type	Universal	Orifice Size	Application	Pressure	Condition
17216	BLDG 1	2ND FLOOR D-2206 1-C-101 HX	3'	JS7N-2.5	2" (50mm)	Screwed	No	0.26" (6.7mm)	Heat Exchanger	15	OK
17217	BLDG 1	2ND FLOOR D-2206 1-C-103 HX	4'	JS7N-2.5	1 1/4" (32mm)	Screwed	No	0.26" (6.7mm)	Heat Exchanger	15	Cold
17218	BLDG 1	2ND FLOOR D-2206 AT HOT WATER STORAGE TANK	3'	J3N-1.0	1/2" (15mm)	Screwed	No	.181" (4.59mm)	Drip	15	OK
17219	BLDG 1	2ND FLOOR D-2206 HWH	2'	15B4	1" (25mm)	Screwed	No	0.313" (7.94mm)	Heat Exchanger	15	Cold
17220	BLDG 1	2ND FLOOR D-2206 PRV	4'	FTI-75	3/4" (20mm)	Screwed	No	0.166" (4.22mm)	Drip	40	OK
17221	BLDG 1	2ND FLOOR D-2206 PRV	4'	J5N-4	3/4" (20mm)	Screwed	No	0.18" (4.51mm)	Drip	40	Failed Open
17222	BLDG 1	2ND FLOOR D-2206 PRV	1'	FT-15	3/4" (20mm)	Screwed	No	0.218" (5.54mm)	Drip	15	OK
17223	BLDG 1	B. SOUTH TUNNEL AT ENTRANCE	4'	J3N-12	3/4" (20mm)	Screwed	No	0.05" (1.2mm)	Drip	120	OK
17224	BLDG 1	B. NORTH TUNNEL 50 FEET FROM ENTRANCE	2'	310-15	3/4" (20mm)	Screwed	No	0.250" (6.35mm)	Drip	15	OK
17225	BLDG 1	B. NORTH TUNNEL 200 FEET FROM ENTRANCE	1'	812-15	3/4" (20mm)	Screwed	No	0.312" (7.92mm)	Drip	15	OK
17226	BLDG 1	A-WING NORTH AT ENTRANCE	3'	800-125	3/4" (20mm)	Screwed	No	0.11" (2.7mm)	Drip	120	OK
17227	BLDG 1	A-WING SOUTH AT ENTRANCE	6'	J3N-1.0	3/4" (20mm)	Screwed	No	.181" (4.59mm)	Drip	15	Cold
17228	BLDG 3	HVAC SHOP	12'	J3N-1.0	3/4" (20mm)	Screwed	No	.181" (4.59mm)	Drip	15	Cold
17229	BLDG 3	HVAC SHOP	12'	J3N-1.0	3/4" (20mm)	Screwed	No	.181" (4.59mm)	Unit Heater	15	Cold
17230	BLDG 3	HVAC SHOP	12'	J3N-1.0	3/4" (20mm)	Screwed	No	.181" (4.59mm)	Unit Heater	15	Cold
17231	BLDG 3	PLUMBING SHOP	12'	J3N-1.0	3/4" (20mm)	Screwed	No	.181" (4.59mm)	Unit Heater	15	Cold
17232	BLDG 3	PLUMBING SHOP	12'	J3N-1.0	3/4" (20mm)	Screwed	No	.181" (4.59mm)	Unit Heater	15	Cold
17233	BLDG 3	TRANSPORTATION SHOP	12'	J3N-1.0	3/4" (20mm)	Screwed	No	.181" (4.59mm)	Unit Heater	15	Cold
17234	BLDG 3	TRANSPORTATION SHOP	12'	J3N-1.0	3/4" (20mm)	Screwed	No	.181" (4.59mm)	Unit Heater	15	Cold
17235	BLDG 3	MACHINE SHOP	12'	J3N-1.0	3/4" (20mm)	Screwed	No	.181" (4.59mm)	Unit Heater	15	Cold
17236	BLDG 3	CARPENTER SHOP	12'	J3N-1.0	3/4" (20mm)	Screwed	No	.181" (4.59mm)	Unit Heater	15	Cold
17237	BLDG 3	GB1-01B MER RIGHT WALL	8'	75A3	3/4" (20mm)	Screwed	No	0.172" (4.37mm)	Drip	40	OK
17238	BLDG 3	GB1-01B MER LEFT WALL	7'	40-215	3/4" (20mm)	Screwed	No	0.250" (6.35mm)	Drip	40	OK
17239	BLDG 3	GB1-01B MER LEFT WALL	3'	Unknown FT 75	2" (50mm)	Screwed	No	.421" (10.6mm)	Heat Exchanger	40	Failed Open
17240	BLDG 3	GB1-01B MER PRV STATION	2'	FTI-125	3/4" (20mm)	Screwed	No	0.125" (3.18mm)	Drip	120	OK
17241	BLDG 3	BESIDE PRV STATION	1'	15J8	2" (50mm)	Screwed	No	0.500" (12.7mm)	Heat Exchanger	40	OK
17242	BLDG 3	PRV	5'	811-125	3/4" (20mm)	Screwed	No	0.125" (3.18mm)	Drip	120	OK
17243	BLDG 3	PRV	2'	FTI-75	3/4" (20mm)	Screwed	No	0.166" (4.22mm)	Drip	40	OK
17244	BLDG 3	HX	3'	Unknown FT 75	1 1/2" (40mm)	Screwed	No	0.312" (7.92mm)	Heat Exchanger	40	Failed Open
17245	BLDG 3	C-106 MECH ROOM	7'	TD52	1/2" (15mm)	Screwed	No	.145" (3.68mm)	Drip	40	Cold

**Complete Trap List
 Veterans Administration - Madison WI**

Trap	Location	Location Detail	Height	Model	Connection Size	Connection Type	Universal	Orifice Size	Application	Pressure	Condition
17246	BLDG 1	8TH FLOOR RECOVERY ROOM AHU 128	1'	75A4	1" (25mm)	Screwed	No	0.172" (4.37mm)	Coil	40	Cold
17247	BLDG 1	8TH FLOOR RECOVERY ROOM AHU 128	10'	J3N-1.0	3/4" (20mm)	Screwed	No	.181" (4.59mm)	Drip	15	OK
17248	BLDG 1	8TH FLOOR RECOVERY ROOM AHU 128	10'	J3N-1.0	3/4" (20mm)	Screwed	No	.181" (4.59mm)	Drip	15	OK
17249	BLDG 1	8TH FLOOR RECOVERY ROOM AHU 128	10'	FT015H	3/4" (20mm)	Screwed	No	0.250" (6.35mm)	Coil	15	Cold
17250	BLDG 1	8TH FLOOR RECOVERY ROOM AHU 128	10'	FT015H	2" (50mm)	Screwed	No	0.500" (12.7mm)	Coil	15	Cold