

SPECIFICATIONS FOR REMODEL GILRUTH SHOWER ROOMS

Project # 14013
JA / CENTER OPERATIONS DIRECTORATE
JM3 / JSC 200/300/400/EF/SCTF Area Branch

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National Aeronautics and
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Lyndon B. Johnson Space Center
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PROJECT DESCRIPTION
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PART 1 GENERAL

1.1 APPLICABILITY

The following is a general description of the work required and shall not be construed as a complete listing of all work required to satisfactorily complete the project as required by the contract drawings and other sections of these specifications.

1.2 DESCRIPTION

Scope Description: Outlined below is the scope for this project which is to Renovate and reconfigure the Men's and Women's shower area of the Gilruth Center B207. The purpose of this remodel is to build individual private shower stalls and dry changing areas with benches, increase floor drainage which has been a constant problem, build a custodial closet to store cleaning equipment and supplies and change lighting configuration. The contractor shall provide a set of construction drawings stamped by the PE registered in the state of Texas and perform all necessary construction activities to complete this remodel.

Architectural

Renovate rooms 145B & 145BA to include 10 shower rooms with individual dry areas and equipment closet, and room 121A to include 10 shower rooms with individual dry areas.

- Each shower stall should be designed larger allowing space for wet and dry area separated by door with curb.
- The dry area should include a bench and hook.
- Proposed design layouts shall comply with ADA.
- Remove and replace Gyp board walls inside working area as required during design.
- Remove all existing plumbing fixtures and accessories in room 145BA & 121A .
- Install new Gyp. Board walls, as required during design. Cement board shall be used in lieu of gypsum board in wet areas
- Room 145B & 145BA dimensions are 23'-0" x 18'-0" (+/-), the existing Gyp. Board ceiling height is 8'-11".
- Room 121A dimensions are 21'-5" x 18'-0" (+/-). The existing Gyp. Board ceiling height is 8'-11"
- Provide and install new (10) shower plumbing fixtures, accessories, (10) benches in room area 145B & 145BA.
- Provide and install new (10) shower plumbing fixtures, accessories, (10) benches in room area 121A.
- Paint, patch and repair existing gyp board walls as required during design in all working area.
- Repair existing and install new 4"x4" ceramic wall tile with accent patterns to match existing in all working area as required.
- Repair existing 2"x2" floor tile with 1"x1" mosaic tile accent patterns as required in all working area.
- Repair existing Gyp. Board ceiling as required in all working area.

Mechanical

Room 145B & 145BA:

- Disconnect and remove twelve (12) existing shower heads with related mixing valves and hot/cold water chase pipes. Pipes running above false ceiling to remain.
- Disconnect and remove three (3) floor drains with related 6" and 3" below grade pipes.
- Disconnect and remove two (2) 3" vertical vent pipe.
- Supply and install new 3" vent pipe, total run approximately 60 feet.
- Supply and install eight (8) new head showers with mixing valves. New ½" hot/cold copper pipe drops.
- Supply and install 2 (two) new head showers with mixing valves per ADA height requirements. New ½" hot/cold copper pipe drops.
- Supply and install 10 (ten) shower grate trench stainless steel drains.
- The fire suppression is to be modified to properly cover the space in accordance with NFPA 13 and JSC 8719.11A code requirements. Design and install shall be performed by a certified Fire Protection Company.

Room 121A:

- Disconnect and remove ten (10) existing shower heads with related mixing valves and hot/cold water chase pipes. Pipes running above false ceiling to remain.
- Disconnect and remove ten (10) floor drains with related 6" and 3" below grade pipes.
- Supply and install new 3" vent pipe, total run approximately 60 feet.
- Supply and install eight (8) new head showers with mixing valves. New ½" hot/cold copper pipe drops.
- Supply and install 2 (two) new head showers with mixing valves per ADA height requirements. New ½" hot/cold copper pipe drops.
- Supply and install 10 (ten) shower grate trench stainless steel drains.

Electrical

Room 145B & 145BA:

- This task consists of providing one new NEMA 5-20R GFCI receptacle in room 145B, east wall. Extend circuit LVA-13 to power the new receptacle using 3#12 THHN in ¾" EMT. Run approx. 20'.

Room 121A:

No electrical work is required in room 121A.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

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DEFINITIONS AND EXPLANATIONS
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PART 1 GENERAL

1.1 EXPLANATIONS

General Requirements: The provisions or requirements of Division 1 sections constitute the General Requirements and apply to the entire work of the contract and, where so indicated, to other elements of work which are included in the project.

1.2 DEFINITIONS

Substantial amount of the specification language constitutes specific definitions for nominal terms found on drawings and in the contract documents.

Indicated: The term "indicated" is a reference to details, notes, or schedules on the drawings, other paragraphs or schedules in the Specification. Where terms such as "shown," "noted," "scheduled," and "specified" are used instead of "indicated," it is for the purpose of locating the reference, and no limitation of location is intended except as specifically noted.

Terms such as "directed," "requested," "authorized," "selected," "approved," "required," "accepted," and "permitted" mean "directed by the Contracting Officer's Technical Representative," "requested by the Contracting Officer's Technical Representative," etc.

Testing Laboratory: An independent organization engaged to perform specific inspections or tests of the work, either at the site or elsewhere, and report the results of those inspections or tests.

Provide, Furnish and Install: Except as otherwise defined in greater detail, the terms "provide," "furnish" and "install" shall mean to supply and deliver to the project site, and install, complete and ready for the intended use.

1.3 ADDITIONAL DEFINITIONS

Wherever in the specifications or upon the drawings the words "directed," "required," "ordered," "designated," "prescribed," or words of like import are used, it shall be understood that the "direction," "requirement," "order," "designation," or "prescription," of the Contracting Officer's Technical Representative is intended and similarly the words "approved," "acceptable," "satisfactory," or words of like import shall mean "approved by" or "acceptable to" or "satisfactory to" the Contracting Officer's Technical Representative unless otherwise expressly stated.

Where "as shown," "as indicated," "as detailed" or words of similar import are used, it shall be understood that the reference is made to the drawings accompanying this contract unless stated otherwise. The word "provided" as

used herein shall be understood to mean "provided complete in place" that is, "furnished and installed."

Where the term "special provision" or "general provision" is used, it shall be understood that the reference is made to an "article" or "clause" in the Contract Schedule.

Where terms such as "performed in the presence of the Contracting Officer," "viewed by the Contracting Officer," "approved by the Contracting Officer's Technical Representative," or "arranged with the Contracting Officer's Technical Representative" are used, it shall be understood that the reference is made to the Contracting Officer or to the Contracting Officer's Technical Representative who shall be designated in writing after the award.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used!

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SPECIAL REQUIREMENTS
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PART 1 GENERAL

1.1 REFERENCES

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

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

29 CFR 1926	Safety and Health Regulations for Construction
40 CFR 112	Oil Pollution Prevention
40 CFR 247	Comprehensive Procurement Guideline for Products Containing Recovered Materials
40 CFR 248	Guidelines for Federal Procurement of Building Insulation Products Containing Recovered Materials
40 CFR 249	Guidelines for Federal Procurement of Cement and Concrete Containing Fly Ash

1.2 DEFINITIONS

Government property means all property owned or leased by the Government. Government property includes both Government-furnished and Contractor-acquired property. Government property includes material, equipment, special tooling, special test equipment, and real property. Government property does not include intellectual property and software.

Personal property means property of any kind or interest in it except real property, records of the Federal Government, and naval vessels of the following categories: (1) Battleships; (2) Cruisers; (3) Aircraft carriers; (4) Destroyers; and (5) Submarines.

Related personal property means any personal property that is an integral part of real property. It is: Related to, designed for, or specifically adapted to the functional capacity of the real property and removal of this personal property would significantly diminish the economic value of the real property; or determined by the Administrator of General Services to be related to the real property.

Construction and demolition (C & D) waste means wastes generated as a result of construction activities associated with removal of building components, but not including asbestos or wastes associated with asbestos abatement, or wastes associated with lead paint abatement performed prior to removal of building components.

1.3 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

As-Built Drawings shall be submitted in accordance with the paragraph entitled, "As-Built Drawings," of this section.

SD-03 Product Data

INSTALLED/REMOVED COLLATERAL EQUIPMENT shall be submitted in accordance with the paragraph entitled, "Installed/Removed Collateral Equipment," of this section.

SD-07 Certificates

Sedimentation and Erosion Control shall be submitted in accordance with the paragraph entitled, "Sedimentation and Erosion Control," of this section.

1.4 SCOPE

This section contains the Special Requirements pertaining to work under this Contract.

1.5 COMMENCEMENT, PROSECUTION, AND COMPLETION OF WORK

The Contractor will be required to commence work under this Contract within 10 calendar days after the date of receipt by him of notice to proceed, to prosecute work diligently, and to complete the entire work ready for use within 119 calendar days after the date of receipt by him of the notice to proceed. The time stated for completion shall include final cleanup of the premises.

1.6 DISCREPANCIES

The Contractor shall check all drawings furnished him immediately upon their receipt and shall promptly notify the Contracting Officer of any discrepancies. Figures marked on drawings shall in general be followed in preference to scale drawings. The Contractor shall compare all drawings and verify the figures before laying out the work and will be responsible for any errors which might have been avoided thereby.

1.7 AS-BUILT DRAWINGS

During construction the Contractor shall maintain a current set of as-built drawings which reflect changes and deviations in the contract drawings as they are installed in the field. The as-built drawings shall be available for inspection by Contracting Officer at all times.

After substantial completion of all construction and before final payment is made under this contract, the Contractor shall provide the Contracting Officer two complete sets of full size hard copy contract drawings with alterations shown in red pencil. These final drawings shall incorporate contract changes and plan deviations. Lines, letters, and details should be

sharp, clear, and legible. Additions or corrections to the drawings will be drawn to the scale of the contract drawings.

The final as-built drawings, certified correct by the Contractor, shall be submitted (SD-02) to the Contracting Officer ten calendar days prior to the contract completion date.

1.8 ELECTRICAL PANEL AND EQUIPMENT DIRECTORY AS-BUILTS

When changes to electrical panels, switchboards, switchgear, or motor control centers are completed (all work in the equipment has been completed) the Contractor shall; 1) Make a copy of the updated panel or equipment directory and attach it to the redline as-built drawings; 2) Provide a copy of the updated directory to the As-built manager; 3) Install the permanent updated directory (provided by the as-built manager) in the panel or equipment.

The copy of the updated directory shall be delivered to the As-built manager within 7 calendar days after the work in the panel or equipment has been completed. The as-built manager will contact the Contractor after the receipt of the updated directory indicating that the new revised directory is ready to be picked up and placed in the equipment.

1.9 SANITATION

The Contractor shall provide and maintain all necessary sanitary convenience for use of his employees. Upon completion of the work, the Contractor shall remove the sanitary facilities and restore the area to its original condition.

Contractor's personnel will be permitted to use a restroom on the premises subject to regulations and control of the Contracting Officer.

1.10 CLEANUP AND DISPOSAL OF MATERIALS

For the purpose of these specifications, the following definitions apply:

Industrial solid and hazardous waste (ISHW) means solid wastes (including solids, liquids, and contained gases) that are regulated under the Resource Conservation and Recovery Act (RCRA) and the Texas Solid Waste Disposal Act as having characteristics or that are specifically listed as presenting a risk or hazard to human health or the environment if improperly managed or disposed of. This waste classification includes asbestos waste and PCB-containing caulk. This waste classification also includes universal wastes such as fluorescent lamps, nickel-cadmium and lead acid batteries, wastes associated with painting and paint removal activities, and mercury containing equipment such as thermostats that are commonly encountered during building deconstruction and demolition activities.

Construction and demolition (C&D) waste means wastes generated as a result of construction activities associated with removal of building components, but not including asbestos or wastes associated with asbestos abatement, or waste associated with lead paint abatement performed prior to removal of building components. Asbestos and lead paint abatement wastes shall be managed as ISHW. Universal wastes such as batteries and bulbs shall also be managed separate from ISHW and C&D

wastes. Typical C&D wastes include but are not limited to concrete, soil, wood, asphalt, scrap metal, and miscellaneous building components such as electrical wiring/conduit, plumbing fixtures, and HVAC equipment/ducts. If concrete pours are required under the contract, concrete truck washout must be collected and recycled.

Plant trash means wastes other than ISHW, universal waste, or C&D waste as described above that are associated with human work activities. Recyclable plant trash such as paper, plastic, or aluminum containers, cardboard, wood pallets, and similar materials shall be properly segregated and recycled and records shall be included in the report described in Section 01 74 19.00 80 CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT . Non-recyclable plant trash (e.g., putrescible wastes, such as food scraps) is also the responsibility of the contractor to segregate, collect and transport to a state-permitted facility approved for management of that type of waste.

At reasonable intervals during the progress of the work, and at the completion of the contract, the Contractor shall clean up the site and accesses thereto and shall dispose of non-recyclable C&D and plant trash wastes, otherwise known as debris. Debris shall not be allowed at any time to accumulate in such a manner as to constitute an unsightly condition or hazard. The Contractor shall remove debris from the Government premises and recycle or dispose of it without additional cost to the Government as required and described in Section 01 74 19. 00 80, CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT, paragraph entitled, "Waste Management Plan". Dumpster equipment located at the Johnson Space Center shall not be used by the Contractor. Upon completion of the construction, the Contractor shall leave the work and premises in a clean, neat, and workmanlike condition satisfactory to the Contracting Officer.

The Contractor shall not dispose of ISHW, including but not limited to fluid waste, such as oil, mineral spirits, etc., in the storm or sewage disposal system. The contractor shall segregate and manage ISHW generated during the project in conformance with the current edition of JPR 8550.1, "JSC Environmental Compliance Procedural Requirements". As appropriate, a satellite accumulation area (SAA) will be established, and a complete JSC Form 1104 will be submitted to the NASA Environmental Office for each ISHW stream identified. The contractor is expressly prohibited from transporting ISHW offsite without explicit authorization from the Contracting Officer. The Contractor shall request empty containers for ISHW and immediately request that full containers be picked up by completing a Form JF 1161 and contacting Work Control at (281) 483-2038.

C&D materials are to be removed as per the approved Waste Management Plan. Scrap metals identified for turn in to the Government are not included in this category. C&D materials removed under this Contract and not specified for reuse or for return to the Government shall become the property of the Contractor and shall be removed from the Government premises and disposed of or recycled at no additional cost to the Government per the approved Waste Management Plan. The contractor shall comply with applicable subsections of Section 01 74 19.00 80 CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT relating to tracking, recordkeeping, and reporting associated with disposition (recycling and/or disposal) of C&D and plant trash wastes.

For offsite transportation and disposition of recyclable C&D materials, the contractor is solely responsible for and required to conform to all

applicable federal and state public transportation requirements, including but not limited to weight limitations, shipping papers, placarding, and oversized permitting requirements. The contractor may utilize the weight scale at Building 420 near the Gate 4 entrance for the purposes of conforming to weight restrictions; however, the Government accepts no liability for the accuracy of the scale or for its operability when needed by the contractor.

1.11 AVAILABILITY OF UTILITY SERVICES

It has been determined by the Contracting Officer that Government-owned and operated utility systems and supplies are adequate for the needs and use of the Contractor as well as the Government. All reasonably required amounts of water, and electricity, will be made available without charge to the Contractor by the Government from existing system outlets and supplies. The Contractor shall, at his own expense, make all temporary connections and install distribution lines; and all such temporary lines will be furnished, installed, connected, and maintained by the Contractor in a safe and workmanlike manner satisfactory to the Contracting Officer and shall be removed by the Contractor in like manner at his expense prior to final acceptance of the construction.

The Government will furnish electric power for general construction purposes, with a maximum demand of 5 kilowatts, without cost to the Contractor. The electrical energy will be made available to the Contractor from the NASA distribution system at the nearest location where such capacity is available, and at the option of the Contracting Officer will be supplied a three-phase, four-wire, 60-cycles, 120/208-volts, or three-phase, four-wire, 60 cycles, 277/480-volts. The Contractor shall provide and install a disconnect switch, suitably protected from the weather, and fused for 70 amperes or less for 120/208 volts or 30 amperes or less for 277/480 volts, at the delivery point. Designated lines extended from the disconnect switch shall be furnished by the Contractor and shall be installed and maintained in a safe and workmanlike manner. All temporary line and the disconnect switch shall be removed by the Contractor at the completion of the contract. This electrical energy is provided for lighting, motor-driven construction equipment, and general construction purposes.

The Government will not provide telephone service for use by the Contractor. The Contractor shall make arrangements for installation and maintenance of telephone service and for removal of same upon completion of Contract.

1.12 UTILITIES OUTAGES AND TIE-INS

Prior to taking electrical or mechanical systems out of service or activating newly installed systems, the Contractor shall provide to the Government a written sequence of events, "utility procedures", describing the starting date and time for the work, total duration of each work item and the estimated time needed for each step. The utility procedure must have sufficient detail so the Contracting Officer can monitor the progress and quality of the work.

The Contractor shall provide the utility procedure to the Government at least fifteen (15) calendar days prior to starting the work.

The Contractor shall not begin working until the Government has reviewed, commented, and approved the work and the utility procedure.

Utility outages and utility tie-ins will normally be accomplished during normal off-duty hours. The Contractor shall insure there will be no interruption of air conditioning or electrical service during normal duty hours.

See Utility Procedure Instructions, Attachments 1-4, and Forms 525/525A, attached to the end of this section upon completion of project.

1.13 OCCUPANCY OF PREMISES

The building(s) will be occupied during performance of work under this Contract.

Before work is started, the Contractor shall arrange with the Contracting Officer, a sequence of procedure, means of access, space for storage of materials and equipment, use of approaches, corridors, and stairways.

1.14 SEDIMENTATION AND EROSION CONTROL

REQUIREMENTS	CATEGORY A ALL PROJECTS	CATEGORY B 0.5 - 1.0 ACRES	CATEGORY C 1.0 - 5.0 ACRES	CATEGORY D > 5 ACRES
Best Management Practices(BMPs) and Dig Permit. Typical BMPs include: filter fencing, inlet protection and street cleaning	All projects (Paragraph 1.19.1, Subparagraphs 1.19.1.1 through 1.19.1.5)	All projects (Paragraph 1.19.1, Subparagraphs 1.19.1.1 through 1.19.1.5)	All projects (Paragraph 1.19.1, Subparagraphs 1.19.1.1 through 1.19.1.5)	All projects (Paragraph 1.19.1, Subparagraphs 1.19.1.1 through 1.19.1.5)
Sedimentation and Erosion Control Plan (SECP)		Add Paragraph 1.19.2	Add paragraph 1.19.2	Add paragraph 1.19.2
Storm Water Pollution Prevention Plan (SWPPP) with Construction Notice			Add paragraph 1.19.3	Add paragraph 1.19.3
Notice of Intent (NOI)/Notice of Termination (NOT)				Add paragraph 1.19.4

1.14.1 General Requirements

All contractors conducting outdoor work at JSC are required to adhere to the requirements of the site specific JSC Municipal Separate Storm Sewer System (MS4) permit issued by the Texas Commission on Environmental Quality (TCEQ) and the Best Management Practices (BMPs) contained in the "JSC Storm Water Management Plan" (SWMP). Although construction activities at Ellington Field (EF) and Sonny Carter Training Facility (SCTF) are not regulated under the JSC MS4, the Contractor shall follow the same BMPs in order to prevent runoff of contaminants into the storm sewer system. The Contractor (and any subcontractors or other agents) shall not submit the Notice of Intent (NOI)/Notice of Termination (NOT) (if required) directly to the TCEQ, City of Houston or any other regulatory agency, but instead shall submit the documents to the Contracting Officer (CO) directly in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

The TCEQ enforces environmental regulation in the State of Texas and may inspect the project for regulatory compliance at any time during construction, with or without providing advance notice. The Contractor is liable for payments of any fines or penalties, and may be required to reimburse the Government for fines, penalties, and any associated administrative costs paid by the Government due to the Contractor's failure to conform to the requirements of this specification/approved project.

NOTE: Copies of the JSC SWMP, JSC Storm Water Pollution Prevention Plan (SWPPP), JSC Spill Prevention, Control, and Countermeasure (SPCC) plan, as well as the Harris County Storm Water Management Handbook for Construction Activities, as referred to in this document, can be obtained by calling the JSC Environmental Info Line at 281-483-6207, or by sending an email to JSC-Environmental-Office@mail.nasa.gov.

The contractor shall adhere to BMPs including but not limited to:

- a) good housekeeping measures and controls,
- b) spill prevention,
- c) storage and lay down yards,
- d) hazardous material, hazardous waste and containment management,
- e) dumpsters and roll-offs,
- f) aboveground storage tanks,
- g) fuel/fuel handling,
- h) loading/unloading, and
- i) erosion control.

The Contractor shall adhere to, implement, maintain, and follow at all times the requirements within the above mentioned plans. General requirements for all projects are detailed in the following subparagraphs of this specification:

- a) 1.19.1.1 Operational Control of Construction Site;
- b) 1.19.1.2 Discharge of Contaminants to Storm Sewer System Prohibited;
- c) 1.19.1.3 Dig Permits;
- d) 1.19.1.4 Spill Prevention, Control, and Countermeasures (SPCC);
- e) 1.19.1.5 Reporting Unintentional Discharges or Releases.

1.14.1.1 Operational Control of Construction Site

The contractor (as opposed to a subcontractor) shall be identified as the Operator, as defined in the JSC TCEQ MS4 General Permit. The Operator shall

maintain day-to-day operational control over the site and ensure compliance with the SWMP/SWPPP and all relevant environmental laws and regulations.

1.14.1.2 Discharge of Contaminants to Storm Sewer System Prohibited

Contractors are specifically prohibited from allowing the discharge of project-related contaminants to the storm sewer system. The system may include area inlets, storm drains, culverts, ditches, surface drainage ways, depressions, or other natural or artificial structures or geographic components that may carry runoff from a significant rainfall event to a storm sewer or other waterway. State and Federal laws and regulations authorize only uncontaminated water (storm water, potable water, and condensate) to be discharged to a storm sewer system from a construction site.

The Contractor shall minimize the tracking sediments, soil or vegetation off-site by vehicles, and the generation of dust. The Contractor shall clean paved surfaces to prevent sediment accumulation on the roadway. Disposal areas, stockpiles, and haul roads shall be constructed in a manner that will minimize and control the amount of sediment that may enter receiving waters. The Contractor shall minimize down-gradient sedimentation during construction and when removing control structures.

1.14.1.3 Dig Permit

The Contractor shall obtain a dig permit, regardless of the size of the jobsite, per section entitled "Dig Permit Procedures".

The Contractor shall obtain a dig permit as stated above however, a Sedimentation and Erosion Control Plan (SECP) is not explicitly required when soil disturbance is less than 1/2 acre in aerial extent and when one of the following two conditions apply: a) completion of the entire job/project is less than 48 hours in duration or when there is more than 10 feet of flat (zero-grade) vegetation/grass between the disturbed area and any storm water feature (i.e., ditch, swale, storm drain inlet/grate).

Regardless of whether a written SECP is required, Best Management Practices (BMPs) are required to be employed to minimize the potential release of pollutants to surface water features. BMPs include: filter fabric fences, straw bale fences, vegetative sediment filter strips, reinforced filter fabric barrier, sandbag barrier, site dewatering, stabilized access roads and parking areas, cleaning of streets and parking areas, and concrete work. Activities with soil disturbance within 10 feet of any storm water conveyance (ditch, swale, or inlet) will require some form of BMP protection for said feature. Stockpiles of soil greater than 10 cubic yards require BMP utilization (i.e. filter fence). Activities that may contribute to mud/dirt/sediment tracking onto paved areas and streets will require BMP implementation such as a stabilized access (entrance/exit) and/or street cleaning. Filter fences installed in areas of concentrated flows (swales, ditches) must be reinforced (either as a reinforced filter fabric barrier, or with a secondary BMP of hay bales). Hay bales are not allowed as a primary BMP in areas of concentrated flow; they must be complimentary to another primary BMP. Concrete washout shall not be discharged to the ground, drains, or ditches. The contractor shall collect all concrete wash out within containment. The contractor shall dispose of the concrete wash out at a JSC authorized, approved off-site recycling center.

BMPs and their specifications for installation are identified in Section 4 of the Storm Water Management Handbook as referenced in Paragraph 1.19.1 above.

1.14.1.4 Spill Prevention, Control, and Countermeasure (SPCC) Requirements

Because JSC maintains an aggregate aboveground storage capacity of greater than 1,320 gallons of oil/petroleum product, NASA maintains a SPCC plan as required by 40 CFR 112. The Contractor shall store all oil and fuel related products contained in tanks or containers with capacity of 55 gallons or greater within secondary containment at the construction site. The secondary containment shall be an impervious pan or similar control system or device that can contain the contents of the largest container plus 10% to allow for accumulated rainfall without overflowing. The Contractor and any subcontractors shall properly manage the containers and secondary containment and shall inspect the containment area weekly for the following:

- a) Containers shall be kept tightly closed except when dispensing oil or fuel, with no evidence of fuel or oil on the exterior of the container or within the containment system.
- b) Containers shall be in good condition, with no significant rusting, pitting or denting.
- c) Containers shall be properly marked and labeled as to contents. The appropriate NFPA diamond shall be prominently displayed on the exterior of the container.
- d) All drain caps shall remain in place or drain valves closed during normal operation of the containment system. Valves or drain caps shall be opened only when necessary to drain the containment of any accumulated, uncontaminated rainfall. In addition, containments shall only be drained by an approved, trained person designated by the contractor and approved by the CO.
- e) Containment systems shall be inspected for evidence of oil within 24 hours of each rainfall event of 0.1 inches or greater. If a sheen or any volume of oil or fuel is noted within the containment system, the Contractor shall notify the Emergency Operations Center (EOC) at 281-483-3333 (JSC and SCTF) or 281-244-4444 (EF) and request environmental support to pump the contained fluids into suitable containers for reuse or proper disposal.
- f) Weekly inspection records shall be made available for inspection by the CO or designated agent upon request.

NOTE: A sample inspection checklist can be obtained by contacting the JSC Environmental Info line or through the email address in paragraph 1.19.1 above. If all oil and fuel related products are stored inside a building or beneath a protective cover where rainfall cannot accumulate, the Contractor can perform monthly inspection if approved by the CO.

1.14.1.5 Reporting Unintentional Discharges or Releases

Pursuant to requirements of the Texas Pollutant Discharge Elimination System (TPDES) permit and related requirements, intentional or unintentional discharges to surface waters containing contaminants, including but not

limited to sewage, chemicals, oil, fuel, solvents, cleaners, etc., are prohibited. The Contractor that immediately report all unintentional discharges (spills or releases to the Emergency Operation Center (EOC) at 281-483-3333 (JSC and SCTF) or to 281-244-4444 (EF).

1.14.2 Requirements for Projects Between 1.0-acres and 5.0-acres in Size

1.14.2.1 Storage of Paints, Chemicals, Solvents, Fertilizers, and other Potentially Toxic Materials

The contractor shall protect all potentially toxic construction materials from storm water at a site approved by the CO. Only enough materials to complete the project shall be stored on-site.

1.14.2.2 Construction Staging and Vehicle Maintenance Areas

The contractor shall construct staging and vehicle maintenance areas in a manner which minimizes pollutant runoff, in a location approved by the CO.

1.14.2.3 Stabilization of the Project Area Once Construction Ceases

Upon permanent or temporary cessation of Construction at a project site, the Contractor shall initiate stabilization of the area by the use of seeding, mulching, soil retention blankets or other appropriate measures within 14 calendar days, unless Construction is scheduled to resume within 21 days. Temporary erosion control measures shall not be removed until the Contractor establishes, at a minimum, a uniform, evenly distributed (without large bare areas) perennial vegetative cover with a density of 70% of the native background vegetation for all areas not covered by permanent structures or pavement.

1.15 DIG PERMIT PROCEDURES

The Contractor shall obtain a dig permit, regardless of the size of the jobsite, prior to any intentional or unintentional removal of vegetation (i.e., digging, excavating, drilling, etc.) or disturbance of soil (i.e., including vehicular and heavy equipment traffic within turf areas and/or establishing a lay down area). The Contractor shall request and obtain an approved Dig Permit by following the procedures outlined in JPR 8800.50 "Excavation and Boring Permits" and CSC Procedure C-PR-6556 "Excavation and Boring Permit Process". Copies of these procedures and additional information regarding the dig permit process can be obtained by contacting the Dig Permit Database Curator at 281-483-5289.

Disturbance of vegetation shall be limited to only what is shown on the construction plans or as directed by the CO. The primary purpose of the dig permit is to identify utilities that need to be protected and /or avoided. A secondary purpose is to obtain approval for associated sedimentation and erosion control.

1.16 USE OF RECYCLED MATERIALS

In conformance with Executive Order 13424, it is JSC's policy to promote the use of recycled materials to the maximum extent practicable, consistent with 40 CFR 247, 40 CFR 248, and 40 CFR 249. Nothing in this specification shall be construed to prohibit the selection and use of recycled materials, provided the performance standards (where specified) will be met.

Contractors are encouraged, and per the Comprehensive Procurement Guidelines published by the US Environmental Protection Agency <http://www.epa.gov/cpg/> in some cases explicitly required to use recycled materials where appropriate. Substitution by the Contractor of specified products or materials, with products or materials containing recycled materials, will be evaluated on a case-by-case basis; in each case the Contractor shall bring such substitutions to the attention of the Contracting Officer or his representative for consideration and approval with his submission(s).

1.17 REPORTING REQUIREMENTS FOR USE OF BIOBASED MATERIALS

The United States Department of Agriculture has established reporting requirements regarding purchases of biobased material. Reporting requirements are part of FAR 52.223-2, Affirmative Procurement of Biobased Products Under Service and Construction Contracts. The contractor shall be required to submit to the Contracting Officer's Representative a monthly financial estimate of the amount of biobased material purchase for use in performance of the contract. These submissions should be made with the contractor's invoice for payment on the form at the end of this section. More information on the USDA program can be found at <http://www.biopreferred.gov/>.

1.18 INSTALLED/REMOVED COLLATERAL EQUIPMENT

Upon removal of any and all Real Property items (labeled by a red/black NASA tag) the Contractor is required to notify the Contracting Officer and provide information as to the items being removed and disposition of the items. The Contracting Officer will notify the NASA Real Property Office (JA161).

The Contractor shall be required to submit on JSC Form 1478 a list of all installed or removed equipment furnished under this contract. This listing shall include all equipment over \$1,000 in value. The listing shall include all information usually listed on manufacturer's name plate, as to positively identifying the piece of property. This list shall also include the cost of each piece of installed property F.O.B. the construction site (do not include installation costs). The list shall be furnished to the Contracting Officer's Representative not later than thirty calendar days prior to completion of any segment of the contract work which has an incremental completion date. Form 1478 is included at the end of this section. Copies of this form will be made available to the Contractor by the Government.

1.19 LEAD BASE PAINT CONTROL

1.19.1 New Paint Application

JSC requires the use of paints that are "lead free" in all new paint applications in facility construction projects. Prior to paint application, paints containing any detectable concentrations of lead must be approved by the JSC Hazardous Materials Review Committee. A time period of 14 calendar days is required for review by the committee. A certification from the manufacturer or supplier that a particular paint is "lead free" will be considered adequate to disregard the need for a determination by the JSC Hazardous Materials Review Committee. A certification of "lead free" or an application for exemption must be supplied for all paints. The Contracting

Officer reserves the right to sample paints for the detectable presence of lead content prior to or upon application for verification purposes.

1.19.2 Existing Lead Base Paint Removal

There are lead base paints to be expected in the work area.

The Contractor shall follow all OSHA standards relating to surveillance, personal protection, monitoring, training/certification, and engineering controls (See 29 CFR 1926.62). The OSHA standards specify the permissible exposure limit (PEL) of 50 micrograms per cubic meter and the Action Level of 30 micrograms per cubic meter, based on 8-hour time-weighted averages, for lead exposure.

The Contractor will implement environmental controls consistent with the Texas Commission on Environmental Quality (TCEQ). Regulations found at Texas Administrative Code (TAC), Title 30, Part 1, Chapter III, Sections 111.131 through 111.139 (30 TAC 111.131-111.139), whether or not the structure is specifically regulated under that standard. Regardless of lead concentration, nuisance conditions, as defined under State regulations, are prohibited (See 30 TAC 101.4). In addition, the permissible exposure limit for lead exposures (under OSHA) must be met.

The Government will handle the disposal of lead contaminated materials and debris caused by paint removal or disturbance and furnish to the Contractor disposal dumpsters, including the transportation. The Contractor shall submit a procedure to remove the lead base paint for review and approval of the Contracting Officer. The removal procedure shall, at a minimum, include the following major elements:

Certificates and associated documentation for Contractors to document compliance with the OSHA standard.

Procedures for establishment of engineering controls, and monitoring to ensure integrity of enclosures, equipment, etc.

Procedures for collecting waste and contaminated debris, in a manner to meet generator standards under State and Federal Solid Waste regulations and JSC Management Directives (8000.3, 8800.4 and 8837.1).

1.20 ASBESTOS CONTROL

1.20.1 New Asbestos Installation

JSC does not desire and will not allow the installation of new asbestos containing materials except in rare circumstances; see Section 01 41 00.00 80, CONTRACTOR SAFETY AND HEALTH PROGRAM.

JSC requires the use of building materials that are "asbestos free" in all new applications in facility construction projects. Prior to installation, building materials containing any detectable concentrations of asbestos must be approved by the JSC Hazardous Materials Review Committee. A time period of 14 calendar days is required for review by the committee. A certification from the manufacturer or supplier that a particular building material is "asbestos free" will be considered adequate to disregard the need for a

determination by the JSC Hazardous Materials Review Committee. A certification of "asbestos free" or an application for exemption must be supplied for all building materials. The Contracting Officer reserves the right to sample suspect building materials prior to or upon installation for verification purposes.

1.20.2 Existing Asbestos Removal

There are no asbestos containing materials expected to be in the work area.

Construction of this project involves incidental exposure to and or removal of asbestos containing materials (ACM). Asbestos is known to exist in spray applied structural and deck fireproofing insulation, sprayed or trowled on acoustical ceilings, pipe and boiler insulation, vinyl asbestos floor tiles (VAT), and asbestos transite pipes and wall boards. Asbestos dust and debris (contamination) have been found to exist in facilities where no visible deterioration of known asbestos products exist.

The Contractor shall comply with OSHA standards issued by the Secretary of Labor in 29 CFR 1926 and the JSC Safety and Health Handbook JPG 1700.1 current revision.

JPG 1700.1 Safety and Health Handbook Part 12 specifies minimum acceptable standards and procedures for all JSC asbestos related activities. It includes specific job specific performance requirements for the most common jobs at JSC. The standards and procedures set forth are consistent with health and safety standards and procedures in industry and those established by OSHA, EPA, and NASA. Other operations may involve asbestos even though they are not specifically cited in this manual.

Operations which are covered are typically those which require activities performed in close proximity to asbestos materials (return air plenums, raised computer floors, and mechanical rooms) or those activities which will disturb or will require removal of asbestos. Deviations to the Handbook's procedures will require written approval by the Contracting Officer.

JPG 1700.1 Safety and Health Handbook is available for review in the building 45 Technical Library and at <http://jschandbook.jsc.nasa.gov>. Additionally, the drawing set contains an Asbestos Schedule, which identifies the anticipated tasks involving asbestos containing materials.

It is the Contractor's responsibility to field verify existing conditions and quantities of ACM when abatement/removal is required. It is also the Contractor's responsibility to adhere to all applicable Federal, State, local, and NASA/JSC specifications.

1.21 WORKING HOURS

The regular work hours for the center are Monday through Friday between the hours of 7 a.m. and 5 p.m.. Demolition work which would disturb building occupants shall be performed outside of normal work hours. All other work shall be performed during regular hours.

The Contractor shall obtain approval for any deviations from the regular working hours or days with exception to demo as noted above by submitting a written request to be received at least 3 working days in advance for the approval of the Contracting Officer. No work shall be performed without

such approval except for safeguarding life or property. However, the COTR/CO on the job may authorize other emergency deviations. The regular working hours for NASA inspection are 7:30 a.m. to 4 p.m. Monday through Friday.

1.22 EMERGENCY CONTACT NUMBERS

The construction contractor shall provide to the Contracting Officer a list of current telephone numbers. The list of current telephone numbers shall include but is not limited to the general contractor (project manager at the job site, superintendent, general foreman, quality manager, safety and health professional/specialist), the superintendent and general foreman for the prime subs (mechanical, electrical, plumbing, fire protection, civil, structural, dry wall, etc.). The telephone number for all of these individuals shall include a 24 hours seven days a week number (cell is preferred) and residence telephone number.

FAR REPORTING CATEGORIES AND USDA DESIGNATED BIOBASED PRODUCT (in accordance with FAR 52.223-2	
Category	
Flood Covering (Non-Carpet	
Fluid-Filled Transformers-Vegetable Oil Based	
Interior Paints and Coatings-Latex and Waterborne Alkyd	
Interior Paints and Coatings-Oil based and Solventborne Alkyd	
Plastic Insulating Foam for Residential and Commercial Construction	
Wood and Concrete Sealers-Membrane Concrete Sealers	
Wood and Concrete Sealers-Penetrating Liquids	
Wood and Concrete Stains	
Custodial/Janitorial/Housekeeping	
Adhesive and Mastic Removers	

-- End of Section --

INSTALLED PROPERTY RECORD SOURCE DATA

1. BUILDING NO.	2A. CONTRACT NO.	PROJECT NO.	3.		4. CARD CONT
	B. T-ORDER NO.	PROJECT NO.	<input type="checkbox"/> INITIAL INSTALLATION	<input type="checkbox"/> REPLACEMENT	
	C. ENGR. WORK REQ. NO.	PROJECT NO.	<input type="checkbox"/> RELOCATION	<input type="checkbox"/> REMOVAL	
	D. MAINT. TASK ORDER NO.				
6. MANUFACTURER PLATE DATA			7. MANUFACTURER	8. SERIAL NO.	9. ACQUISITION COST (\$)
A.					
B.					
C.					
D.					
E.					
F.					
G.					
H.					

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SECTION 01 33 00

SUBMITTAL PROCEDURES

04/11

PART 1 GENERAL

1.1 SUMMARY

The requirements of this Section apply to, and are a component part of, each section of the specifications.

1.1.1 Submittal

Contract Clauses "FAR 52.236-5, Material and Workmanship," paragraph (b) and "FAR 52.236-21, Specifications and Drawings for Construction," paragraphs (d), (e), and (f) apply to all "submittals."

1.2 DEFINITIONS

Coordination Drawings

Coordination drawings shall be composite drawings showing coordination of work of one trade with that of other trades and with the structural and architectural elements of the work. Drawings shall be in sufficient detail to show overall dimensions of related items, clearances, and relative locations of work in allotted spaces. Drawings shall indicate where conflicts or clearance problems exist between the various trades.

Demolition Plan

Detailed procedures defining the Contractor's provisions for all construction activities, protection of personnel, and facilities and proper control of vehicular and pedestrian traffic.

Detail Drawings

Detail drawings consisting of fabrication and assembly drawings for all parts of the work in sufficient detail to enable the Government to check conformity with the requirements of the contract documents

Elementary Diagrams

Diagrams indicating, in straight-line form and without regard for physical relationship, supporting systems and elements of equipment and associated apparatus. Items shall be clearly labeled to indicate ratings and use in the system.

Field Test Report

A written report which includes the findings of a test made at the job site, in the vicinity of the job site, or on a sample taken from the job site, on a portion of the work, during or after installation. The report must be signed by an authorized official of a testing laboratory

or agency and must state the test results; and indicate whether the material, product, or system has passed or failed the test.

Installation Instructions

Provide manufacturer's installation instructions, special tool requirements, technique descriptions, and provisions required to install the equipment, components, and system packages including integrated system data concerning alignment, capacity, etc. Special notices shall detail impedances, hazards, and safety precautions.

Listing of Product Installations

A manufacturer's certified list shall include identification, of a minimum of 5, of his installed units, similar to those proposed for use, that have been in successful service for a minimum period of 5 years. The list shall include purchaser, address of installation, service organization, and date of installation.

Maintenance Instructions

Provide procedures for preventive maintenance of all equipment. The procedure shall identify the time-based frequency to inspect, condition monitor, perform predictive testing, adjust, lubricate, clean and change filters to ensure an effective and reliable maintenance program of each component, device, system and of the integrated system itself. Vibration testing baseline results shall be provided on each applicable piece of equipment to be defined in the pertinent specification section.

Manufacturer's Catalog Data

Data composed of catalog cuts, brochures, circulars, specifications and product data, and printed information in sufficient detail and scope to verify compliance with requirements of the contract documents.

Mix Designs

Mix designs for each type of concrete, grout, or blended material including a complete list of ingredients and admixtures including manufacturer data.

Outline Drawings

Outline drawings indicating overall physical features, dimensions, ratings, service requirements, and weights of equipment.

Parts List

A list of parts, tools, and components for the system by manufacturer's name, part number, nomenclature, and stock level required for maintenance and repair necessary to ensure continued operation with minimal delay.

Posted Instructions

Labels, signs, and templates of operating instructions that are required to be mounted or installed on or near the product for normal, safe operation.

Preventive Maintenance and Inspection

Procedures and instructions pertaining to frequency of preventive maintenance, inspection, adjustment, lubrication, and cleaning necessary to minimize corrective maintenance and repair.

Protection Plan

Detailed formulation of procedures to prevent damage to existing facilities or infrastructures. If accidents do occur, sufficient detail will address repair and replacement of damaged property at the Contractor's expense.

Safety Considerations

Information relating to load limits, speeds of operation, environmental criteria (temperature and pressure limitations), and personnel hazards and equipment safety precautions.

Test Reports

A report signed by an authorized official of a testing laboratory that a material, product, or system identical to the material, product, or system to be provided has been tested in accordance with requirements specified by naming the test method and material. The test report must state the test was performed in accordance with the test requirements; state the test results; and indicate whether the material, product, or system has passed or failed the test. Testing must have been within three years of the date of award of this contract.

1.3 SUBMITTAL DESCRIPTION (SD)

Submittal requirements are specified in the technical sections. Submittals are identified by SD numbers and titles as follows.

Government approval is required for all submittals at JSC.

A standard transmittal form (JSC Form 262) provided by the Government shall be used to transmit each copy of submittals.

Submittal Description (SD): Drawings, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, performance and test data, and similar materials to be furnished by the Contractor explaining in detail specific portions of the work required by the contract.

The following items, SD-01 through SD-11, are descriptions of data to be submitted for the project. The requirements to actually furnish the applicable items will be called out in each specification.

SD-01 Preconstruction Submittals

Submittals which are required prior to a notice to proceed on a new contract. Submittals required prior to the start of the next major phase of the

construction on a multi-phase contract. Schedules or tabular list of data or tabular list including location, features, or other pertinent information regarding products, materials, equipment, or components to be used in the work, submitted prior to contract notice to proceed or next major phase of construction.

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

SD-03 Product Data

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

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

SD-06 Test Reports

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

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

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

Investigation reports.

Daily logs and checklists.

Final acceptance test and operational test procedure.

SD-07 Certificates

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

Document required of Contractor, or of a manufacturer, supplier, installer or subcontractor through Contractor, the purpose of which is to further quality

of orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel qualifications.

Confined space entry permits.

Text of posted operating instructions.

SD-08 Manufacturer's Instructions

Preprinted material describing installation of a product, system, or material, including special notices and material safety data sheets, if any concerning impedances, hazards, and safety precautions.

SD-11 Closeout Submittals

Special requirements necessary to properly close out a construction contract. For example, as-built drawings, manufacturer's help and product lines necessary to maintain and install equipment. Also, submittal requirements necessary to properly close out a major phase of construction on a multi-phase contract.

1.4 PREPARATION

1.4.1 Marking

Permanent marking shall be provided on each submittal to identify it by contract number; transmittal date; Contractor's, Subcontractor's, and supplier's name, address(es) and telephone number(s); submittal name; specification or drawing reference; and similar information to distinguish it from other submittals.

1.4.2 Drawing Format

Drawing submittals shall be prepared on not less than 8-1/2 by 11 inch nor larger than 28 by 40 inch paper, except for full size patterns or templates. Drawings shall be prepared to accurate size, with scale indicated, unless other form is required.

Copies of each drawing shall have the following information clearly marked thereon:

- a. The job name, which shall be the general title of the contract drawings.
- b. The date of the drawings and revisions.
- c. Name of Contractor.
- d. Name of Subcontractor.
- e. The name of the item, material, or equipment detailed thereon.
- f. The number of the submittal (e.g., first submittal, etc.) in a uniform location adjacent to the title block.
- g. The Government contract number shall appear in the margin, immediately below the title block.

Drawings shall be numbered in logical sequence. The Contractor may use his own number system. Each drawing shall bear the number of the submittal in a uniform location adjacent to the title block. The Government contract number shall appear in the margin, immediately below the title block, for each drawing.

A blank space, no smaller than 1 inch shall be reserved on the right hand side of each sheet for the Government disposition stamp.

CAD drawings are required. Refer to the paragraph entitled, "Performance Requirements For CAD Drawing File Compatibility", at the end of this section.

1.4.3 Data Format

Required data submittals for each specific material, product, unit of work, data package sub paragraph Title, or system shall be collected into a single submittal and marked for choices, options, and portions applicable to the submittal. Marking of each copy of product data submitted shall be identical. Partial submittals may be accepted for expedition of construction effort.

1.4.4 Samples

Samples shall be physically identical with the proposed material or product to be incorporated in the work, fully fabricated and finished in the specified manner, and full scale. Where variations in color, finish, pattern, or texture are inherent in the material or product represented by the sample, multiple units of the sample, showing the near-limits of the variations and the "average" of the whole range (not less than 3 units), shall be submitted. Each unit shall be marked to describe its relation to the range of the variation. Where samples are specified for selection of color, finish, pattern, or texture, the full set of available choices shall be submitted for the material or product specified. Sizes and quantities of samples shall represent their respective standard unit. Samples shall be labeled with corresponding transmittal number, item number, and description as stated on the transmittal form (JSC Form 262).

1.5 SUBMISSION REQUIREMENTS

1.5.1 Schedules

Within 15 calendar days of notice to proceed, the Contractor shall provide for approval by the Contracting Officer, the following schedule of submittals:

- a. A schedule of shop drawings and technical submittals required by the specifications and drawings. The schedule shall indicate the specification or drawing reference requiring the submittal; the material, item, or process for which the submittal is required; the "SD" number and identifying title of the submittal; the Contractor's anticipated submission date and the approval need date. In preparing the schedule, adequate time (21 calendar days, exclusive of time in the mails) shall be allowed for review and possible resubmittal.

- b. A separate schedule of other submittals required under the contract but not listed in the specifications or drawings. Schedule will indicate the contract requirement reference; the type or title of the submittal; the Contractor's anticipated submission date and the approved need date (if approval is required).
- c. Scheduling shall be coordinated with the approved construction progress chart.

Contractor shall maintain, revise, and update schedule as directed.
- d. Copies of schedules shall be re-submitted monthly or as directed by the Contractor with actual submission and approval dates. When all items on a schedule have been fully approved, no further re-submittal of the schedule is required and written notice to the Contracting Officer's Technical Representative shall be provided.
- e. Monthly progress reports shall be furnished on scheduled submittal transmissions, reasons for delays and steps taken to expedite or overcome delays.

1.5.2 Drawings Submittals

One electronic copy on CD-ROM and (3) prints of each shop drawing shall be submitted. The reproducible, or one print marked with review notations by the Contracting Officer, will be returned to the Contractor. All required installation, fabrication and connection drawings shall be submitted and approved prior to the start of work detailed on these drawings.

When drawings are created in Autocad or Microstation format, refer to the paragraph entitled, "Performance Requirements For CAD Drawing File Compatibility", at the end of this section.

1.5.3 Data Submittals

One electronic copy in PDF Format shall be submitted by email. One set, marked with review notations by the Contracting Officer, will be returned to the Contractor.

Resubmittals shall meet all requirements as stated in Section 01 33 00 and address all comments of original submittal. Resubmittals shall be complete and the Contractor shall not request that the Government insert or make changes to previous submittals.

1.5.4 Samples

Two sets of identified samples shall be submitted. A copy of the transmittal form, marked with review notations including selections by the Contracting Officer, will be returned to the Contractor with one set of samples.

Samples that are intended or permitted to be returned and actually incorporated in the work are so indicated in the individual technical sections. These samples will be returned to the Contractor, at his expense, to be clearly labeled, with installation location recorded. Samples shall be in undamaged condition at the time of installation.

Where mockups and similar large samples are required by individual technical sections, it is recognized that these are a special type of sample which cannot be readily "transmitted" as specified for submittal of samples. Otherwise, and except as indicated in the individual technical sections, the requirements for samples shall be complied with and a transmittal form shall be processed for each mockup, to provide a record of the activity.

Samples shall be physically identical with the proposed material or product to be incorporated in the work, fully fabricated and finished in the manner specified, and at full scale. Where variations in color, finish, pattern or texture are inherent in the material or product represented by the sample, multiple units of the sample, which will show the near-limits of the variations and the "average" of the whole range (not less than 3 units), shall be submitted. Each unit shall be marked to describe its relation to the range of the variation. Where samples are specified for selection of color, finish, pattern or texture, the full set of available choices shall be submitted for the material or product as specified. Sizes and quantities of samples shall be of their respective standard unit, insofar as possible or practical.

1.5.5 Transmittal Form

A standard transmittal form (JSC Form 262) provided by the Government shall be used to transmit each copy of the submittal. Photo copies of the transmittal form are acceptable; however, both sides of the form must be copied for each copy of the submittal. The transmittal form shall be completed in accordance with the instructions on the reverse side of JSC Form 262.

1.5.6 Operation and Maintenance Manuals

Operation and Maintenance Manuals are to be contents and collection of data packages defined as per Section entitled, OPERATION AND MAINTENANCE DATA and other paragraphs of Section 01 33 00 SUBMITTAL PROCEDURES.

1.5.7 Testing

Contractor shall submit a schedule two weeks in advance showing when each system will be tested. Schedule shall include anticipated length of each test, a list of certified test apparatus, number of personnel required, responsibility of each, and a testing validation procedure itemized to the extent that will permit recording operating capability performance system requirements. Each test feature (gpm, rpm, psi, etc.) shall have a sign off blank for the Contractor, Contracting Officer, and the Using Agency. A remarks column of the testing validation procedure shall include all necessary references to operating limits of time, pressure, temperature, volume, voltage, current, acceleration, velocity, alignment, calibration, adjustments, cleaning, and other special system notes. Three copies of the completed test log shall be delivered to the Contracting Officer, no later than 48 hours after the completion of each test.

1.5.8 Variations

Variations from contract requirements require Government approval pursuant to contract Clause entitled "FAR 52.236-21, Specifications and Drawings for Construction" and will be considered where advantageous to Government. Variations are to be clearly marked as such on the required submittal.

1.5.8.1 Considering Variations

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

1.5.8.2 Proposing Variations

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

1.5.8.3 Warranting That Variations Are Compatible

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

1.5.8.4 Variation Review Time

Additional submittal review time when a variance is included is 20 days.

1.6 GOVERNMENT'S REVIEW

1.6.1 Review Notations

The Contracting Officer will review submittals and provide pertinent notation within 21 calendar days after date of submission. Submittals will be returned to the Contractor with the following notations:

- a. Submittals marked (A) "approved as submitted" authorizes the Contractor to proceed with the work covered.
- b. Submittals marked (B) "approved, except as noted on drawings. Resubmission not required" authorize the Contractor to proceed with exceptions and corrections noted. The notes shall be incorporated prior to submission of the final submittal.
- c. Submittals marked (C) "approved, except as noted on drawings. Refer to attached sheet. Resubmission required." require the Contractor to make the necessary corrections and revisions and to re-submit them for approval at the same time proceeding with the work depicted by the submittal.
- d. Submittals marked (E) "Disapproved" indicate noncompliance with the contract requirements and shall be re-submitted with appropriate changes. No item requiring a submittal shall be accomplished until the submittals are approved or approved as noted.
- e. Submittals marked (F) "Acknowledge Receipt" indicate that Government review is not required and the submittal is for

Government's information and use only. The Contractor is still required to comply with the contract drawings.

- f. The Contractor shall make corrections required by the Contracting Officer. If the Contractor considers any correction or notation on the returned submittals to constitute a change to the contract drawings or specifications; notice as required under the clause entitled "Changes" shall be given to the Contracting Officer. Approval of the submittals by the Contracting Officer shall not be construed as a complete check, but will indicate only that the general method of construction and detailing is satisfactory. The Contractor shall be responsible for the dimensions and design of connection details and construction of work. Failure to point out deviations may result in the Government requiring rejection and removal of such work at the Contractor's expense.
- g. If changes are necessary to approved submittals, the Contractor shall make such revisions and submission of the submittals in accordance with the procedures above. No unapproved item of work requiring a submittal change shall be accomplished until the revised submittals are approved.

1.6.2 Sample Approval

The Contractor shall furnish, for the approval of the Contracting Officer, samples required by the specifications or by the Contracting Officer. Shipping charges shall be paid by the Contractor. Materials or equipment requiring sample approval shall not be delivered to the site or used in the work until approved in writing by the Contracting Officer.

Each sample shall have a label indicating:

- a. Name of project
- b. Name of Contractor
- c. Material or equipment
- d. Place of origin
- e. Name of producer and brand
- f. Specification section to which samples applies
- g. Samples of furnished material shall have additional markings that will identify them under the finished schedules.

The Contractor shall submit to the Contracting Officer two samples of materials where samples are requested. The Contractor shall transmit with each sample a letter, original and two copies, containing the above information.

Approval of a sample shall be only for the characteristics or use named in such approval and shall not be construed to change or modify any contract requirements. Before submitting samples, the Contractor shall assure that the materials or equipment will be available in quantities required in the

project. No change or substitution will be permitted after a sample has been approved.

Materials and equipment incorporated in the work shall match the approved samples. If requested, approved samples, including those which may be damaged in testing, will be returned to the Contractor, at his expense, upon completion of the contract. Samples not approved will also be returned to the Contractor at its expense, if so requested.

Failure of any materials to pass the specified tests will be sufficient cause for refusal to consider, under this contract, any further samples of the same brand or make of that material. The Government reserves the right to disapprove any material or equipment which previously has proved unsatisfactory in service.

Variations from contract requirements shall be specifically pointed out in transmittal letters. Failure to point out deviations may result in the Government requiring rejection and removal of such work at no additional cost to the Government.

Samples of various materials or equipment delivered on the site or in place may be taken by the Contracting Officer for testing. Samples failing to meet contract requirements will automatically void previous approvals. The Contractor shall replace such materials or equipment to meet contract requirements.

Approval of the Contractor's samples by the Contracting Officer shall not relieve the Contractor of his responsibilities under the contract.

1.7 STATUS REPORT ON MATERIALS ORDERS

Within 15 calendar days after notice to proceed, the Contractor shall submit, for approval by the Contracting Officer, an initial status report on materials orders. This report will be updated and re-submitted every 30 calendar days as the status on material orders changes.

The report shall list, in chronological order by need date, materials orders necessary for completion of the contract. The following information will be required for each material order listed:

- a. Material name, supplier, and invoice number.
- b. Bar chart line item or CPM activity number affected by the order.
- c. Delivery date needed to allow directly and indirectly related work to be completed within the contract performance period.
- d. Current delivery date agreed on by supplier.
- e. When item d exceeds item c, the effect that delayed delivery date will have on contract completion date.
- f. When item d exceeds item c, a summary of efforts made by the Contractor to expedite the delayed delivery date to bring it in line with the needed delivery date, including efforts made to place the order (or subcontract) with other suppliers.

1.8 PERFORMANCE REQUIREMENTS FOR CAD DRAWING FILE COMPATIBILITY

The Contractor shall provide and modify as necessary, the shop drawings in a CAD file format that is compatible with the NASA-JSC CAD system on CD-ROM's in Microstation or AutoCAD format. Files submitted on CD-ROM shall be compressed using Winzip if possible. Files shall be submitted preferably in MicroStation 2004 (InterGraph) (DGN) format, or AutoCAD (DWG) format; or in other CAD program systems, formats preferred in the following order: DGN, DWG.

1.8.1 MicroStation (InterGraph)

MicroStation 2004 (InterGraph) or later drawing file compatibility requirements for compliance are as follows:

1. Drawing files shall use the .DGN file name extension and their respective cell library files shall use the .CEL file name extension.
2. Drawing files shall be transferred along with all of their respective reference and cell library files. A listing of each drawings reference and cell library files shall also be made.
3. Files shall be delivered on CD-ROM's in Microstation 2004 or later format.

1.8.2 AutoCAD

AutoCAD drawing file/disk/tape compatibility requirements for compliance are as follows:

1. Drawing files shall use the .DWG file name extension.
2. Drawing files shall be transferred along with all of their respective reference and library files. A listing of each drawings reference and library files shall also be made.
3. Files shall be delivered on CD-ROM's in AutoCAD 2009 or earlier format.

1.8.3 CAD File Names

The CAD file names for Master (Composite) Drawings shall match the Dwg. No. of the Master Drawing where possible. The following Directory and Filename specifications shall be used for saving and transferring all NASA-JSC Facility Drawings.

Directory Structure:

In Example: COF92015\FILENAME.DGN

Where:

COF92015	=	Directory Name - Engineering Job Code, 8 Characters (max.)
\	=	Backslash as Directory Indicator
FILENAME.DGN	=	Filename, 8 Characters (max.) with File Format Extension, 3 Characters

L = Lobby/Library
M = Mezzanine/Mission Operations
N = North
P = Penthouse
R = Roof
S = South
T = Tower
V = Visitor
W = West

5. **Drawing Type Codes** are two letter designator as follows:

EP = Enlarged Plan
KP = Key Plan
RP = Roof Plan
WP = Wall Plan

6. **File Format Extensions** are three character letter designators as follows:

.CIT = CCITT Group IV Raster File Format
.DGN = MicroStation native file format based on the MicroStation 95 (InterGraph) Graphics Design Specification (IGDS)
.DWG = AutoCAD native file format
.DXF = AutoCAD ASCII based File Translation Protocol

1.8.4 CAD Drawing Scale

All CAD drawings shall be full scale, with the Plot Scale indicated on the drawing along with a NASA-JSC Standard Graphic Scale and a North Arrow. Drawings that contain only non-scaled details or information, such as diagrams, may be drawn with an expected Plot Scale of 1:1.

1.8.5 CAD Compatibility Test

A CAD compatibility test drawing set, in either MicroStation (InterGraph), or AutoCAD, shall be submitted at 50% construction completion to verify CAD file transfer compatibility. The submitted test drawings shall be actual progress sample drawings from the project, representative of the Contractor's work. The compatibility test drawings shall be submitted on CD-ROM in accordance with the compatibility requirements stated above. Included with the CD-ROM shall be a written description of the originating CAD system, a description of the MicroStation (InterGraph), or AutoCAD, translation program used (if separate from the originating CAD software), and a hard copy plot of the test drawings produced by the Contractor's CAD system. Also to be included is a written description or listing of the CAD layers, symbology, pen weights, and colors used in the test drawing showing the contents of each. If the CAD test drawing translation is incompatible, the test CD-ROM will be returned with comments and shall be re-submitted with corrections made. The final submittal drawings and CAD compliance CD-ROM will not be accepted until a successful test translation of the sample drawings has been performed.

1.8.6 CAD Drawing File Submittal

Copies of the red-lined CAD drawings and CAD file CD-ROM shall be submitted at 90% construction completion for review. The 100% final red-lined CAD drawings and CAD file disk(s) shall be submitted at the end of the construction period.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

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CONTRACTOR SAFETY AND HEALTH PROGRAM
06/12

PART 1 GENERAL

1.1 JSC SAFETY INFORMATION

1.1.1 Safety and Health Information

1.1.1.1 Commitment to Safety and Health

The success of this center starts with an unwavering commitment to safety. The culture of this institution is one of safe accomplishment of our missions, including construction projects.

Mission success starts with safety. A commitment to safety permeates everything we do. We are committed to protecting the safety and health of the general public, astronauts, the workforce, and our high-value assets.

No activities are important enough to compromise the safety and health of any person. If you suspect something isn't quite right, trust your instincts and your experience, and do something to correct the situation. If something about this project, or any task, is unclear, ask for clarification.

JSC is an OSHA Voluntary Protection Program (VPP) Star site. This means that our safety and health program exceeds the minimum OSHA requirements; that we continue to improve our program; that we want you to join with us on making this site a safe place to work. Because of this what was acceptable in other places may not be acceptable here.

The JSC's safety and health policy is that:

All mishaps can be prevented and everyone must remove or control hazards at work. Management will maintain a safe workplace and ensures employees are trained to work safely. Employees are expected to work safely and watch out for others. Working safely will result in the best possible performance.

1.1.1.2 Safety and Health Culture

Safety and Health are of paramount concern. We assure a commitment by employing systems and processes that ensure the safety and health of the public, the employees, and assets. We ensure safety in all aspects of personal endeavors and we are committed to ensuring the safety of others. We take ownership for safety. We know every incident is preventable.

All employees should be aware of the hazards and the precautions to be taken in performance of work. We not only watch out for ourselves, but we watch out for others around us. Know not only the hazards of your work and how your work affects others, but the hazards of other work around you. Here at JSC we are our "brother's keeper".

Near Miss/Close Call identification by all employees is a positive mechanism that leads to incident prevention and worker protection. NASA ensures that there is no reprisal to personnel for reporting unsafe or unhealthy conditions.

1.1.1.3 Construction Safety and Health Goals

In this spirit, we expect the Contractor to implement the safety and health provisions of this section so that:

- a. Everyone involved in this project goes home as healthy as they arrived.
- b. This construction work site is free of recognizable hazards.
- c. We have zero reportable incidents in the workplace.

1.2 SUMMARY

The requirements of this Section apply to, and are a component part of, each section of the specifications and requirements of the control package.

1.3 REFERENCES

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

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

10 CFR 20	Standards for Protection Against Radiation
29 CFR 1910	Occupational Safety and Health Standards
29 CFR 1926	Safety and Health Regulations for Construction

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 30	(2007; Errata 2008) Flammable and Combustible Liquids Code
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JOHNSON SPACE CENTER

JPR 1700.1	Johnson Space Center Safety and Health Handbook
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1.4 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

The Contractor shall submit the following items in accordance with the paragraph entitled, "Safety and Health Plan Requirements," of this section:

Contractor's General Safety and Health Plan

Contract Specific Safety and Health Plan

Subcontractor's performing asbestos work shall submit an Asbestos Project Design

Subcontractor's Safety and Health Plans

SD-02 Shop Drawings

The Contractor shall submit the following in accordance with the paragraph entitled, "Pre-Use Planning for Hazardous Operations," of this specification.

Pre-use plans
Advanced Notification of Equipment

SD-03 Product Data

The Contractor shall submit the following in accordance with the paragraph entitled, "Hazard Communication Program," of this specification

Listing of all Hazardous Material
Material Safety Data Sheets

SD-06 Test Reports

The Contractor shall submit the following items in accordance with the paragraph entitled, "Safety and Health Activity Reports," of this specification:

Safety and Health Activity reports

The Contractor shall submit the following items in accordance with the paragraph entitled, "Exposure Monitoring," of this specification:

Exposure Monitoring

SD-07 Certificates

The Contractor shall submit the following items in accordance with the paragraph entitled, "Radiation and Laser Safety," of this specification:

US Nuclear Regulatory Commission Licenses

1.5 SAFETY AND HEALTH PROGRAM GENERAL PROVISIONS

The Contractor shall take all reasonable safety and health measures in performing under this contract and shall submit safety and health plans for the Contracting Officer's approval. The Contractor is subject to: (1) all applicable federal, state, and local laws, regulations, ordinances, codes, and orders relating to safety and health in effect on the date of this contract; and (2) shall comply with safety and health standards,

specifications, issuances, reporting requirements, and provisions in the current Johnson Space Center Safety and Health Handbook, JPR 1700.1. See paragraph entitled, "Compliance Reference," of this section.

During the performance of work under this Contract, the Contractor shall comply with procedures prescribed for the control and safety of persons visiting the project site. The Contractor is responsible for his personnel and for familiarizing each of his subcontractors with safety and health requirements. The Contractor shall advise the Contracting Officer of any special safety restrictions established so that Government personnel can be notified of these restrictions.

Contracting Officer may, from time to time, notify the Contractor in writing of any noncompliance with the provisions of this specification and may specify corrective action to be taken. Further, the Contractor shall take or cause to be taken such other safety and health measures, as the Contracting Officer shall direct. The Contractor shall, after receipt of such notice, immediately take corrective action.

If the Contractor fails or refuses to institute prompt corrective action in accordance with the above, the Contracting Officer may invoke the provisions of the clause in the contract entitled "Stop Work," or may invoke whatever other rights are available to the Government under the terms and conditions of this contract or at common law, to remedy such failure or refusal to institute prompt corrective action.

The Contractor agrees that authorized Government representatives of the Contracting Officer shall have access to and the right to examine the sites or areas where work under this contract is being performed to determine the adequacy of the Contractor's safety and health measures under this specification.

The Contractor shall maintain copies of the Contractor's General Safety and Health Plan, the [Contract Specific Safety and Health Plan](#), each [Subcontractor's Safety and Health Plans](#), or Subcontractor's acceptance of the Contractor's Safety and Health Plans, permits, [Material Safety Data Sheets](#), and other Safety and Health Program documents on-site readily available for review by all employees, subcontractors, the Contracting Officer and the Government's Safety and Health Representatives.

The Contractor shall ensure that each new employee receives safety and health orientation and that all employees are initially and regularly trained in job safety and health. The Contractor's personnel shall have undergone all OSHA required safety and health training applicable to this project. JSC specific safety and health training may be used to supplement required training but is not intended to replace minimum required OSHA training

1.5.1 Meetings

After the Pre-Construction Conference, before start of construction, and prior to acceptance by the Government of the Safety and Health Plans, the Contractor shall meet with the Contracting Officer to discuss the Safety and Health Program. During this meeting, a mutual understanding of the Contractor's Safety and Health Program and how it integrates with the Johnson Space Center Safety and Health requirements shall be developed.

Discussions will include the hazard assessment process, procedures, permits, emergencies, and other requirements.

The Contractor shall meet with the Contracting Officer in a preparatory phase meeting prior to each feature of work to discuss safety and health issues for that Feature of work. Discussions will include hazard assessments, procedures, permits, emergencies, and other requirements.

There may be occasions when subsequent conferences/meetings may be called by either party to reconfirm mutual understandings, to discuss changes to the Contractor's Safety and Health Plans, and/or to address deficiencies in the Safety and Health Program or procedures which require corrective action.

Each work crew shall conduct Daily Safety and Health Review meetings. These "Tool Box" type meetings shall be held before the start of each crew's work shift activities or before the start of a new task/activity during a work shift. These meetings shall be led by the work activity/craft supervisor, foreman, or crew chief and shall review/discuss: (a) basic job steps for the task/activity, (b) potential hazards and corrective actions for each job step, (c) precautions, permits, personal protective equipment, barricades, energy isolation, work platforms, and abatements necessary for the activity, and (d) other pertinent topics and issues. Attendance will be recorded. A Daily Safety & Health Review form shall be used to document minutes of this meeting (see suggested form attached at the end of this section). The Contracting Officer shall be notified at least 48 hours in advance of the time and location of each crew's meeting(s).

The Contractor shall prepare the minutes of each meeting described in this section and furnish them to the Contracting Officer to become part of the contract file.

1.5.2 Inspections

The Contractor shall implement, as a minimum, a four phase inspection system for all definable features of work, as follows:

1.5.2.1 Preparatory Inspection

This shall be performed prior to beginning any definable feature of work. It shall include a review of contract requirements (with all personnel responsible for supervision of the work). Review of contract requirements shall include; a check to assure compliance for all specific requirements for the feature of work, a review of the appropriate activity hazard assessment, hazard abatement plans, and a discussion of procedures for controlling the safety of the work including repetitive deficiencies; examination of the work area to ascertain that all preliminary work has been completed. The Contracting Officer shall be notified at least 48 hours in advance of each preparatory inspection and such inspection shall be made a matter of record in the Contractor's safety documentation. Preparatory Inspections will be reconvened when and if changes in the work or crew occur.

1.5.2.2 Initial Inspection

This shall be performed as soon as hazard abatement plan is in place for that particular feature of work. The inspection shall include examination of the physical implementation of safety and health contract requirements; a

review of safety and health procedures, a review of compliance with the activity hazard analysis. The Contracting Officer shall be notified at least 24 hours in advance of the inspection and such inspection shall be made a matter of record in the Contractor's safety documentation. Initial inspections will be reconvened when and if changes in the work or crew occur.

1.5.2.3 Follow-up Inspection

These shall be performed daily to assure continuing compliance with contract requirements until completion of the particular feature of work. Such inspection shall be made a matter of record in the Contractor's safety documentation.

1.5.2.4 Weekly Inspections

The Contractors shall inspect the site at least weekly for hazards and failures in following safety, health, and environmental requirements and document any identified hazards in accordance with JPR 1700.1 Chapter 10.1 "Safety and health requirements for designing, constructing, and operating facilities," Chapter 2.4 Hazard Abatement, Chapter 2.5, "Routine Inspections," and Chapter 3.5 "Hazard Correction Tracking".

1.5.3 Safety and Health Activity Reports

These reports shall be on an acceptable form and shall include factual evidence that required safety and health activities have been performed. The original and one (1) copy of these reports shall be furnished to the Government daily within 24 hours after the date(s) covered by the report, except that reports need not be submitted for calendar days on which no work is performed. One (1) report shall be prepared and submitted for every 7 calendar days of no work and on the last day of a no work period. All calendar days shall be accounted for throughout the life of the contract. The first report following a day of no work shall be for that day only. Reports shall be signed and dated by the Safety and Health System Professional or Safety and Health System Specialist. The report shall include copies of reports prepared by all subordinate safety staff personnel. The reports will include, but not limited to the following:

Plans and permits submitted/furnished/approved.

MSDS submitted.

Inspections performed with results and references to specification section or OSHA paragraph. The control phase should be identified (Preparatory, Initial, Follow-Up Completion, or Weekly). List all deficiencies noted along with corrective action taken or proposed.

Investigations of reported hazards, mishaps, close calls/near misses, and other safety and health related incidents with action taken to correct and to prevent recurrence.

List instructions given/received.

1.5.4 Inspection and Hazard Tracking Records

Contractor shall maintain on-site the records of each inspection performed throughout the life of the contract. Records shall include, but not be limited to, factual evidence that the required inspections or tests have been performed, including type and number of inspections, result of inspections, nature of defects, causes for rejection, proposed remedial action, and corrective action taken.

1.5.4.1 Hazard Tracking System

The Contractor shall have a system for initiating and tracking hazard elimination or control. The system must; (1) track all hazards identified through inspections, investigations, employee reports, surveys, near misses/close calls, etc. to completion and (2) include interim measures to protect employees and the environment from hazard while permanent action is in work.

1.5.4.2 Hazard Tracking Records

The Contractor shall maintain hazard tracking records that tracks the hazards to closure in accordance with JPR 1700.1 Chapter 3.5 "Hazard Correction Tracking". Records shall include at least the following information: Hazard Identified, when and where identified, actions(s) taken to correct the hazards (Abatement Plans), and when corrected.

1.5.4.3 Hazard Abatement Plans

The Contractor shall record hazard correction to closure using abatement plans (also commonly referred to as action plans or corrective action plans) developed to address hazards found during hazard analyses, mishap investigations, close call investigations, inspections, surveys, and other similar activities where hazards are identified and analyzed.

1.5.5 Mishap Investigation and Reporting

The Contractor shall report, if witness to, or involved in, a mishap or close call. Immediately notify the JSC Emergency Operations Center (EOC) 281-483-3333 (for fire, ambulance, security) of the need for assistance, and the supervisor, project manager, management official and a safety/health staff member of the circumstance of the mishap or of close call. Additionally, within 24 hours report all mishap or close call by telephone and by NASA Form 1627 (NASA Mishap Report) to the Contracting Officer which fall into the categories:

Type A - Mishaps causing occupational injuries and/or illnesses that result in a death, a permanent total disability, or the hospitalization for inpatient care of 3 or more people within 30 workdays of the mishap; or causing damage to equipment or property equal to or greater than \$2 million.

Type B - Mishaps causing occupational injuries and/or illnesses that result in permanent partial disability to one or more persons or result in hospitalization for inpatient care of 1-2 people within 30 workdays of the mishap; or causing damage to equipment or property equal to or greater than \$500,000, but less than \$2 million.

Type C - Mishaps causing a non-fatal occupational injury or illness which results any workdays away from work restricted duty case or a

transfer to another job; or causing damage to equipment or property equal to \$50,000, but less than \$500,000.

Type D - Mishaps causing non-fatal OSHA recordable occupational injuries and/or illnesses that do not meet the definition of Type C; or causing property damage less than \$50,000, but greater than \$1,000.

Instructions for completion of the NASA Form 1627 are printed on the reverse of the form, Blocks 1-22, 27-28, and 33 are required to be filed with the Contracting Officer within 24 hours of the mishap.

The Contractor shall investigate all such work related incidents or accidents to persons and property to the extent necessary to positively conclude what root cause or causes resulted in said accident or incident. After the Contractor completes an investigation of the mishap and has developed a plan of corrective action, the Contractor will complete the rest of the NASA Form 1627 and submit it to the Contracting Officer or his/her representative and the Occupational Safety Team. If an investigation board is convened or will be convened, the supervisor or Safety Representative of the Contractor will complete the form as best as possible and forwards it to the Contracting Officer or his/her representative and the Occupational Safety Team.

1.5.6 Near Miss Investigation

A Near Miss/Close Call is defined as an event in which there is no injury or only minor injury requiring first aid and/or no equipment/property damage or minor equipment/property damage (less than \$1000), but which has the potential for any of the Mishap categories shown in the paragraph entitled, "Mishap Investigation and Reporting" of this section. A Near Miss/Close Call may result from hazards or unsafe acts.

The Contractor shall develop a method or process for his/her employees, or subcontractor employees, to anonymously report Near Misses/Close Calls. The process for reporting Near Misses/Close Calls shall be explained to all Contractor and Subcontractor employees.

The Contractor shall investigate all such Near Misses/Close Calls to persons and property to the extent necessary to positively conclude what root cause or causes resulted in said Near Miss/Close Call. The Contractor shall document his/her investigation and develop a plan of corrective action. The corrective action plan shall be entered into the Contractor's Hazard Tracking System. This documentation will remain on the project site for the duration of the project and shall be made available for review by the Contracting Officer.

1.5.7 Form JF288 "Statistical Information"

Contractor shall provide a Johnson Space Center Form JF288, Statistical Information - Contractor Safety and Health Program, to the Contracting Officer each month during the contract period and also at the end of the contract.

1.5.8 Clearance of Roadways

The Contractor shall keep clear for traffic at least one-half of any roadway involved in his operations, and any such road clearance shall be adequate for not less than one-way traffic.

1.5.9 Protection From Injurious Dirt and Dust

The contractor shall protect existing structures, machinery and equipment from injurious dirt and dust from the construction operations at all times. Rubbish and flammable material shall be removed at once.

1.5.10 Hydrostatic or Other Special Testing

Where hydrostatic or other special testing above 25 psig is required under the Contract, the Contractor shall submit for approval a complete and detailed testing procedure and shall not undertake any such testing until the procedure has been approved.

1.6 SAFETY AND HEALTH PLAN REQUIREMENTS

1.6.1 Contractor's General Safety and Health Plan

The Contractor shall submit a current, comprehensive, written General Safety and Health Plan describing the Contractor's overall Safety and Health Program. The General Safety and Health Plan shall be submitted and approved prior to work activities being started. The General Safety and Health Plan shall contain the following items at a minimum:

Safety and Health Policy of the corporation/company signed by the firm's CEO, President, Owner, or other senior executive

Purpose and Scope of the Safety and Health Program

Management Leadership Commitment and Employee Involvement in the Safety and Health Program

Responsibilities of participants in the Safety and Health Program

Managers

Supervisors

Employees

Safety and Health Manager

Training Coordinator

Process for Hazard Assessment

Process for reporting hazards and Close Calls/Near Misses and mishaps within the company structure

Process for investigating reported hazards, mishaps and close calls/near misses within the company

Processes for hazard identification, prevention, and control as applicable:

Inspections and Surveys

Exposure monitoring (chemical, noise, radiation)

Asbestos Program

Lead and Heavy Metal Exposures

Confined Space Entry Program

Hearing Conservation Program

Written Hazard Communication Program

Written Respiratory Protection Program

Personal Protective Equipment

Energy Control and Lockout/Tagout

Welding and Cutting Program

Fall Protection Program

Crane Operations and Heavy Lifting

Material Handling Program

Scaffolding and Ladder Safety

Excavations and Trenches

Concrete and Masonry Program

Motor Vehicle and Heavy Equipment Operation

Demolition

Written Multi Language Work Site Management Plan

Other construction activities applicable to the firm

Safety and Health Training Requirements

New Employee Orientation

Initial and refresher training all employees must receive

Initial and refresher training specific to on-the-job hazards and activities

Safety and Health Program Requirements for subcontractors

1.6.2 Contract Specific Safety and Health Plan

The Contractor shall submit a comprehensive, written Contract Specific Safety and Health Plan describing how the Contractor's General Safety and Health Program will be tailored to the activities on this contract at Johnson Space Center. The Contract Specific Safety and Health Plan shall be submitted and approved prior to work activities being started. The Contract Specific Safety and Health Plan shall contain the following items at a minimum:

Names of:

The Safety & Health System Specialist (SHSS). Provide a resume listing this individual's education, work experience and training in occupational safety and health topics.

The Safety & Health System Professional (SHSP), if applicable. Provide a resume listing this individual's education, work experience, and training in occupational safety and health topics.

The appropriate "Competent Person" for specific activities. A "Competent Person" must be named for confined space entry, asbestos work, lead abatement, scaffolding, assured grounding, ionizing radiation, rigging equipment, fall protection, excavations, steel erection, and other construction activities as required by OSHA. Provide documentation of each person's competency. These names may be provided at the beginning of each construction feature of work.

Hazard Assessment(s) specific to the construction activities with identified hazard controls and PPE.

The Contractor's Daily Safety and Health Review Form to be used on the project.

Standardized company procedures that incorporate recognized controls for the protection of personnel and property.

The contractor shall include any standardized procedures written for activities to describe how the contractor's employees will perform that activity or use equipment.

Recognized controls include the use of: fixed, rigid and flexible barricades, warnings, limited access signs, personal protective equipment, work practices, shielding, lockout/tagout, and inspections,

Ground Fault Protection Program.

Safety and Health Training that employees will receive before beginning work at JSC and a description of how the training will be documented.

Procedures for hazardous material spill/release at JSC.

Emergency procedures in the event of a fire, personnel injury, and property damage at JSC.

Hazard Communication Program to include location where Material Safety Data Sheets will be kept at the job site.

Written Respiratory Protection Program, if applicable.

Frequency and location of Safety and Health meetings.

Compliance, Enforcement, and Disciplinary actions.

Description of methods and procedures to assure compliance with the Safety and Health Plan by employees and subcontractors.

Description of methods and procedures to enforce safety and health requirements with his employees and the subcontractor's employees.

Description of methods and procedures for the discipline of employees (both his and subcontractors') for violations of the safety and health plans.

Description of methods and procedures for award and reward of employees (both his and subcontractors') for outstanding implementation and compliance of the safety and health plans.

Drug Free Workplace Program

Visitor Protection and Control Program

Safety barricades, signs, and signal lights

Safeguard the public and Government personnel, exposed to operations and activities

Include company procedure for defining smoking risk for the various phases of work. Include company procedure for establishing, maintaining, and enforcing smoking only in designated areas.

1.6.3 Subcontractor Safety and Health Plans

The Contractor shall submit detailed, written Subcontractor Safety and Health Plans as described below. Each subcontractor's plan shall be specific to the activities at Johnson Space Center. The Subcontractor Safety and Health Plans shall be submitted and approved by the Contracting Officer prior to subcontractor work activities being started. The requirements for Subcontractor Safety and Health Plans are:

1. The Subcontractor's Safety and Health Plan shall be a combination of all applicable topics as described in the general and contract-specific plans from paragraphs entitled, "Contractor's General Safety and Health Plan," and "Contract Specific Safety and Health Plan," of this section.
2. Except as listed in the following paragraphs 3 through 8 subcontractors may elect to participate in and be covered by the Prime contractor's Safety and Health Program.

A senior executive of the subcontractor's firm shall sign a statement that they will participate in the prime contractor's program. A copy of this document shall be submitted with the prime Contractor's Contract Specific Safety and Health Plan.

The prime contractor shall then be responsible for: the safety and health of the subcontractor's employees, providing and documenting all safety and health training for the subcontractor's employees, ensuring compliance with all work practices and hazard assessments/analyses, obtaining permits for all hazardous work performed by the subcontractor, and other safety and health issues affecting the subcontractor's employees on this contract.

3. The Subcontractor will provide:

Independently documented Safety Experience Modifier Rate (EMR) used to calculate Workmen's Compensation Insurance. The subcontractor must provide the current EMR and the previous two years EMRs.

Certified evidence of the OSHA Total Recordable Incident Rate (TRIR) with NAICS Code for the current Recordable Incident Rate (RIR) and the previous three full year's RIRs.

Certified evidence of the OSHA Days away from work, days of restricted work activity or job transfer (DART) rate with NAICS Code for the current DART rate and the previous three full year's DART rates.

Information on all OSHA citations issued to the firm over the past three years. Additionally, provide information on how each citation was resolved or mitigated.

Information on all previous OSHA-reportable mishaps (OHS Forms 200 & 300) that have occurred in the past 3 years to include: any fatalities that have occurred; identify whether the investigation has been completed and the results; The cause of the safety and health mishaps; describe the corrective action taken and when it was implemented. If the corrective action has not yet been implemented, provide the planned implementation date. The following website shall be used to verify data. (<http://www.osha.gov/oshstats/index.html>)

4. Subcontractors performing asbestos related work on/with materials containing any percentage of asbestos at NASA JSC shall provide their firm's Safety and Health Plan in accordance with paragraph 1 above. This plan shall discuss work procedures, provide a written Hazard Communication Program, [Subcontractors performing asbestos work shall submit an Asbestos Project Design](#) and provide a written Respiratory Protection Program. This plan shall demonstrate compliance with [29 CFR 1926.1101](#), [29 CFR 1910.134](#), and [JPR 1700.1](#) Part 12 Asbestos Control Requirements. The Contracting Officer will approve these written document before the subcontractor is allowed to perform asbestos work at JSC.
5. Subcontractors who require the use of respiratory protection, or voluntarily allow it to be worn, shall provide a written Respiratory Protection Program demonstrating compliance with [29 CFR 1910.134](#). The Contracting Officer will approve this

written document before the subcontractor is allowed to perform work at JSC.

6. Subcontractors performing work with lead-containing materials at NASA JSC shall provide a written plan demonstrating their compliance with 29 CFR 1926.62. The Contracting Officer will approve this written document before the subcontractor is allowed to perform work at JSC.
7. Subcontractors performing leading edge work; or working on scaffolds, roofs, steel structures; or working at unprotected heights above 6 feet shall provide a written fall protection plan demonstrating compliance with 29 CFR 1926 Subparts L, M, R, and X as applicable.
8. Subcontractors performing work on energized systems (electrical, hydraulic, kinetic, mechanical, pressurized, etc) shall provide a written plan demonstrating compliance with isolation and lockout/tagout (LOTO) requirements of 29 CFR 1910.147 and JPR 1700.1 Chapter 8.2 "Lockout/Tagout".

1.6.4 Changes to Safety and Health Plans

After acceptance of the Safety and Health Plans, the Contractor shall notify the Contracting Officer in writing a minimum of seven (7) calendar days prior to any proposed change. Proposed changes must be submitted to the Contracting Officer for approval.

1.7 SAFETY AND HEALTH SYSTEM ORGANIZATION REQUIREMENTS

1.7.1 Safety & Health System with Safety & Health Specialist (SHSS)

The Contractor shall identify a Safety & Health System Specialist (SHSS), who shall be responsible for the implementation of Safety and Health requirements. This individual shall be on-site at all times during construction.

The Contractor shall provide a Safety & Health staff at the work site at all times during progress with complete authority to take any action necessary to ensure compliance with the Safety & Health Contract requirements. All Safety & Health personnel shall be subject to acceptance by the Contracting Officer. The following are considered minimum requirements and should be supplemented as necessary to assure adequate staff to meet the Safety & Health requirements at all times during construction.

The Contractor shall identify an individual, within his organization at the work site, who shall be responsible for the overall Safety & Health System and have the authority to act in all Safety & Health matters for the Contractor. The SHSS shall report directly to the site management authority or upper management in the Contractor's off-site organization. This SHSS shall be on-site at all times during construction, unless an alternate for the Safety & Health System Specialist is identified in the Plan to serve in the event of the Safety & Health System Specialist absence. The SHSS will not be absent from the work site for periods exceeding 1 week at any time, and not more than 20 workdays during a calendar year. The requirements for

the alternate shall be the same as for the designated Safety & Health System Specialist.

1.7.2 Safety & Health System Staff

The Contractor shall provide as part of the Safety & Health System organization, as a minimum, specialized personnel for each definable feature of work (see Section 01 45 04.00 80 Contractor Quality Control). These personnel shall assist and report to the SHSS. Each person will be responsible for assuring the Safety & Health complies with the Safety & Health requirements for their area of specialization. These individuals shall be responsible to the SHSS; be physically present at the construction site during work on their areas of responsibility; have the necessary education and experience in Safety & Health System compliance in those areas. A staff shall be maintained under the direction of the SHSS to perform all Safety & Health activities. The staff must be of sufficient number to ensure adequate Safety & Health System coverage for all features of work, crafts, work shifts, and work crews involved in the construction. These personnel may perform other duties, but must be fully qualified by experience and technical training to perform their assigned Safety & Health responsibilities and must be allowed sufficient time to carry out these responsibilities. The Safety & Health Plan will clearly state the duties and responsibilities of each staff member.

1.8 SPECIAL SAFETY AND HEALTH PROGRAM REQUIREMENTS

1.8.1 Hazard Assessment and Daily Safety and Health Review

Identify hazardous operations as defined in JPR 1700.1 Chapter 10.1 "Safety And Health Requirements For Facilities And Facility Systems" and Chapter 5.8 "Hazardous Operations: Safe Practices And Certification".

Identify safety and health hazards associated with construction activities.

Prior to the start of work, prepare and submit Hazard Assessments (i.e. Job Hazard Analysis (JHA), Job Safety Analysis (JSA), Work Site Hazard Analysis (WSHA)), which includes hazard abatement procedures and controls, for each definable feature of work or identified hazardous operation in accordance with JPR 1700.1, Chapter 3.5 "Hazard Correction Tracking".

This Hazard Assessment shall be documented on the Hazard Assessment Worksheet form (attached to this section) or equivalent. The hazard assessment will list tasks/steps, describe potential hazards, specify required engineering, administrative, or personal protective equipment (PPE) controls, and verification. The foreman or crew chief will be familiar with the hazard assessments applicable to his/her activities.

The Contractor and each Subcontractor shall conduct Daily Safety and Health Review meetings with his/her employees before the start of each crew's work shift activities or before the start of a new task/activity during a work shift. See paragraph titled "Meetings" above. The daily review will address all hazards listed on the Hazard Assessment Worksheet.

The hazard assessments shall be updated as conditions change.

1.8.2 Pre-use Planning for Hazardous Operations

The Contractor shall submit the following information relating to hazardous operations and the equipment used in those operations requiring a pre-use inspection.

Pre-use plans, drawings, or sketches for crane lifting/rigging, working under suspended loads, scaffold erection, fall protection, excavations and trenching, blocking, and demolition.

Advanced notification of equipment to be used on-site, which requires pre-use inspections, shall be made at least 48 hours prior to intended use. Advance notification is required for scaffolding, lifting, blocking, fall protection, and mechanized equipment.

The Contractor shall complete Johnson Space Center Forms JF8, Hazardous Operation Permit, or JF 1475, Hot Work - Welding - Cutting Permit, for operations as described in **JPR 1700.1**, Chapter 3.5 "Hazard Correction Tracking". These permits are required for activities involving welding, torch cutting, operating a crane, applying pesticides, working with high voltage electricity, operating aerial lift buckets or truck platforms, operating Class 3A or 3B or 4 lasers, using radioactive materials, using industrial x-ray machine, and handling cryogenic materials. These forms shall be provided to the appropriate JSC office for approval and issue of permit prior to the start of the operation.

1.8.3 Critical Lifts

Critical lifts are identified as those lifts that involve special, high dollar items, one-of-a kind articles, spacecraft or major facility components, whose loss would have serious programmatic or institutional impact. Critical lifts shall follow the requirements for "critical lifts" in NASA Technical Standard; NASA-STD-8719.9; NASA Standard for Lifting Devices and Equipment; Revised 9 May 2002. Critical lift requirements include: special design features, maintenance, inspection, and test intervals, extra operator training and certification, and specific written procedures for each lift.

1.8.4 Emergency Response

The emergency telephone numbers for use at JSC shall be posted in a readily visible location.

The contractor shall exercise his emergency procedures for fire, personnel injury, and property damage within the first 60 calendar days of the notice to proceed and at least annually thereafter. The Contractor shall exercise his emergency procedures as conditions change at the construction site.

All fires and all accidents at JSC and Ellington Field requiring medical response shall be reported immediately by telephone to the JSC Emergency Operations Center (EOC) at 281-483-3333.

1.8.5 Minimum Construction Safety Training

JSC 0.5-hour Orientation to Safety and Health at Johnson Space Center for all employees prior to issuance of site access badge.

Houston Area Safety Council (HASC) 4.5-hour General Safety, Health, and Hazard Recognition - "Basic Orientation Plus" for all employees prior to issuance of site access badge. Valid for 1 year.

HASC 1.5 hours JSC Site Specific Safety and Health Awareness for all employees prior to issuance of site access badge. Valid for 2 years.

OSHA 10-hour 29 CFR 1926 Construction Industry Safety Training (craft specific) for all first line supervisors (i.e. foremen, crew chiefs) and employees designated as a "competent person." Valid for 4 years.

OSHA 30-hour 29 CFR 1926 Construction Industry Safety Training for all project managers, superintendents, supervisors and the SHSS. Valid for 4 years.

JSC 3 hour Confined Space Training for employees prior to entering a Confined Space and first line supervisor, project managers, superintendents, competent person, the SHSP, and the SHSS. Valid for 2 years.

JSC 4 hour LO/TO Training for exposed employees, first line supervisor, project managers, superintendents, competent person, the SHSP, and the SHSS. Valid for 2 years.

JSC 8 hour Asbestos Class III O&M (Restricted) if do Class III asbestos work. Initial plus annual 2 hour refresher.

OSHA Asbestos training as required by JPR 1700.1, Part 12 if do Class I/II/III work. Initial plus annual refresher.

The Contractor shall conduct Safety and Health orientation training with all employees of each crew prior to the start of each definable feature of work. The orientation will discuss The Safety and Health Program, hazard analyses, procedures, the Hazard Communication Program, emergencies, training, and permits. Attendance will be recorded. The Contracting Officer shall be notified at least 48 hours in advance of this training.

1.8.6 Approved Training Sources

JSC offers onsite S&H training on a pre-established schedule basis that will be made available. Courses listed above may also be obtained from the Houston Area Safety Council (HASC) or other Safety Council that is listed as a member in good standing with the "Association of Reciprocal Safety Councils, Inc.(ARSCI)"

1.8.7 Proof of Training

Employees shall maintain evidence that the required training has been completed and is current prior to working on the jobsite. Acceptable evidence of training:

Badge from HASC or ARSCI.

Card(s) issued by JSC.

OSHA Card showing course topic signed by an OSHA certified trainer.

Attendance records for safety and health orientation training.

1.8.8 Training Documentation

The Contractor shall submit documents showing that employees performing any OSHA Class I/Class II/Class III asbestos work at JSC have received the training required by JPR 1700.1, Part 12, Asbestos Control Requirements. A copy of a current Texas Department of Health (TDH) Asbestos Worker License or a current TDH Asbestos Supervisor License is sufficient documentation of training for OSHA Class I and Class II work. These documents shall be submitted to the Contracting Officer for review prior to start of any asbestos related work.

The Contractor shall submit documents showing that employees performing any OSHA Class I/Class II/Class III asbestos work at JSC have a current medical examination and a current respirator fit test.

The Contractor shall submit documents showing that employees performing Lead Abatement Work are trained to the requirements of OSHA Standard 29 CFR 1926.62 and have a current respirator fit test. A copy of a current TDH Lead Abatement Worker License is sufficient documentation of training. These documents shall be submitted to the Contracting Officer for review prior to start of any lead abatement work.

Documentation of Asbestos Training, Lead Abatement Training, and all other required Safety and Health Training shall be maintained on-site by Contractor and shall be made available for review by the Contracting Officer.

1.8.9 Hazard Communication Program

The Contractor shall have a written Hazard Communication Program meeting the requirements of OSHA Standard 29 CFR 1910.1200.

Provide a listing of all hazardous material to be used on the contract and a Material Safety Data Sheet (MSDS) for each item on the list. Current lists and MSDS shall be provided prior to each Construction Feature of Work.

The Contractor shall submit MSDSs using a NASA/Johnson Space Center Form, JF 277, Request for Material Safety Data Sheets Processing, for inclusion in the JSC MSDS Database as required by JPR 1700.1, Chapter 3.5 "Hazard Correction Tracking". The MSDSs must be accepted before the hazardous material is brought on-site.

The Contractor shall maintain at the contract job site a copy of the hazardous material list(s) and an MSDS for each hazardous material used during the life of the contract.

The Contractor shall ensure that each subcontractor is covered by a Hazard Communication Program

1.8.10 Exposure Monitoring

The Contractor shall conduct any personnel exposure monitoring required for work involving airborne inhalation exposures to hazardous materials.

Contractor shall submit copies of exposure monitoring results, along with an explanation of the operation monitored, to the Contracting Officer.

Contractor shall submit results within 10 business days after collection of samples. The report will include the description of the operation monitored, date(s) of sampling, job location, sampling duration for each sample, the calculated duration exposure concentration, the calculated 8-hour time-weighted-average exposure concentration, and the applicable OSHA, ACGIH, or AIHA exposure limit. The report shall be signed by a Certified Industrial Hygienist, or a Certified Safety Professional, or, for asbestos only, an Air Monitoring Technician.

The Government's Safety and Health representatives may conduct personnel or environmental exposure monitoring to verify the adequacy of work procedures. Exposure monitoring may be conducted for exposures to asbestos, lead, and other hazardous chemicals. The Government will furnish the contractor the personnel exposure monitoring results. The Government's air monitoring is for the governments use only and is not intended to replace the use of proper safety and health procedures when working with hazardous materials.

1.8.11 Asbestos

1.8.11.1 Existing Asbestos Materials

Existing Asbestos Materials may be found in and on, but not limited to, areas above suspended ceilings, mechanical rooms, and below raised computer flooring. Asbestos containing materials (ACM) are known to exist in spray-applied insulation and fireproofing, sprayed or troweled acoustical ceilings, pipe and boiler insulation, gypsum (e.g. "Sheetrock" wall systems, ceiling tiles, and floor tiles. Asbestos dust and debris (contamination) have been found to exist in facilities where there is no visible deterioration of known ACM products. See Section 01 22 00.00 80 SPECIAL REQUIREMENTS to determine if asbestos is expected to be found and/or removed as part of this project. Specific requirements for the handling of asbestos are also addressed in Section 01 22 00.00 80 SPECIAL REQUIREMENTS.

1.8.11.2 New Asbestos Materials

Asbestos materials and products containing asbestos in any form shall not be used, specified, or installed without the express, advanced written consent or direction of the Contracting Officer. In the event of any inconsistency between this specification and any other contract specification, this specification shall apply.

1.8.11.3 Asbestos Related Work Involving Materials with less than one percent (< 1%) asbestos

Contractors performing any work involving asbestos must follow the criteria in the JSC Safety and Health Handbook, JPR 1700.1 (latest version), Part 12, Asbestos Control Requirements.

Contractors removing or abating asbestos materials with <1% asbestos shall submit an Asbestos Project Design/Work Plan meeting the requirements of OSHA under the applicable sections of 29 CFR 1926.1101(g), 1926.1101(k)(9)(vii), and 1926.1101(m)(1), and associated interpretation letters. Contractors shall conduct an initial exposure assessment or provide documentation of a negative exposure assessment for similar work. Exposure monitoring shall meet the requirements of paragraph 1.8.10 of this specification.

1.8.11.4 Asbestos Related Work Involving Materials With Equal To Greater Than One Percent (>1%) Asbestos

Contractors performing any work involving asbestos containing materials (as defined by OSHA in 29 CFR 1926.1101) shall follow the criteria in the JSC Safety and Health Handbook, JPR 1700.1 (latest version), Part 12, Asbestos Control Requirements.

Contractors removing or abating asbestos containing materials shall submit an Asbestos Project Design/Work Plan meeting the requirements of both OSHA (under 29 CFR 1926.1101(g)) and the EPA (under 40 CFR 763.90(g)). This plan shall be reviewed and approved by the Contractor's accredited Asbestos Project Designer who must meet the requirements of 40 CFR 763, Appendix C, Model Accreditation Plan (ACM). The Contractor shall conduct all exposure monitoring required by 29 CFR 1926.1101. Exposure monitoring shall meet the requirements of paragraph 1.8.10 of this specification.

Contractors using and maintaining Negative Pressure Enclosures (NPE) for OSHA Class 1 and Class II abatement activities shall meet the following requirements:

The machine used to maintain a negative pressure enclosure (NPE) must provide at least 4 air changes per hour and maintain a pressure differential of at least -0.02 column inches of water inside the NPE relative to outside pressure. (Ref OSHA 29 CFR 1926.1101(g)(5)(i)(A))

The NPE must be kept under negative pressure throughout its period of use. (Ref OSHA 29 CFR 1926.1101(g)(5)(i)(A))

Pressure measurements shall be recorded for the NPE throughout its entire period of use. The recording of the pressures may be done by either using a strip-chart recorder on the manometer or by an employee writing down the pressure readings on a log sheet at hourly intervals.

An employer maintaining a NPE must have an employee immediately available for the entire period of use to take action to restore negative pressure case the machine maintaining the NPE fails. Discussion of the machine failure shall be included in the Contractor's Daily Safety and Health Activity Report.

Documentation of the negative pressure recordings shall be provided to the Contracting Officer as an attachment to the Contractor's Daily Safety and Health Activity Report.

1.8.12 Lead Containing Materials

Lead containing materials may be found at Johnson Space Center on structures, metal siding and decking, door frames, hand rails, and other building system components. Additionally, lead sheeting may be found in roof drains. See Section 01 22 00.00 80 SPECIAL REQUIREMENTS to determine if leaded paint or other lead containing materials are expected to be found and/or removed as part of this project. Specific requirements for the handling of lead are also addressed in Section 01 22 00.00 80 SPECIAL REQUIREMENTS.

Contractors performing any work involving the abatement of leaded paints and other lead containing materials shall follow the criteria in the OSHA

Standard 29 CFR 1926.62. Activities which sand, grind, drill, or burn lead containing paints may cause exposures which exceed OSHA criteria.

Where possible "peel-away" chemical strippers should be used to remove lead containing paints from metal structures, siding, decking, and other metal building components before sanding, grinding, drilling, cutting, welding or torching. The paint shall be removed for a distance of at least six (6) inches on either side of the cut line or area to be worked. If welding or torching, paint shall be removed on all sides of the component.

1.8.13 Noise

The Contractor shall ensure that employees using or working around equipment that produces continuous noise greater than 85 decibels on the A-weighted scale (dBA) wear hearing protection regardless of the duration of exposure.

The Contractor shall ensure that employees using or working around equipment that produces impact/impulse noise greater than 140 db peak (impulse) sound pressure (dBp) wear hearing protection.

The Contractor shall identify hazardous noise areas where hearing protection is required to be worn.

The Contractor shall ensure that employees are instructed on the proper method for inserting ear plugs and wearing aural "ear muff" protectors.

The Contractor shall provide hearing protection to any visitor entering a hazardous noise area.

1.8.14 Confined Spaces

Contractor shall complete a Johnson Space Center Form JF992, Confined Space Entry Procedure, for each confined space, including trenches and excavations. The Contractor shall provide the JF992 for approval before any entry/entries are made to any designated JSC-Permit or OSHA Permit space. Requirements for confined space entry at JSC are found in JPR 1700.1, Chapter 6.10 "Entering Confined Spaces and Controlled Areas".

The Contractor shall complete a Johnson Space Center Form JF1476, Confined Space Entry Permit, upon each entry into a confined space and retain completed JFs 1476 on site for review and inspection by the Contracting Officer. A copy of each completed JF1476 shall be forwarded to the Occupational Health Department (OHD), Mail Code SD3229 Building 229; copies may be collected but shall be forwarded to OHD at least weekly.

1.8.15 Radiation and Laser Safety

Radiographs shall be performed in an approved manner and in presence of an approved source handler. Prior to bringing any radiograph equipment on the JSC Site, the Contractor shall obtain written approval from the Contracting Officer of the procedure and type and size of radioactive source to be used, plus date and time of testing. No testing shall be performed without a JSC Form 8, Hazardous Operations Permit and presence of the inspector. Approval to perform radiography at other than normal working hours will be granted only when such work introduces hazards to other personnel working in the vicinity of the testing

Any Contractor who brings radioactive material, radiographic equipment, or an x-ray generator onto Johnson Space Center shall submit a copy of their State Agreement License or [US Nuclear Regulatory Commission Licenses](#) (See reference standard [10 CFR 20](#)) to the Contracting Officer prior to the material or device arrival on JSC property.

The use of Class 2, 3 and 4 lasers shall be approved by the Contracting Officer before the device is brought onto JSC property. A Hazardous Operations Permit, JSC Form 8, shall be submitted for the use of Class 3 and 4 lasers.

1.8.16 Respiratory Protection

Employees wearing tight-fitting face-piece respirators, whether required or voluntary, must show proof of current medical clearance, fit testing, and training.

Contractors and subcontractors allowing employees to voluntarily use filtering face pieces (i.e., dust masks), must provide those employees with training in accordance with [29 CFR 1910.134](#).

1.8.17 Lockout/Tagout (LO/TO) and Energy Control

The Contractor shall follow the requirements of JPR 1700.1, Chapter 8.2 "Lockout/Tagout" for the control of energy (e.g.; electrical, air, steam, or fluid driven mechanisms).

JSC will provide the Contractor with locks to perform lock out for energy control. The Contractor shall use the JSC Forms JF 19A and JF 1291A for tag out.

1.8.18 Welding, Burning or Torch Cutting Work

The Contractor shall ensure that safety precautions are in effect before, and maintained during the performance of all such work. Personnel and property shall be protected from flash burns and sparks. The Contractor shall see that each employee performing such work is thoroughly familiar with all safety requirements.

The operation of all welding, burning, and torch cutting equipment shall be checked and approved by a competent person. Any defective equipment shall be put in safe operating condition immediately or removed from the site.

Tarpaulins used for covers or shields shall be fire resistant.

Shields shall be used wherever possible. Where shields cannot be used, the area must be specifically approved by the Contracting Officer.

An approved fire extinguisher, with the Contractor's name or label on it, is a shall requirement with each welding, burning or torch cutting operation. Operation is defined as one or more outfits operating in the same confined area.

The Contractor shall complete and provide a JSC Form 1475, Hot Work - Welding - Cutting Permit, to the appropriate JSC office for approval and

issue of permit prior to the start of any welding, burning or torch cutting operation.

1.8.19 Open Flames

The use of open-flame heating devices will not be allowed except by special permission of the Contracting Officer and the Authority Having Jurisdiction (AHJ). Such permission shall not be granted unless the Contractor has taken all reasonable precautions to make such devices safe to include proper venting. Burning trash, brush, or trees on the job site will not be allowed. Approval for the use of open fires and open-flame heating devices shall in no way relieve the Contractor from the responsibility of any damage incurred because of fires.

1.8.20 Flammable Materials

Flammable liquids shall be stored and handled in accordance with [NFPA 30](#), Flammable and Combustible Liquids Code of the National Fire Protection Association.

1.8.21 Fire Extinguishers

The Contractor shall provide a sufficient number of fire extinguishers on site to meet the requirements of [29 CFR 1926.150](#).

Each fire extinguisher shall be marked or tagged with the Contractor's name. Each extinguisher shall be inspected at least once per month. The inspection shall be documented and defective equipment will be replaced immediately.

1.8.22 Severe Storm Warnings

The Contractor shall not perform outdoor construction activities when lightning is within 6 miles of the Center and shall comply with [JPR 1700.1](#), Chapter 5.9 "Weather Safety Requirements".

1.8.23 Drug Free Workplace Program

The contractor shall provide a Drug Free Workplace Program that:

1. Contains a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the workplace and specifying the actions that will be taken against employees for violations of such prohibition;
2. Establishes an ongoing drug-free awareness program to inform employees about:

The dangers of drug abuse in the workplace,

The policy of maintaining a drug-free workplace,

Any available drug counseling, rehabilitation, and employee assistance programs,

The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace.

3. Provides all employees engaged in performance of the contract with a copy of the above statement.
4. Notifies employees in writing in the statement required above that, as a condition of continued employment on this contract, the employee will:

Abide by the terms of the statement

Notify the employer in writing of the employee's conviction under a criminal drug statute for a violation occurring in the workplace no later than 5 calendar days after such conviction

5. Notifies the Contracting Officer in writing within 10 calendar days after receiving this notice of conviction, from an employee or otherwise receiving actual notice of such conviction. The notice shall include the position title of the employee.
6. Within 30 calendar days after receiving notice of a conviction, take one of the following actions with respect to any employee who is convicted of a drug abuse violation occurring in the workplace:

Taking appropriate personnel action against such employee, up to and including termination; or

Require such employee to satisfactorily participate in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State, or local health, law enforcement, or other appropriate agency; and

7. Make a good faith effort to maintain a drug-free workplace through implementation of paragraphs 1) through 6).
8. A "Controlled substance" means a controlled substance in schedules I through V of section 202 of the Controlled Substances Act (21 U.S.C. 812) and as further defined in regulation at 21 CFR 1308.11 - 1308.15.

1.8.24 Roofing

Flamed Asphalt re-heaters shall not be allowed on building roofs.

1.8.25 Fall Protection

The Contractor shall ensure that any employee working at heights greater than six (6) feet above a lower level (ten (10) feet on scaffold), to include work on a ladder, is protected by a fall protection or fall prevention system.

Employees performing leading edge work shall be protected by a fall protection or fall prevention system.

The Contractor shall protect workers and visitors from falling objects.

1.8.26 Smoking

Work sites shall have designated smoking areas that are away from hazardous operations, and condition risk such as: combustible, flammable, and ignitable sources. Contractor and subcontractor employees shall only smoke in designated areas. Each smoking area shall be clearly marked "Smoking Area", maintained, and enforced by the prime contractor. Each smoking area shall have an approved method for collection and disposing of smoking products waste.

PART 2 PRODUCTS

Not Used

PART 3 PARTS

Not Used

-- End of Section --

Hazard Assessment Worksheet

Company (print name): _____

Date: _____

Preparer (print name): _____

Preparer's Signature: _____

Definable Feature of Work: _____

Worksheet Number: _____

Task or Step	Hazard Description	Required Controls: Engineering, Administrative, PPE	Validation/Verification Methods
1.	a. b. c. ...	a. b. c. ...	a. b. c. ...
2.	a. b. c. ...	a. b. c. ...	a. b. c. ...
3.	a. b. c. ...	a. b. c. ...	a. b. c. ...
4.	a. b. c. ...	a. b. c. ...	a. b. c. ...
5.	a. b. c. ...	a. b. c. ...	a. b. c. ...
...			

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02/11

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CONTRACTOR'S QUALITY CONTROL
02/11

PART 1 GENERAL

1.1 SUMMARY

The requirements of this Section apply to, and are a component part of, each section of the specifications and requirements of the contract package.

1.2 DEFINITIONS

Quality: Conformance with the plans, specifications, and referenced codes.

Inspection: Examining and testing supplies, services, materials, components or assemblies to determine contract performance.

Testing: Element of inspection that determines the properties of functional operation of materials or components by the application of established scientific principles and procedures with formally documented records.

Independent Testing Laboratory: An organization, approved by the Contracting Officer, engaged to perform specific inspections or tests of work, either at the construction site, or elsewhere, and report the results.

Quality Control: Those actions that control the quality of the work to be performed and the documentation that reflects that control.

Quality Assurance: Those actions that verify and assure in the effectiveness of the Contractor's quality control program.

1.3 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

The Contractor shall submit the following items in accordance with the paragraph entitled, "Records," of this section.

Quality Control Data
Field Test
Quality Control Coordination Actions
Inspection Records
Quality Control Training
Letter of Authority or Delegation

SD-07 Certificates

The Contractor shall submit **Statement of Records** in accordance with the paragraph entitled, "Quality Control Plan," of this section.

1.3.1 Quality Control (QC) Plan

The Contractor shall submit a detailed written [Statement of Records](#) describing procedures that will be implemented to achieve quality on the project and in accordance with the Quality Control (QC) Plan.

The Quality Control (QC) Plan shall be submitted and approved prior to work activities being started. The Contractor shall develop and maintain an effective QC plan that results in full compliance with the contract provisions. It shall describe how the quality requirements of the specifications will be monitored, met, and addressed for each of the following items at a minimum:

- a. The Contractor's quality organization concerned with each of the construction contract activities. A chart showing lines of authority and communication of Quality Control staff.
- b. The name, qualifications (in resume format), duties, responsibilities and authorities of each person assigned a Quality Control function.
- c. A letter of authority to the Quality Control System Manager (QCSM) signed by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the QCSM including authority to prevent defective work from being built upon or concealed.
- d. The Inspection System and Operational Plan for accomplishing and reviewing work controls, fabrication controls, certifications, and documentation of quality control operations, inspections, and test records, including those for subcontractors. The inspection system provisions shall include the methods to be effected during the procurement cycle (order to deliver) for those items of materials or equipment that require source inspections, shop fabrications, or similar operations removed from the work site. The plan shall identify personnel, procedures, control, instructions, tests, records, and forms to be used.
- e. Procedures for survey control of the work to include the qualification and experience of the key individuals designated to accomplish the layout and control.
- f. Define the on-site/off-site coordinating procedures and authorities for the quality functions accomplished by personnel not located at the site or not directly under the supervision of the QCSM.
- g. Training requirements for personnel.
- h. Procedure for control, verification, and acceptance of certification(s) of personnel required by the specifications.
- i. Procedure for control, verification, and acceptance of certification of processes or equipment required by the specifications.

- j. Procedures for control, verification, and acceptance of testing (Nondestructive, etc.) requirements required by the specifications and the independent certifying and testing laboratories to be used.
- k. Procedures for tracking preparatory, initial, and follow-up control phases.
- i. A daily report describing each QC inspection phase, employees working, active equipment, weather conditions, delays experienced, flaws exposed, corrective actions, and verifications, etc.
- m. Procedures for tracking nonconforming materials and workmanship from identification through acceptable corrective action. These procedures will establish verification that the identified deficiencies have been corrected.
- n. Plan shall contain an appendix with a reproduction of each form, report format, or similar record to be used in the program.

After the Pre-construction Conference, before start of construction, and prior to acceptance by the Government of the Quality Control Plan, the Contractor shall meet with the Contracting Officer's Technical Representative (COTR) and discuss the Quality Control System. During the meeting, a mutual understanding of the system details shall be developed, including the forms for recording the Quality Control operations, control activities, testing, administration of the system for both on-site and off-site work, and the interrelationship of Contractor's management and control with the Government's Quality Assurance Program. Minutes of the meeting shall be prepared by the Contractor and shall become a part of the contract file. There may be occasions when subsequent conferences will be called by either party to reconfirm mutual understandings and/or address deficiencies in the Quality Control system or procedures which may require corrective action. After acceptance of the Quality Control Plan, the Contractor shall notify the Contracting Officer in writing a minimum of 7 calendar days prior to any proposed change. Proposed changes are subject to acceptance by the Contracting Officer.

1.3.2 Records

The Contractor shall submit records for [Quality Control Data](#), [Field Test](#), [Quality Control Coordination Actions](#), [Inspection Records](#), [Quality Control Training](#), and [Letter of Authority or Delegation](#).

Records shall include all quality control data; daily reports, factory tests, or manufacturer's certifications, quality control coordinating actions; record of quality control training/certifications as well as routine hydrostatic, electrical continuity, grounding, welding, line cleaning, and similar tests. Quality records shall be available for examination by the Contracting Officer. The Contractor shall provide copies of reports, tests, and data to the Contracting Officer.

1.4 QUALITY CONTROL PROGRAM (QCP)

1.4.1 Quality Control Organization

The Contractor shall provide a Quality Control staff at the work site at all times during progress with complete authority to take any action necessary

to ensure compliance with the contract. All Quality Control personnel shall be subject to acceptance by the Contracting Officer. The following are considered minimum requirements and should be supplemented as necessary to assure adequate staff to meet the Quality Control requirements at all times during construction.

1.4.1.1 Quality Control System Management, (QCSM)

The Contractor shall identify an individual, within his organization work site, who shall be responsible for overall management of Quality Control and have the authority to act in all Quality Control matters for the Contractor. The QCSM shall report directly to the site management authority or upper management in the Contractor's off-site organization. This QCSM shall be on-site at all times during construction, unless: An alternate for the Quality Control System Manager is identified in the plan to serve in the event of the System Manager's absence. The QCSM will not be absent from the work site for periods exceeding 1 week at any time, and not more than 20 workdays during a calendar year. The requirements for the alternate shall be the same as for the designated Quality Control System Manager.

The Quality Control System Manager shall have a minimum of 5 year's construction experience on similar type construction. The Quality Control System Manager shall be assigned as System Manager but may have duties as project superintendent in addition to quality control.

1.4.1.2 Quality Control Staff

The Contractor shall provide as part of the Quality Control organization, as a minimum, specialized personnel for the following areas: electrical, mechanical, civil, structural, survey control, and environmental. These personnel shall assist and report to the QCSM. Each person will be responsible for assuring the construction complies with the contract requirements for their area of specialization. These individuals shall be responsible to the QCSM; be physically present at the construction site during work on their areas of responsibility; have the necessary education and/or experience to ensure contract compliance. A staff shall be maintained under the direction of the Quality Control System Manager to perform all Quality Control activities. The staff must be of sufficient number to ensure adequate Quality Control coverage of all work phases, work shifts, and work crews involved in the construction. These personnel may perform other duties, but must be fully qualified by experience and technical training to perform their assigned Quality Control responsibilities and must be allowed sufficient time to carry out these responsibilities. The Quality Control plan will clearly state the duties and responsibilities of each staff member.

1.4.1.3 Organizational Changes

The Contractor shall obtain Contracting Officer's acceptance before replacing any member of the Quality Control staff. Requests shall include the names, qualifications, duties, and responsibilities of each proposed replacement.

1.4.2 Identification and Data Retrieval

The Contractor shall have an identification and data retrieval system. Records, drawings, submittals, and equipment shall be identified to reference the following:

- a. Contract Number
- b. Contract Specification Number
- c. Contract Drawing Number
- d. Submittal Document Number
- e. Contract Change Number
- f. Contractor's Drawing Number System

1.4.2.1 Procurement

The Contractor shall be responsible for controlling procurement sources and those of his subcontractors to ensure that each purchase meets quality requirements.

- a. The Contractor shall ensure that his purchase documents include:

- (1) The basic quality requirements, standards, drawings, and specifications called out in the contract specifications.
- (2) Inspection and Test Characteristics.
- (3) Inspection and Test Records.
- (4) Operational and Maintenance (O&M) manuals, Instructions, Certifications of Compliance, and such other data as may be required by the specification.
- (5) Preservation, packaging, shipping directions.

- b. When Government source inspection is required on a Contractor's purchase, the purchase document shall include the following statement:

"All work on this order is subject to inspection and testing by the Government at any time and place. The Contracting Officer shall be notified immediately upon receipt of this order. The Contracting Officer shall be notified 48 hours in advance of the time articles or processes are ready for inspection or test."

- c. Procurements that do not require Government source inspection shall include the following statement:

"The Government reserves the right to inspect any or all of the materials included on this order at the Contractor's plant."

- d. Required Government source inspections will be determined by the Contracting Officer. Government source inspections shall not replace Contractor inspections or relieve the Contractor of his

responsibility for ensuring quality procurements and records verifying quality control activities.

1.4.2.2 Receiving Inspection System

Contractor shall maintain a receiving inspection system that ensures procured materials and equipment and inspected and tested as required by specifications, drawings, and approved submittal documents.

Receiving inspection records will accompany each procurement delivery to the construction site. The Contractor will maintain records of these receiving inspections at the construction site.

The records shall show defects, discrepancies, dispositions, and waivers, including evidence of Government source inspection.

1.4.2.3 Handling and Storage

The Contractor shall provide controls and procedures which meet requirements of each section of the specifications. The Contractor shall include documentation with each shipment. The data shall consist of documentation required by the contract along with specifications required to identify, store, preserve, operate, and maintain the items shipped.

1.4.2.4 Nonconforming Articles and Material Control

The Contractor shall develop procedures for tracking the correction of nonconforming articles from first identification through remediation and shall prevent the defective work from being built upon or concealed. The system developed will include, at a minimum, the following:

- a. A means of identifying the deficiency in the field.
- b. A log or listing for management and control.
- c. A unique and traceable number assigned to each item.
- d. A description of the nonconforming article.
- e. Remedial action taken or recommended.
- f. Current disposition of the nonconforming article.
- g. A system of feedback to prevent reoccurrence.

1.4.2.5 Quality Control Records

Quality control records shall be maintained in a central on-site location. Maintenance of quality control records shall not relieve the Contractor from submitting samples, test data, detail drawings, material certificates, or other information required by each section in the specification.

The Contractor shall ensure each record is identified and traceable to specific requirements in the specifications and drawings.

1.4.2.6 Drawings and Change Control

A drawings-control system shall be maintained to provide revised drawings, change distribution and removal of obsolete drawings from work areas. Changes involving interface with other work areas, or affecting articles or materials controlled by others shall be controlled by the Contractor. This system shall be integrated with the document requirements of the contract.

Accomplished changes shall be clearly identified and associated drawings shall be revised. Drawings that have been approved, or approved as noted, by the Contracting Officer shall be used for fabrication and inspection.

1.4.3 Quality Inspections

The Contractor shall implement, as a minimum, a four phase inspection system for all definable features of work, as follows:

- a. Preparatory Inspection: This shall be performed prior to beginning any definable feature of work. It shall include a review of contract requirements (with all personnel responsible for supervision of the work). Review of contract requirements shall include; a check to assure that all materials and/or equipment have been tested, submitted, and approved; a check to assure that provisions have been made to provide required control testing; a discussion of procedures for controlling quality of the work including repetitive deficiencies; examination of the work area to ascertain that all preliminary work has been completed; and a physical examination of materials and equipment to assure that they conform to contract requirements. The Contracting Officer's Technical Representative (COTR) shall be notified at least 48 hours in advance of the preparatory inspection and such inspection shall be made a matter of record in the Contractor's quality control documentation. Preparatory Inspections will be reconvened when and if changes in the work or crew occur.
- b. Initial Inspection: This shall be performed as soon as a representative portion of the particular feature of work has been accomplished. The inspection shall include examination of the quality of workmanship and materials being incorporated to assure conformance with contract requirements; a review of control testing, and a comparison of requirements; a review of control testing, and a comparison of requirements for completeness of work. The COTR shall be notified at least 24 hours in advance of the inspection and such inspection shall be made a matter of record in the Contractor's quality control documentation. Initial inspections will be reconvened when and if changes in the work or crew occur.
- c. Follow-up Inspection: These shall be performed daily to assure continuing compliance with contract requirements until completion of the particular feature of work. Such inspection shall be made a matter of record in the Contractor's quality control documentation.
- d. Completion Inspection: At or near the completion of all work or any increment thereof established by a separate completion date, the Contractor shall conduct an inspection of the work and develop a list of items which are incomplete or do not conform to contract requirements. The COTR shall be notified at least 48 hours in advance of the completion inspection. The "Punch List," along with

a schedule for the completions and/or correction, shall be provided to the COTR.

1.4.4 Quality Control Testing

The Contractor shall perform tests specified or required to verify that control measures are adequate to provide a product which conforms to contract requirements. Testing includes operation and/or acceptance test when specified. The Contractor shall procure the services of an approved testing laboratory or establish an approved testing laboratory at the project site. A list of tests to be performed shall be furnished as a part of the Quality Control Plan. The list shall give the test name, frequency, specification paragraph containing the test requirements, the personnel and laboratory responsible for each type of test, and an estimate of the number tests required. The Contractor shall perform the following activities and record and provide the following data:

- a. Verify that testing procedures comply with contract requirements.
- b. Verify that facilities and testing equipment are available and comply with testing standards.
- c. Check test instrument calibration data against certified standards.
- d. Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.
- e. Results of all tests taken, both passing and failing test, shall be recorded on the Quality Control report for the date taken. Specification paragraph reference, location where tests were taken, and the sequential control number identifying the test shall be given. Actual test reports may be submitted later, if approved by the Contracting Officer, with a reference to the test number and date taken. An information copy of tests performed by an off-site or commercial test facility shall be provided directly to the Contracting Officer.

1.4.5 Quality Control Daily Reports

These reports shall be on an acceptable form and shall include factual evidence that required quality control activities and/or tests have been performed. The original and one (1) copy of these reports shall be furnished to the Government daily within 24 hours after the date(s) covered by the report, except that reports need not be submitted for days on which no work is performed. One (1) report shall be prepared and submitted for every 7 days of no work and on the last day of a no work period. All calendar days shall be accounted for throughout the life of the contract. The first report following a day of no work shall be for that day only. Reports shall be signed and dated by the Quality Control System Manager. The report shall include copies of reports prepared by all subordinate quality control personnel. The reports will include, but not limited to the following:

- a. Contractor/subcontractor and their area of responsibility.
- b. Operating plant/equipment.

- c. Weather conditions encountered.
- d. Work performed on the current day, giving location, description, trades working, and number of personnel. When Network Analysis System (NAS) is used, identify each phase of work performed each day by NAS activity number.
- e. Test and/or control activities performed with results and references to specifications/plan requirements.
- f. Material received with statement as to its acceptability and storage.
- g. Inspections performed with results and references to specification section. The control phase should be identified (Preparatory, Initial, Follow-Up Completion). List all deficiencies noted along with corrective action taken or proposed.
- h. Off-site surveillance activities, including actions taken.
- i. List instructions given/received.
- j. Conflicts in plans and/or specifications.
- k. Contractor's verification statement that equipment and material incorporated in the work and workmanship comply with the contract requirements.

The Contractor shall provide on-site records of each test performed throughout the life of the contract. Records shall include, but not be limited to, factual evidence that the required inspections or tests have been performed, including type and number of inspections or tests involved, identification of operators and inspectors, result of inspections or tests, nature of defects, causes for rejection, proposed remedial action, and corrective action taken.

Inspection records, test procedures, test results, and associated forms shall contain a signature line to indicate verification or witness by the Government.

1.4.6 Audits

The Contractor shall establish a system of scheduled or random audits to ensure objectives are met.

1.5 GOVERNMENT QUALITY ASSURANCE INSPECTIONS

The Contractor Quality Control Program (CQCP) and the work performed under the contract will be subject to continuous evaluation, review, and verification by representatives of the Contracting Officer. Quality Assurance inspections and tests will be performed by the Government to verify the effectiveness of the CQCP. These inspections and tests are for the sole benefit of the Government and do not relieve the Contractor of any Quality Control requirement. The Contractor will be notified in writing of any noncompliance area of the Quality Control program and will be given 15 calendar days to correct the deficiency.

A Government representative will be afforded the opportunity to inspect all work at all times. In-process and end item inspections may be performed at both on and off-site locations of the Contractor, subcontractor, or supplier facilities.

The Contracting Officer's Technical Representative will be notified 48 hours in advance of operations that will conceal and/or encase work performed and will be allowed the opportunity to inspect the work to be encased and/or concealed. This notice will be provided for the following activities at a minimum:

- a. Backfilling and/or encasement of underground utilities.
- b. Wall and/or pipe chase closures.
- c. Ceiling closures.
- d. Concrete placements.

Failure to provide such notification shall necessitate uncovering or exposing concealed or encased work for Government inspection. All rework associated with this inspection will be performed at no additional expense to the Government.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

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CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT

04/11

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CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT
04/11

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM E 1609 (2001) Development and Implementation of a Pollution Prevention Program

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED (2002; R 2005) Leadership in Energy and Environmental Design(tm) Green Building Rating System for New Construction (LEED-NC)

1.2 GOVERNMENT POLICY

Government policy is to apply sound environmental principles in the design, construction and use of facilities. As part of the implementation of that policy: (1) practice efficient waste management when sizing, cutting, and installing products and materials and (2) use all reasonable means to divert construction and demolition waste from landfills and incinerators and to facilitate their recycling or reuse. A minimum of 50 percent by weight of total project solid waste shall be diverted from the landfill.

1.3 MANAGEMENT

Develop and implement a waste management program in accordance with **ASTM E 1609** and as specified. Take a pro-active, responsible role in the management of construction and demolition waste and require all subcontractors, vendors, and suppliers to participate in the effort. Construction and demolition waste includes products of demolition or removal, excess or unusable construction materials, packaging materials for construction products, and other materials generated during the construction process but not incorporated into the work. Construction and demolition waste, industrial and hazardous solid waste, and plant trash are further defined in Section 01 22 00.00 80, SPECIAL REQUIREMENTS, under paragraph entitled, "Cleanup And Disposal Of Materials". In the management of waste consideration shall be given to the availability of viable markets, the condition of the material, the ability to provide the material in suitable condition and in a quantity acceptable to available markets, and time constraints imposed by internal project completion mandates. The Contractor is responsible for implementation of any special programs involving rebates or similar incentives related to recycling of waste. Revenues or other savings obtained for salvage, or recycling accrue to the Contractor. Appropriately permit firms and facilities used for recycling, reuse, and

disposal for the intended use to the extent required by federal, state, and local regulations. Also, provide on-site instruction of appropriate separation, handling, recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

1.4 SUBMITTALS

Government approval is required for all submittals. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Waste Management Plan; (LEED)

SD-11 Closeout Submittals

Records; (LEED)

1.5 MEETINGS

Conduct Construction Waste Management meetings. After award of the Contract and prior to commencement of work, schedule and conduct a meeting with the Contracting Officer to discuss the proposed Waste Management Plan and to develop a mutual understanding relative to the details of waste management. The requirements for this meeting may be fulfilled during the coordination and mutual understanding meeting outlined in Section 01 45 04.00 80 CONTRACTOR QUALITY CONTROL. At a minimum, environmental and waste management goals and issues shall be discussed at the following additional meetings:

- a. Pre-bid meeting.
- b. Preconstruction and Pre-demolition meeting.
- c. Regular site QC meetings.
- d. Work safety meetings.

1.6 WASTE MANAGEMENT PLAN

The Contractor shall submit a Waste Management Plan in accordance with ASTM E 1609 that documents a planned diversion rate of 50% or greater for the entire project. The waste management plan shall be submitted within 15 days after notice to proceed and not less than 10 days before the preconstruction meeting. The plan shall demonstrate how the project waste diversion rate of 50% shall be met and shall include the following:

- a. Name of individuals on the Contractor's staff responsible for waste prevention and management.
- b. Actions that will be taken to reduce solid waste generation, including coordination with subcontractors to ensure awareness and participation.
- c. Description of the regular meetings to be held to address waste management.

- d. Description of the specific approaches to be used in the recycling/reuse of the various materials generated, including the areas on site and equipment to be used for processing, sorting, and temporary storage of wastes.
- e. Characterization, including estimated types and quantities, or the waste to be generated.
- f. Identification of local and regional reuse programs, including non-profit organizations such as schools, local housing agencies, and organizations that accept used materials such as materials exchange networks and Habitat for Humanity. Include the name, location, and phone number of each reuse facility to be used, and provide a copy of the permit or license for each facility.
- g. Identification of materials that cannot be recycled/reused with an explanation and a justification, by way of submitting a waiver request via Form JF 844 to the Contracting Officer for approval if the Contractor cannot comply with the minimum 50% diversion rate.
- h. Description of the means by which any waste materials identified on the Construction and Demolition Recycling Record, Form JF 845, will be protected from contamination and stored in compliance with Section 01 22 00.00 80 SPECIAL REQUIREMENTS, paragraph entitled "Sedimentation and Erosion Control", Best Management Practices.
- i. Description of the means of transportation of the recyclable materials (whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler and removed from the site).

Revise and resubmit Plan as required by the Contracting officer. Approval of the Contractor's Plan will not relieve the Contractor of responsibility for compliance with applicable environmental regulations or meeting project cumulative waste diversion requirement. Distribute copies of the Waste Management Plan to each subcontractor, the Quality Control Manager, and the Contracting Officer.

1.7 RECORDS

Records shall be maintained 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 using the LEED Letter Template.] Quantities may be measured by weight.

Demolition accomplished by other parties on this project site count toward the project's total waste diversion cumulative score for LEED. Information on the quantity and disposition of these materials will be provided by the Contracting Officer. Include this data in records, annotated to indicate that it was accomplished by another party.

All construction and demolition debris removed from the site must be weighed at the disposal or recycling facility. All bills of lading, weigh tickets, receipts, manifests, and/or signed certified reports identifying the project and the waste material shall be delivered to the Contracting Officer as attachments form JF 845 - Construction And Demolition Recycling Record. The

contractor shall complete and submit Form JF 845 - Construction And Demolition Recycling Record by the 20th of each month for the time period two months previous (see Table 1) and submit to the Contracting Officer.

Table 1: Reporting Periods

Due Date	Reporting Period
Jan 20	Nov 1-30
Feb 20	Dec 1-31
Mar 20	Jan 1-31
Apr 20	Feb 1-28
May 20	Mar 1-31
Jun 20	Apr 1-30
Jul 20	May 1-31
Aug 20	Jun 1-30
Sept 20	Jul 1-31
Oct 20	Aug 1-31
Nov 20	Sept 1-30
Dec 20	Oct 1-31

If the Contractor cannot comply with the minimum 50% diversion rate, the Contractor shall submit a waiver request via Form JF 844 to the Contracting Officer prior to Notice to Proceed. The Contractor shall still recycle to the maximum extent possible and shall submit the Form JF 845 - Construction And Demolition Recycling Record monthly as noted in Table 1.

1.8 COLLECTION

Separate, store, protect, and handle identified recyclable and salvageable waste products at the site in a manner that maximizes recyclability and salvagability of identified materials. Provide the necessary containers, bins and storage areas to facilitate effective waste management and clearly and appropriately identify them. Provide materials for barriers and enclosures around recyclable material storage areas which are nonhazardous and recyclable or reusable. Locate out of the way of construction traffic. Provide adequate space for pick-up and delivery by subcontractors. Recycling and waste bin areas are to be kept neat and clean, and recyclable materials shall be handled to prevent contamination of materials from incompatible products and materials. Clean contaminated materials prior to placing in collection containers. Use cleaning materials that are

nonhazardous and biodegradable. Handle hazardous waste and hazardous materials in accordance with applicable regulations and coordinate with Section 01 22 00.00 80 SPECIAL REQUIREMENTS. Separate materials by one of the following methods:

1.8.1 Source Separated Method.

Waste products and materials that are recyclable shall be separated from trash and sorted as described below into appropriately marked separate containers and then transported to the respective recycling facility for further processing. Deliver materials in accordance with recycling or reuse facility requirements (e.g., free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process). Separate materials into the following category types as appropriate considering the waste type and available recycling and reuse programs in the area:

- a. Appliances/White Goods
- b. Asphalt
- c. Cardboard
- d. Carpet/Carpet tiles/Carpet backing
- e. Concrete/Masonry
- f. Electronics
- g. Green Waste (e.g., landscape trimmings)
- h. Gypsum (Drywall)
- i. Land Clearing (Soil and Sand)
- j. Metal, Scrap: Aluminum
- k. Metals, Scrap: Mixed, wiring, cables
- l. Other Materials (tires, roofing, glass, insulation, non asbestos ceiling and floor tiles, etc.)
- m. Plastic
- n. Salvaged/ Surplus materials for reuse (e.g., doors, windows, equipment)
- o. Waste (other municipal-type)
- p. Wood (lumber, pallets)

1.8.2 Co-Mingled Method.

Waste products and recyclable materials shall be placed into a single container and then transported to a recycling facility where the recyclable materials are sorted and processed.

1.8.3 Other Methods.

Other methods proposed by the Contractor may be used when approved by the Contracting Officer.

1.9 DISPOSAL

Control accumulation of waste materials and trash. Recycle or dispose of collected materials off-site at intervals approved by the Contracting Officer and in compliance with waste management procedures. Unless specified elsewhere in the specifications, disposal shall be in accordance with the following:

1.9.1 Reuse.

First consideration shall be given to salvage for reuse since little or no re-processing is necessary for this method, and less pollution is created when items are reused in their original form. Coordinate reuse with the Contracting Officer. [Reuse materials as indicated on the drawings.](#) Sale or donation of waste suitable for reuse shall be considered.

1.9.2 Recycle.

Waste materials not suitable for reuse, but having value when recycled, shall be made available for recycling. Arrange for timely pickups from the site or deliveries to recycling facilities in order to prevent contamination of recyclable materials.

1.9.3 Compost

If a reasonable amount of compostable material is available, contact the grounds keeping Contractor to coordinate the placement of compostable materials only include plant material and sawdust. Composting food scraps in not allowed.

1.9.4 Waste.

All non-construction and demolition waste deemed as industrial solid waste should be managed as per Specification Section [01 22 00.00 80 SPECIAL REQUIREMENTS](#), under paragraph entitled, "Cleanup And Disposal Of Materials".

1.9.5 Return

Set aside and protect misdelivered and substandard products and materials and return to supplier for credit.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

NOTE TO PM: Please verify that JSC Form 844 - Construction and Demolition Recycling Waiver Form and JSC Form 845 - Construction and Demolition Recycling Record is attached to the back of this section on final print.

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DEMOLITION
03/12

PART 1 GENERAL

1.1 REFERENCES

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

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

40 CFR 61-SUBPART M

National Emission Standard for Asbestos

1.2 GENERAL REQUIREMENTS

It is the intent of NASA to recycle as much of the removed items as possible.

Asbestos Containing Materials (ACM) and those items that cannot be salvaged or recycled due to ACM contamination are exempt from the recycling data. Refer to NASA JPRs for disposition of these materials.

Do not begin demolition until authorization is received from the Contracting Officer. Remove rubbish and debris from the project site; do not allow accumulations inside or outside the building. The work includes demolition, salvage of identified items and materials, and removal of resulting rubbish and debris. Rubbish and debris shall be removed from Government property daily, unless otherwise directed, to avoid accumulation at the demolition site. Materials that cannot be removed daily shall be stored in areas specified by the Contracting Officer. In the interest of conservation, recycling shall be pursued to the maximum extent possible. Items for re-cycling shall be stored in covered bins within the construction site as shown on the drawings.

1.2.1 Demolition Plan

Prepare a [Demolition Plan](#) and submit proposed demolition, and removal procedures for approval before work is started. Include in the plan procedures for careful removal and disposition of materials specified to be turned over to the Government, coordination with other work in progress, a disconnection schedule of utility services, a detailed description of methods and equipment to be used for each operation and of the sequence of operations. Except for items listed in paragraph entitled, ITEMS TO BE TURNED OVER TO THE GOVERNMENT, of this section, the contractor shall remove all materials and equipment from the facility and recycle to the maximum extent possible.

1.2.2 General Requirements

Do not begin demolition or deconstruction until authorization is received from the Contracting Officer. The work of this section is to be performed in a manner that maximizes recycling of materials. Remove rubbish and

debris from the project site daily; do not allow accumulations inside or outside the buildings. The work includes demolition, of identified items and materials, and removal of resulting rubbish and debris. Remove rubbish and debris from Government property daily, unless otherwise directed. Store materials that cannot be removed daily in areas specified by the Contracting Officer.

The Contractor shall include in demolition Plan complete and detailed description of coordination and protection measures for this project with respect to mitigation of risk of asbestos and lead containing materials to contractor workers, building occupants, and building equipment and systems. This part of the demolition plan shall be titled "Coordination and Protection For Asbestos Containing Materials". This part of the demolition plan should cross-reference to the requirements for an Asbestos Project Design, per JPR 1700.1J, Chapter 12, which must be prepared by an EPA-accredited (licensed) designer (per EPA Model Accreditation Plan), and must address all of the requirements for managing the work areas to control asbestos exposure for workers and building occupants. This section of the demolition plan shall explicitly reference the performance goal for the discharge of no visible emissions outside of the regulated area(s), and the evidence of visible emissions will provide the basis for the Government to shut down the Contractor or for the Contractor to revise the demolition plan/asbestos project design to achieve this performance requirement.

1.3 ITEMS TO REMAIN IN PLACE

Take necessary precautions to avoid damage to existing items to remain in place, or to remain the property of the Government. Repair or replace damaged items as approved by the Contracting Officer. Coordinate the work of this section with all other work indicated.

1.3.1 Existing Construction Limits and Protection

Do not disturb existing construction beyond the extent indicated or necessary for installation of new construction. Provide temporary shoring and bracing for support of building components to prevent settlement or other movement. Provide protective measures to control accumulation and migration of dust and dirt in all work areas. Remove dust, dirt, and debris from work areas daily.

1.4 BURNING

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

1.5 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

- Existing Conditions
- Demolition Plan

SD-07 Certificates

- Demolition Plan

Notification of Demolition

SD-11 Closeout Submittals

LEED submittals - spreadsheet indicating weights of recycled and non-recycled construction debris.

1.6 QUALITY ASSURANCE

Furnish timely [notification of demolition](#) projects to JSC Environmental Office in accordance with [40 CFR 61-SUBPART M](#) and the Contracting Officer in writing 10 working days prior to the commencement of work in accordance with [40 CFR 61-SUBPART M](#).

1.6.1 Dust and Debris Control

Prevent the spread of dust and debris to occupied portions of the building on airfield pavements and avoid the creation of a nuisance or hazard in the surrounding area. Do not use water if it results in hazardous or objectionable conditions such as, but not limited to, ice, flooding, or pollution. Vacuum and dust the work area daily. Sweep pavements as often as necessary to control the spread of debris that may result in foreign object damage potential to aircraft.

1.7 PROTECTION

1.7.1 Protection of Personnel

Before, during and after the demolition work continuously evaluate the condition of the structure being demolished and take immediate action to protect all personnel working in and around the project site. No area, section, or component of floors, roofs, walls, columns, pilasters, or other structural element will be allowed to be left standing without sufficient bracing, shoring, or lateral support to prevent collapse or failure while workmen remove debris or perform other work in the immediate area.

1.8 EXISTING CONDITIONS

Before beginning any demolition work, survey the site and examine the drawings and specifications to determine the extent of the work. Record existing conditions in the presence of the Contracting Officer showing the condition of structures and other facilities adjacent to areas of alteration or removal. Photographs sized [4 inch](#) will be acceptable as a record of existing conditions. Include in the record the elevation of the top of foundation walls, finish floor elevations, possible conflicting electrical conduits, plumbing lines, alarms systems, the location and extent of existing cracks and other damage and description of surface conditions that exist prior to before starting work. It is the Contractor's responsibility to verify and document all required outages which will be required during the course of work, and to note these outages on the record document.

PART 2 PRODUCTS

PART 3 EXECUTION

3.1 EXISTING FACILITIES TO BE REMOVED

3.1.1 Materials and Equipment Removal

All equipment and materials to be removed shall become the property of the contractor and shall be removed from Government property. Scrap metal and electrical wiring are included in materials to be removed. See JPR 8550.1A for special waste management requirements. Disregard Chapter 4.3.2.9 for scrap metals. A change in value of salvage and recyclable materials over the course of the task order shall not be considered a change of conditions and a reason to request a change order or modification by the Government nor the Contractor.

3.1.2 General Demolition

Perform general demolition to remove and recycle/dispose of all architectural, structural, mechanical, plumbing and electrical items to the extents shown on the drawings.

3.1.3 Patching

Where removals leave holes and damaged surfaces exposed in the finished work, patch and repair these holes and damaged surfaces to match adjacent finished surfaces, using on-site materials when available. Where new work is to be applied to existing surfaces, perform removals and patching in a manner to produce surfaces suitable for receiving new work. Finished surfaces of patched area shall be flush with the adjacent existing surface and shall match the existing adjacent surface as closely as possible as to texture and finish. Patching shall be as specified and indicated, and shall include:

- a. Concrete and Masonry: Completely fill holes and depressions, caused by previous physical damage or left as a result of removals in existing masonry walls to remain, with an approved masonry patching material, applied in accordance with the manufacturer's printed instructions.
- b. Where existing partitions have been removed leaving damaged or missing resilient tile flooring, patch to match the existing floor tile.
- c. Patch acoustic lay-in ceiling where partitions have been removed. The transition between the different ceiling heights shall be effected by continuing the higher ceiling level over to the first runner on the lower ceiling and closing the vertical opening with a painted sheet metal strip.

3.2 DISPOSITION OF MATERIAL

3.2.1 Title to Materials and Equipment

All materials and equipment removed shall become the property of the Contractor and shall be removed from Government property. Title to materials and equipment resulting from demolition is vested in the Contractor upon approval by the Contracting Officer of the Contractor's demolition plan, and authorization by the Contracting Officer to begin demolition and deconstruction. The Government will not be responsible for the condition or loss of, or damage to such property after contract award. Showing for sale or selling materials on site is prohibited.

3.2.2 Reuse of Materials and Equipment

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

3.3 CLEANUP

Remove debris and rubbish from work site. Remove and transport in a manner that prevents spillage on streets or adjacent areas. Apply all applicable federal, state, and local regulations regarding hauling and disposal.

3.4 DISPOSAL OF REMOVED MATERIALS

3.4.1 Regulation of Removed Materials

Dispose of debris, rubbish, scrap, and other non-salvageable and non-recyclable materials resulting from removal operations with all applicable federal, state and local regulations as contractually specified. Recyclable materials such as concrete, scrap metal, and other waste materials shall be recycled to the maximum extent practicable. The Contractor shall maintain records of materials disposed of and recycled, for the purpose of computing the quantity of solid waste diverted from land disposal, and provide these records with close-out documentation. Storage of removed materials on the project site is prohibited. Disposal of industrial solid and hazardous waste, including but not limited to materials containing asbestos or lead will be by the government. It is the contractor's responsibility to accumulate, collect and label these industrial solid and hazardous waste materials according to federal, state, and JSC regulations and requirements per JPR 8550.1 (current edition).

3.4.2 Removal from Government Property

Transport waste materials removed from demolished and deconstructed structures, except hazardous materials containing asbestos or lead or otherwise classified as industrial solid and hazardous waste, from Government property for legal disposal or recycling in accordance with all applicable federal, state and local regulations.

3.5 REUSE OF REMOVED ITEMS

Reinstall equipment designated for reuse and reinstallation before installation. Replace items damaged during removal operations or restore them as necessary to usable condition.

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PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 90.1 - IP (2010; Errata 1-3 2011; INT 1-12 2011; Addenda A, B, C, G, H, J, K, O, P, S, Y, Z, BZ, CG, CI and DS 2012; Errata 4-8 2012; INT 13-16 2012; Errata 9-10 2013) Energy Standard for Buildings Except Low-Rise Residential Buildings

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)

ANSI Z21.22/CSA 4.4 (1999; Addenda A 2000, Addenda B 2001; R 2004) Relief Valves for Hot Water Supply Systems

ASSE 1003 (2009) Performance Requirements for Water Pressure Reducing Valves for Domestic Water Distribution Systems - (ANSI approved 2010)

ASSE 1018 (2001) Performance Requirements for Trap Seal Primer Valves - Potable Water Supplied (ANSI Approved 2002)

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA 10084 (2005) Standard Methods for the Examination of Water and Wastewater

AWWA B300 (2010; Addenda 2011) Hypochlorites

AWWA B301 (2010) Liquid Chlorine

AWWA C203 (2008) Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot-Applied

AWWA C606 (2011) Grooved and Shouldered Joints

AWWA C651 (2005; Errata 2005) Standard for Disinfecting Water Mains

AWWA C652	(2011) Disinfection of Water-Storage Facilities
AMERICAN WELDING SOCIETY (AWS)	
AWS A5.8/A5.8M	(2011; Amendment 2012) Specification for Filler Metals for Brazing and Braze Welding
AWS B2.2/B2.2M	(2010) Specification for Brazing Procedure and Performance Qualification
ASME INTERNATIONAL (ASME)	
ASME A112.14.1	(2003; R 2012) Backwater Valves
ASME A112.19.2M	(2003) Standard for Vitreous China Plumbing Fixtures and Hydraulic Requirements for Water Closets and Urinals
ASME A112.19.5	(2011) Trim for Water-Closet Bowls, Tanks and Urinals
ASME A112.36.2M	(1991; R 2012) Cleanouts
ASME A112.6.1M	(1997; R 2012) Floor Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use
ASME A112.6.3	(2001; R 2007) Standard for Floor and Trench Drains
ASME B1.20.1	(1983; R 2006) Pipe Threads, General Purpose (Inch)
ASME B16.12	(2009) Cast Iron Threaded Drainage Fittings
ASME B16.15	(2011; INT thru June 2011) Cast Copper Alloy Threaded Fittings Classes 125 and 250
ASME B16.18	(2012) Cast Copper Alloy Solder Joint Pressure Fittings
ASME B16.21	(2011) Nonmetallic Flat Gaskets for Pipe Flanges
ASME B16.22	(2012) Standard for Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
ASME B16.23	(2011) Cast Copper Alloy Solder Joint Drainage Fittings - DWV
ASME B16.24	(2011) Cast Copper Alloy Pipe Flanges and Flanged Fittings: Classes 150, 300, 600, 900, 1500, and 2500
ASME B16.29	(2012) Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV

ASME B16.3	(2011) Malleable Iron Threaded Fittings, Classes 150 and 300
ASME B16.34	(2013) Valves - Flanged, Threaded and Welding End
ASME B16.39	(2009) Standard for Malleable Iron Threaded Pipe Unions; Classes 150, 250, and 300
ASME B16.4	(2011) Standard for Gray Iron Threaded Fittings; Classes 125 and 250
ASME B16.5	(2009) Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24 Metric/Inch Standard
ASME B16.50	(2001; R 2008) Wrought Copper and Copper Alloy Braze-Joint Pressure Fittings
ASME B31.1	(2012; INT 2-6, 8-10, 13, 15, 17-25, 27-31 and 42-46) Power Piping
ASME B31.5	(2010) Refrigeration Piping and Heat Transfer Components
ASME BPVC SEC IV	(2010) BPVC Section IV-Rules for Construction of Heating Boilers
ASME BPVC SEC IX	(2010) BPVC Section IX-Welding and Brazing Qualifications
ASME CSD-1	(2012) Control and Safety Devices for Automatically Fired Boilers

ASTM INTERNATIONAL (ASTM)

ASTM A105/A105M	(2012) Standard Specification for Carbon Steel Forgings for Piping Applications
ASTM A183	(2003; R 2009) Standard Specification for Carbon Steel Track Bolts and Nuts
ASTM A193/A193M	(2012a) Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service and Other Special Purpose Applications
ASTM A47/A47M	(1999; R 2009) Standard Specification for Ferritic Malleable Iron Castings
ASTM A515/A515M	(2010) Standard Specification for Pressure Vessel Plates, Carbon Steel, for Intermediate- and Higher-Temperature Service
ASTM A516/A516M	(2010) Standard Specification for Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service

ASTM A518/A518M	(1999; R 2012) Standard Specification for Corrosion-Resistant High-Silicon Iron Castings
ASTM A53/A53M	(2012) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A536	(1984; R 2009) Standard Specification for Ductile Iron Castings
ASTM A733	(2003; E 2009; R 2009) Standard Specification for Welded and Seamless Carbon Steel and Austenitic Stainless Steel Pipe Nipples
ASTM A74	(2009) Standard Specification for Cast Iron Soil Pipe and Fittings
ASTM A888	(2011) Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications
ASTM B152/B152M	(2013) Standard Specification for Copper Sheet, Strip, Plate, and Rolled Bar
ASTM B306	(2009) Standard Specification for Copper Drainage Tube (DWV)
ASTM B32	(2008) Standard Specification for Solder Metal
ASTM B370	(2012) Standard Specification for Copper Sheet and Strip for Building Construction
ASTM B42	(2010) Standard Specification for Seamless Copper Pipe, Standard Sizes
ASTM B43	(2009) Standard Specification for Seamless Red Brass Pipe, Standard Sizes
ASTM B584	(2012a) Standard Specification for Copper Alloy Sand Castings for General Applications
ASTM B75/B75M	(2011) Standard Specification for Seamless Copper Tube
ASTM B813	(2010) Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube
ASTM B828	(2002; R 2010) Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings

ASTM B88	(2009) Standard Specification for Seamless Copper Water Tube
ASTM B88M	(2005; R 2011) Standard Specification for Seamless Copper Water Tube (Metric)
ASTM C1053	(2000; R 2010) Standard Specification for Borosilicate Glass Pipe and Fittings for Drain, Waste, and Vent (DWV) Applications
ASTM C564	(2012) Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings
ASTM C920	(2011) Standard Specification for Elastomeric Joint Sealants
ASTM D1785	(2012) Standard Specification for Poly(Vinyl Chloride) (PVC), Plastic Pipe, Schedules 40, 80, and 120
ASTM D2000	(2012) Standard Classification System for Rubber Products in Automotive Applications
ASTM D2235	(2004; R 2011) Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings
ASTM D2239	(2012) Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter
ASTM D2241	(2009) Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
ASTM D2464	(2006) Standard Specification for Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D2466	(2006) Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
ASTM D2467	(2013) Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D2564	(2012) Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems
ASTM D2657	(2007) Heat Fusion Joining Polyolefin Pipe and Fittings
ASTM D2661	(2011) Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS)

	Schedule 40, Plastic Drain, Waste, and Vent Pipe and Fittings
ASTM D2665	(2012) Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings
ASTM D2672	(1996a; R 2009) Joints for IPS PVC Pipe Using Solvent Cement
ASTM D2683	(2010) Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing
ASTM D2737	(2012a) Polyethylene (PE) Plastic Tubing
ASTM D2846/D2846M	(2009; E 2011) Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems
ASTM D2855	(1996; R 2010) Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings
ASTM D2996	(2001; E 2007; R 2007) Filament-Wound "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe
ASTM D3035	(2012; E 2012) Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter
ASTM D3122	(1995; R 2009) Solvent Cements for Styrene-Rubber (SR) Plastic Pipe and Fittings
ASTM D3138	(2004; R 2011) Solvent Cements for Transition Joints Between Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Non-Pressure Piping Components
ASTM D3139	(1998; R 2011) Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM D3212	(2007; R 2013) Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D3261	(2012) Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
ASTM D3311	(2011) Drain, Waste, and Vent (DWV) Plastic Fittings Patterns
ASTM D4101	(2011) Standard Specification for Polypropylene Injection and Extrusion Materials

ASTM F1290	(1998a; R 2011) Electrofusion Joining Polyolefin Pipe and Fittings
ASTM F1760	(2001; R 2011) Coextruded Poly(Vinyl Chloride) (PVC) Non-Pressure Plastic Pipe Having Reprocessed-Recycled Content
ASTM F2389	(2010) Standard Specification for Pressure-rated Polypropylene (PP) Piping Systems
ASTM F437	(2009) Standard Specification for Threaded Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80
ASTM F438	(2009) Standard Specification for Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40
ASTM F439	(2012) Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80
ASTM F441/F441M	(2012) Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80
ASTM F442/F442M	(2012) Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR)
ASTM F477	(2010) Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F493	(2010) Solvent Cements for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings
ASTM F628	(2012) Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe with a Cellular Core
ASTM F877	(2011a) Crosslinked Polyethylene (PEX) Plastic Hot- and Cold-Water Distribution Systems
ASTM F891	(2010) Coextruded Poly (Vinyl Chloride) (PVC) Plastic Pipe with a Cellular Core

CAST IRON SOIL PIPE INSTITUTE (CISPI)

CISPI 301	(2009) Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications
CISPI 310	(2011) Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for

Sanitary and Storm Drain, Waste, and Vent
Piping Applications

COPPER DEVELOPMENT ASSOCIATION (CDA)

CDA A4015 (1994; R 1995) Copper Tube Handbook

INTERNATIONAL ASSOCIATION OF PLUMBING AND MECHANICAL OFFICIALS
(IAPMO)

IAPMO PS 117 (2005b) Press Type Or Plain End Rub Gasketed
W/ Nail CU & CU Alloy Fittings 4 Install On
CU Tubing

INTERNATIONAL CODE COUNCIL (ICC)

ICC A117.1 (2009) Accessible and Usable Buildings and
Facilities

ICC IPC (2009) International Plumbing Code

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS
INDUSTRY (MSS)

MSS SP-110 (2010) Ball Valves Threaded, Socket-Welding,
Solder Joint, Grooved and Flared Ends

MSS SP-25 (2008) Standard Marking System for Valves,
Fittings, Flanges and Unions

MSS SP-44 (2010; Errata 2011) Steel Pipeline Flanges

MSS SP-58 (2009) Pipe Hangers and Supports - Materials,
Design and Manufacture, Selection,
Application, and Installation

MSS SP-67 (2011) Butterfly Valves

MSS SP-69 (2003; Notice 2012) Pipe Hangers and Supports
- Selection and Application (ANSI Approved
American National Standard)

MSS SP-70 (2011) Gray Iron Gate Valves, Flanged and
Threaded Ends

MSS SP-71 (2011; Errata 2013) Gray Iron Swing Check
Valves, Flanged and Threaded Ends

MSS SP-72 (2010a) Ball Valves with Flanged or Butt-
Welding Ends for General Service

MSS SP-78 (2011) Cast Iron Plug Valves, Flanged and
Threaded Ends

MSS SP-80 (2008; Errata 2012) Bronze Gate, Globe, Angle
and Check Valves

- MSS SP-83** (2006) Class 3000 Steel Pipe Unions Socket Welding and Threaded
- MSS SP-85** (2011) Gray Iron Globe & Angle Valves Flanged and Threaded Ends
- NACE INTERNATIONAL (NACE)
- NACE SP0169** (1992; R 2007) Control of External Corrosion on Underground or Submerged Metallic Piping Systems
- NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
- NFPA 90A** (2012) Standard for the Installation of Air Conditioning and Ventilating Systems
- NSF INTERNATIONAL (NSF)
- NSF 372** (2011) Drinking Water System Components - Lead Content
- NSF/ANSI 14** (2012) Plastics Piping System Components and Related Materials
- NSF/ANSI 61** (2012; Errata 1013) Drinking Water System Components - Health Effects
- PLASTIC PIPE AND FITTINGS ASSOCIATION (PPFA)
- PPFA Fire Man** (2010) Firestopping: Plastic Pipe in Fire Resistive Construction
- PLUMBING AND DRAINAGE INSTITUTE (PDI)
- PDI WH 201** (2010) Water Hammer Arresters Standard
- SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)
- SAE J1508** (2009) Hose Clamp Specifications
- U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)
- PL 93-523** (1974; A 1999) Safe Drinking Water Act
- U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)
- 40 CFR 141.80** National Primary Drinking Water Regulations; Control of Lead and Copper; General Requirements
- PL 109-58** Energy Policy Act of 2005 (EPAct05)

1.2 SUBMITTALS

[SD-02 Shop Drawings](#)

Plumbing System

Detail drawings consisting of schedules, performance charts, instructions, diagrams, and other information to illustrate the requirements and operations of systems that are not covered by the Plumbing Code. Detail drawings for the complete plumbing system including piping layouts and locations of connections; dimensions for roughing-in, foundation, and support points; schematic diagrams and wiring diagrams or connection and interconnection diagrams. Detail drawings shall indicate clearances required for maintenance and operation. Where piping and equipment are to be supported other than as indicated, details shall include loadings and proposed support methods. Mechanical drawing plans, elevations, views, and details, shall be drawn to scale.

SD-03 Product Data

Fixtures;

List of installed fixtures with manufacturer, model, and flow rate.

Flush valve water closets

Flush valve urinals

Countertop lavatories

Welding

A copy of qualified procedures and a list of names and identification symbols of qualified welders and welding operators.

Plumbing System

Diagrams, instructions, and other sheets proposed for posting. Manufacturer's recommendations for the installation of bell and spigot and hubless joints for cast iron soil pipe.

SD-06 Test Reports

Tests, Flushing and Disinfection

Test reports in booklet form showing all field tests performed to adjust each component and all field tests performed to prove compliance with the specified performance criteria, completion and testing of the installed system. Each test report shall indicate the final position of controls.

SD-07 Certificates

Materials and Equipment

Where equipment is specified to conform to requirements of the ASME Boiler and Pressure Vessel Code, the design, fabrication, and installation shall conform to the code.

Bolts

Written certification by the bolt manufacturer that the bolts furnished comply with the specified requirements.

SD-10 Operation and Maintenance Data

Plumbing System

1.3 STANDARD PRODUCTS

Specified **materials and equipment** shall be standard products of a manufacturer regularly engaged in the manufacture of such products. Specified equipment shall essentially duplicate equipment that has performed satisfactorily at least two years prior to bid opening. Standard products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year use shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2 year period.

1.3.1 Alternative Qualifications

Products having less than a two-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturer's factory or laboratory tests, can be shown.

1.3.2 Service Support

The equipment items shall be supported by service organizations. Submit a certified list of qualified permanent service organizations for support of the equipment which includes their addresses and qualifications. These service organizations shall be reasonably convenient to the equipment installation and able to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

1.3.3 Manufacturer's Nameplate

Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

1.3.4 Modification of References

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction", or words of similar meaning, to mean the Contracting Officer.

1.3.4.1 Definitions

For the International Code Council (ICC) Codes referenced in the contract documents, advisory provisions shall be considered mandatory, the word

"should" shall be interpreted as "shall." Reference to the "code official" shall be interpreted to mean the "Contracting Officer." For Navy owned property, references to the "owner" shall be interpreted to mean the "Contracting Officer." For leased facilities, references to the "owner" shall be interpreted to mean the "lessor." References to the "permit holder" shall be interpreted to mean the "Contractor."

1.3.4.2 Administrative Interpretations

For ICC Codes referenced in the contract documents, the provisions of Chapter 1, "Administrator," do not apply. These administrative requirements are covered by the applicable Federal Acquisition Regulations (FAR) included in this contract and by the authority granted to the Officer in Charge of Construction to administer the construction of this project. References in the ICC Codes to sections of Chapter 1, shall be applied appropriately by the Contracting Officer as authorized by his administrative cognizance and the FAR.

1.4 DELIVERY, STORAGE, AND HANDLING

Handle, store, and protect equipment and materials to prevent damage before and during installation in accordance with the manufacturer's recommendations, and as approved by the Contracting Officer. Replace damaged or defective items.

1.5 PERFORMANCE REQUIREMENTS

1.5.1 Welding

Piping shall be welded in accordance with qualified procedures using performance-qualified welders and welding operators. Procedures and welders shall be qualified in accordance with ASME BPVC SEC IX. Welding procedures qualified by others, and welders and welding operators qualified by another employer, may be accepted as permitted by ASME B31.1. The Contracting Officer shall be notified 24 hours in advance of tests, and the tests shall be performed at the work site if practicable. Welders or welding operators shall apply their assigned symbols near each weld they make as a permanent record.

1.6 REGULATORY REQUIREMENTS

Unless otherwise required herein, plumbing work shall be in accordance with ICC IPC. Energy consuming products and systems shall be in accordance with PL 109-58 and ASHRAE 90.1 - IP

1.7 PROJECT/SITE CONDITIONS

The Contractor shall become familiar with details of the work, verify dimensions in the field, and advise the Contracting Officer of any discrepancy before performing any work.

1.8 ACCESSIBILITY OF EQUIPMENT

Install all work so that parts requiring periodic inspection, operation, maintenance, and repair are readily accessible. Install concealed valves, expansion joints, controls, dampers, and equipment requiring access, in locations freely accessible through access doors.

PART 2 PRODUCTS

2.1 MATERIALS

Pipe schedules shall be selected based on service requirements. Pipe fittings shall be compatible with the applicable pipe materials. Plastic pipe, fittings, and solvent cement shall meet [NSF/ANSI 14](#) and shall be NSF listed for the service intended. Plastic pipe, fittings, and solvent cement used for potable hot and cold water service shall bear the NSF seal "NSF-PW." Polypropylene pipe and fittings shall conform to dimensional requirements of Schedule 40, Iron Pipe size and shall comply with [NSF/ANSI 14](#), [NSF/ANSI 61](#) and [ASTM F2389](#). Polypropylene piping that will be exposed to UV light shall be provided with a Factory applied UV resistant coating. Pipe threads (except dry seal) shall conform to [ASME B1.20.1](#). Grooved pipe couplings and fittings shall be from the same manufacturer. Material or equipment containing a weighted average of greater than 0.25 percent lead shall not be used in any potable water system intended for human consumption, and shall be certified in accordance with [NSF/ANSI 61](#), Annex G or [NSF 372](#). In line devices such as water meters, building valves, check valves, meter stops, valves, fittings and back flow preventers shall comply with [PL 93-523](#) and [NSF/ANSI 61](#), Section 8. End point devices such as drinking water fountains, lavatory faucets, kitchen and bar faucets, residential ice makers, supply stops and end point control valves used to dispense water for drinking must meet the requirements of [NSF/ANSI 61](#), Section 9. Hubless cast-iron soil pipe shall not be installed underground, under concrete floor slabs, or in crawl spaces below kitchen floors. Plastic pipe shall not be installed in air plenums. Plastic pipe shall not be installed in a pressure piping system in buildings greater than three stories including any basement levels.

2.1.1 Pipe Joint Materials

Grooved pipe and hubless cast-iron soil pipe shall not be used under ground. Solder containing lead shall not be used with copper pipe. Cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Institute. Joints and gasket materials shall conform to the following:

- a. Coupling for Cast-Iron Pipe: for hub and spigot type [ASTM A74](#), [AWWA C606](#). For hubless type: [CISPI 310](#)
- b. Coupling for Steel Pipe: [AWWA C606](#).
- c. Couplings for Grooved Pipe: Ductile Iron [ASTM A536](#) (Grade 65-45-12) Malleable Iron [ASTM A47/A47M](#), Grade 32510. Copper [ASTM A536](#).
- d. Flange Gaskets: Gaskets shall be made of non-asbestos material in accordance with [ASME B16.21](#). Gaskets shall be flat, 1/16 inch thick, and contain Aramid fibers bonded with Styrene Butadiene Rubber (SBR) or Nitro Butadiene Rubber (NBR). Gaskets shall be the full face or self centering flat ring type. Gaskets used for hydrocarbon service shall be bonded with NBR.
- e. Brazing Material: Brazing material shall conform to [AWS A5.8/A5.8M](#), BCuP-5.

- f. Brazing Flux: Flux shall be in paste or liquid form appropriate for use with brazing material. Flux shall be as follows: lead-free; have a 100 percent flushable residue; contain slightly acidic reagents; contain potassium borides; and contain fluorides.
- g. Solder Material: Solder metal shall conform to [ASTM B32](#).
- h. Solder Flux: Flux shall be liquid form, non-corrosive, and conform to [ASTM B813](#), Standard Test 1.
- i. PTFE Tape: PTFE Tape, for use with Threaded Metal or Plastic Pipe.
- j. Rubber Gaskets for Cast-Iron Soil-Pipe and Fittings (hub and spigot type and hubless type): [ASTM C564](#).
- k. Rubber Gaskets for Grooved Pipe: [ASTM D2000](#), maximum temperature 230 degrees F.
- l. Flexible Elastomeric Seals: [ASTM D3139](#), [ASTM D3212](#) or [ASTM F477](#).
- m. Bolts and Nuts for Grooved Pipe Couplings: Heat-treated carbon steel, [ASTM A183](#).
- n. Solvent Cement for Transition Joints between ABS and PVC Nonpressure Piping Components: [ASTM D3138](#).
- o. Plastic Solvent Cement for ABS Plastic Pipe: [ASTM D2235](#).
- p. Plastic Solvent Cement for PVC Plastic Pipe: [ASTM D2564](#) and [ASTM D2855](#).
- q. Plastic Solvent Cement for CPVC Plastic Pipe: [ASTM F493](#).
- r. Flanged fittings including flanges, bolts, nuts, bolt patterns, etc., shall be in accordance with [ASME B16.5](#) class 150 and shall have the manufacturer's trademark affixed in accordance with [MSS SP-25](#). Flange material shall conform to [ASTM A105/A105M](#). Blind flange material shall conform to [ASTM A516/A516M](#) cold service and [ASTM A515/A515M](#) for hot service. Bolts shall be high strength or intermediate strength with material conforming to [ASTM A193/A193M](#).
- s. Plastic Solvent Cement for Styrene Rubber Plastic Pipe: [ASTM D3122](#).
- t. Press fittings for Copper Pipe and Tube: Copper press fittings shall conform to the material and sizing requirements of [ASME B16.18](#) or [ASME B16.22](#) and performance criteria of [IAPMO PS 117](#). Sealing elements for copper press fittings shall be EPDM, FKM or HNBR. Sealing elements shall be factory installed or an alternative supplied fitting manufacturer. Sealing element shall be selected based on manufacturer's approved application guidelines.
- u. Copper tubing shall conform to [ASTM B88](#), Type K, L or M.
- v. Heat-fusion joints for polypropylene piping: [ASTM F2389](#).

2.1.2 Miscellaneous Materials

Miscellaneous materials shall conform to the following:

- a. Water Hammer Arrestor: PDI WH 201. Water hammer arrester shall be piston type.
- b. Copper, Sheet and Strip for Building Construction: ASTM B370.
- d. Hose Clamps: SAE J1508.
- e. Supports for Off-The-Floor Plumbing Fixtures: ASME A112.6.1M.
- f. Metallic Cleanouts: ASME A112.36.2M.
- g. Plumbing Fixture Setting Compound: A preformed flexible ring seal molded from hydrocarbon wax material. The seal material shall be nonvolatile nonasphaltic and contain germicide and provide watertight, gastight, odorproof and verminproof properties.
- i. Hypochlorites: AWWA B300.
- j. Liquid Chlorine: AWWA B301.

2.2 PIPE HANGERS, INSERTS, AND SUPPORTS

Pipe hangers, inserts, and supports shall conform to MSS SP-58 and MSS SP-69.

2.3 VALVES

Valves shall be provided on supplies to equipment and fixtures. Valves 2-1/2 inches and smaller shall be bronze with threaded bodies for pipe and solder-type connections for tubing. Valves 3 inches and larger shall have flanged iron bodies and bronze trim. Pressure ratings shall be based upon the application. Grooved end valves may be provided if the manufacturer certifies that the valves meet the performance requirements of applicable MSS standard. Valves shall conform to the following standards:

Description	Standard
Butterfly Valves	MSS SP-67
Cast-Iron Gate Valves, Flanged and Threaded Ends	MSS SP-70
Cast-Iron Swing Check Valves, Flanged and Threaded Ends	MSS SP-71
Ball Valves with Flanged Butt-Welding Ends for General Service	MSS SP-72
Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends	MSS SP-110

Cast-Iron Plug Valves, Flanged and Threaded Ends	MSS SP-78
Bronze Gate, Globe, Angle, and Check Valves	MSS SP-80
Steel Valves, Socket Welding and Threaded Ends	ASME B16.34
Cast-Iron Globe and Angle Valves, Flanged and Threaded Ends	MSS SP-85
Backwater Valves	ASME A112.14.1
Vacuum Relief Valves	ANSI Z21.22/CSA 4.4
Water Pressure Reducing Valves	ASSE 1003
Water Heater Drain Valves	ASME BPVC SEC IV, Part HLW-810: Requirements for Potable-Water Heaters Bottom Drain Valve
Trap Seal Primer Valves	ASSE 1018
Temperature and Pressure Relief Valves for Hot Water Supply Systems	ANSI Z21.22/CSA 4.4
Temperature and Pressure Relief Valves for Automatically Fired Hot Water Boilers	ASME CSD-1 Safety Code No., Part CW, Article 5

2.3.1 Backwater Valves

Backwater valves shall be either separate from the floor drain or a combination floor drain, P-trap, and backwater valve, as shown. Valves shall have cast-iron bodies with cleanouts large enough to permit removal of interior parts. Valves shall be of the flap type, hinged or pivoted, with revolving disks. Hinge pivots, disks, and seats shall be nonferrous metal. Disks shall be slightly open in a no-flow no-backwater condition. Cleanouts shall extend to finished floor and be fitted with threaded countersunk plugs.

2.3.2 Wall Faucets

Wall faucets with vacuum-breaker backflow preventer shall be brass with 3/4 inch male inlet threads, hexagon shoulder, and 3/4 inch hose connection. Faucet handle shall be securely attached to stem.

2.3.3 Thermostatic Mixing Valves

Provide thermostatic mixing valve for lavatory faucets. Mixing valves, thermostatic type, pressure-balanced or combination thermostatic and pressure-balanced shall be line size and shall be constructed with rough or finish bodies either with or without plating. Each valve shall be constructed to control the mixing of hot and cold water and to deliver water at a desired temperature regardless of pressure or input temperature changes. The control element shall be of an approved type. The body shall be of heavy cast bronze, and interior parts shall be brass, bronze, corrosion-resisting steel or copper. The valve shall be equipped with necessary stops, check valves, unions, and sediment strainers on the inlets. Mixing valves shall maintain water temperature within 5 degrees F of any setting.

2.4 FIXTURES

Fixtures shall be water conservation type, in accordance with ICC IPC. Fixtures for use by the physically handicapped shall be in accordance with ICC A117.1. Vitreous China, nonabsorbent, hard-burned, and vitrified throughout the body shall be provided. No fixture will be accepted that shows cracks, crazes, blisters, thin spots, or other flaws. Fixtures shall be equipped with appurtenances such as traps, faucets, stop valves, and drain fittings. Each fixture and piece of equipment requiring connections to the drainage system, except grease interceptors, shall be equipped with a trap. Brass expansion or toggle bolts capped with acorn nuts shall be provided for supports, and polished chromium-plated pipe, valves, and fittings shall be provided where exposed to view. Fixtures with the supply discharge below the rim shall be equipped with backflow preventers. Internal parts of flush and/or flushometer valves.

2.4.1 Automatic Controls

Flushing and faucet systems shall consist of solenoid-activated valves with light beam sensors. Flush valve for water closet shall include an override pushbutton. Flushing devices shall be provided as described in the Project Description 01 01 90.00 80.

2.4.2 Flush Valve Water Closets

ASME A112.19.2M, white vitreous china, siphon jet, elongated bowl, wall mounted, wall outlet. Top of toilet seat height above floor shall be 14 to 15 inches, except 17 to 19 inches for wheelchair water closets. Provide wax bowl ring including plastic sleeve. Provide white solid plastic elongated open-front seat.

Provide large diameter flush valve including angle control-stop valve, vacuum breaker, tail pieces, slip nuts, and wall plates; exposed to view components shall be chromium-plated or polished stainless steel. Flush valves shall be nonhold-open type. Mount flush valves not less than 11 inches above the fixture. Mounted height of flush valve shall not interfere with the hand rail in ADA stalls. Provide solenoid-activated flush valves including electrical-operated light-beam-sensor to energize the solenoid.

2.4.3 Flush Valve Urinals

ASME A112.19.2M white vitreous china, wall-mounted, siphon jet, integral trap, and extended side shields. Provide urinal with the rim 17 inches above the floor. Provide urinal with the rim 24 inches above the floor. Water flushing volume of the urinal and flush valve combination shall not exceed 0.125 gallons per flush. Provide ASME A112.6.1M concealed chair carriers with vertical steel pipe supports. Provide large diameter flush valve including angle control-stop valve, vacuum breaker, tail pieces, slip nuts, and wall plates; exposed to view components shall be chromium-plated or polished stainless steel. Flush valves shall be nonhold-open type. Mount flush valves not less than 11 inches above the fixture. Provide solenoid-activated flush valves including electrical-operated light-beam-sensor to energize the solenoid.

2.4.4 Wheelchair Flush Valve Type Urinals

ASME A112.19.2M, white vitreous china, ,wall-mounted, wall outlet, blowout action, integral trap, elongated projecting bowl, 20 inches long from wall to front of flare, and ASME A112.19.5 trim. The water flushing volume of the flush valve and urinal combination shall not exceed 0.125 gallon per flush. Furnish urinal manufacturer's certification of conformance. Provide ASME A112.6.1M concealed chair carriers. Mount urinal with front rim a maximum of 17 inches above floor and flush valve handle a maximum of 44 inches above floor for use by handicapped on wheelchair. Provide solenoid-activated flush valves including electrical-operated light-beam-sensor to energize the solenoid.

2.4.5 Countertop Lavatories

ASME A112.19.2M, white vitreous china, self-rimming, minimum dimensions of 19 inches wide by 17 inches front to rear, with supply openings for use with top mounted centerset faucets. Furnish template and mounting kit by lavatory manufacturer. Provide aerator with faucet. Water flow rate shall not exceed 0.5 gpm when measured at a flowing water pressure of 60 psi. Mount counter with the top surface 34 inches above floor and with 29 inches minimum clearance from bottom of the counter face to floor. Provide top-mounted solenoid-activated lavatory faucets including electrical-operated light-beam-sensor to energize the solenoid.

2.5 DRAINS

Provide trap primers.

2.5.1 Floor Drains

Floor drains shall consist of a galvanized body, integral seepage pan, and adjustable perforated or slotted chromium-plated bronze, nickel-bronze, or nickel-brass strainer, consisting of grate and threaded collar. Floor drains shall be cast iron except where metallic waterproofing membrane is installed. Drains shall be of double drainage pattern for embedding in the floor construction. The seepage pan shall have weep holes or channels for drainage to the drainpipe. The strainer shall be adjustable to floor thickness. A clamping device for attaching flashing or waterproofing membrane to the seepage pan without damaging the flashing or waterproofing membrane shall be provided when required. Drains shall be provided with

threaded connection. Between the drain outlet and waste pipe, a neoprene rubber gasket conforming to ASTM C564 may be installed, provided that the drain is specifically designed for the rubber gasket compression type joint. Floor and shower drains shall conform to ASME A112.6.3. Provide drain with trap primer connection, trap primer, and connection piping.

2.5.2 Area Drains

Area drains shall be plain pattern with polished stainless steel perforated or slotted grate and bottom outlet. The drain shall be circular or square with a 12 inch nominal overall width or diameter and 10 inch nominal overall depth. Drains shall be cast iron with manufacturer's standard coating. Grate shall be easily lifted out for cleaning. Outlet shall be suitable for inside caulked connection to drain pipe. Drains shall conform to ASME A112.6.3.

2.6 TRAPS

Unless otherwise specified, traps shall be copper-alloy adjustable tube type with slip joint inlet and swivel. Tubes shall be copper alloy with walls not less than 0.032 inch thick within commercial tolerances, except on the outside of bends where the thickness may be reduced slightly in manufacture by usual commercial methods. Inlets shall have rubber washer and copper alloy nuts for slip joints above the discharge level. Swivel joints shall be below the discharge level and shall be of metal-to-metal or metal-to-plastic type as required for the application. Nuts shall have flats for wrench grip. Outlets shall have internal pipe thread, except that when required for the application, the outlets shall have sockets for solder-joint connections. The depth of the water seal shall be not less than 2 inches. The interior diameter shall be not more than 1/8 inch over or under the nominal size, and interior surfaces shall be reasonably smooth throughout. A copper alloy "P" trap assembly consisting of an adjustable "P" trap and threaded trap wall nipple with cast brass wall flange shall be provided for lavatories. The assembly shall be a standard manufactured unit and may have a rubber-gasketed swivel joint.

2.7 MISCELLANEOUS PIPING ITEMS

2.7.1 Escutcheon Plates

Provide one piece or split hinge metal plates for piping entering floors, walls, and ceilings in exposed spaces. Provide chromium-plated on copper alloy plates or polished stainless steel finish in finished spaces. Provide paint finish on plates in unfinished spaces.

2.7.2 Pipe Sleeves

Provide where piping passes entirely through walls, ceilings, roofs, and floors. Sleeves are not required where supply drain, waste, and vent (DWV) piping passes through concrete floor slabs located on grade, except where penetrating a membrane waterproof floor.

2.7.2.1 Sleeves in Masonry and Concrete

Provide steel pipe sleeves or schedule 40 PVC plastic pipe sleeves. Sleeves are not required where drain, waste, and vent (DWV) piping passes through concrete floor slabs located on grade. Core drilling of masonry and

concrete may be provided in lieu of pipe sleeves when cavities in the core-drilled hole are completely grouted smooth.

2.7.2.2 Sleeves Not in Masonry and Concrete

Provide 26 gage galvanized steel sheet or PVC plastic pipe sleeves.

2.7.3 Pipe Hangers (Supports)

Provide **MSS SP-58** and **MSS SP-69**, Type 1 with adjustable type steel support rods, except as specified or indicated otherwise. Attach to steel joists with Type 19 or 23 clamps and retaining straps. Attach to Steel W or S beams with Type 21, 28, 29, or 30 clamps. Attach to steel angles and vertical web steel channels with Type 20 clamp with beam clamp channel adapter. Attach to horizontal web steel channel and wood with drilled hole on centerline and double nut and washer. Attach to concrete with Type 18 insert or drilled expansion anchor. Provide Type 40 insulation protection shield for insulated piping.

2.7.4 Nameplates

Provide **0.125 inch** thick melamine laminated plastic nameplates, black matte finish with white center core, for equipment, gages, thermometers, and valves; valves in supplies to faucets will not require nameplates. Accurately align lettering and engrave minimum of **0.25 inch** high normal block lettering into the white core. Minimum size of nameplates shall be **1.0 by 2.5 inches**. Key nameplates to a chart and schedule for each system. Frame charts and schedules under glass and place where directed near each system. Furnish two copies of each chart and schedule.

2.7.5 Labels

Provide labels for sensor operators at flush valves and faucets. Include the following information on each label:

- a. Identification of the sensor and its operation with graphic or written description.
- b. Range of the sensor.
- c. Battery replacement schedule, if required.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

Piping located in air plenums shall conform to **NFPA 90A** requirements. Piping located in shafts that constitute air ducts or that enclose air ducts shall be noncombustible in accordance with **NFPA 90A**. Installation of plastic pipe where in compliance with NFPA may be installed in accordance with **PPFA Fire Man**. The plumbing system shall be installed complete with necessary fixtures, fittings, traps, valves, and accessories. Water and drainage piping shall be extended **5 feet** outside the building, unless otherwise indicated. A [gate valve] [full port ball valve] [ball valve] and drain shall be installed on the water service line inside the building approximately **6 inches** above the floor from point of entry. Piping shall be connected to the exterior service lines or capped or plugged if the exterior

service is not in place. Sewer and water pipes shall be laid in separate trenches, except when otherwise shown. Exterior underground utilities shall be at least 12 inches below the [average local frost depth] [finish grade] or as indicated on the drawings. If trenches are closed or the pipes are otherwise covered before being connected to the service lines, the location of the end of each plumbing utility shall be marked with a stake or other acceptable means. Valves shall be installed with control no lower than the valve body.

3.1.1 Water Pipe, Fittings, and Connections

3.1.1.1 Utilities

The piping shall be extended to fixtures, outlets, and equipment. The hot-water and cold-water piping system shall be arranged and installed to permit draining. The supply line to each item of equipment or fixture, except faucets, flush valves, or other control valves which are supplied with integral stops, shall be equipped with a shutoff valve to enable isolation of the item for repair and maintenance without interfering with operation of other equipment or fixtures. Supply piping to fixtures, faucets, hydrants, shower heads, and flushing devices shall be anchored to prevent movement.

3.1.1.2 Cutting and Repairing

The work shall be carefully laid out in advance, and unnecessary cutting of construction shall be avoided. Damage to building, piping, wiring, or equipment as a result of cutting shall be repaired by mechanics skilled in the trade involved.

3.1.1.3 Protection of Fixtures, Materials, and Equipment

Pipe openings shall be closed with caps or plugs during installation. Fixtures and equipment shall be tightly covered and protected against dirt, water, chemicals, and mechanical injury. Upon completion of the work, the fixtures, materials, and equipment shall be thoroughly cleaned, adjusted, and operated. Safety guards shall be provided for exposed rotating equipment.

3.1.1.4 Mains, Branches, and Runouts

Piping shall be installed as indicated. Pipe shall be accurately cut and worked into place without springing or forcing. Structural portions of the building shall not be weakened. Aboveground piping shall run parallel with the lines of the building, unless otherwise indicated. Branch pipes from service lines may be taken from top, bottom, or side of main, using crossover fittings required by structural or installation conditions. Supply pipes, valves, and fittings shall be kept a sufficient distance from other work and other services to permit not less than 1/2 inch between finished covering on the different services. Bare and insulated water lines shall not bear directly against building structural elements so as to transmit sound to the structure or to prevent flexible movement of the lines. Water pipe shall not be buried in or under floors unless specifically indicated or approved. Changes in pipe sizes shall be made with reducing fittings. Use of bushings will not be permitted except for use in situations in which standard factory fabricated components are furnished to accommodate specific accepted installation practice. Change in direction shall be made with fittings, except that bending of pipe 4 inches

and smaller will be permitted, provided a pipe bender is used and wide sweep bends are formed. The center-line radius of bends shall be not less than six diameters of the pipe. Bent pipe showing kinks, wrinkles, flattening, or other malformations will not be acceptable.

3.1.1.5 Pipe Drains

Pipe drains indicated shall consist of 3/4 inch hose bibb with renewable seat and [gate] [full port ball] [ball] valve ahead of hose bibb. At other low points, 3/4 inch brass plugs or caps shall be provided. Disconnection of the supply piping at the fixture is an acceptable drain.

3.1.1.6 Expansion and Contraction of Piping

Allowance shall be made throughout for expansion and contraction of water pipe. Each hot-water and hot-water circulation riser shall have expansion loops or other provisions such as offsets, changes in direction, etc., where indicated and/or required. Risers shall be securely anchored as required or where indicated to force expansion to loops. Branch connections from risers shall be made with ample swing or offset to avoid undue strain on fittings or short pipe lengths. Horizontal runs of pipe over 50 feet in length shall be anchored to the wall or the supporting construction about midway on the run to force expansion, evenly divided, toward the ends. Sufficient flexibility shall be provided on branch runouts from mains and risers to provide for expansion and contraction of piping. Flexibility shall be provided by installing one or more turns in the line so that piping will spring enough to allow for expansion without straining. If mechanical grooved pipe coupling systems are provided, the deviation from design requirements for expansion and contraction may be allowed pending approval of Contracting Officer.

3.1.1.7 Thrust Restraint

Plugs, caps, tees, valves and bends deflecting 11.25 degrees or more, either vertically or horizontally, in waterlines 4 inches in diameter or larger shall be provided with thrust blocks, where indicated, to prevent movement. Thrust blocking shall be concrete of a mix not leaner than: 1 cement, 2-1/2 sand, 5 gravel; and having a compressive strength of not less than 2000 psi after 28 days. Blocking shall be placed between solid ground and the fitting to be anchored. Unless otherwise indicated or directed, the base and thrust bearing sides of the thrust block shall be poured against undisturbed earth. The side of the thrust block not subject to thrust shall be poured against forms. The area of bearing will be as shown. Blocking shall be placed so that the joints of the fitting are accessible for repair. Steel rods and clamps, protected by galvanizing or by coating with bituminous paint, shall be used to anchor vertical down bends into gravity thrust blocks.

3.1.2 Joints

Installation of pipe and fittings shall be made in accordance with the manufacturer's recommendations. Mitering of joints for elbows and notching of straight runs of pipe for tees will not be permitted. Joints shall be made up with fittings of compatible material and made for the specific purpose intended.

3.1.2.1 Threaded

Threaded joints shall have American Standard taper pipe threads conforming to ASME B1.20.1. Only male pipe threads shall be coated with graphite or with an approved graphite compound, or with an inert filler and oil, or shall have a polytetrafluoroethylene tape applied.

3.1.2.2 Mechanical Couplings

Mechanical couplings may be used in conjunction with grooved pipe for aboveground, ferrous or non-ferrous, domestic hot and cold water systems, in lieu of unions, brazed, soldered, welded, flanged, or threaded joints.

Mechanical couplings are permitted in accessible locations including behind access plates. Flexible grooved joints will not be permitted, except as vibration isolators adjacent to mechanical equipment. Rigid grooved joints shall incorporate an angle bolt pad design which maintains metal-to-metal contact with equal amount of pad offset of housings upon installation to ensure positive rigid clamping of the pipe.

Designs which can only clamp on the bottom of the groove or which utilize gripping teeth or jaws, or which use misaligned housing bolt holes, or which require a torque wrench or torque specifications will not be permitted.

Rigid grooved pipe couplings shall be for use with grooved end pipes, fittings, valves and strainers. Rigid couplings shall be designed for not less than 125 psi service and appropriate for static head plus the pumping head, and shall provide a watertight joint.

Grooved fittings and couplings, and grooving tools shall be provided from the same manufacturer. Segmentally welded elbows shall not be used. Grooves shall be prepared in accordance with the coupling manufacturer's latest published standards. Grooving shall be performed by qualified grooving operators having demonstrated proper grooving procedures in accordance with the tool manufacturer's recommendations.

The Contracting Officer shall be notified 24 hours in advance of test to demonstrate operator's capability, and the test shall be performed at the work site, if practical, or at a site agreed upon. The operator shall demonstrate the ability to properly adjust the grooving tool, groove the pipe, and to verify the groove dimensions in accordance with the coupling manufacturer's specifications.

3.1.2.3 Unions and Flanges

Unions, flanges and mechanical couplings shall not be concealed in walls, ceilings, or partitions. Unions shall be used on pipe sizes 2-1/2 inches and smaller; flanges shall be used on pipe sizes 3 inches and larger.

3.1.2.4 Grooved Mechanical Joints

Grooves shall be prepared according to the coupling manufacturer's instructions. Grooved fittings, couplings, and grooving tools shall be products of the same manufacturer. Pipe and groove dimensions shall comply with the tolerances specified by the coupling manufacturer. The diameter of grooves made in the field shall be measured using a "go/no-go" gauge, vernier or dial caliper, narrow-land micrometer, or other method

specifically approved by the coupling manufacturer for the intended application. Groove width and dimension of groove from end of pipe shall be measured and recorded for each change in grooving tool setup to verify compliance with coupling manufacturer's tolerances. Grooved joints shall not be used in concealed locations.

3.1.2.5 Cast Iron Soil, Waste and Vent Pipe

Bell and spigot compression and hubless gasketed clamp joints for soil, waste and vent piping shall be installed per the manufacturer's recommendations.

3.1.2.6 Copper Tube and Pipe

- a. Brazed. Brazed joints shall be made in conformance with **AWS B2.2/B2.2M**, **ASME B16.50**, and **CDA A4015** with flux and are acceptable for all pipe sizes. Copper to copper joints shall include the use of copper-phosphorus or copper-phosphorus-silver brazing metal without flux. Brazing of dissimilar metals (copper to bronze or brass) shall include the use of flux with either a copper-phosphorus, copper-phosphorus-silver or a silver brazing filler metal.
- b. Soldered. Soldered joints shall be made with flux and are only acceptable for piping **2 inches** and smaller. Soldered joints shall conform to **ASME B31.5** and **CDA A4015**. Soldered joints shall not be used in compressed air piping between the air compressor and the receiver.
- c. Copper Tube Extracted Joint. Mechanically extracted joints shall be made in accordance with **ICC IPC**.
- d. Press connection. Copper press connections shall be made in **strict** accordance with the manufacturer's installation instructions for manufactured rated size. The joints shall be pressed using the tool(s) approved by the manufacturer **of that joint**. Minimum distance between fittings shall be in accordance with the manufacturer's requirements.

3.1.2.7 Plastic Pipe

Acrylonitrile-Butadiene-Styrene (ABS) pipe shall have joints made with solvent cement. PVC and CPVC pipe shall have joints made with solvent cement elastomeric, threading, (threading of Schedule 80 Pipe is allowed only where required for disconnection and inspection; threading of Schedule 40 Pipe is not allowed), or mated flanged.

3.1.2.8 Corrosive Waste Plastic Pipe

Joints for polyolefin pipe and fittings shall be made by mechanical joint or electrical fusion coil method in accordance with **ASTM D2657** and **ASTM F1290**. Joints for filament-wound reinforced thermosetting resin pipe shall be made in accordance with manufacturer's instructions. Unions or flanges shall be used where required for disconnection and inspection.

3.1.2.9 Polypropylene Pipe

Joints for polypropylene pipe and fittings shall be made by heat fusion welding socket-type or butt-fusion type fittings and shall comply with **ASTM F2389**.

3.1.2.10 Other Joint Methods

3.1.3 Dissimilar Pipe Materials

Connections between ferrous and non-ferrous copper water pipe shall be made with dielectric unions or flange waterways. Dielectric waterways shall have temperature and pressure rating equal to or greater than that specified for the connecting piping. Waterways shall have metal connections on both ends suited to match connecting piping. Dielectric waterways shall be internally lined with an insulator specifically designed to prevent current flow between dissimilar metals. Dielectric flanges shall meet the performance requirements described herein for dielectric waterways. Connecting joints between plastic and metallic pipe shall be made with transition fitting for the specific purpose.

3.1.4 Corrosion Protection for Buried Pipe and Fittings

Coatings shall be selected, applied, and inspected in accordance with NACE SP0169 and as otherwise specified. The pipe shall be cleaned and the coating system applied prior to pipe tightness testing. Joints and fittings shall be cleaned and the coating system applied after pipe tightness testing. For tape coating systems, the tape shall conform to AWWA C203 and shall be applied with a 50 percent overlap. Primer utilized with tape type coating systems shall be as recommended by the tape manufacturer.

3.1.5 Pipe Sleeves and Flashing

Pipe sleeves shall be furnished and set in their proper and permanent location.

3.1.5.1 Sleeve Requirements

Unless indicated otherwise, provide pipe sleeves meeting the following requirements:

Secure sleeves in position and location during construction. Provide sleeves of sufficient length to pass through entire thickness of walls, ceilings, roofs, and floors.

A modular mechanical type sealing assembly may be installed in lieu of a waterproofing clamping flange and caulking and sealing of annular space between pipe and sleeve. The seals shall consist of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and sleeve using galvanized steel bolts, nuts, and pressure plates. The links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and each nut. After the seal assembly is properly positioned in the sleeve, tightening of the bolt shall cause the rubber sealing elements to expand and provide a watertight seal between the pipe and the sleeve. Each seal assembly shall be sized as recommended by the manufacturer to fit the pipe and sleeve involved.

Sleeves shall not be installed in structural members, except where indicated or approved. Rectangular and square openings shall be as detailed. Each sleeve shall extend through its respective floor, or roof, and shall be cut flush with each surface, except for special circumstances.

Pipe sleeves passing through floors in wet areas such as mechanical equipment rooms, lavatories, kitchens, and other plumbing fixture areas shall extend a minimum of 4 inches above the finished floor.

Unless otherwise indicated, sleeves shall be of a size to provide a minimum of 1/4 inch clearance between bare pipe or insulation and inside of sleeve or between insulation and inside of sleeve. Sleeves in bearing walls and concrete slab on grade floors shall be steel pipe or cast-iron pipe. Sleeves in nonbearing walls or ceilings may be steel pipe, cast-iron pipe, galvanized sheet metal with lock-type longitudinal seam, or plastic.

Except as otherwise specified, the annular space between pipe and sleeve, or between jacket over insulation and sleeve, shall be sealed as indicated with sealants conforming to ASTM C920 and with a primer, backstop material and surface preparation. The annular space between pipe and sleeve, between bare insulation and sleeve or between jacket over insulation and sleeve shall not be sealed for interior walls which are not designated as fire rated.

Sleeves through below-grade walls in contact with earth shall be recessed 1/2 inch from wall surfaces on both sides. Annular space between pipe and sleeve shall be filled with backing material and sealants in the joint between the pipe and masonry wall as specified above. Sealant selected for the earth side of the wall shall be compatible with dampproofing/waterproofing materials that are to be applied over the joint sealant.

3.1.5.2 Pipe Penetrations of Slab on Grade Floors

Where pipes, fixture drains, floor drains, cleanouts or similar items penetrate slab on grade floors, except at penetrations of floors with waterproofing membrane as specified in paragraphs Flashing Requirements and Waterproofing, a groove 1/4 to 1/2 inch wide by 1/4 to 3/8 inch deep shall be formed around the pipe, fitting or drain. The groove shall be filled with a sealant.

3.1.5.3 Pipe Penetrations

Provide sealants for all pipe penetrations. All pipe penetrations shall be sealed to prevent infiltration of air, insects, and vermin.

3.1.6 Fire Seal

Where pipes pass through fire walls, fire-partitions, fire-rated pipe chase walls or floors above grade, a fire seal shall be provided.

3.1.7 Supports

3.1.7.1 General

Hangers used to support piping 2 inches and larger shall be fabricated to permit adequate adjustment after erection while still supporting the load. Pipe guides and anchors shall be installed to keep pipes in accurate alignment, to direct the expansion movement, and to prevent buckling, swaying, and undue strain. Piping subjected to vertical movement when operating temperatures exceed ambient temperatures shall be supported by variable spring hangers and supports or by constant support hangers. In the

support of multiple pipe runs on a common base member, a clip or clamp shall be used where each pipe crosses the base support member. Spacing of the base support members shall not exceed the hanger and support spacing required for an individual pipe in the multiple pipe run. Threaded sections of rods shall not be formed or bent.

3.1.7.2 Pipe Hangers, Inserts, and Supports

Installation of pipe hangers, inserts and supports shall conform to [MSS SP-58](#) and [MSS SP-69](#), except as modified herein.

- a. Types 5, 12, and 26 shall not be used.
- b. Type 3 shall not be used on insulated pipe.
- c. Type 18 inserts shall be secured to concrete forms before concrete is placed. Continuous inserts which allow more adjustment may be used if they otherwise meet the requirements for type 18 inserts.
- d. Type 19 and 23 C-clamps shall be torqued per [MSS SP-69](#) and shall have both locknuts and retaining devices furnished by the manufacturer. Field-fabricated C-clamp bodies or retaining devices are not acceptable.
- e. Type 20 attachments used on angles and channels shall be furnished with an added malleable-iron heel plate or adapter.
- f. Type 24 may be used only on trapeze hanger systems or on fabricated frames.
- g. Type 39 saddles shall be used on insulated pipe [4 inches](#) and larger when the temperature of the medium is [60 degrees F](#) or higher. Type 39 saddles shall be welded to the pipe.
- h. Type 40 shields shall:
 - (1) Be used on insulated pipe less than [4 inches](#).
 - (2) Be used on insulated pipe [4 inches](#) and larger when the temperature of the medium is [60 degrees F](#) or less.
 - (3) Have a high density insert for all pipe sizes. High density inserts shall have a density of [8 pcf](#) or greater.
- i. Horizontal pipe supports shall be spaced as specified in [MSS SP-69](#) and a support shall be installed not over [1 foot](#) from the pipe fitting joint at each change in direction of the piping. Pipe supports shall be spaced not over [5 feet](#) apart at valves. Operating temperatures in determining hanger spacing for PVC or CPVC pipe shall be [120 degrees F](#) for PVC and [180 degrees F](#) for CPVC. Horizontal pipe runs shall include allowances for expansion and contraction.
- j. Vertical pipe shall be supported at each floor, except at slab-on-grade, at intervals of not more than [15 feet](#) nor more than [8 feet](#) from end of risers, and at vent terminations. Vertical pipe risers shall include allowances for expansion and contraction.

- k. Type 35 guides using steel, reinforced polytetrafluoroethylene (PTFE) or graphite slides shall be provided to allow longitudinal pipe movement. Slide materials shall be suitable for the system operating temperatures, atmospheric conditions, and bearing loads encountered. Lateral restraints shall be provided as needed. Where steel slides do not require provisions for lateral restraint the following may be used:
 - (1) On pipe 4 inches and larger when the temperature of the medium is 60 degrees F or higher, a Type 39 saddle, welded to the pipe, may freely rest on a steel plate.
 - (2) On pipe less than 4 inches a Type 40 shield, attached to the pipe or insulation, may freely rest on a steel plate.
 - (3) On pipe 4 inches and larger carrying medium less than 60 degrees F a Type 40 shield, attached to the pipe or insulation, may freely rest on a steel plate.
- l. Pipe hangers on horizontal insulated pipe shall be the size of the outside diameter of the insulation. The insulation shall be continuous through the hanger on all pipe sizes and applications.
- m. Where there are high system temperatures and welding to piping is not desirable, the type 35 guide shall include a pipe cradle, welded to the guide structure and strapped securely to the pipe. The pipe shall be separated from the slide material by at least 4 inches or by an amount adequate for the insulation, whichever is greater.
- n. Hangers and supports for plastic pipe shall not compress, distort, cut or abrade the piping, and shall allow free movement of pipe except where otherwise required in the control of expansion/contraction.

3.1.7.3 Structural Attachments

Attachment to building structure concrete and masonry shall be by cast-in concrete inserts, built-in anchors, or masonry anchor devices. Inserts and anchors shall be applied with a safety factor not less than 5. Supports shall not be attached to metal decking. Supports shall not be attached to the underside of concrete filled floor or concrete roof decks unless approved by the Contracting Officer. Masonry anchors for overhead applications shall be constructed of ferrous materials only.

3.1.8 Welded Installation

Plumbing pipe weldments shall be as indicated. Changes in direction of piping shall be made with welding fittings only; mitering or notching pipe to form elbows and tees or other similar type construction will not be permitted. Branch connection may be made with either welding tees or forged branch outlet fittings. Branch outlet fittings shall be forged, flared for improvement of flow where attached to the run, and reinforced against external strains. Beveling, alignment, heat treatment, and inspection of weld shall conform to ASME B31.1. Weld defects shall be removed and repairs made to the weld, or the weld joints shall be entirely removed and rewelded. After filler metal has been removed from its original package, it shall be protected or stored so that its characteristics or welding properties are not affected. Electrodes that have been wetted or that have lost any of their coating shall not be used.

3.1.9 Pipe Cleanouts

Pipe cleanouts shall be the same size as the pipe except that cleanout plugs larger than 4 inches will not be required. A cleanout installed in connection with cast-iron soil pipe shall consist of a long-sweep 1/4 bend or one or two 1/8 bends extended to the place shown. An extra-heavy cast-brass or cast-iron ferrule with countersunk cast-brass head screw plug shall be caulked into the hub of the fitting and shall be flush with the floor. Cleanouts in connection with other pipe, where indicated, shall be T-pattern, 90-degree branch drainage fittings with cast-brass screw plugs, except plastic plugs shall be installed in plastic pipe. Plugs shall be the same size as the pipe up to and including 4 inches. Cleanout tee branches with screw plug shall be installed at the foot of soil and waste stacks, at the foot of interior downspouts, on each connection to building storm drain where interior downspouts are indicated, and on each building drain outside the building. Cleanout tee branches may be omitted on stacks in single story buildings with slab-on-grade construction or where less than 18 inches of crawl space is provided under the floor. Cleanouts on pipe concealed in partitions shall be provided with chromium plated bronze, nickel bronze, nickel brass or stainless steel flush type access cover plates. Round access covers shall be provided and secured to plugs with securing screw. Square access covers may be provided with matching frames, anchoring lugs and cover screws. Cleanouts in finished walls shall have access covers and frames installed flush with the finished wall. Cleanouts installed in finished floors subject to foot traffic shall be provided with a chrome-plated cast brass, nickel brass, or nickel bronze cover secured to the plug or cover frame and set flush with the finished floor. Heads of fastening screws shall not project above the cover surface. Where cleanouts are provided with adjustable heads, the heads shall be cast iron.

3.2 FIXTURES AND FIXTURE TRIMMINGS

Polished chromium-plated pipe, valves, and fittings shall be provided where exposed to view. Angle stops, straight stops, stops integral with the faucets, or concealed type of lock-shield, and loose-key pattern stops for supplies with threaded, sweat or solvent weld inlets shall be furnished and installed with fixtures. Where connections between copper tubing and faucets are made by rubber compression fittings, a beading tool shall be used to mechanically deform the tubing above the compression fitting. Exposed traps and supply pipes for fixtures and equipment shall be connected to the rough piping systems at the wall, unless otherwise specified under the item. Floor and wall escutcheons shall be as specified. Drain lines and hot water lines of fixtures for handicapped personnel shall be insulated and do not require polished chrome finish. Plumbing fixtures and accessories shall be installed within the space shown.

3.2.1 Fixture Connections

Where space limitations prohibit standard fittings in conjunction with the cast-iron floor flange, special short-radius fittings shall be provided. Connections between earthenware fixtures and flanges on soil pipe shall be made gastight and watertight with a closet-setting compound or neoprene gasket and seal. Use of natural rubber gaskets or putty will not be permitted. Fixtures with outlet flanges shall be set the proper distance from floor or wall to make a first-class joint with the closet-setting compound or gasket and fixture used.

3.2.2 Flushometer Valves

Flushometer valves shall be secured to prevent movement by anchoring the long finished top spud connecting tube to wall adjacent to valve with approved metal bracket. Flushometer valves for water closets shall be installed **39 inches** above the floor, except at water closets intended for use by the physically handicapped where flushometer valves shall be mounted at approximately **30 inches** above the floor and arranged to avoid interference with grab bars.

3.2.3 Height of Fixture Rims Above Floor

Lavatories shall be mounted with rim **31 inches** above finished floor. Installation of fixtures for use by the physically handicapped shall be in accordance with **ICC A117.1**.

3.2.4 Fixture Supports

Fixture supports for off-the-floor lavatories, urinals, water closets, and other fixtures of similar size, design, and use, shall be of the chair-carrier type. The carrier shall provide the necessary means of mounting the fixture, with a foot or feet to anchor the assembly to the floor slab. Adjustability shall be provided to locate the fixture at the desired height and in proper relation to the wall. Support plates, in lieu of chair carrier, shall be fastened to the wall structure only where it is not possible to anchor a floor-mounted chair carrier to the floor slab.

3.2.4.1 Support for Solid Masonry Construction

Chair carrier shall be anchored to the floor slab. Where a floor-anchored chair carrier cannot be used, a suitable wall plate shall be imbedded in the masonry wall.

3.2.4.2 Support for Concrete-Masonry Wall Construction

Chair carrier shall be anchored to floor slab. Where a floor-anchored chair carrier cannot be used, a suitable wall plate shall be fastened to the concrete wall using through bolts and a back-up plate.

3.2.4.3 Support for Steel Stud Frame Partitions

Chair carrier shall be used. The anchor feet and tubular uprights shall be of the heavy duty design; and feet (bases) shall be steel and welded to a square or rectangular steel tube upright. Wall plates, in lieu of floor-anchored chair carriers, shall be used only if adjoining steel partition studs are suitably reinforced to support a wall plate bolted to these studs.

3.2.4.4 Support for Wood Stud Construction

Where floor is a concrete slab, a floor-anchored chair carrier shall be used. Where entire construction is wood, wood crosspieces shall be installed. Fixture hanger plates, supports, brackets, or mounting lugs shall be fastened with not less than No. 10 wood screws, **1/4 inch** thick minimum steel hanger, or toggle bolts with nut. The wood crosspieces shall extend the full width of the fixture and shall be securely supported.

3.2.4.5 Wall-Mounted Water Closet Gaskets

Where wall-mounted water closets are provided, reinforced wax, treated felt, or neoprene gaskets shall be provided. The type of gasket furnished shall be as recommended by the chair-carrier manufacturer.

3.2.5 Backflow Prevention Devices

Plumbing fixtures, equipment, and pipe connections shall not cross connect or interconnect between a potable water supply and any source of nonpotable water. Backflow preventers shall be installed where indicated and in accordance with ICC IPC at all other locations necessary to preclude a cross-connect or interconnect between a potable water supply and any nonpotable substance. In addition backflow preventers shall be installed at all locations where the potable water outlet is below the flood level of the equipment, or where the potable water outlet will be located below the level of the nonpotable substance. Backflow preventers shall be located so that no part of the device will be submerged. Backflow preventers shall be of sufficient size to allow unrestricted flow of water to the equipment, and preclude the backflow of any nonpotable substance into the potable water system. Bypass piping shall not be provided around backflow preventers. Access shall be provided for maintenance and testing. Each device shall be a standard commercial unit.

3.2.6 Access Panels

Access panels shall be provided for concealed valves and controls, or any item requiring inspection or maintenance. Access panels shall be of sufficient size and located so that the concealed items may be serviced, maintained, or replaced.

3.2.7 Traps

Each trap shall be placed as near the fixture as possible, and no fixture shall be double-trapped. Traps installed on cast-iron soil pipe shall be cast iron. Traps installed on steel pipe or copper tubing shall be recess-drainage pattern, or brass-tube type. Traps installed on plastic pipe may be plastic conforming to ASTM D3311. Traps for acid-resisting waste shall be of the same material as the pipe.

3.3 ESCUTCHEONS

Escutcheons shall be provided at finished surfaces where bare or insulated piping, exposed to view, passes through floors, walls, or ceilings, except in boiler, utility, or equipment rooms. Escutcheons shall be fastened securely to pipe or pipe covering and shall be satin-finish, corrosion-resisting steel, polished chromium-plated zinc alloy, or polished chromium-plated copper alloy. Escutcheons shall be either one-piece or split-pattern, held in place by internal spring tension or setscrew.

3.4 TESTS, FLUSHING AND DISINFECTION

3.4.1 Plumbing System

The following tests shall be performed on the plumbing system in accordance with ICC IPC, except that the drainage and vent system final test shall

include the smoke test. The Contractor has the option to perform a peppermint test in lieu of the smoke test. If a peppermint test is chosen, the Contractor must submit a testing procedure to the Contracting Officer for approval.

- a. Drainage and Vent Systems Test. The final test shall include a smoke test.
- b. Building Sewers Tests.
- c. Water Supply Systems Tests.

3.4.2 Defective Work

If inspection or test shows defects, such defective work or material shall be replaced or repaired as necessary and inspection and tests shall be repeated. Repairs to piping shall be made with new materials. Caulking of screwed joints or holes will not be acceptable.

3.4.3 System Flushing

3.4.3.1 During Flushing

Before operational tests or disinfection, potable water piping system shall be flushed with hot potable water. Sufficient water shall be used to produce a water velocity that is capable of entraining and removing debris in all portions of the piping system. This requires simultaneous operation of all fixtures on a common branch or main in order to produce a flushing velocity of approximately 4 fps through all portions of the piping system. In the event that this is impossible due to size of system, the Contracting Officer (or the designated representative) shall specify the number of fixtures to be operated during flushing. Contractor shall provide adequate personnel to monitor the flushing operation and to ensure that drain lines are unobstructed in order to prevent flooding of the facility. Contractor shall be responsible for any flood damage resulting from flushing of the system. Flushing shall be continued until entrained dirt and other foreign materials have been removed and until discharge water shows no discoloration. All faucets and drinking water fountains, to include any device considered as an end point device by NSF/ANSI 61, Section 9, shall be flushed a minimum of 0.25 gallons per 24 hour period, ten times over a 14 day period.

3.4.3.2 After Flushing

System shall be drained at low points. Strainer screens shall be removed, cleaned, and replaced. After flushing and cleaning, systems shall be prepared for testing by immediately filling water piping with clean, fresh potable water. Any stoppage, discoloration, or other damage to the finish, furnishings, or parts of the building due to the Contractor's failure to properly clean the piping system shall be repaired by the Contractor. When the system flushing is complete, the hot-water system shall be adjusted for uniform circulation. Flushing devices and automatic control systems shall be adjusted for proper operation according to manufacturer's instructions. Comply with ASHRAE 90.1 - IP for minimum efficiency requirements. Unless more stringent local requirements exist, lead levels shall not exceed limits established by 40 CFR 141.80 (c)(1). The water supply to the building shall be tested separately to ensure that any lead contamination found during

potable water system testing is due to work being performed inside the building.

3.4.4 Operational Test

Upon completion of flushing and prior to disinfection procedures, the Contractor shall subject the plumbing system to operating tests to demonstrate satisfactory installation, connections, adjustments, and functional and operational efficiency. Such operating tests shall cover a period of not less than 8 hours for each system and shall include the following information in a report with conclusion as to the adequacy of the system:

- a. Time, date, and duration of test.
- b. Water pressures at the most remote and the highest fixtures.
- c. Operation of each fixture and fixture trim.
- d. Operation of each valve, hydrant, and faucet.
- e. Pump suction and discharge pressures.
- f. Temperature of each domestic hot-water supply.
- g. Operation of each floor and roof drain by flooding with water.
- h. Operation of each vacuum breaker and backflow preventer.
- i. Complete operation of each water pressure booster system, including pump start pressure and stop pressure.
- j. Compressed air readings at each compressor and at each outlet. Each indicating instrument shall be read at 1/2 hour intervals. The report of the test shall be submitted in quadruplicate. The Contractor shall furnish instruments, equipment, and personnel required for the tests; the Government will furnish the necessary water and electricity.

3.4.5 Disinfection

After all system components are provided and operational tests are complete, the entire domestic hot- and cold-water distribution system shall be disinfected. Before introducing disinfecting chlorination material, entire system shall be flushed with potable water until any entrained dirt and other foreign materials have been removed.

Water chlorination procedure shall be in accordance with AWWA C651 and AWWA C652 as modified and supplemented by this specification. The chlorinating material shall be hypochlorites or liquid chlorine. The chlorinating material shall be fed into the water piping system at a constant rate at a concentration of at least 50 parts per million (ppm). Feed a properly adjusted hypochlorite solution injected into the system with a hypochlorinator, or inject liquid chlorine into the system through a solution-feed chlorinator and booster pump until the entire system is completely filled.

Test the chlorine residual level in the water at 6 hour intervals for a continuous period of 24 hours. If at the end of a 6 hour interval, the chlorine residual has dropped to less than 25 ppm, flush the piping including tanks with potable water, and repeat the above chlorination procedures. During the chlorination period, each valve and faucet shall be opened and closed several times.

After the second 24 hour period, verify that no less than 25 ppm chlorine residual remains in the treated system. The 24 hour chlorination procedure must be repeated until no less than 25 ppm chlorine residual remains in the treated system.

Upon the specified verification, the system including tanks shall then be flushed with potable water until the residual chlorine level is reduced to less than one part per million. During the flushing period, each valve and faucet shall be opened and closed several times.

Take addition samples of water in disinfected containers, for bacterial examination, at locations specified by the Contracting Officer
 Test these samples for total coliform organisms (coliform bacteria, fecal coliform, streptococcal, and other bacteria) in accordance with [AWWA 10084](#). The testing method used shall be EPA approved for drinking water systems and shall comply with applicable local and state requirements.

Disinfection shall be repeated until bacterial tests indicate the absence of coliform organisms (zero mean coliform density per 100 milliliters) in the samples for at least 2 full days. The system will not be accepted until satisfactory bacteriological results have been obtained.

3.5 WASTE MANAGEMENT

Place materials defined as hazardous or toxic waste in designated containers. Return solvent and oil soaked rags for contaminant recovery and laundering or for proper disposal. Close and seal tightly partly used sealant and adhesive containers and store in protected, well-ventilated, fire-safe area at moderate temperature. Place used sealant and adhesive tubes and containers in areas designated for hazardous waste. Separate copper and ferrous pipe waste in accordance with the Waste Management Plan and place in designated areas for reuse.

3.6 TABLES

TABLE I							
PIPE AND FITTING MATERIALS FOR DRAINAGE, WASTE, AND VENT PIPING SYSTEMS							
Item #	Pipe and Fitting Materials	SERVICE A	SERVICE B	SERVICE C	SERVICE D	SERVICE E	SERVICE F

TABLE I							
PIPE AND FITTING MATERIALS FOR DRAINAGE, WASTE, AND VENT PIPING SYSTEMS							
Item #	Pipe and Fitting Materials	SERVICE A	SERVICE B	SERVICE C	SERVICE D	SERVICE E	SERVICE F
1	Cast iron soil pipe and fittings, hub and spigot, ASTM A74 with compression gaskets. Pipe and fittings shall be marked with the CISPI trademark.	X	X	X	X	X	
2	Cast iron soil pipe and fittings hubless, CISPI 301 and ASTM A888. Pipe and fittings shall be marked with the CISPI trademark.		X	X	X	X	
3	Cast iron drainage fittings, threaded, ASME B16.12 for use with Item 10	X		X	X		
4	Cast iron screwed fittings (threaded) ASME B16.4 for use with Item 10				X	X	
5	Grooved pipe couplings, ferrous and non-ferrous pipe ASTM A536 And ASTM A47/A47M	X	X		X	X	
6	Ductile iron grooved joint fittings for ferrous pipe ASTM A536 and ASTM A47/A47M for use with Item 5	X	X		X	X	
7	Bronze sand casting grooved joint pressure fittings for non-ferrous pipe ASTM B584, for use with Item 5	X	X		X	X	

TABLE I							
PIPE AND FITTING MATERIALS FOR DRAINAGE, WASTE, AND VENT PIPING SYSTEMS							
Item #	Pipe and Fitting Materials	SERVICE A	SERVICE B	SERVICE C	SERVICE D	SERVICE E	SERVICE F
8	Wrought copper grooved joint pressure fittings for non-ferrous pipe ASTM B75/B75M, C12200, ASTM B152/B152M, C11000, ASME B16.22 ASME B16.22 for use with Item 5	X	X				
9	Malleable-iron threaded fittings, galvanized ASME B16.3 for use with Item 10				X	X	
10	Steel pipe, seamless galvanized, ASTM A53/A53M, Type S, Grade B	X			X	X	
11	Seamless red brass pipe, ASTM B43				X	X	
12	Bronzed flanged fittings, ASME B16.24 for use with Items 11 and 14				X	X	
13	Cast copper alloy solder joint pressure fittings, ASME B16.18 for use with Item 14				X	X	
14	Seamless copper pipe, ASTM B42						X
15	Cast bronze threaded fittings, ASME B16.15				X	X	
16	Copper drainage tube, (DWV), ASTM B306	X*	X	X*	X	X	

TABLE I							
PIPE AND FITTING MATERIALS FOR DRAINAGE, WASTE, AND VENT PIPING SYSTEMS							
Item #	Pipe and Fitting Materials	SERVICE A	SERVICE B	SERVICE C	SERVICE D	SERVICE E	SERVICE F
17	Wrought copper and wrought alloy solder-joint drainage fittings. ASME B16.29	X	X	X	X	X	
18	Cast copper alloy solder joint drainage fittings, DWV, ASME B16.23	X	X	X	X	X	
19	Acrylonitrile-Butadiene-Styrene (ABS) plastic drain, waste, and vent pipe and fittings ASTM D2661, ASTM F628	X	X	X	X	X	X
20	Polyvinyl Chloride plastic drain, waste and vent pipe and fittings, ASTM D2665, ASTM F891, (Sch 40) ASTM F1760	X	X	X	X	X	X
21	Process glass pipe and fittings, ASTM C1053						X
22	High-silicon content cast iron pipe and fittings (hub and spigot, and mechanical joint), ASTM A518/A518M		X			X	X
23	Polypropylene (PP) waste pipe and fittings, ASTM D4101						X
24	Filament-wound reinforced thermosetting resin (RTRP) pipe, ASTM D2996						X

TABLE I							
PIPE AND FITTING MATERIALS FOR DRAINAGE, WASTE, AND VENT PIPING SYSTEMS							
Item #	Pipe and Fitting Materials	SERVICE A	SERVICE B	SERVICE C	SERVICE D	SERVICE E	SERVICE F
SERVICE: A - Underground Building Soil, Waste and Storm Drain B - Aboveground Soil, Waste, Drain In Buildings C - Underground Vent D - Aboveground Vent E - Interior Rainwater Conductors Aboveground F - Corrosive Waste And Vent Above And Belowground * - Hard Temper							

-- End of Section --

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ELECTRICAL WORK
04/11

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C80.3 (1994; R 1995) Electrical Metallic Tubing - Zinc-Coated

ANSI C80.5 (1994; R 1995) Rigid Aluminum Conduit

ASTM INTERNATIONAL (ASTM)

ASTM A 123/A 123M (2009) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM A 153/A 153M (2009) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

ASTM D 1000 (2004) Standard Test Methods for Pressure-Sensitive Adhesive-Coated Tapes Used for Electrical and Electronic Applications

ASTM D 3005 (1999) Standard Specification for Low Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape

U. S. GENERAL SERVICES ADMINISTRATION (GSA)

FS J-C-30 (Rev B) Cable and Wire, Electrical (Power, Fixed Installation)

FS W-B-30 (Rev A; Am 2) Ballast, Fluorescent Lamp

FS W-C-1094 (Rev A) Conduit and Conduit Fittings, Plastic, Rigid

FS W-C-375 (Rev C) Circuit Breakers, Molded Case; Branch Circuit and Service

FS W-C-586 (Rev D) Conduit Outlet Boxes, Bodies, and Entrance Caps, Electrical: Cast Metal

FS W-C-596 (Rev F; Supple 1; Am 1) Connector, Electrical Power

FS W-F-1234 (Rev A) Fixture, Lighting (Fluorescent Lamp, Industrial)

FS W-F-406 (Rev D) Fittings for Cable, Power, Electrical and Conduit, Metal, Flexible

FS W-F-408 (Rev E) Fittings for Conduit, Metal, Rigid (Thick-Wall and Thin-Wall (EMT) Type)

FS W-F-414 (Rev E; Int Am 1) Fixture, Lighting (Fluorescent, Alternating Current, Pendant Mounting)

FS W-J-800 (Rev F) Junction Box: Extension, Junction Box; Cover, Junction Box (Steel Cadmium, or Zinc-Coated)

FS W-L-305 (Rev D; Int Am 1) Light Set, General Illumination (Emergency or Auxiliary)

FS W-S-610 (Rev E) Splice Connectors

FS W-S-896 (Rev E; Am 2; Notice 1) Switch, Toggle (Toggle and Lock), Flush Mounted (General Specification)

FS WW-C-566 (Rev C) Conduit, Metal, Flexible

U. S. GENERAL SERVICES ADMINISTRATION (GSA)

INSULATED CABLE ENGINEERS ASSOCIATION (ICEA)

ICEA S-19-81 (1992) Rubber-insulated Wire and Cable for the Transmission and Distribution of Electrical Energy

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C2 (2007; Errata 2006 & 2007; INT 44-56 2007; INT 47, 49, 50, 52-56 2008; INT 57, 58, 51, 48, 59 2009) National Electrical Safety Code

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

21 CFR 1040 Performance Standards for Light-Emitting Products

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA KS 1 (2001; R 2006) Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum)

NEMA SG 3 (1995) Power Switching Equipment

NEMA VE 1 (2009) Standard for Metallic Cable Tray Systems

NEMA WD 1	(1999; R 2005) Standard for General Requirements for Wiring Devices
NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)	
NFPA 101	(2009; AMD 1 & 2 2009) Life Safety Code
NFPA 70	(2008; AMD 1 2008) National Electrical Code - 2008 Edition
UNDERWRITERS LABORATORIES (UL)	
UL 1	(2005; Rev thru Jul 2007) Standard for Flexible Metal Conduit
UL 6	(2007) Standard for Electrical Rigid Metal Conduit-Steel
UL 20	(2000; Rev thru Dec 2008) Standard for General-Use Snap Switches
UL 510	(2005; Rev thru Aug 2005) Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape
UL 514B	(2004; Rev thru Nov 2009) Standard for Conduit, Tubing and Cable Fittings
UL 797	(2007) Standard for Electrical Metallic Tubing -- Steel
UL 844	(2006; Rev thru Nov 2008) Standard for Electric Lighting Fixtures for Use in Hazardous (Classified) Locations
UL 870	(1995; Rev thru Jul 2003) Standard for Wireways, Auxiliary Gutters, and Associated Fittings
UL 924	(2006; Rev thru Oct 2009) Standard for Emergency Lighting and Power Equipment
UL 1571	(1995; Rev thru Nov 1999) Incandescent Lighting Fixtures
UL 1572	(1995; Rev thru Nov 1999) High Intensity Discharge Lighting Fixtures

1.2 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

[SD-01 Preconstruction Submittals](#)

[Material, Equipment, and Fixture Lists](#) shall be submitted for the following in accordance with the paragraph entitled, "General Requirements," of this section.

[Lamps and Lighting Fixtures](#)
SD-02 Shop Drawings

[Connection Diagrams](#)

SD-03 Product Data

Manufacturer's Catalog Data (catalog cuts, brochures, circulars, specifications, product data, and other printed information) showing in sufficient detail and scope to verify compliance with the requirements of the contract documents shall be submitted for the following:

[Wireways and Auxiliary Gutter](#)
[Cable Trays](#)
[Wire and Cable](#)
[Connectors](#)
[Tape](#)
[Safety Switches](#)
[Wall Switches](#)
[Receptacles](#)
[Device Plates](#)
[Outlets, Outlet Boxes, and Pull Boxes](#)
[Circuit Breakers](#)
[Lamps and Lighting Fixtures](#)

SD-08 Manufacturer's Instructions

Manufacturer's Instructions showing the manufacturer's recommended method and sequence of installation, shall be submitted for the following:

[Conduit and Tubing](#)
[Wireways and Auxiliary Gutter](#)
[Surface Metal Raceways](#)
[Surface Multi-Outlet Assemblies](#)
[Wire and Cable](#)
[Connectors](#)
[Tape](#)
[Safety Switches](#)
[Wall Switches](#)
[Receptacles](#)
[Device Plates](#)

1.3 GENERAL REQUIREMENTS

[Material, Equipment, and Fixture Lists](#), including the manufacturer's style or catalog numbers, specification and drawing reference numbers, warranty information, and fabricate site information shall be submitted for [Lamps and Lighting Fixtures](#).

The electrical systems shall be provided as indicated and shall include the following:

1.4 QUALITY ASSURANCE

Approval of materials and equipment will be based on the manufacturer's published data. Proof that the items furnished conform to the specified requirements as indicated below shall be submitted for approval.

Where material and equipment are specified to conform to the standards of the Underwriters' Laboratories (UL), Inc., the UL label or listing will be acceptable as sufficient evidence that the items conform to requirements. In lieu of such label, or listing, the Contractor may submit a written certificate from any nationally recognized testing agency, adequately equipped and competent to perform such services, stating that the items have been tested and that they conform to the UL requirements including methods of testing.

Where materials or equipment are specified to be constructed or tested, in accordance with the standards of NEMA, ANSI, ASTM, or other commercial standard, a manufacturer's certificate indicating complete compliance of each item with the applicable NEMA, ANSI, ASTM, or other commercial standard specified, will be acceptable as proof of compliance.

Equipment design, fabrication, testing, performance, and installation shall, unless shown otherwise, comply with the applicable requirements of NFPA 70 (the NEC), IEEE C2 (the NESC), and referenced industrial codes and standards.

1.5 INSPECTIONS

Work shall not be covered up nor enclosed until it has been inspected, tested, and approved. Any work that is enclosed or covered up before such inspection and test shall be uncovered and, after it has been inspected and approved, shall be restored to its original condition at no additional cost to the Government.

1.6 COORDINATION

The electrical work shall be coordinated with the work of all other trades. Coordination shall include adequate clearances for the installation and maintenance of equipment and physical and electrical requirements of items or equipment requiring connections.

When it is necessary to coordinate with work of other trades, Contractor shall provide electrical service, extend conduits, and make all necessary connections as required to minimize interruption of service in any area.

1.7 STORAGE AND PRESERVATION OF MATERIALS AND EQUIPMENT

Equipment and materials stored at the site, prior to final installation, shall be fully protected from damage, dirt, debris, and weather.

Equipment provided with a factory finish shall be fully protected during construction and shall be maintained free of dust, dirt, and foreign matter. Dents, marred finishes, and other damaged equipment shall be repaired to its original condition or replaced.

1.8 PREVENTION OF CORROSION

Metallic materials shall be protected against corrosion. Equipment enclosures shall be given a rust-inhibiting treatment and the standard finish by manufacturer when used for most indoor installations. For harsh indoor environments (any area subjected to chemical and/or abrasive action), and all outdoor installations, refer to Section 09 96 00 HIGH-PERFORMANCE COATINGS. Aluminum shall not be used in contact with earth or concrete and, where connected to dissimilar metal, shall be protected by approved fittings and treatment. Ferrous metals such as anchors, bolts, braces, boxes, bodies, clamps, fittings, guards, nuts, pins, rods, shims, thimbles, washers, and miscellaneous parts not of corrosion-resistant steel shall be hot-dip galvanized in accordance with [ASTM A 123/A 123M](#) or [ASTM A 153/A 153M](#) except where other equivalent protective treatment is specifically approved in writing for exterior locations and cadmium-plated in conformance with [FS W-J-800](#) for interior locations.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

Materials and equipment to be provided shall be the standard cataloged products of manufacturers regularly engaged in the manufacture of the products. Materials and equipment shall meet the specified requirements, the detailed requirements indicated, be suitable for the installation shown, and shall represent products that have been in satisfactory use at least two years. Products not meeting all specified requirements will not be accepted.

Where two or more units of the same equipment class are furnished, the equipment shall be from the same manufacturer and shall be interchangeable. Equipment and materials shall be new, and free from defects.

2.2 CONDUIT AND RACEWAYS

2.2.1 Rigid Steel Conduit

Rigid steel conduit shall conform to [UL 6](#). Where underground and in corrosive areas, rigid steel conduit shall be polyvinylchloride (PVC) coated in accordance with NEMA RN 1 or shall be painted with bitumastic. Conduit fittings shall conform to [FS W-F-406](#) and [FS W-F-408](#).

2.2.2 Rigid Plastic (PVC) Conduit

PVC conduit shall not be lighter than Schedule 40. Rigid PVC shall be the slip-joint solvent-weld type, and all fittings shall be unthreaded solid PVC. Conduit and fittings shall conform to [FS W-C-1094](#).

2.2.3 Electrical Metallic Tubing (EMT)

EMT shall be rigid metallic conduit of the thin wall type in straight lengths, elbows, or bends and shall conform to [ANSI C80.3](#) and the requirements of [UL 797](#).

Couplings and [connectors](#) shall be hex-nut expansion-gland compression type, with insulating throat, zinc- or cadmium-plated. Crimp, spring, or set-screw type fittings are not acceptable. Where EMT enters outlet boxes,

cabinets, or other enclosures, connectors shall be the insulated-throat type, with a locknut. Fittings shall meet the requirements of [FS W-F-408](#).

2.2.4 Flexible Metallic Conduit

Flexible metallic conduit shall meet the requirements of [FS WW-C-566](#) and [UL 1](#).

Liquidtight flexible metallic conduit shall be provided with a protective jacket of PVC extruded over a flexible interlocked galvanized steel core to protect wiring against moisture, oil, chemicals, and corrosive fumes.

Fittings for flexible metallic conduit shall meet the requirements of [FS W-F-406](#), Types I (box connector, electrical), III (coupling, electrical conduit, flexible steel), or IV (adapter, electrical conduit), class and style as required.

Fittings for liquidtight flexible metallic conduit shall meet the requirements of [FS W-F-406](#), Type I (box connector, electrical), Class 3 (liquidtight flexible metallic conduit connectors), style as required.

2.2.5 Rigid Aluminum Conduit

Rigid aluminum conduit shall conform to [ANSI C80.5](#).

2.2.6 Wireways and Auxiliary Gutter

Wireways and auxiliary gutters for use in exposed, dry locations shall be a prefabricated channel-shaped sheetmetal trough with hinged or removable covers, associated fittings, and supports for housing, and protecting electrical wires and cables in accordance with [UL 870](#), as indicated and herein specified.

Straight sections of trough, elbows tees, crosses, closing plates, connectors, and hanging brackets shall be constructed from sheet steel of commercial quality not less than [16 gage](#). All sheetmetal component parts shall be cleaned, phosphatized, and coated with a corrosion-resistant gray paint.

Straight sections of wireways and auxiliary gutters shall be solid or have knock outs as indicated in both sides and bottom, [3 inches](#) on centers.

Straight sections shall be not more than [5 feet](#) long, with covers held closed with screws.

2.2.7 Surface Metal Raceways

Surface metal raceways shall conform to the requirements of [NFPA 70](#) (the NEC), Article 356. The minimum size shall equal or exceed the capacity of [1/2 inch](#) trade size conduit.

2.2.8 Surface Multi-Outlet Assemblies

Surface multi-outlet assemblies shall conform to the requirements of [NFPA 70](#) (the NEC), Article 380 and shall be provided with receptacles conforming to [NEMA WD 1](#), Type 5-20R.

2.2.9 Cable Trays

Cable trays shall be the ladder type conforming to NEMA VE 1.

2.3 WIRING AND CABLE - 600-VOLT AND LESS

Thermoplastic-insulated wire and cable shall conform to FS J-C-30.

Flexible cable shall conform to FS J-C-30 Type SO or ICEA S-19-81, and shall contain a ground conductor with green insulation.

2.4 CONNECTORS

Wire pressure connectors and conductor splices shall conform to FS W-S-610.

2.5 TAPE

2.5.1 Vinyl Plastic Electrical Tape

The vinyl plastic electrical tape shall be 8.5 mils thick per ASTM D 1000, heavy duty, all weather vinyl plastic insulating tape. The tape shall be UL listed, and shall meet the requirements of UL 510 and ASTM D 3005 Type II. The tape shall have a polyvinyl chloride (PVC) backing, and shall have a pressure-sensitive rubber-based adhesive. The tape shall be compatible with solid dielectric cable insulations, and shall be compatible with rubber and synthetic splicing compounds as well as epoxy and polyurethane resins. The tape shall inhibit corrosion of electrical conductors. The tape shall be suitable for both indoor and outdoor applications. The tape shall be marked per UL 510 as flame retardant, cold and weather resistant. The tape must be applicable at temperatures ranging from 0 degrees F through 100 degrees F without loss of physical or electrical properties. The voltage rating of the tape shall be 600 volts per UL 510.

2.6 SAFETY SWITCHES

Switches shall comply with NEMA KS 1.

Safety switches shall be the heavy-duty type with voltage, current rating, number of poles, and fusing as shown on the contract drawings. Switch construction shall be such that, with the switch handle in the ON position, the cover or door cannot be opened. The cover release device shall be coinproof and shall be so constructed that an external tool (screwdriver) must be used to open the cover. Provisions shall be made to lock the handle in the OFF position, but the switch handle shall not be capable of being locked in the ON position.

Switches shall be the quick-make, quick-break type. Terminal lugs shall be approved for use with copper conductors.

2.7 WALL SWITCHES

Snap switches installed for the control of incandescent, mercury, and fluorescent lighting fixtures shall be heavy-duty general-purpose noninterchangeable flush devices conforming to UL 20 and NEMA WD 1, as indicated and specified.

Snap switches shall be the specification grade toggle type: single-pole, double-pole, three-way, and four-way two-position devices rated 20 amperes at 277 volts, 60 hertz, ac only, meeting the requirements of [FS W-S-896](#).

All snap switches shall be made by the same manufacturer.

Where two or more snap switches are to be installed at the same location, they shall be mounted in one-piece ganged switch boxes, with a gang cover plate.

Combination snap switch and single or duplex receptacles shall be mounted in two-gang switch boxes, with a combination two-gang cover plate.

Combination snap switch and flush pilot light shall be interchangeable devices mounted in a one-gang switch box with a one-gang two-opening cover plate. The pilot-light cover opening shall be fitted with a rectangular-shaped ruby-red plastic jewel in a metal frame.

2.8 RECEPTACLES

Duplex receptacles shall be 5-20R configuration in [NEMA WD 1](#) and conforming to [FS W-C-596](#).

Special-purpose receptacles shall be as indicated.

2.9 DEVICE PLATES

Device plates shall be one piece to suit the devices installed. Plates shall be stainless steel [0.035 inches](#) thick.

2.10 OUTLETS, OUTLET BOXES, AND PULL BOXES

Sheetmetal boxes shall conform to [FS W-J-800](#).

Castmetal boxes shall conform to [FS W-C-586](#).

Outlets, outlet boxes, and pull boxes shall have sufficient volume to accommodate the number of conductors entering the box in accordance with the requirements of [NFPA 70](#) (the NEC), Article 314. Boxes exposed to the weather or mounted in normally wet locations or locations susceptible to physical damage (surface mounted) shall be the cast-metal type with threaded hubs and gasketed covers. Boxes in other areas shall be cadmium-plated or zinc-coated sheetmetal. Outlet boxes for use with conduit systems shall be not less than [1-1/2 inches](#) deep and [4 inches](#) by [4 inches](#). Pull and junction boxes shall be furnished with screw-fastened covers. Boxes mounted on surface mounted wireway under computer flooring shall be a minimum of [2-1/8 inches](#) deep. Fittings shall conform to [UL 514B](#).

Pull and splice boxes for power conductors (feeders) which are specifically detailed and described on the drawing shall be of the type specified and shall be no smaller than the dimensions indicated. The boxes shall be large enough to perform their intended function (i.e., pulling point, cable splicing, etc.).

2.11 CIRCUIT BREAKERS

Molded-case circuit breakers shall conform to [FS W-C-375](#).

Low-voltage draw-out power circuit breakers shall conform to [NEMA SG 3](#).

Circuit breakers shall have the minimum interrupting ratings indicated. All molded case circuit breakers shall have bolted connections to the bus.

2.12 LAMPS AND LIGHTING FIXTURES

2.12.1 Fluorescent

Commercial fluorescent fixtures shall conform to [FS W-F-414](#).

Industrial fluorescent fixtures shall conform to [FS W-F-1234](#).

All fluorescent lamps shall be the high efficiency (34 or 35 watt, 425 mA) rapid-start type unless otherwise specified.

Ballasts shall conform to [FS W-B-30](#).

Manufacturers and catalog numbers shown are indicative of the general type desired and are not intended to restrict the selection to fixtures of any particular manufacturer. Fixtures with the same salient features and equivalent light distribution and brightness characteristics, of equal finish and quality, will be acceptable as approved by the Contracting Officer. All fluorescent fixtures shall have a radio interference (rfi) filter similar to GE 89G635.

Ballasts shall be high power factor, low-energy type, UL listed and CBM certified by Electrical Testing Laboratories. Ballasts shall be Class P for 120- or 277-volt operation as indicated and shall be rapid-start energy efficient type. Ballasts shall be A sound rated. Ballasts shall be equipped with integral thermal circuit opening protection devices. Ballasts shall be solid-state type.

Energy-efficient solid-state ballasts shall not use capacitors containing polychlorinated biphenyls (PCB's).

Solid-state ballast shall allow a 90 to 110 percent voltage variation with a typical 0.9 leading power factor. This type of ballast shall have a mean time between failures (MTBF) of 30,000 hours, and shall have no third harmonic generation.

Solid-state ballasts shall be interchangeable with conventional ballast.

2.12.2 Incandescent

Incandescent fixtures shall conform to [UL 1571](#). Fixtures in hazardous areas shall conform to [UL 844](#).

2.12.3 High-Intensity Discharge

High-intensity discharge fixtures shall conform to [UL 1572](#) and shall utilize energy-efficient ballasts and lamps. Lamps shall be in accordance with [21 CFR 1040](#). Roadway and floodlighting applications shall utilize high-intensity discharge (including sodium type) luminaires.

2.12.4 Emergency and Exit

Emergency and exit lighting fixtures shall conform to [UL 924](#). Emergency lighting luminaires shall be in accordance with [FS W-L-305](#). Exit lights shall be as specified in [NFPA 101](#).

PART 3 EXECUTION

3.1 GENERAL

Materials and equipment shall be installed in accordance with the requirements indicated, the approved recommendations of the manufacturers, and [NFPA 70](#). The Manufacturer's installations instructions, showing the manufacturer's recommended method and sequence of installation, shall be submitted in accordance with paragraph entitled, "General Requirements," of this section. The installation shall be accomplished by workers skilled in this type of work and shall be done in accordance with the best practice of the trades.

All wiring for the connection of motors and control equipment as indicated on the electrical drawings shall be furnished and installed under this Section of the Specifications.

3.2 CONDUIT SYSTEMS

3.2.1 Aboveground Conduit Systems

Conduit and fittings shall be installed in accordance with [NFPA 70](#) and as specified herein.

Conduit and raceways shall not be less than 3/4 inch trade size except switch legs run exposed.

Electric metallic tubing (EMT) may be installed indoors in dry locations not subject to mechanical injury. EMT connectors shall be of the compression ring gland type only.

Aluminum conduit and aluminum fittings shall not be used in wet locations. Aluminum or other nonmagnetic conduit and fittings shall be used in lieu of steel for wiring-carrying frequencies greater than 180 cycles per second.

Conduit in all locations subject to mechanical injury shall be rigid galvanized steel.

Conduits shall be fastened to all sheet metal boxes, gutters and cabinets with two locknuts and a bushing.

The Contractor shall provide and install above grade conduit systems as specified, including all necessary supports, hangers, and other hardware. Systems shall be installed such that there is no interference with normal operations. If there are any major discrepancies, changes, or questionable routing, the Contractor shall notify the Contracting Officer for resolution and/or approval.

Routing of conduits overhead as shown on plan drawings are approximate; and unless located by dimensions may be modified to avoid obstructions. The adjustments shall be held to a minimum to avoid excessive cable pulling

tensions or interference with other work. Contracting Officer shall be notified if the routing, direction or elevation of conduit is altered.

Exposed conduit shall be neatly and evenly spaced and shall run parallel to ceiling, floors, walls or other permanent structures.

The Contractor will be held responsible for the placing of all conduits and conduit sleeves passing through walls, partitions, beams, roof, etc. If conduit and/or conduit sleeves are not properly installed and cutting and patching becomes necessary, it shall be done entirely at the expense of the Contractor.

Principal openings in walls and roofs shall be provided as shown on the drawings. Where additional holes or openings become necessary in new or existing structures, Contractor shall inform Contracting Officer of the need. Upon receipt of permission, Contractor shall cut holes or openings of approved sizes. Upon completion of the installations for which holes or openings are cut, the surrounding areas shall be grouted or patched and returned to its original condition and finish by the Contractor.

Aboveground conduits shall be as specified on drawings.

All conduit runs shall avoid obstructions and unnecessary bends and shall maintain suitable spacing from hot surfaces to prevent damage to the wire insulation. All overhead conduit runs shall clear steam lines, hot vapor lines, or any other hot objects over 250 degrees F, by 12 inches minimum. Expansion fittings shall be installed to allow movements as required.

Conduit and equipment shall be arranged to prevent the accumulation of moisture in apparatus housing. Drains shall be provided at the low point of long vertical or horizontal runs of conduit.

Field conduit bends shall maintain a uniform circular cross section throughout the bend with a minimum radius at the inner edge of the curve as follows:

<u>Size of Conduit</u>	<u>Radius of Bend</u>
3/4 inch	8 inch
1 inch	10 inch
1-1/2 inch	12 inch
2 inch	14 inch
2-1/2 inch	18 inch
3 inch	24 inch
3-1/2 inch	24 inch
4 inch	30 inch

Conduit bends shall be made by approved bender providing a smooth bend without crushing, cracking, or crimping the conduit or its coating. Heating of conduits to make bends is not permitted. Conduit which has been flattened or wrinkled during bending shall not be used.

Before making up conduit runs, the interiors of all conduits, conduit bends, and fittings shall be inspected and cleaned of all dirt, cuttings, thread cutting oil, and other foreign material.

There shall be no more than three 90 degree bends, or equivalent, in a run between pull fittings.

All rigid galvanized steel conduit threads shall be coated with an approved metal oxide paint or thread lubricant for weatherproof joint and electrical conductivity. Joints shall provide structural rigidity and low electrical resistance across the joints. Conduit runs into boxes without threaded hubs shall have a locknut outside and a locknut and a grounding-type bushing inside unless shown otherwise on the drawings. All open conduit ends shall have grounding type bushings unless other terminations are shown.

Expansion joints, as required, shall be provided on horizontal runs(of 100 feet or more) of conduit.

All unused openings in fittings or equipment shall be plugged with metallic plugs.

Drain fittings shall be provided throughout the conduit system at the points where condensation is likely to be trapped.

All conduits shall be securely fastened within 3 feet of each outlet box, junction, cabinet, fitting, or end of conduit, or as shown on the drawings.

Contractor shall use center-loading type beam clamps to mount or support electrical equipment. When it is not possible to use center-loading clamps, eccentric-loading beam clamps may be used for conduit sizes 2 inches and less. For conduits sizes 2 inches through 6 inches, provide two counterbalancing clamps per point of pipe support. C-clamps shall not be used.

Conduits and cable trays shall not be supported from piping. No welding to piping will be allowed.

Supports shall be hot-dipped galvanized steel or as indicated on the drawings.

3.3 WIRING

Raceways and wiring shall be installed as indicated, and circuits shall not be combined.

The following raceways and wiring shall be run separate and shall not be combined:

- Fire Alarm Systems
- Utility Control Systems
- Video Systems
- Security Systems
- General Power Systems
- General Lighting Systems
- Water Detection Systems
- Telephone Systems
- Computer Systems

Raceways shall be completely installed, with interiors protected from the weather, before proceeding with the installation of wires and cables. Conductors of special-service systems and emergency light and power systems

shall not occupy the same enclosure with light and power conductors or the same enclosure with each other. Conductors shall be continuous with splices and connections made in outlet, junction, or pull boxes only.

Phase conductors and the neutral conductor of each branch or feeder circuit shall be contained in a single enclosure or paralleled in separate enclosures to avoid overheating the raceway by electro and close-up magnetic induction. Conductors and conduit in parallel shall be the same length and size, shall have conductors of the same type of insulation, shall be terminated at both ends in a manner to ensure equal division of the total current between conductors, and shall have a separate neutral and ground conductor in each conduit.

Conductors for motor circuits and control circuits shall be stranded only. Conductors for lighting, branch circuit wiring and control circuits shall be 600 volt, standard copper wire listed by Underwriters' Laboratories as Type THW, THHN, XHHW, or THWN. Wire shall be delivered to the job in original unbroken packages or reels bearing the Underwriters' label. Copper conductors smaller than No. 8 shall be solid or stranded; No. 8 and larger shall be stranded. Wire sizes are American Wire Gauge (AWG). Minimum wire sizes shall be No. 12 except No. 14 for final connections to small motors and for control, and No. 16 AWG for class 2 low energy conductors. Power conductors shall be stranded copper conductors.

CONDUCTOR SIZE NO.	<u>USE</u>
<u>12, 10, 8</u>	
Solid	Receptacles rated 30 amperes and less
Solid	Toggle switches rated 30 amperes or less
Solid	Light fixtures rated 1000 watts or less
Solid	Terminal blocks rated 30 amperes or less
Solid	Circuit breakers rated 30 amperes or less
Solid or stranded	Internal wiring within a control cabinet

CONDUCTOR SIZE NO.	<u>USE</u>
<u>6 AND LARGER</u>	
Stranded	Everywhere

All feeder and branch circuit conductors shall be color coded as follows:

<u>CONDUCTOR</u>	<u>208/120V</u>	<u>480/277V</u>
Phase A	Black	Brown
Phase B	Red	Purple
Phase C	Blue	Yellow
Neutral	White	White
Equipment Grounds	Green	Green

Conductors up to and including No. 2 shall be manufactured with colored insulating materials. Conductors larger than No. 2 shall have ends identified with colored plastic tape in all outlet, pull, or junction boxes. All control circuit conductors shall be identified at each connection point.

Connectors and splices shall conform to **FS W-S-610** and shall be made in approved enclosures utilizing solderless pressure connectors and adequate insulation with vinyl-plastic electrical insulating tape. Conductors and

materials used in a splice, tap, or connection shall be thoroughly cleaned prior to makeup to ensure good electrical and mechanical connections. Conductor identification shall be provided within each enclosure where a tap, splice, or termination is made and at the equipment terminal of each conductor. Terminal and conductor identification shall match that shown on approved shop drawings. Hand lettering or marking is not acceptable. Each wire shall be marked with preprinted heat-shrink wire sleeves for easy identification.

3.4 CABLE INSTALLATION

Cables shall be installed in conduits or with the specified support systems in accordance with the drawings. Any change in routing or method of installation will be permitted only with the approval of the Contracting Officer.

Each section of cable shall be protected with temporary tape and/or coatings to prevent moisture from entering cable ends before termination is completed.

Cable attachments for pulling shall be woven cable grips or similar devices with a swivel connection subject to Contracting Officer's approval. If abnormally difficult pulling occurs, Contractor shall check pull required, manufacturer's maximum pulling tension allowable, and if necessary, suspend pulling until a revised procedure has been approved by the Contracting Officer.

Maximum cable pulling tension shall not exceed values recommended by cable manufacturer.

Cables and wires shall be identified at each end and in pull boxes with identifying numbers called for on drawings.

Cable reels shall be handled with care. Do not drop reels or allow flange to bump cables on adjacent reels. Do not lift reels under turns of cable or bracing. Approved cable reel stands shall be used when removing cable.

Circuit conductors shall be same AWG size from source to load. Neutral wires shall be same size as phase wires except as noted on the drawings.

3.5 CABLE TERMINATIONS AND CONNECTIONS - 600 VOLT AND LESS

It is the intent that the Contractor shall terminate all conductors and in such a manner that the various functions are performed as intended, and he shall be responsible for rearrangement as necessary to satisfy these requirements. If there is any question as to proper connection, the Contractor shall make temporary connections with sufficient length so that conductor can be switched to another terminal without splicing. Splices will not be accepted (except for specified circuits or lighting branch circuits at approved locations), and any conductors cut too short shall be replaced at the Contractor's expense.

Control conductor terminations shall be made in accordance with schematic and/or [connection diagrams](#) using conductor numbers as assigned on the diagrams.

Power and control conductors shall be rung out and identified before terminal connections are made. Polarity, phasing, and rotation shall be checked and changes made as required before terminal connections are made.

Terminations shall be made using compression-type lugs, unless otherwise specified. Connections at transformers and other similar connections to insulated leads or buses shall be covered and taped in a manner appropriate to the class of insulation originally on the conductor.

The Contractor shall submit a sample compression connection for each type of termination for approval by Contracting Officer. The following information is required with each sample: Cable data (type, size, insulation, jacket, physical data, etc.), type of hydraulic compression device, type of compression dye, and type of compression connector. Mechanical connectors are not acceptable.

All stranded wire connections, No. 10 AWG and smaller, to binding screw type equipment terminals shall be vinyl insulated, ring-type lugs, T&B Sta-Kon or equal. Compression fitting shall not be permitted on solid wire.

All 600 volt rated wire connections, No. 8 AWG and larger, to stud-type or flat-bar type equipment terminals shall be terminated with a compression type lug. Contractor shall furnish one sample crimp of each wire size to be installed. Contractor shall crimp each lug per manufacturer's printed instructions with the manufacturer's recommended die tool.

All splices and taps in 600-volt rated wire, for lighting systems, No. 10 and smaller shall be T&B Sta-Kon, or equal, pressure connector with insulation cap.

All splices and taps in 600 volt rated wire for lighting systems, No. 8 and larger, shall be Burndy-Servit KS connector or equal. Servit connectors shall be insulated with 3 half-lapped layers of Scotch Brand, or equal, electrical tape, or approved molded insulation.

3.6 CONDUIT AND WIRE IDENTIFICATION TAGGING

Each conduit containing a feeder cable, each multiconductor cable, and each bundle of single conductor wires shall be tagged with identification tags or identification ties. Each wire shall be marked with preprinted heat-shrink wire sleeves.

Stainless steel tags shall be installed at each end of conduit or cable, on each side of walls or floors, where cable enters or leaves equipment lineup, and where a conduit or cable passes through a junction box, wiring trench or pullbox.

Each single conductor wire or individual conductors of multi-conductor cables shall be identified at each end or where individual conductors separate from their main bundle.

The 15kV feeders, from the substation to the switches, shall be numbered by the Bus number and the Breaker number. An example of this is "Feeder 5-11".

All other cables will be numbered to indicate the source device number and the termination device number. The source device of the electrical wire may be a Motor Control Center, a Lighting Panel, or a Receptacle Panel. An

example of the termination device may be a Motor Control Center, a Lighting Panel, a Receptacle Panel, a pump, or an Air Handling Unit. Should a wire be fed through a pull box or a junction box, the wire should be labeled at that device. Refer to Figure 1 and Figure 2 at the end of this section for examples of a cable numbering system.

NOTE: Please make sure that the "Cable Labeling - Figure's 1 and 2 Sketch" is attached to this section on final print.

3.7 WIRING DEVICES

3.7.1 Wall Switches and Receptacles

Wall switches and receptacles shall be so installed that when device plates are applied, the plates will be aligned vertically to within $1/16$ inch.

The ground terminal of each flush-mounted receptacle shall be bonded to the outlet box with an approved green bonding jumper.

The grounding contacts for the receptacle shall be pointed to the floor.

3.7.2 Device Plates

Device plates for switches that are not within sight of the loads controlled shall be suitably identified with a nameplate with a description of the loads.

Device plates and receptacle cover plates for all receptacles shall be labeled, showing the circuit number, voltage, frequency, phasing, and amperage available at the receptacle; for example: "RP1-12, 208 volts, 60 hertz, 3 phase, 30 amperes". An engraved metal identification label shall be applied. The labels shall be W.H. Brady Co., Part Number CL-317-969-BK size 317 CUAU 32475 or approved equal.

3.8 BOXES AND FITTINGS

Pullboxes shall be furnished and installed on conduit runs longer than 100 feet or with more than three right-angle bends.

Outlet boxes shall be equipped with plaster rings, extension rings, and fixture studs where required. All unused openings in boxes shall be closed with factory made knockout seals. Where several feeders pass through a common pull box, the feeders shall be tagged to indicate clearly the electrical characteristics, circuit number and panel designation.

Boxes and enclosures shall be securely mounted to the building structure with supporting facilities independent of the conduit entering or leaving the boxes.

3.9 LIGHTING FIXTURES

A fixture shall be installed at each outlet indicated, and lamps of the proper type and wattage shall be installed in each fixture.

New lamps shall be installed immediately prior to completion of the project.

Fixture shall be installed parallel and perpendicular to major axes of structures and shall be plumb and aligned to a tolerance of 1/2 inch in 10 feet.

Supports for recessed fixtures shall have a minimum capacity of 150 pounds, and all parts of the support shall be arranged to prevent their vibrating free.

Surface-mounted fixtures shall be attached securely to structural members or to metal supports which span structural members. Fixtures shall be fastened near each end and, if over 4 feet long, shall also be fastened at the center. If surface-mounted fixtures are not of a type approved by the UL for direct mounting on combustible ceilings, suitable spacers shall be installed.

Fixtures located in equipment rooms shall be so installed that they clear all obstructions such as duct, piping, bracing, and supports.

3.10 CUTTING AND PATCHING

The Contractor shall install his work in such a manner, and at such time, as will require a minimum of cutting and patching of the building structure.

All holes in or through existing masonry walls and floors shall be drilled and smoothed by sanding in exposed locations. The use of a jack hammer will be permitted only where specifically approved.

3.11 DAMAGE TO WORK

All required repairs and replacement of damaged work shall be done as directed by, and subject to the approval of, the Contracting Officer, and at no additional cost.

3.12 CLEANING

Exposed surfaces of wireways, conduit systems and equipment which have become covered with dirt, plaster, or other material during handling and construction shall be thoroughly cleaned before such surfaces, are prepared for final finish, painting, or are enclosed within the building structure.

Before final acceptance, all electrical equipment, including fixtures and glass, shall be clean and free from dirt, grease, and finger marks.

-- End of Section --