2023
Design Guidelines & Construction Standards

DES

Washington State
DEPARTMENT OF
ENTERPRISE SERVICES



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Design Guidelines & Construction Standards

Updates to the 2021 Department of Enterprise Services
Facility Design Guidelines & Construction Standards

August 21, 2023

Approved

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AUGUST 2023 Design Guidelines Updates

Below is a list of changes made on August 21, 2023, to the Design Guidelines. Carefully read the updated sections to understand the changes fully. The 2023 updates replace older versions; if there's a conflict, the 2023 changes take precedence.

DIVISION 01 – General

Programming Guide 00022

Additional language added to Section A, Safety and Security

Additional language added to Section B, Site Requirements

Document requirements 00023

Additional language added to Section H, Document Security Protocol.

01 11 00

Additional language added to Summary of Work Section, 1.06 Contractor's Work and Responsibilities – General

Additional language added to Summary of Work Section, 1.10 Contractor use of the premises.

Additional language added to Summary of Work Section, 1.13 Owner – Furnished Items.

01 50 00

Additional language added to Part 3 – Execution, section D and F.

01 78 00

Additional language added to Section 3.03, Operation and Maintenance Data for Equipment and Submittals.

DIVISION 23 – Heating, Ventilating and Air-Conditioning (HVAC)

23 00 00

Additional language added to Section 1.3 Steam and Heating Systems.

Additional language added to Section 1.6 Air Conditioning.

Additional language added to Section 1.9 Mechanical Equipment required to have BACnet

interface.
Additional language added to Section 2.1 Steam and Heating Systems.

DIVISION 25 –Integrated Automation

25 00 00

Remove and replace 2.2 Cabinets in its entirety with updated electrical requirements.

25 30 00

Additional language added to Section 2.20 Signal Transmitters
Additional language added to Section 2.27 Water Flow Monitoring
Additional language added to Section 2.29 Current Transducers
Additional language added to Section 2.31 Current Sensing Relays
Additional language added to Section 2.44 Power Meter

25 50 00

Additional language added to Section 1.1 Definitions.
Additional language / updated web link added to Section 2.2, General BACnet HVAC Interface Requirements, A.
Modification to existing equipment interface, Section 2.2 General BACnet HVAC Interface Requirements, D.
Additional language added to Section 2.9, Power Meter BACnet Interface, 2.

July 15, 2021 Design Guidelines Updates

DIVISION 01 – General

Requirements 01 35 20
Remove and replace this Section in its entirety with attached Section updated July 15, 2021.

01 73 29
Remove and replace this Section in its entirety with attached Section updated July 15, 2021.

01 74 19
Remove and replace this Section in its entirety with attached Section updated July 15, 2021.

01 79 00
Remove and replace this Section in its entirety with attached Section updated July 15, 2021.

01 81 19
Remove and replace this Section in its entirety with attached Section updated July 15, 2021.

August 2023 Construction Standards Updates

Below is a list of changes made on August 21, 2023, to the Construction Standards. Carefully read the updated sections to understand the changes fully. The 2023 updates replace older versions; if there's a conflict, the 2023 changes take precedence.

DIVISION 07 – Thermal & Moisture Protection

07 72 00
Additional language Added to section 1.1 design criteria, B.

DIVISION 08 – Openings

08 10 00
Additional equipment requirements added to Products, Materials and Equipment table.

DIVISION 28 – Electronic Safety and Security

28 13 00
Additional equipment requirements added to Products, Materials and Equipment table.

28 23 00
Remove and replace section with updated documents for required equipment integration and compatibility.

July 15, 2021 Construction Standards Updates

DIVISION 02 – Existing

Conditions 02 80 00
Remove and replace this Section in its entirety with attached Section updated July15, 2021.

DIVISION 07 – Thermal & Moisture

Protection 07 72 00
Remove and replace this Section in its entirety with attached Section updated July 15, 2021.

DIVISION 08 - Openings

08 10 00
Remove and replace this Section in its entirety with attached Section updated July 15, 2021.

08 70 00
Remove and replace this Section in its entirety with attached Section updated July 15, 2021.

DIVISION 28 – Electronic Safety and Security

28 05 13
Remove and replace this Section in its entirety with attached Section updated July 15, 2021.

28 13 00
Remove and replace this Section in its entirety with attached Section updated July 15, 2021.

28 23 00
Remove and replace this Section in its entirety with attached Section updated July 15, 2021

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Introduction:

A. Authority and Purpose

The Department of Enterprise Services Facilities Design Guidelines and Construction Standards (G&S) incorporate into one document DES' requirements and guidelines for all projects in DES- owned facilities. They have been developed to:

- Establish a set of standard operating practices and materials for DES owned facilities. DES intends that construction and maintenance projects associated with its facilities follow these guidelines to promote sustainable, universally accessible, energy efficient, high-quality buildings. Projects done according to these guidelines will lead to more cost-efficient maintenance over the long-term and promote clean, comfortable and healthy workspace for state employees occupying the buildings.
- Facilitate the work of consulting Architect/Engineers (A/Es), construction contractors, DES project managers, and internal trade staff doing smaller in-house projects on DES owned facilities.
- Establish parameters to insure the protection of significant historic features and fabric of some of Washington's most significant historic buildings through application of the Secretary of the Interior's Standards for the Treatment of Historic Properties.

The G&S convey information that is unique to State owned buildings. Many of the requirements have developed out of maintenance experience; others are owner preference to maintain consistency. **Compliance is mandatory**. Exceptions will be made only upon specific written approval. Submit exceptions to Department of Enterprise Services (DES) Project Manager using the "Design Guidelines and Construction Standards Modification Request" form.

Compliance with requirements of these G&S will be monitored and enforced by the DES Project Manager.

Requirements set forth in the G&S are to be incorporated in contract documents and complied with during construction. The A/E shall follow the G&S in programming and design and shall review Contract Documents for compliance with the G&S before bidding.

A secondary purpose of the G&S is guidance for the Project Manager on each project.

B. G&S Control Procedures

DES is responsible for the development, maintenance, revision and distribution of these G&S. The most recent version of the G&S, as well as other related guidelines, are accessible through the DES internet home page. The Project Manager will ensure that the A/E has access to a current copy of all appropriate guidelines and standards at the time of an Agreement.

The G&S will be routinely reviewed and updated by DES.

G&S distribution will be primarily through the DES internet home page (www.des.wa.gov). Each revision will be dated. Paper copies will be made available upon request to the Project Manager.

END OF INTRODUCTION

Each prime consultant has signed an A/E Agreement with DES that refers to several other documents, including the Conditions of the Agreement. For DES owned facilities, these Guidelines and Standards are a Condition of the Agreement.

A. Functional Program

If a functional program exists, it will be provided to the Consultant, unless the A/E Agreement provides for the Consultant to develop the program.

The functional program is intended to identify the types of spaces required, the activities and number of people to be accommodated, space sizes and proximity relationships, service requirements, equipment to be accommodated, etc.

B. Technical Program

The technical program identifies the service and functional requirements relative to infrastructure. If a technical program exists, it will be provided to the Consultant, unless the A/E Agreement provides for the Consultant to develop the program.

The requirements of both the functional and technical programs shall be fulfilled by the Consultant and evidenced at the schematic design phase.

C. Codes and Ordinances

Consultants are required to comply with all applicable codes and ordinances. Enterprise Services owns buildings throughout the State. Projects at any location shall comply with applicable codes and ordinances of the local Authority Having Jurisdiction (AHJ).

D. Record Information

Enterprise Services maintains a Historical Records Center of drawings, specifications, operation and maintenance manuals, and other records for existing facilities. Consultants are expected to utilize this resource where applicable. Other locations, such as Secretary of State Archives and University of Washington library Manuscripts and Special Collection (Harry White collection and Joseph Wohleb Collection) may also contain pertinent information for the A/E to review.

Record information, while helpful, does not take the place of careful field investigation, measurement, and interviews with Enterprise Services facilities staff. Consultants shall not rely on Enterprise Services drawings for location of existing utilities on site. It is mandatory that consultant's field-verify all existing conditions. Consultants must contact Maintenance Operations for verification of location of actual existing on-site utilities for A/E consultant work.

E. Design Considerations

Identify and evaluate any necessary alternates early in the design process. If there are continuous occupancy requirements, a construction sequence shall be identified as part of the bid documents. At the beginning of the Project, the consultant shall prepare a detailed master schedule of the bid document stages (Schematic, Design Development, and Construction), as well as a basic indication of the construction process (Bidding, Construction – broken down for phases if part of the project, Substantial Completion, Commissioning – if required, and Close-Out).

Consultants together with their cost estimators shall visit the site during the initial design phase so there is a clear understanding of the project complexities. Such complexities shall be reflected in the cost estimate. Construction cost estimates must include consideration of difficult work-site conditions, lack of parking, off-hours and overtime work, legislative sessions, working within occupied spaces, visitors, etc. Cost estimates are to reflect the time of bid, not current calendar submittal date.

F. Connections to Existing Utilities & Services

Current policy mandates that any new and/or added capacity hook-ups to existing DES facility utilities and services, including electrical, sewer, storm, water, etc., will require the appropriate DES staff to concur with such hook-up as part of 00024 Design Review Process. A required prerequisite, if it cannot be determined from existing and new documents, will be a "live test" and/or "proof" that the existing utility lines have sufficient capacity to appropriately accommodate the new projected loads.

G. Hazardous Material Considerations

PPD will enter into a separate consultant agreement to provide any Construction Documents that need to be included for the Project. These documents will be incorporated in the A/E Construction Documents.

1. Asbestos: Enterprise Services periodically surveys its facilities and maintains records of asbestos containing materials in compliance with WAC 296-62-07727. DES will provide a good faith inspection report to the Project for inclusion in the bid documents.
2. Lead Paint:
   a. Enterprise Services has surveyed certain facilities for presence of lead paint and maintains records of such surveys in compliance with WAC 296-62-07521. DES will provide a good faith inspection report to the Project for inclusion in the bid documents. The bid documents shall also include the following statement:
   b. "Under the WISHA Lead Standard in Construction, WAC 296-155-176, air monitoring to determine if lead levels are safe shall be conducted, or a negative declaration which states no lead is present or that the work activity will not be unsafe based on prior monitoring of the same activity. All sampling data for exposure monitoring shall be submitted to the Owner's Representative for record retention."
3. Light Fixtures: Any project disposing of fluorescent light fixtures shall confirm if PCB ballasts exist and dispose of the ballasts and fluorescent tubes in accordance with hazardous material requirements.

H. Commissioning

1. It is the policy of the State of Washington to have larger renovation projects and new buildings commissioned to ensure that the facility's mechanical, electrical and other designated systems performance meets the design intent and the owner's functional criteria and operational needs. Other smaller projects may require commissioning as well. PPD PM, in conjunction with other DES staff, will determine if any commissioning is required. In either case, the A/E shall coordinate its contract documents with the commissioning agents requirements. If the commissioning agent is a sub-consultant to the A/E, the consultant shall comply with Appendix VII (7) of the Instructions to Architects and Engineers doing business with PPD, titled "Commissioning Guidelines". This is found on the PPD internet home page. As a minimum,

any Project that has HVAC equipment and/or controls shall have commissioning completed for those components.

2. Any project that must comply with LEED silver requirements must also comply with the High-Performance Public Buildings statutes (RCW 39.35D) and be monitored for performance. The preferred method of monitoring is to establish capabilities through the Energy Management Control System (EMCS).

3. All monitoring systems must be programmed to collect the consumption of energy and water. All such monitoring systems must be commissioned. It is also recommended that the commissioning authority check the monitoring system(s) after ten (10) months during the Enhanced Commissioning effort of the EMCS, HVAC and electrical systems to ensure systems are functioning as intended.

I. Energy Life Cycle Cost Considerations

It is the policy of the State of Washington that major facility designs be based on the total life cycle cost, including the initial construction cost, the cost of the energy consumed, and the costs of the operation and maintenance of the facility over its economic life.
These guidelines are for the preparation of an Energy Life Cycle Cost Analysis (ELCCA) for a major facility (defined as having twenty-five thousand square feet or more of usable floor space) that is to be constructed or renovated by any public agency. Part of the ELCCA is to include Green Building Options related to the U.S. Green Building Council's Leadership in Energy and Environment Design (LEED), Silver Standard, as required by the 2011 Washington State Legislature, *RCW 39.35.030 (7)(a.)*

J. Waste Reduction

1. Enterprise Services desires to reduce impacts to the environment by minimizing waste and using materials from recycled products. The A/E shall confirm with the PM if the Project Documents are to address the following:
   a. Salvaged, re-furbished or re-used materials shall be 5% to 10% of the MACC.
   b. Specify new material such that the sum of post-consumer recycled content plus one-half of the pre-consumer content constitutes 10% to 20% of the total value of the materials provided for the Project.
   c. Specify that 10% to 20% of the building materials used in the Project are extracted, processed and manufactured regionally, within a 500-mile radius.
2. All projects having an energy or water component included in the scope of work shall exceed, at a minimum, the Washington State Energy Code by 20% and the EPACT 2005 Standards for Water Efficiency by 20%.

K. General Building Requirements For ADA

A/E shall review codes and these WAC references to confirm they are the latest requirements.

1. Barrier-Free Codes Unique to Washington State (WAC 51-50, Ch 10 and 11) include, but are not limited to:
   a. **Control switches.** Manually operated control switches shall comply with Section 309,

      except they shall be placed 32 inches minimum and 40 inches maximum above the floor. The clear floor spaces adjacent to the control switch shall be located beyond the arc of the door swing and centered on the control switch.

   b. **Landings for walking surfaces**. The maximum rise for any run is 30 inches. Landings

shall be provided at the top and bottom of any run. Landings shall be level and have a minimum dimension measured in the direction of travel of not less than 60 inches.

c. **60 Inch clear width of accessible route.** Clear width of an accessible route shall comply with ICC A117.1 Table 403.5. For exterior routes of travel, the minimum clear width shall be 60 inches.

d. **Outpatient medical care facilities.** 10 percent, but not less than one, of the parking spaces provided accessory to such occupancies shall be accessible.

e. **Inpatient and outpatient medical care facilities.** For Group I-1 and I-2 units and facilities specializing in the treatment of persons with mobility impairments on either an inpatient or outpatient basis, 20 percent, but not less than one, of the parking spaces provided accessory to such units and facilities shall be accessible.

f. **Accessible parking spaces.** shall be located on the shortest accessible route of travel from adjacent parking to an accessible building entrance.

g. **Types of parking areas.** Accessible parking spaces shall be dispersed among the various types of parking facilities provided.

h. **Shortest Route.** In parking facilities that do not serve a particular building, accessible parking spaces shall be located on the shortest route to an accessible pedestrian entrance to the parking facility.

i. **Dispersed Accessible Parking.** Where buildings have multiple accessible entrances with adjacent parking, accessible parking spaces shall be dispersed and located near the accessible entrances.

j. **The accessible route of travel shall not cross lanes of vehicular traffic.** Where crossing traffic lanes is necessary, the route of travel shall be designated and marked as a crosswalk.

k. **Sheltered entrance,** at least one accessible entrance shall be under shelter. Every such entrance shall include a passenger loading zone.

l. **White on Blue Background:** International Symbol of Accessibility All interior and exterior signs depicting the International Symbol of Accessibility shall be white on a blue background.

m. **See other requirements in Section:** 10 28 00.

2. Existing Buildings:

a. **Public entrances:** In addition to accessible entrances required at least 50 percent of all public entrances shall be accessible.

b. **All exterior exits** that are located adjacent to accessible areas and within 6 inches of grade shall be made accessible.

L. Historical Buildings and Grounds

The following state capitol buildings and grounds are designated as historic under RCW 79.24.710, or have been determined eligible for the National Register of Historic Places. Treatment of these properties shall follow the U. S. Secretary of the Interior's Standards for the Treatment of Historic Properties and associated guidelines, unless or until directe4d otherwise by the State in consultation with the Department of Archaeology and Historic Preservation:

a. The east, west and north capitol campus grounds, Sylvester Park, Heritage Park, Marathon Park, Centennial Park, the Deschutes River basin commonly known as Capitol Lake, the Interpretive Center, Deschutes Parkway, and the landscape, memorials, artwork, fountains, streets, sidewalks, lighting, and infrastructure of each of these areas

not including state-owned aquatic lands in these areas managed by the Department of Natural Resources;

b. General Administration, Governor's Mansion, Legislative, John O'Brien, Cherberg, Newhouse, Powerhouse, Pritchard, Temple of Justice, Insurance, Dolliver, Capitol Court, and the Old Capitol buildings

2. Other statewide DES facilities may have historical significance. The A/E and PM shall review the Project requirements and consult with appropriate State staff and/or the Department of Archaeology and Historic Preservation.

M. Artwork in Public Places

Pursuant to RCW 43.46.090 through 43.46.095, all state agencies including all state departments, boards, councils, commissions, and quasi-public corporations shall allocate out of any moneys appropriated for the original construction of any public building, an amount of one-half of one percent (1/2%) of the appropriation to be expended by the Washington state arts commission for the administration, acquisition, and conservation of works of art for the state art collection.

1. The formula is applied to escalated maximum allowable construction cost (MACC) and may be applied to architecture and engineering fees and equipment cost.
2. Funding is generated by construction of any new building and/or additions to an existing building or structure except for highway construction sheds, warehouses, or other temporary buildings. In addition, funding is generated by any renovation and remodel work exceeding two hundred thousand dollars ($200,000) at universities, colleges, and community colleges. Renovation and remodel work does not include repair, maintenance, or replacement of building systems, such as HVAC, plumbing, wiring, fire sprinklers, roofs, insulation, lighting, or other system that keeps the building functional and safe.

END OF GENERAL DESIGN REQUIREMENTS SECTION

A. General Building Requirements

1. Serviceability

The initial design and construction is a small fraction of the facility's life cycle cost. The true value of an improvement is measured by its ability to accommodate users and provide low-cost operations and maintenance.

Building services must be efficient, and ideally, transparent to the occupants and public. Service access and maintenance considerations must be given first priority to keep life cycle costs low.

2. Safety and Security

Capitol Campus Construction Projects – Physical Security Strategy and Requirements
DES has adopted the U.S Dept. of Homeland Security (DHS) Interagency Security Committee (ISC) Risk Management Process to understand the risk of existing and new Capitol Campus facilities and grounds. This process identifies the risks associated to each facility along with providing mitigation strategies to provide the appropriate level of protection. During the pre-design, design and construction phases of a Capitol Campus project, the Risk Management Process shall be used. CSVS shall provide the facility security level rating, which determines the appropriate levels of protection for each facility. Any request for deviation to the Facility Security Level shall be approved by DES CSVS. Non-compliance to the appropriate Levels of Protection has the potential to leave the facility exposed to risks in protecting employees, visitors, and the facility itself. More information on the Risk Management Process can be found here:

https://www.cisa.gov/resources-tools/resources/isc-standard-risk-management-process

Components that shall be considered, but not limited to are:
• Identification of facility security level counter measures
  - Specific counter measures for childcare centers
• Facility hardening including:
  - Progressive collapse
  - Façade blast resistance
  - Barrier Protection
• Crime Prevention Through Environmental Design (CPTED)
• Security technologies

The Owner and consultant shall consider building physical security in the pre-design and design of each facility. The consultant shall provide a physical security sub-consultant to facilitate and provide subject matter expertise. The physical security sub-consultant shall have existing, demonstrated knowledge and expertise utilizing the Department of Homeland Security (DHS) Interagency Security Committee (ISC) Risk Management Process.
The Owner, PPD Program Manager, DES Capitol Security & Visitor Services and possible Washington State Patrol security personnel shall be consulted throughout the pre-design and design phase to discuss and incorporate into the project physical security measures including but not limited to:

- Review of DHS ISC Risk Management Process and Requirements
- Progressive Collapse
- Blast Protection

- Barrier Protection
- Video Surveillance
- Access Control
- Intrusion detection and duress

3. **Structural Considerations**

Provide adequate floor to floor height and interstitial space to allow effective maintenance. Consult with DES maintenance staff, through PM, for minimum requirements.

4. **Seismic Considerations**

The A/E shall provide seismic bracing for all systems in accordance with the current interpretation of the International Building Code of the Local Jurisdiction. Generally, this means all piping, conduit, ductwork, suspended equipment, suspended ceilings, etc. shall be braced.

5. **Acoustical Control**

Acoustical control is critical and management of noise from mechanical systems, the exterior environment and occupant's activities must be achieved. Particular care is needed for evaluation of vibration from mechanical equipment mounted on structural members. Computer modeling and analysis shall be used where there is reasonable doubt concerning acoustical

control. In new construction, ventilation equipment and other mechanical noise sources in office spaces shall be designed and specified to provide background sound which conforms to a noise criterion curve or equivalent not to exceed NC-35.

ANSI/ASA Standard S12.60-2010/Part 1, Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools, Part 1: Permanent Schools, can be obtained from ASA's online standards store. A design resource for architects, educators, and school planners for use in new construction or renovation of existing learning spaces, it can be downloaded free from the ASA website @ http://scitation.aip.org/content/asa/standards. The American Speech- Language-Hearing Association has published two Technical Reports on Acoustics in Educational Settings; see Acoustics in Educational Settings: Technical Report" and "Guidelines for Addressing Acoustics in Educational Settings.: The State of Washington Department of Health rules, WAC 246-366-110 Sound Control, include a limit (NC-35) on background noise in classrooms.

6. **Internal Accessibility**

Mechanical, electrical and communications distribution systems shall be provided with access. Pipe and duct shafts shall be provided with platforms, access doors at each landing, lighting and convenience outlets. Suspended ceiling grid systems shall be heavy duty classification to minimize support and seismic bracing wires.

7. Room Data Sheets for Mechanical and Electrical Requirements

Room data sheets shall be developed as part of the schematic design phase. Data sheets shall include electrical, mechanical, communications, storage, security and other requirements as applicable. Completed data sheets will be reviewed and approved by the Project Manager and tenant representative prior to starting Design Development.

8. Maintenance Based Design & Construction

The Owner desires a completed facility that will be efficiently operated and maintained with minimum expenditure of resources during the useful life of the building. The following is intended to provide general guidance for maintenance-based design and construction and does not replace standards established for a specific facility by the Owner.

a. Design is to be consistent with applicable codes, industry standards, and best practices as determined by the Owner.

1) Electrical equipment shall have sufficient access and working space for safe,

convenient operations and maintenance per Article 110 of the National Electrical Code.

2) Mechanical equipment room layouts shall be arranged to provide access for removal and servicing of all equipment.
3) Provisions shall be made for maintenance access to all items of mechanical equipment, such as valves, controls, cleanouts, traps, strainers, heaters, filters, heat exchangers, etc.
4) Access to new roof areas shall be provided with stairway and railings or as approved by DES. Access shall be keyed to maintenance master standard.

b. Installed equipment should be economical to operate. Avoid discontinued, special order, or high-energy demand equipment that will cost more to replace, repair and operate than standard materials.
c. Lighting fixtures designed for inaccessible locations, such as high ceilings, requiring specialized equipment for maintenance should not be installed; but, if accepted by the Owner as part of the design, the project shall provide access and the tools and equipment required to service and maintain the fixtures.
d. Surplus space to accommodate future expansion and technology needs shall be provided where possible.
e. Avoid spatial and functional conflict between HVAC mixing boxes and light fixtures, fire sprinklers and other systems.
f. Design shall provide for effective and efficient custodial care in recognition of its high life cycle cost. Criteria shall include, but not be limited to, custodial product and equipment storage areas adequate in terms of numbers and locations with sufficient space and ventilation.
g. HVAC system shall be designed with open protocol systems controls.
h. HVAC system ductwork shall be designed to exclude the use of interior duct lining.

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3) Provisions shall be made for maintenance access to all items of mechanical equipment, such as valves, controls, cleanouts, traps, strainers, heaters, filters, heat exchangers, etc.
4) Access to new roof areas shall be provided with stairway and railings or as approved by DES. Access shall be keyed to maintenance master standard.

j. Installed equipment should be economical to operate. Avoid discontinued, special order, or high-energy demand equipment that will cost more to replace, repair and operate than standard materials.
k. Lighting fixtures designed for inaccessible locations, such as high ceilings, requiring specialized equipment for maintenance should not be installed; but, if accepted by the Owner as part of the design, the project shall provide access and the tools and equipment required to service and maintain the fixtures.
l. Surplus space to accommodate future expansion and technology needs shall be provided where possible.
m. Avoid spatial and functional conflict between HVAC mixing boxes and light fixtures, fire sprinklers and other systems.
n. Design shall provide for effective and efficient custodial care in recognition of its high life cycle cost. Criteria shall include, but not be limited to, custodial product and equipment storage areas adequate in terms of numbers and locations with sufficient space and ventilation.
o. HVAC system shall be designed with open protocol systems controls.
p. HVAC system ductwork shall be designed to exclude the use of interior duct lining.

B. **Site Requirements**

1. **Roadways and Sidewalks**

Routes of travel shall comply with ADA requirements and accommodate both abled and disabled persons. All outside paths shall be not less than 60 inches wide and shall have a slope no greater than 1:20. Refer to applicable Sections of Division 32, Exterior Improvements, for additional design criteria and related requirements.

Sidewalks and any other hardscape should be designed to meet the latest version of LEED requirements regarding storm water and heat island (non-roof) issues to the greatest extent possible.

2. **Barriers**

All Capitol Campus pre-designs, designs and construction projects shall consider and implement appropriate barrier protection methods and strategies. These strategies shall be based on completion of the DHS ISC Risk Management Process and in coordination with CSVS. Elements may, but not be limited to the types of barriers listed below. Final approval of the selected method shall be made by CSVS.

- CPTED
- Hydraulic bollards
- Permanent bollards
- Removable bollards
- Electric wedge barriers
- Fencing

3. **Utility Tunnels**

Utility tunnels shall be minimum six feet high with service access width minimum 30”.

4. **Landscaping**

   Refer to Guide Specification Section 01 15 00, Temporary Facilities & Controls, for protection requirements of existing landscaping.

   Refer to Planting Section of Division 32 (32 90 00) for additional design criteria and related requirements

5. **Exterior Furnishings**

   See "Washington State Capitol Campus Exterior Furnishings and Fixtures Design Guidelines" for building exterior and site guidance.

C. Building Service Requirements

1. **Vehicular access**

   Above grade emergency vehicle access shall be provided to all building entrances, either by roadway or sidewalk. Turning radiuses shall be adequate for the largest piece of emergency equipment maintained by the Local Fire Department. Garage access to emergency vehicles is not required.

2. **Loading Dock**

   The loading dock shall provide a convenient, covered, all weather location for loading and unloading. Simultaneous access shall be provided for not less than three vehicles. Docks shall accommodate truck bed level unloading. A dock leveler shall be provided in one vehicle location.

   Each loading dock bay shall be not less than twelve feet in width and eight feet in depth. Additional storage space shall be furnished for waste handling and recycling containers, as well as a cardboard compactor. Three phase, 120/208V power shall be provided to the compactor.

   To avoid bird problems, loading docks should have flat, smooth walls and ceilings, with all light fixtures, conduits and pipes recessed.

   For security purposes, include a call box/button to summon state escort and access. Provide conduit to accommodate CCTV camera coverage.

3. **Waste/Recycling Handling**

   Adequate space for separate waste and recycling containers shall be provided in interior and

   exterior locations.

4. **Elevators, Vertical Access**

   Elevators and stairways are required in every facility more than one story high to handle movement of people, material and equipment between floors. A dedicated freight elevator should be provided adjacent to the loading dock.

   A landing stop at rooftop level for buildings with flat/low sloped roof decks is desired.

   Refer to Elevator Standard 14 20 00 for additional design criteria and related requirements.

5. **Custodial Provisions**

   Custodial care is the most costly annual maintenance item for any facility. Every provision that facilitates effective and efficient custodial care is an investment in the reduction of annual maintenance costs.

   Design criteria for custodial spaces shall include the following:

   a. Storage space near the loading dock or freight elevator near the loading dock area. This

space will be used to store large quantities of paper products, spare lamps, cleaning supplies, and equipment. The room shall not contain any electrical panels, telephone panels or other mechanical equipment. The following are additional room requirements:

- Ceiling height shall be a minimum of eight feet.
- Door shall be a minimum of 3'6" wide, opening outward.
- Fluorescent lighting with an average of 40 foot-candles, maintained, at the floor.
- Ventilation to provide conditioned air with appropriate exhaust to the building exterior.
- A floor mounted sink, 30 x 30 inch or larger, no deeper than 6 inch external sidewall, with hot and cold running water from a double supply spout
  Splash shields located on the walls adjacent to the sink
  A floor drain in the center of the room
  No less than 2 duplex receptacles on 2 separate walls

This space shall be scalable sized based on building square footage as follows:

- Buildings up to 50,000 sq.ft. in size: Minimum 100 sq.ft.
- Buildings over 50,000 up to 100,000 sq.ft. in size: Minimum 150 sq.ft.
- Buildings over 100,000 up to 200,000 sq.ft. in size: Minimum 200 sq.ft.
- Buildings greater than 200,000 sq.ft. in size: Minimum 400 sq.ft.

b. A separate subdivided area for a custodial office and break room. (This can be near the storage area but should be located near the loading dock to facilitate in and out access by staff.). This room shall not contain any electrical or telephone panels or mechanical equipment. The room will have the following:

- 4 outlets on 4 separate walls
- At least one computer jack and telephone jack on wall
- 1 wall mounted sink and cabinet in the break room area
- Ventilation to provide conditioned air

This space shall be scalable sized based on building square footage as follows:

- Buildings up to 50,000 sq.ft. in size: No separate custodial office/break room required.
- Buildings over 50,000 up to 100,000 sq.ft. in size: Minimum 100 sq.ft.
- Buildings over 100,000 up to 200,000 sq.ft. in size: Minimum 150 sq.ft.
- Buildings greater than 200,000 sq.ft. in size: Minimum 200 sq.ft.

c. A storage space of maximum 50 square feet in size shall be provided on each floor as near to restrooms as possible. This room shall not contain any electrical or telephone panels or mechanical equipment. The following will be required:

- Ceiling height shall be a minimum of eight feet.
- Door shall be a minimum of 3' 6" wide, opening outward.
- Florescent lighting should provide an average of 40 foot candles, maintained, at the floor.
- Ventilation shall provide conditioned air with appropriate exhaust to the building exterior. (Do not mix with building HVAC to ensure good indoor air quality.)
- A floor mounted sink shall be located near the door with splash shields on adjacent walls.
- A floor drain shall be provided in the center of the room
- 2 Duplex receptacles shall be provided on 2 separate walls.

6. **Restrooms**

Restrooms shall be provided with adequate floor drains in the center of the room.

Plumbing chases are to be provided with access.

Water closets are to be wall hung.

Jumbo roll tissue dispensers, flat seat cover dispensers and surface mounted Sanitary Napkin disposal units (in women's and unisex restrooms) shall be located in each stall. (Specifications in Section 10 28 00)

Sanitary napkin dispensers shall be located in women's restrooms which can be configured to dispense products without charge.

Hot and cold-water valves for garden hose hook ups under sinks/vanities are to be provided for custodial use. (Security faucet type)

Trash receptacles will be freestanding and are not to be recessed into walls.

Shower areas will have hot and cold water valves for garden hose hook up installed in wall panel for custodial use.

Renovated restrooms shall include one utility sink with a goose neck faucet to facilitate occupant dishwashing, coffee making, etc.

7. **Stairwells**

Electrical outlets shall be installed on every landing.

Review type of finish material with PM and custodial services.

8. **Electrical Rooms and Closets**

Electrical rooms shall be devoted entirely to electrical equipment. There shall be no foreign piping, ductwork, etc. in the electrical room. Electrical room size shall provide for additional future equipment. Working clearances around equipment shall exceed National Electric Code

minimum requirements by 25 percent. Unless otherwise exempted by code, there shall be two (2) exits, one at each end of the working space, in electrical rooms containing equipment rated 1200 amperes or more and over 6 feet in width containing overcurrent devices, switching devices, control devices, relays, and similar equipment.

Electrical closets shall be devoted entirely to electrical equipment. Closet doors shall be not less than 36" wide and shall swing out, away from electrical equipment.

HVAC shall take into consideration heat loads from dry transformers.

9. **Communication Rooms**

Individual rooms shall be a minimum of 120 square feet for each floor. Provide adequate ventilation or air conditioning for heat control.

10. **Designated Areas for Printers and Copiers**

Specific areas shall be designated for locations for printers and copiers. Spaces for copiers shall have direct ventilation to the exterior of the building.

END OF PROGRAMMING GUIDE

A. Drawing Requirements

Drawings shall be prepared in accordance with PPD Instructions for Architects and Engineers Doing Business with PPD, DOC, and DSHS. For remodel and renovation projects, existing features and systems shall be screened or half-toned to allow easy identification. Drawings shall include one-line diagrams, equipment schedules and text and/or graphical Sequence of Operations.

B. As-Builts

As-built drawings shall be provided at the conclusion of the project. One set of Revit or AutoCAD.DWG files shall be furnished.

Refer to Guide Specification Section 01 78 00, Closeout Submittals, for coordination with Record Document submittals required by Contractor at project close-out. Refer to Guide Specification Section 01 31 19, project meetings, for 'as-built' meetings required by Contractor and their subcontractors during the construction phase.

C. Specifications

Specifications shall be prepared in the Construction Specification Institute (CSI) format. Files shall be provided in Microsoft Word format. All addenda items issued during bidding period, plus all COs, COPs, FAs, RFIs, and the like, shall be annotated. Refer to Guide Specifications Section 01 78 00, Closeout Submittals, for additional Record Document submittal requirements at project close-out.

D. Permits and Certificates

Refer to Guide Specifications 01 78 00, Closeout Submittals.

E. Training

Refer to Guide Specifications 01 77 00, Closeout Procedures.

F. Warranty Contacts

Refer to Guide Specifications 01 78 00, Closeout Submittals.

G. Sub-Consultants Closeout Submittals

All sub-consultants to the prime consultant are not to include their own requirements regarding close-out submittals. Sub-consultants' specification sections regarding closeout submittals including project record documents, operation and maintenance manuals, warranties, bonds, extra stock, etc., are only to reference seeing Section 01 78 00. If the consultant has specific criteria, they need beyond Section 01 78 00, they can specifically identify it at the same time as being in addition to requirements of Section 01 78 00.

H. Document Security Protocol

Projects involving high security risk and certain other locations will involve special document security protocol as described below for purposes of maintaining building security protection. The Project Manager will notify the A/E when such protocol is to be enforced.

Communications

When specific security issues on a project need discussion, do not use e-mail or fax. All such communications are to be by telephone, meetings, or through regular mail.

Crime Prevention Through Environmental Design

To ensure the application of industry best practices are applied in new construction and projects that include retrofitting of existing buildings, redesign of outdoor spaces, CSVS will apply 'Crime Prevention Through Environmental Design' (CPTED) principles. During the planning and through the construction phase, CSVS will be required to review all plans as well as in progress work to ensure CPTED principals are applied where it is appropriate and possible.

CPTED is a crime prevention theory focusing on tactical design and the effective use of the built environment, which when applied, reduces both crime and the fear of crime. A main objective of CPTED is to reduce/remove the opportunity for crime to occur in an environment and promote positive interaction with the space by legitimate users. CPTED is a preventative, pro-active model, and not a reactive one.

CPTED comprises five principles: 1) physical security 2) surveillance; 3) movement control; 4) management and maintenance and 5) defensible space.
During planning and implementation phases, CSVS will consult on plans and provide a list of recommended approaches, installments, and changes that will increase the overall security and crime prevention attributes that can be used in that project.

CSVS will provide a consultant that is certified in CPTED to consult on all planning workgroups from the beginning of each effort to ensure opportunities are defined.
CPTED Process

The CPTED process has seven stages:

- Identify the crime risk dynamic of the location and its environment.
- Triage the crime risk dynamic to identify which crime risks need to be addressed and when
- Identify opportunities at the location to use environmental design to reduce crime
- Triage the environmental design opportunities to provide the most effective crime prevention outcomes at the appropriate times
- Identify potential conflicts and adverse consequences and revise as necessary
- Integrate into the development plans and design
- Implement and review the outcomes at appropriate times and record any lessons learned

City Plan Review

When design documents are delivered to the Authority having Jurisdiction (AHJ) for review and permit application they will have

an attached cover letter stating: “These documents will not be released without written approval of Enterprise Services and the Washington State Patrol.”

Contractor Pre-Bid Walkthrough

All contractors at pre-bid walk through will have submitted name, date of birth and driver’s license number to Site Representative 48 hours prior to walk through for security screening.

Bid Documents

1. Only design documents that contain information that could be viewed by public passer-by will be available.
2. No floor plans will be available.
3. No site plans will be available.
4. Scope and quantity of work will be available.
5. Exterior elevations of building will be available.

Construction Phase

1. All copies of construction documents shall be signed out, numbered, and stamped “Do Not Duplicate.” by the architect.
2. Upon completion of project architect will return all copies of construction documents to Enterprise Services.

END OF DOCUMENT REQUIREMENT

Project document (drawings, specifications, cost estimate) review by stakeholders shall occur at 95% completion of the schematic design, design development, and construction document stages. The design development presentation will also include a second presentation to the State Facilities Access committee (SFAC)

These two presentation meetings may occur on the same day. The design schedule shall include time frames for the review process as outlined below. The DES Asset Manager will develop the stakeholder and project review notification lists.

Certain Capitol Campus projects are also subject to review and approval of the State Capitol Committee (SCC) and/or the Capitol Campus Design Advisory Committee (CCDAC). These reviews and stakeholder presentations may each occur on different days. They may also require varying submittal criteria.

Project Document Review

1. For stakeholder Project document review, the objective is to:
    a. Receive benefit of multiple reviewers and enhance Project quality.
    b. Provide feedback to reviewers of A/E's responses.
    c. Provide consistent format and process for reviews.

2. Submitted documents shall comply with PPD Instructions for Architects and Engineers.

3. A/E is to present the Project documents and provide a detailed written summary handout of changes made to the design since the previous review period. The presentation will be to the stakeholder group at an overview meeting. The overview meeting is to occur at the facility where the Project is located, or an alternative location acceptable to the PM. The purpose of this meeting is to provide a familiarization "walk-through" of the Project documents to all reviewers so that appropriate review comments can be made.

4. The PM will determine the number of sets of Project documents that are needed for distribution at this meeting. All drawings are to be full size sheets unless otherwise requested.

5. Review Process.
    a. Depending on the scope of the Project, reviewers may have up to 3 weeks after the overview meeting to provide comments to the PM for forwarding to the A/E. Comments will be on the Document Review form included at the end of this section.
    b. The A/E will analyze the comments and provide responses in the Explanation column of the Document Review form. No comments are to be left blank in the Explanation column. Completed forms are to be provided to the PM within 5 working days.
    c. If Explanation responses indicate the original comment is in conflict with the intended scope, these items will be reviewed with appropriate parties by DES representatives to make a determination, or the A/E will be advised within 5 working days by the PM that it is being evaluated.
    d. At the end of the timeframes indicated in items 1, 2 and 3, a roundtable discussion will be convened at the location of the overview meeting. Attendees will be the A/E and all other parties who provided comments/responses. A/E responses will be reviewed and any disputes resolved, except those that might still be under evaluation in item 3. The roundtable may last one or more days. Within 3 working days, the A/E will provide to the PM written minutes of the meeting indicating the final resolution of each comment. The PM will distribute a copy of the minutes to all reviewers.

END OF DESIGN REVIEW PROCESS

Document Review

Date: Reviewer: Position: Agency:			Project Title: Building: Owner Rep: Phone:	Action Taken on Comments By: C - Correction Made NC - Correction Not Made
Item No:	DWG Sheet/ SPEC Sect:	DWG Detail/ SPEC Para:	Comments:	Explanation:

A/E shall work with the DES Project Manager to set the pre-bid meeting and bid dates. E&A Services will advertise the invitation to bid in accordance with Public Works law.

A. Documents

1. **Instructions to Bidders**

   The A/E will find this information at the DES internet home page for inclusion in the documents.

2. **Supplemental Bidder Responsibility Criteria**

   The A/E will find this information at DES internet home page. When included in a project, requirements shall be tailored to fit the specific project as developed with the PM. Insert the Supplemental Bidder Responsibility Criteria document immediately following the Instructions to Bidders document.

3. **Bid Proposal and Advertisement for Bids**

   The A/E will find this information at DES internet home page. The A/E will complete the Advertisement for Bids with the exception of the project number and identification of Plan Centers. The A/E will identify how the Project documents are to be printed. Project documents must be ready for printing prior to advertising for bids. Include or eliminate reference to Supplemental Bidder Responsibility Requirements as determined with the PM. Once completed, forward the document to the PM for reviewing and forwarding on to DES's Contract Specialist for finalization. The Contract Specialist will email the final Advertisement for Bids document back to the A/E for including in the A/E Project Manual. The Contract Specialist will notify appropriate news media to advertise the project for bid.

END OF PROCUREMENT REQUIREMENTS STANDARD

A. Documents

1. **Prevailing Wage Rates**

   A. This project is subject to the payment of prevailing wages to all workers. It is the Contractor's responsibility to determine and use the most recent set of rates for the appropriate area of the state, as published by the Washington State Department of Labor and Industries. These rates are available on the web at:

   http://www.lni.wa.gov/TradesLicensing/PrevWage/WageRates

   B. Contractor shall include these provisions in all subcontracts for work performed under this Contract.

2. M**odifications to Supplemental Conditions**

   This would be a new section to include special requirements for a Project that would change requirements in the Supplemental Conditions approved by PPDContracts Section.

3. Sequence in Specifications

The A/E is to organize this information in the Specifications in the following order:
Advertisement for Bids
Instruction to Bidders for Washington State Facilities Construction
Supplemental Bidder Responsibility Criteria (if used)
Bid Proposal
Certificate of Insurance
General Conditions for Washington State Facility Construction
Supplemental Conditions for Washington State Facility Construction
Modifications to Supplemental Conditions for Washington State Facilities Construction (if necessary

END OF CONDITIONS OF THE CONTRACT STANDARD

Guide Specifications

Summary of Work

Refer to Guide Specification Section 01 11 00.

Appendix A: Assignment of Pre-Purchased Products/Equipment

Allowances

Refer to Guide Specification Section 01 21 00. Coordinate with Bid Proposal form.

Unit Prices

Refer to Guide Specification Section 01 22 00. Coordinate with Bid Proposal form.

Alternates

Refer to Guide Specification Section 01 23 00. Coordinate with Bid Proposal form.

Contract Modification Procedures

Refer to Guide Specification Section 01 26 00.

Payment Procedures

Refer to Guide Specification Section 01 29 00.

Project Management and Coordination

Refer to Guide Specification Section 01 31 00.

Communication

Refer to Guide Specification Section 01 31 15.

Project Meetings

Refer to Guide Specification Section 01 31 19.

Construction Progress Schedule

Refer to Guide Specification Section 01 32 16. For projects of limited scope and projects with a construction cost less than $1,000,000, coordinate with the PM whether the Construction Schedule provisions contained in the General Conditions and Supplemental Conditions for Washington State Facility Construction will suffice and the more detailed requirements of Section 01 32 16 may be omitted.

Submittal Procedures

Refer to Guide Specification Section 01 33 00.

Safety Procedures

Refer to Guide Specification Section 01 35 20.

Protection, Storage & Treatment Procedures for Historic Building Materials

Refer to Guide Specification Section 01 35 91.

Plan & Procedures for Unanticipated Discovery of Cultural Resources

Refer to Guide Specification Section 01 35 93.

Regulatory Requirements

Refer to Guide Specification Section 01 41 00.

References

Refer to Guide Specification Section 01 42 00.

Contractor Field Quality Control Procedures

Refer to Guide Specification Section 01 45 16. Refer also to the following associated forms:

Form 01 45 16-F1: Contractor Quality Control Daily Report

Form 01 45 16-F2: Contractor's Quality Control Test Report

Historic Preservation Inspection Services

Refer to Guide Specification Section 01 45 23.

Waterproofing Inspection Services

Refer to Guide Specification Section 01 45 24.

Testing Laboratory Services Provided by Owner

Refer to Guide Specification Section 01 45 29.

Temporary Facilities & Controls

Refer to Guide Specification Section 01 50 00.

Temporary Tree & Plant Protection

Refer to Guide Specification Section 01 56 39.

Common Product Requirements

Refer to Guide Specification Section 01 61 00.

Substitution Request Form

Field Engineering

Refer to Guide Specification Section 01 71 23.

Cutting and Patching

Refer to Guide Specification Section 01 73 29.

Cleaning

Refer to Guide Specification Section 01 74 00.

Construction Waste Management and Disposal

Refer to Guide Specification Section 01 74 19. Refer also to the following associated forms:

Sample Form: Demolition & Construction Waste Management Plan

Blank Form: Demolition & Construction Waste Management Plan

Closeout Procedures

Refer to Guide Specification Section 01 77 00.

Closeout Submittals

Refer to Guide Specification Section 01 78 00.

Blank Form: Watertightness Warranty

Warranty Tracking Procedures

Refer to Guide Specification Section 01 78 36.

Demonstration & Training

Refer to Guide Specification Section 01 79 00.

Indoor Air Quality

Refer to Guide Specification Section 01 81 19.

General Commissioning Requirements

Refer to Guide Specification Section 01 91 13.

END OF GENERAL REQUIREMENTS STANDARD

GUIDE SPECIFICATIONS

The following specification is intended to be used, generally verbatim, in the contract documents. ***[Specifier notes]*** shall be deleted during the editing process. Where [ ] appear in this document, this indicates requirements which are optional depending upon the project scope and conditions. Edit as appropriate for the project. The A/E consultant shall take ownership and responsibility for the contents of this section and is expected to modify other portions as necessary to accurately reflect conditions of the project. For draft copies during the design process, use Microsoft Word, Track Changes. Set criteria so that deletions show as strikethroughs. Deletions and additions are to be in red.

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 WORK COVERED BY THE CONTRACT DOCUMENTS

A. This project includes various trades. Coordinating of construction activities by the Contractor will be required to ensure that the project will not affect the operation of State personnel throughout the entire construction process. Site access is limited, and adjacent areas will remain occupied during construction.

1. Each trade is governed by General and Supplemental Conditions of the Contract and all provisions of Division 1, General Requirements, whether or not specifically referenced for its particular work.

B. Briefly, and without force and effect upon the Contract Documents, the Work of the Contract can be summarized as follows:

[Specifier insert description]

C. ***[Specifier modify as required]*** The Project work also includes the selective demolition, removal, and disposal of various type of hazardous materials off-site, using methods and locations approved by the state, including all costs thereof.

D. ***[Specifier modify as required]*** The Work is included in a single Base Bid, plus alternate bids, if indicated and as accepted.

1.03 SPECIAL REQUIREMENTS

A. Special requirements and conditions apply to the work of this contract and are intended to limit the disruption of existing operations. Refer to Section TEMPORARY FACILITIES & CONTROLS, Section 01 50 00.

B. The Contractor shall photograph and videotape in sufficient detail the existing interior and/or exterior and grounds of all areas that will be affected by construction and haul routes to substantiate existing conditions that might otherwise be construed as damage caused by the Contractor. Date all material and deliver a copy to the Owner within (7) days following the Notice to Proceed. Any damage within the limits of construction or areas used by the Contractor outside of the limits of construction shall be the responsibility of the Contractor to repair unless the damage can be positively identified by photograph or videotape as being a previously existing condition.

1. Photo-documentation of special, secure areas may require special handling and storage. Owner will identify when these circumstances are present and how the photo-documentation will be handled.

1.04 HAZARDOUS MATERIALS ***[Specifier delete or modify as required]***

A. ***[Specifier modify as required]*** Hazardous material abatement is included in the scope of work of this project. Refer to Hazardous Material Abatement for detailed information and requirements.

B. Hazardous materials anticipated to be impacted by the work of this project include ***[Specifier identify]***. No other hazardous materials have been identified or are known to exist within the project area at the time of bid. Should any work activities by this Contract discover/disturb any additional hazardous material, the Contractor is directed to immediately cease work activity in the area found to be potentially hazardous, notify the Owner, and await Owner's directions as the appropriate action to be initiated.

C. All products used in the construction shall be asbestos free. Products which are described as "less than 1% asbestos" or "virtually asbestos free" are not acceptable. Only products which are asbestos free are permitted in the construction of this project.

D. All paint products used in the construction shall be lead free.

1.05 WORK UNDER OTHER CONTRACTS

A. Work on the Project which may be executed by others, and which is excluded from this Contract, are as follows:

1. Prior to the Contractor's Notice to Proceed, the Owner will remove all moveable items within the limits of construction that are not identified to remain or be removed or reused by the contractor.
2. The removal from the construction area of any containers of toxic or hazardous chemicals or materials is to be accomplished by the Owner prior to any construction activities commencing. Should there be any known hazardous materials left in the construction area, Contractor shall be informed by the Owner pursuant to Article 5.07 of the General Conditions.

B. ***[Specifier modify as required]*** The Contractor shall be aware that the Owner is planning on undertaking a number of other distinct projects which will be occurring in and around the project site during the duration of this project. At the time of bid, those projects include:

[Specifier insert description]

C. Cooperate fully with separate contractors so that work under those contracts may be carried out smoothly, without interfering with or delaying work under this Contract.

1.06 CONTRACTOR'S WORK & RESPONSIBILITIES - GENERAL

A. Unless otherwise indicated, Contractor's work and responsibilities include, but are not limited to the following:

1. Providing and paying for labor, materials, equipment, tools, machines, facilities, and services necessary for proper execution and completion of work.
2. Paying required taxes.
3. Securing and paying for, the following items as necessary for proper execution and

completion of work (as applicable at time or receipt of Bid):

a. Permits; See 01 11 00 - 8.
b. Fees.
c. Licenses.
d. Inspections, unless otherwise noted.
e. Connection and tap charges.

4. Enforcing strict discipline and good order among employees.
   a. Smoking shall not be permitted within any building or within 25 feet of any building entrance. Smoking shall not be permitted on building rooftops or parking garages
   b. No Contractor employee shall bring family members or animals onto project site.
   c. Any and all individuals performing work on the campus will pass a background check and obtain an ID/access badge prior to conducting any work.
   d. All ID/access badges will be worn where they are visible at all times while working.
   e. All ID/access badges will be returned to the project manager or designee at the completion of the contracted work or if employment status changes for a specific individual prior.
   f. Any individual without an ID/Access badge must be escorted by a DES employee at all times until a badge is available.
5. Using new materials, unless otherwise noted.
6. Maintaining required egress and other requirements in accordance with governing Codes and Ordinances throughout the work.
7. Disposing of demolition debris and other non-usable items on a regular basis. Do not allow debris to accumulate. Do not leave food waste to attract rodents.
8. Maintaining all existing utilities used by State personnel.
9. Maintain in a secure state all areas used or controlled by the Contractor.
10. Compliance with all OSHA and WISHA requirements.
11. Ensuring that all subcontractors are familiar with requirements of Division 0, Division 1, and the work of other sections related to its own work.
12. Giving required notices.
13. Providing hazard free Project site.

B. Do not employ on work persons not skilled in assigned tasks.

1.07 WORKING HOURS

A. The project site has a number of agencies and tenants, as well as the public doing business with those agencies, which will continue to conduct business during the course of this project. At any given time, agencies and tenants may or do operate twenty-four (24) hours per day, seven (7) days per week.

[A/E identify if phased work is required and develop write-up with Specifier for insertion here; adjust descriptions of working hours discussed below.]

B. Contractor's normal working hours for this project shall be defined as follows ***[Specifier select option and modify as required***]:

C. contractor's normal working hours for this project shall be defined as follows ***[Specifier select option and modify as required***]:

(or)

Normal working hours for this project are defined as 7:00am to 6:00pm Monday through Friday. Outside working hours for this project are defined as 6:00pm to 5:00am Monday through Friday. Construction phasing and work hours are identified in the Contract Documents.

Normal working hours for this project are defined as 6:00pm to 5:00am Monday through Friday. Outside working hours for this project are defined as 7:00am to 5:00pm Monday through Friday. Construction phasing and work hours are identified in the Contract Documents.

Contractor's normal working hours may, at Contractor's option, also include weekends which shall be defined as beginning at 6:00pm Friday evening and ending at 5:00am Monday morning. Owner approval of weekend work must be obtained before weekend work will be permitted. Contractor shall notify Owner of intent to engage in weekend work a minimum of seven (7) days in advance of dates of work. Owner reserves right to deny request for weekend work depending on potential conflicts with other activities that may be occurring. Denial of request for weekend work shall not be cause for a delay claim to project.

D. ***[Specifier modify as required]*** The A/E, Owner and E&A Services Project Manager will not typically be working during Contractor's normal working hours as defined above. Contractor shall incorporate any affect that this may have on the progress of the project as part of the Base Bid of the project – no overtime payments will be authorized for contractor or subcontractors to communicate with the A/E, Owner and E&A Services Project Manager outside of Contractor's normal working hours nor will time delays be recognized due to the unavailability of these parties during Contractor's normal working hours.

E. All service outages and electrical tie-ins will be required to be made at specific times and may occur only with advance notification and Owner approval. The Contractor shall be responsible for scheduling and completing this work in compliance with the requirements of the contract documents. Refer to Temporary Facilities & Controls for scheduling service interruptions and outages with the Owner. Refer to Project Coordination for specified utility outage and tie-in requirements.

F. Weekly and Special construction meetings during the State workday are to be attended by the Contractor's Project Manager, Superintendent, Quality Control Representative and Sub-contractor representative(s) of current work in progress.

G. At the end of the Contractor's normal working hours, adjacent areas to the Project shall be suitable for normal tenant operations. The Contactor shall continue working at no additional cost, to rectify anything affecting normal tenant operations caused by Contractor work.

H. The Contractor shall provide the Owner a contact list of people who are capable of addressing an emergency issue that may occur outside of Contractor's normal working hours. See 01 31 15.

1.08 PREMIUM PAY

A. Any overtime required to complete this Project outside the Contractor's defined normal working hours shall be included as a part of this contract. No additional payments will be authorized for work performed on weekends, holidays, time required to attend meetings outside the Contractor's normal working hours, or time outside the Contractor's normal working hours required to communicate any identified issues from a previous work shift.

1.09 OWNER'S USE OF PREMISES

A. ***[Specifier – verify Owner will vacate]*** Owner will vacate the building and make all areas accessible to the Contractor by the date of the Notice to Proceed.

B. There may be other temporary or permanent facilities in use by other State agencies in the vicinity of this project. The Contractor shall coordinate construction staging and access to the Work to avoid disruption to activities within other facilities.

C. Owner will maintain existing lawn and landscape areas outside the Contractor's limits of construction.

1. During the project contract time, the contractor is to maintain the appearance of landscaping, grass and other features within its limits of construction as they were when turned over to the contractor.
2. Contractor shall provide reasonable and safe access to Owner's personnel as needed for maintenance of these areas.

3. Contractor shall provide continued electrical and water service to the existing automatic irrigation system while it is operational during the construction period.

D. Owner's personnel will be present on a limited basis during the construction period as necessary to maintain or inspect existing facilities.

1. Contractor shall provide Owner's personnel reasonable and safe access and escort as needed to maintain and inspect facilities.

1.10 CONTRACTOR USE OF THE PREMISES

A. During the construction period the Contractor shall have use of the premises in areas containing project work as indicated in the Contract Documents. Coordinate ingress and egress to minimize disruption of traffic and Owner's use of the premises. Contractors shall not block ingress and egress to accessible entrance, accessible routes of travel or accessible parking.

B. ***[Specifier – verify whether entire building or portion thereof will be vacated; modify as appropriate.]*** Contractor shall control, secure and have responsibility for certain portions of the project site and building areas from the date when the area is vacated by Owner to the date of Substantial Completion. These areas shall generally include:

[Specifier insert description]

C. Monitor and secure portions of the buildings and site under Contractor's control to prevent unauthorized access. Inspect premises at end of each workday to ensure all doors are locked and exterior openings are closed and secure. Scaffolding installed adjacent to a building needs to be secured with plywood to ensure someone cannot gain direct access or

scale scaffolding to access any additional portion of the building.

D. Keep existing driveways and entrances serving the premises clear at all times. Do not use these areas for parking or storage of materials, except where noted.

E. Do not unreasonably encumber the sites with materials or equipment. Confine stockpiling of materials and location of storage sheds to the areas indicated. If additional storage is necessary, obtain and pay for such storage off-site.

F. Limit construction access to only those areas that require work under this Contract.

G. Contractor is fully responsible for damage or loss that occurs to existing facilities, occupants and public as a result of the work performed. Take precautions to protect existing facilities, occupants and public. Immediately repair or replace items damaged or lost as a result of work under the Contract.

H. Cooperate fully with the Owner during construction operations to minimize disruptions of Owner's operations at and around the project site.

I. Assume full responsibility for protection and safekeeping of products stored on-site.

J. Do not use the following area except as indicated:
   1. Owner occupied areas and accessible route of travel without permission
   2. Parking or accessible parking areas other than indicated.
   3. Owner's garbage and recycle dumpsters.

K. Maintain water and electrical service to existing irrigation system to allow operation during construction period.

L. The existing building and surrounding surfaces that are affected by this Project are to be maintained in a watertight condition throughout the construction period. At all times during the Project, the Contractor is to cover any existing horizontal or vertical surfaces exposed by construction work which have not been made watertight by the installation of new materials prior to the end of the work shift. Repair damage immediately caused by water infiltration.

M. Schedule deliveries to avoid Owner peak commute time periods between the hours of 7:00am to 8:30am and the hours of 4:30pm to 6:00pm.

1.11 WORK SEQUENCE

Specific interim milestones within the overall Contract Time may be required by this Contract. Refer to Project Coordination, Section 01 31 00.

1.12 PRODUCTS ORDERED IN ADVANCE ***[Specifier delete or modify as required]***

A. General: The Owner has negotiated purchase orders with suppliers of material and equipment to be shipped to the project site for incorporation into the Work. The Owner has assigned these purchase orders to the Contractor. The costs for purchasing and shipping are included in Owner's pre-purchase. Costs for receiving handling, storage, and installation shall be included in Contractor's Contract Sum.

   1. The Contractor's responsibilities are the same as if the Contractor negotiated the purchase orders. If necessary, as directed by the Owner, the Contractor shall execute

final purchase order agreements and arrange for shipping.
2. A “Schedule of Products Ordered in Advance” is included at the end of this Section, Appendix A.

1.13 OWNER-FURNISHED ITEMS ***[Specifier delete or modify as required]***

A. FOIC Equipment: Items designated by the abbreviation “FOIC”, furnished by Owner and Installed by Contractor, will be delivered to the jobsite for consignment to the Contractor. Contractor shall assume custody and responsibility for same after inspecting and determining that they are complete and in acceptable condition for installation. Under no conditions is any equipment to be installed prior to the building being enclosed and heated unless specifically approved by the Owner. Installation of such items includes uncrating and all preparatory work necessary for proper installation including blocking and backing, rough-ins, setting in place, building-in, leveling and attaching to building elements, making all mechanical and electrical connections required, and finish work including caulking, grouting, furring, and painting adjacent surfaces, leaving same in completely installed and operable conditions satisfactory to A/E.

1. The Owner will arrange for and deliver necessary shop drawings, product data, and samples to the Contractor.
2. The Owner will arrange and pay for delivery of Owner-furnished items according to the Contractor's Construction Schedule. Contractor shall clearly identify dates for delivery of F.O.I.C. items on schedule.
3. Following delivery, the Owner and Contractor will inspect items delivered for damage.
4. If Owner-furnished items are damaged, defective, or missing, the Owner will arrange for replacement.
5. The Owner will arrange for manufacturer's field services and for the delivery of manufacturer's warranties to the appropriate Contractor.
6. The Contractor shall designate delivery dates of Owner-furnished items in the Contractor's Construction Schedule.
7. The Contractor shall review shop drawings, product data, and samples and return them to the A/E noting discrepancies or problems anticipated in use of the product.
8. The Contractor is responsible for receiving, unloading, and handling Owner-furnished items at the site.
9. The Contractor is responsible for protecting Owner-furnished items from damage, including damage from exposure to the elements. The Contractor shall repair or replace items damaged as a result of his/her operations. Owner furnished and contractor equipment should be fully secured to include lay down areas and fencing.

1.14 WORK NOT INCLUDED IN CONTRACT ***[Specifier delete or modify as required]***

A. Work Not Included in Contract: NIC & FIO: The items of work noted on Drawings and/or described in the Project Manual as “NIC” (Not In Contract) or “FIO” (Furnished and Installed by Owner) will be performed under other contracts operating concurrently with the work of this Contract, and are not included in this Contract:

[Specifier insert description]

B. Contractor is responsible for scheduling the work, storing such equipment if requested, and coordinating related work in the Contract with installation of NIC and FIO equipment. Contractor shall provide all preparatory work necessary for proper installation including blocking and backing, and finish work including caulking, grouting, furring, and painting adjacent surfaces as required for NIC and FIO equipment.

1.15 MISCELLANEOUS PROVISIONS

A. Stored Products
   1. Assume full responsibility for the protection and safekeeping of products under this Contract, stored on and off the site.
   2. Move any stored products, under Contractor's control, interfering with operations of the Owner or separate contractor.
   3. Obtain and pay for the use of additional storage or work areas needed for operations.

B. Notify subcontractors to become familiar with requirements of Division 00, Division 01 and the work of Sections related to their own work. Instruct them that these conditions and requirements apply to their work in each Section of the technical specifications.

C. Contractors and Subcontractors submitting bids for this Project are required to thoroughly familiarize themselves with specified products and installation procedures. Submit any objections or substitution requests for the products and procedures specified in accordance with Product Requirements. Submittal of Bid constitutes acceptance of products and procedures specified.

D. Conflicts & Omissions in Contract Documents
   1. Bring immediately to A/E's attention any conflicts and omissions between the Drawings and Specifications and between the Drawings or Specifications and actual site conditions. In the event of a conflict or discrepancy among or in the Contract Documents, interpretation shall be governed as indicated in Article 1.02 of the General Conditions for Washington State Facility Construction.
   2. Where conflicts and omissions have not been brought to A/E's attention, it is understood that Contractor has figured the most costly method or methods.

E. Mechanical/Electrical Requirements of General Work
   1. General: Except as otherwise indicated, comply with applicable requirements of Divisions 22 and 23 for mechanical provisions within units of general work (Divisions 02-14) and with applicable requirements of Division 26 Sections for electrical provisions within units of general work (Divisions 02-14).

   2. Refer to Division 22, 23 and 26 Sections for the characteristics of the respective mechanical and electrical services to be connected to units of general work. Provide units manufactured or fabricated for proper connection to and utilization of available services. Except as otherwise indicated, final connection of mechanical service to general work is defined as being mechanical work, and final connection of electrical service to general and mechanical work is defined as being electrical work.
   3. Except as otherwise indicated, comply with applicable provisions of the National Electrical Code (NEC) and standards by National Electrical Manufacturer's Association (NEMA), for electrical components of General Work. Provide Underwriters Laboratories listed and labeled products where applicable.

F. It is the Contractor's responsibility to verify all field measurements, survey control, staking and conditions. No allowance will be made for any items incorrectly fabricated or installed due to failure to perform such verification prior to commencing the work.

1.16 PERMITS AND FEES

A. General.

1. For projects within the City of Olympia jurisdiction, the Owner will provide the General Contractor an Owner Permit Billing Tracking Slip for the Contractor to submit to the City to obtain the General Contractor's Building Permit. The Tracking Slip will be used by the City to bill the Owner directly.
2. ***[Specifier - edit as required]*** The Contractor shall obtain all other permits and local business licenses necessary for the execution of the work and pay all permit (except as indicated in paragraph "1" above), utility and miscellaneous fees required by the appropriate Authority Having Jurisdiction (AHJ).
3. The Contractor shall coordinate and schedule all work with respective permitting agencies and utility companies necessary for completion of the work.
4. Contractor shall be responsible for providing all information, documents, and fees to the permitting agencies and utility companies within 30 days after issuance of the Notice to Proceed as necessary to obtain and coordinate permits and utility connections.

B. ***[Specifier - edit as required]*** The Drawings and Specifications have been submitted for plan review to the appropriate AHJ, so that permits will be available to the Contractor for this project on or before the Date of Notice to Proceed.

1.17 UTILITIES

A. Existing Utilities
1. Utilities of record are shown on the Drawings insofar as possible to do so. These however, are shown for convenience only and neither the Owner nor A/E assumes responsibility for improper locations or failure to show utility locations on the Drawings.
2. The Contractor shall contact all utility companies to perform a site locate of the respective utilities, including but not limited to telephone/cable/data, electrical, gas, sewer, water and storm services. Notify Owner's Site Representative when such utility locates are to take place.
3. The Contractor is responsible to locate and protect all public utilities. The Contractor is to work with DES staff for locating and protecting all utilities that belong to the Owner. See other applicable Sections of Divisions 01, 02, 22, 26 and 33 for more information.
4. Exercise reasonable care to prevent damage to existing utilities. If damage does occur, immediately notify Owner to determine appropriate repair. If repair is a life safety issue, proceed with necessary repairs to eliminate this issue and make final repairs upon arrival and approval of Owner. Contractor shall not leave site until repairs have been accomplished.

B. Coordinate all new utility service requirements with serving utility companies including, telephone/cable/data, electrical, gas, sewer, water and storm services. Observe specification standards, written details, and sketches showing equipment locations and dimensions as indicated by the utility company. Coordinate scheduling of utility company work with all other trades.

C. Utility Costs
1. Contractor shall be responsible for securing all public utility connection, tap and inspection fees necessary to make the project fully operational. See Supplemental Conditions for reimbursement / payment of utility connection charges. The Owner will not reimburse the Contractor for additional charges due to the Contractor's lack of coordination, timelines or schedules and payment of charges.
2. Contractor to obtain and pay for, without reimbursement from Owner, permits and fees required for water usage from fire hydrants.

D. Utility shut-downs may not occur prior to the Date of the Notice to Proceed, or after the date of

E. Substantial Completion. The Owner has a process for any utility shut down which requires the Contractor to submit an Owner provided outage request three (3) working days prior to the work occurring. Failure by the Contractor to make such a request and get approval will require the Contractor to reschedule the outage. Do not shut down utility systems until approval to do so is confirmed. Utility systems include but are not limited to irrigation, heating, air conditioning, ventilation, water, sewer, telephones, fire alarm, electrical power, lighting, communications, clocks, security, natural gas, and mechanical control systems.

F. Contractor to provide all layout, site preparation, trenching, backfilling, patching and restoration work required for utility work at no additional cost to the Owner.

G. See Section 01 50 00 for using existing permanent utilities.

PART 2 – PRODUCTS

Not Used. ***[Specifier modify as required]***

2.01 ROOFING MATERIAL

A. Special requirements for substitution requests on membrane waterproofing are required for this project. The submittals are to be received by the A/E no later than 20 days prior to bid opening date. Any membrane roofing submittals received after that date will not be considered.

PART 3 – EXECUTION

3

The Contractor shall be aware of all special requirements for the Project execution described in the Contract Documents. These items consist of, but are not limited to: specific time frames for work, sequence and special requirements for demolition, load limits, and all other criteria described in the Contract Documents.

[Specifier – if PRODUCTS ORDERED IN ADVANCE is used, insert a schedule here. See Appendix A of this Section for "Assignment of Pre-Purchased Materials" form to be used by the Owner to designate pre-purchased products/equipment.]

[Schedule of Products Ordered in Advance]

[Section Product/Equipment Description Manufacturer]

END OF SECTION 01 11 00

Appendix A

Assignment of Pre-Purchased Products/Equipment

Section _____

To ensure timely acquisition of long-lead-time products or equipment, the following items have been pre-purchased by the Owner for installation by the Contractor. Full payment for this products/ equipment will be made by the Owner, including all standard delivery charges to the site.

_____

_____

This equipment has been purchased [through] [directly from]:

Company Name _____

Address _____

Contact Person _____Phone No. _____

Effective on the date of Notice to Proceed, the Contractor accepts assignment of this purchase and shall be fully responsible for all further coordination of the manufacturing and delivery process as if the equipment had been purchased directly by the Contractor. This responsibility includes ensuring that the equipment meets the Owner's specifications of Section _____and ensuring that this equipment is delivered in a timely manner to meet the Contractor's construction schedule.

The Contractor shall be responsible for providing the Owner with all standard equipment and installation warranties as if the equipment were purchased by the Contractor.

The projected shipping date at the time the Owner placed the order is _____. The Contractor shall coordinate with the Manufacturer or his designated representative to ensure that this date is met or adjusted to meet the Contractor's installation schedule.

Following Notice to Proceed, no further contact will be made by the Owner with the Manufacturer other than for billing and payment purposes.

Owner-provided equipment includes only the items listed above. All appurtenances, parts, and other fittings required for a complete and operational installation shall be provided and installed by the Contractor, including _____.

Failure by the Contractor to execute the requirements of this Section may result in non-compliance with the contract completion date which may result in payment of liquidated damages.

GUIDE SPECIFICATIONS

The following specification is intended to be used, generally verbatim, in the contract documents. ***[Specifier notes]*** shall be deleted during the editing process. Where [ ] appear in this document, this indicates requirements which are optional depending upon the project scope and conditions. Edit as appropriate for the project. The A/E consultant shall take ownership and responsibility for the contents of this section and is expected to modify other portions as necessary to accurately reflect conditions of the project. For draft copies during the design process, use Microsoft Word, Track Changes. Set criteria so that deletions show as strikethroughs. Deletions and additions are to be in red.

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes administrative and procedural requirements governing allowances.

1. Selected material and/or equipment allowances are specified in the Contract Documents. In some cases, these allowances include installation. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and/or equipment to a later date when additional information is available. If necessary, additional requirements will be issued by Change Order.

B. Types of allowances include the following:

[Specifier delete items not required]
1. Lump-sum allowances.
2. Unit-cost allowances.

1.03 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise the A/E of the date when the final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

B. At the A/E's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

C. Purchase products and systems selected by the A/E from the designated supplier.

1.04 SUBMITTALS

A. Submit proposals for use of allowances, in the form specified for Change Orders.

B. Submit invoices to show the actual amount paid.

C. Submit any permit requirements and its cost.

1.05 ALLOWANCES

A. Use the allowances only as directed for the Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.

B. Unused amounts remaining in the allowances will be deducted from the Contract by Change Order.

1.06 UNUSED MATERIALS

A. Return unused materials to the manufacturer or supplier for credit to the Owner, after installation has been completed and accepted.

1. When requested by the A/E, prepare unused material for storage by Owner where it is not economically practical to return the material for credit. When directed by the A/E, deliver unused material to the Owner's storage space. Otherwise, disposal of unused material is the Contractor's responsibility.

PART 2 – PRODUCTS

Not Used.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine products covered by an allowance promptly upon delivery for damage or defects.

3.02 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.03 SCHEDULE OF ALLOWANCES ***[Specifier delete or modify as required]***

A. Allowance No 1:

END OF SECTION 01 21 00

GUIDE SPECIFICATIONS

The following specification is intended to be used, generally verbatim, in the contract documents. ***[Specifier notes]*** shall be deleted during the editing process. Where [ ] appear in this document, this indicates requirements which are optional depending upon the project scope and conditions. Edit as appropriate for the project. The A/E consultant shall take ownership and responsibility for the contents of this section and is expected to modify other portions as necessary to accurately reflect conditions of the project. For draft copies during the design process, use Microsoft Word, Track Changes. Set criteria so that deletions show as strikethroughs. Deletions and additions are to be in red.

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 DEFINITIONS

A. Unit price is an amount proposed by bidders, stated on the Bid Form as a price per unit of measurement for materials or services added to or deducted from the Contract Sum. The Unit Price is used if the estimated quantities of Work required by the Contract Documents are increased or decreased.

1.03 PROCEDURES

A. Unit prices include all necessary material, labor, equipment, services, mobilization, demobilization, safety and tool costs, delay and impact costs, insurance, all overhead, profit, and applicable taxes.

B. Contractor shall notify the A/E and Owner when work designated as an allowance or unit price is to be performed. Contractor and Owner's representative shall jointly measure the affected work and confirm in writing the agreed upon quantities prior to proceeding with the work. Contractor shall not receive credit or payment for work designated as a unit price if the Contractor fails to follow this process.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Comply with Specifications and standards for each applicable product.

PART 3 – EXECUTION

3.01 UNIT PRICE SCHEDULE

[Specifier list and describe individual work for unit prices.]

END OF SECTION 01 22 00

GUIDE SPECIFICATIONS

The following specification is intended to be used, generally verbatim, in the contract documents. ***[Specifier notes]*** shall be deleted during the editing process. Where [ ] appear in this document, this indicates requirements which are optional depending upon the project scope and conditions. Edit as appropriate for the project. The A/E consultant shall take ownership and responsibility for the contents of this section and is expected to modify other portions as necessary to accurately reflect conditions of the project. For draft copies during the design process, use Microsoft Word, Track Changes. Set criteria so that deletions show as strikethroughs. Deletions and additions are to be in red.

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes administrative and procedural requirements governing Alternates.

B. General:

1. Each bidder shall state in their bid, in the spaces provided in the Bid Form: ***[Specifier modify as required]***
    a. Their proposal for performing the Base Bid work.
    b. Additive Alternate proposals, stating the sums to be added to the Base Bid for adding items of work listed in this section.
    c. Substitute Alternate proposals, stating the sums to be added to or deducted from the Base Bid for substituting materials and/or construction listed in this section.
    d. Deductive Alternate proposals, stating the sums to be deducted from the Base Bid for deleting items of work listed in this section.
2. All bid prices shall include adjustments in the work of all trades as may be necessary.
3. Identification of Work listed below is general in nature. The Contractor shall provide all materials and associated work necessary to complete the Work of each respective described Alternate.
4. The cost or credit for each Alternate is the net addition to or deduction from the Contract Sum to incorporate the Alternate into the Work. No other adjustments are made to the Contract Sum.

1.03 DEFINITIONS

A. The Base Bid includes all work indicated in the Contract Documents and any issued Addenda for all building and site construction work, all as designated and shown in the Contract Documents, EXCEPT the work included in the following Alternate Bids described in this section which may result in changes to the costs.

B. An Additive Alternate is an amount proposed by bidders and stated on the Bid Form for certain work defined in the Contract Documents that may be added to the Base Bid amount if accepted by the Owner.

C. A Substitute Alternate is an amount proposed by bidders and stated on the Bid Form for certain work defined in the Contract Documents that may be added to or deducted from the Base Bid amount if accepted by the Owner.

D. A Deductive Alternate is an amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be deducted from the Base Bid amount if accepted by the Owner.

1.04 PROCEDURES

A. Modify or adjust affected adjacent Work as necessary to completely and fully integrate the Alternate Work into the Project.

1. Include as part of each Alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not mentioned as part of the Alternate.

B. Immediately following the award of the Contract, notify each party involved, in writing, of the status of each Alternate. Indicate whether Alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of any negotiated modifications to Alternates.

C. Execute accepted Alternates under the same conditions as other Work of this Contract.

D. A "Schedule of Alternates" is included at the end of this Section. Specification Sections referenced in the Schedule contain requirements for materials necessary to achieve the Work described under each alternate.

PART 2 – PRODUCTS

Not Used.

PART 3 - EXECUTION

3.01 SCHEDULE OF ALTERNATE BIDS

[Specifier include Alternate Bid(s) by number and a brief description of the work. Identify any pertinent Alternates on the drawing sheets.]

END OF SECTION 01 23 00

GUIDE SPECIFICATIONS

The following specification is intended to be used, generally verbatim, in the contract documents. ***[Specifier notes]*** shall be deleted during the editing process. Where [ ] appear in this document, this indicates requirements which are optional depending upon the project scope and conditions. Edit as appropriate for the project. The A/E consultant shall take ownership and responsibility for the contents of this section and is expected to modify other portions as necessary to accurately reflect conditions of the project. For draft copies during the design process, use Microsoft Word, Track Changes. Set criteria so that deletions show as strikethroughs. Deletions and additions are to be in red.

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Requirements for Changes are also included in Part 7 of the General Conditions for Washington State Facility construction and Supplemental Conditions. This Section specifies additional detail regarding administrative and procedural requirements for handling and processing contract modifications. In the event of conflicts between this specification and Part 7, the General Conditions and Supplemental Conditions shall supersede any requirements identified herein.

1.03 INITIAL REQUIREMENTS

A. Prior to submitting any cost proposals, the Contractor shall submit a breakdown of all applicable trade and class wage rates intended to be incorporated into this Project using a form acceptable to the A/E and Owner. As a minimum, the breakdown shall show:

1. Basic wage rate (based on L&I Intent to Pay Prevailing Wages or union agreement);
2. Fringe Package (based on L&I Intent to Pay Prevailing Wages or union agreement);
3. FUI (Federal Unemployment Insurance);
4. FICA (Federal Insurance Compensation Act);
5. SUI (State Unemployment Compensation Act);
6. WC (Workers Compensation);
7. Medicare;
8. Any other specific trade costs that affect hourly rate. If an acronym is used, also identify the full name for it.

B. Contractor shall submit verification of the above rates if requested by the Owner.

C. Within 30 days of the Notice to Proceed, the Contractor shall submit a list of all equipment anticipated to be used on the project and whether it is owned or to be rented, using a form acceptable to the A/E and Owner. If during the construction process additional equipment is brought to the Project site, the Contractor shall submit an updated list.

1.04 MINOR CHANGES IN THE WORK

A. The A/E will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or Contract Time, on a form prepared by the A/E. If the contractor believes a cost is associated with the supplemental instructions, the Contractor is to provide written notice to the A/E within 7 days of receipt of the instructions.

1.05 OTHER CHANGES IN THE WORK

A. Changes to the work can be by:

1. Change Order Proposal issued by the A/E to the Contractor on the Owner's behalf.
2. Field Authorization issued by the A/E to the Contractor on the Owner's behalf.
3. Request initiated by the Contractor and submitted to the A/E.

B. Change Order Proposal (COP). The A/E will issue a detailed description of proposed Owner initiated changes in the Work on the Owner's standard COP form that may require adjustment to the Contract Sum or Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. COP requests issued by the A/E are for information only. Do not consider them as an instruction either to stop work in progress or to execute the proposed change.
2. Within 14 calendar days of receipt of a proposal request, or quicker if the project schedule necessitates, the contractor shall submit an estimate of cost necessary to execute the change to the A/E who will evaluate the cost and make a recommendation for the Owner's review.

C. Field Authorization (FA). The A/E may issue, on behalf of the Owner, a FA instructing the Contractor to proceed with a change or specific portion of the change in the Work or specific portion of a COP, for subsequent inclusion in a Change Order.

1. The FA will contain a complete description of the change in the Work. It also designates the method to be followed to determine change in the Contract Sum or Contract Time.
2. The Contractor must provide a Not To Exceed (NTE) amount to be indicated on the FA.
3. As the Work progresses, the Contractor is to monitor its costs. If the costs indicate they will exceed the NTE prior to being able to complete the work, the Contractor is to stop work and notify the Owner. A decision will be made by the Owner to stop the change at that time, or authorize an increase in the NTE amount.
4. The Contractor is not to proceed with the work until the FA is signed by the Contractor, A/E, Owner, and PPDProject Manager.
5. Maintain detailed records of time and material documentation of work as required by the Field Authorization.
    a. After completion of the change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.
    b. Include daily accounting of time spent by each person working specifically on such work, signed by Owner's Site Representative, together with copies of all related purchase orders.

D. Contractor Initiated Change Request. When latent, unforeseen, or other conditions require modifications to the Contract, the Contractor may propose changes by submitting a request for a change to the A/E.

1. Provide initial documentation describing the proposed change, reason for changes, and why the proposed change is not part of the Base Bid.

E. Detailed Documentation of Owner or Contractor initiated Changes.

1. Support each lump sum proposal quotation, and each unit price (not previously established) with sufficient substantiating data.
2. On request, provide additional data to support time and cost computations:
    a. Labor required.
    b. Equipment required.
    c. Products required.
        1) Recommended source of purchase and unit cost.

2) Quantities required.

d. Taxes, insurance, and bonds.
e. Documented credit for work deleted from Contract.
f. Overhead and profit.
g. Justification for any change in Contract Time.

3. Support each proposal for additional costs, and time-and-material/force account work with documentation, as required for lump-sum proposal. Include additional information:
   a. Name of A/E or Owner's authorized agent who ordered work, and date of order.
   b. Dates and times work was performed, and by whom.
   c. Time record, summary of hours worked, and hourly rates paid.
   d. Receipts and invoices for:
      1) Equipment used, listing dates and times of use.
      2) Products used and listing of quantities.
      3) Subcontracts.
4. Document Requests for Substitutions.
5. Statement as to whether overtime work is, or is not, authorized.

F. Approval or Rejection of Proposal.

1. When change is initiated by A/E or Owner through a COP.
   a. Contractor to submit a detailed proposal in writing. Quotation will be guaranteed for period specified in Proposal Request beginning from signing of proposal. If no period is specified, guarantee quotation for sixty (60) days from signing.
   b. Owner reviews proposal and responds in writing as follows:
      1) Request for additional information.
      2) Proposal will be incorporated into a Change Order.
      3) Rejecting the proposal.
   c. Contractor is not to proceed with work until a signed Change Order is received from the Owner.
2. When change is initiated by Contractor.
   a. Owner reviews and responds in writing as follows:
      1) Agrees with Contractor's cost proposal;
      2) Request for additional information;
      3) Rejecting the proposal.
   b. If the Owner responds by agreeing to the Contractor's change proposal, a Change Order will be processed.
   c. If additional information is requested by Owner, respond in writing within fifteen (15) days of Owner's request.

1.06 CHANGE ORDER PROCEDURES

A. Upon final agreement of costs and/or time on either an Owner COP, FA or a Contractor initiated proposal, a Change Order will be processed by PPD.

1. The Contractor cannot submit an invoice for Work changes until a fully executed Change Order is completed.

END OF SECTION 01 26 00

GUIDE SPECIFICATIONS

The following specification is intended to be used, generally verbatim, in the contract documents. ***[Specifier notes]*** shall be deleted during the editing process. Where [ ] appear in this document, this indicates requirements which are optional depending upon the project scope and conditions. Edit as appropriate for the project. The A/E consultant shall take ownership and responsibility for the contents of this section and is expected to modify other portions as necessary to accurately reflect conditions of the project. For draft copies during the design process, use Microsoft Word, Track Changes. Set criteria so that deletions show as strikethroughs. Deletions and additions are to be in red.

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section specifies administrative and procedural requirements governing the Contractor's Applications for Payment.

B. Requirements for Schedule of Values and Applications for Payment are also included in part 6 of the General Conditions For Washington State Facility Construction. This specification section includes additional detail regarding procedural requirements. In the event of conflicts between this specification and Part 6, the General Conditions shall supersede any requirements identified herein.

1.03 SCHEDULE OF VALUES

A. Submit a list of all Subcontractors and Material Suppliers. Submit a copy of each Subcontractor’s and Material Supplier’s contract with the General Contractor, signed by both parties.

B. The Schedule of Values and the Contractor's Construction Schedule are to be developed and agreed to with the Subcontractors.

1. Correlate line items in the Schedule of Values with other required administrative schedules and forms, including:
   a. Contractor's Construction Schedule.
   b. Application for Payment forms, including Continuation Sheets.
   c. List of subcontractors.
   d. Schedule of allowances.
   e. Schedule of alternates.
   f. List of products.
   g. List of principal suppliers and fabricators.
   h. Schedule of submittals.
2. Submit the Schedule of Values to the A/E for approval at the earliest possible date but no later than 30 days after the issuance of the Notice to Proceed, and not less than 14 days prior to the first application for payment.

C. Use the Project Manual table of contents as a guide to format the Schedule of Values. Provide at least one line item for each listed Specification Section beginning with Division 2. Relate applicable activities of the Progress Schedule with each line item broken down separately for labor and materials. Include the following as a minimum:

1. Include separate line-item values for construction progress schedule and updates, mobilization, permits/bonds/insurances, temporary facilities, supervision, survey and layout, demobilization, commissioning and equipment/systems start-up, and project closeout retainage.
    a. General Conditions and Mobilization shall not exceed 3% of the Contract amount.
    b. Demobilization shall be not less than 1% of the Contract amount.
    c. Project closeout retainage value, for duration between Substantial Completion and Final Acceptance, shall be not less than 2% of the Contract amount. Of that amount, 1% shall be for "Punchlist Work". This amount will not be released until Final Completion is reached.
        1) This closeout retainage shall be in addition to the 5% retainage withheld under General Conditions item 6.04, and shall be for the purpose of protection of the Owner in the completion of any outstanding items on the Final Acceptance Punch List, and for reimbursing the Architect and their consultants for additional 'punch list' re-inspections beyond the first re-inspection; refer to Section 01 77 00.
    d. Schedule preparation and updates shall not be less than 1/2% of the Contract amount.
2. Major cost items, which are not directly a cost of actual work-in-place, such as distinct temporary facilities, may be either shown as items in the Schedule of Values or included in General Conditions and Mobilization or Demobilization at the Contractor's option.
3. Line item amounts shall be rounded off to nearest whole dollar, with total of the primary schedule of values breakdown equal to the Contract Sum.
4. Provide at least one line item for each Specification Section, and at least one line item for each pertinent item within each specification section.
5. No line item of the Schedule of Values shall be greater than $30,000 unless agreed to by PPD Project Manager.
6. Break down items of work that include both labor and material into those respective components.
7. Provide breakdown by construction phasing or area of work.
8. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment, purchased or fabricated and stored, but not yet installed.
    a. Differentiate between items stored on-site and items stored off-site. Include requirements for insurance and bonded warehousing, if required.
    b. Include separate line item cost for shop drawing preparation.
9. Unit Cost Allowances: Show the line-item value of unit-cost allowances, as a product of the unit cost, multiplied by the measured quantity. Estimate quantities from the best indication in the Contract Documents.
10. Margins of Cost: Show line items for indirect costs and margins on actual costs only when such items are listed individually in Applications for Payment. Each item in the Schedule of Values and Applications for Payment shall be complete. Include the total cost and proportionate share of general overhead and profit margin for each item.

D. Identify work, if any, to be performed by minority-owned business enterprises (MBE) and women-owned business enterprises (WBE).

E. Identification: Include the following Project identification on the Schedule of Values:

1. Project name and location.
2. Name of Architect.
3. Project Number.
4. Contractor's name and address.
5. Date of submittal.

F. Listing: Arrange the Schedule of Values in tabular form with separate columns indicating the following for each item listed:

1. Related Specification Section.
2. Description of Work.
3. Name of subcontractor.
4. Name of manufacturer or fabricator.
5. Name of supplier.
6. Change Order (numbers) that affect value.
7. Dollar value.
8. Percentage of Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

G. Schedule of Values Updating: Update and resubmit Schedule of Values prior to the next Application for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum. Add a new line item for each Change Order, and provide a breakdown of several line items for large or complicated Change Orders.

1.04 APPLICATIONS FOR PAYMENT

A. General:

1. Submit itemized payment request as required in General Conditions together with Schedule of Values and other submittals as listed herein.
2. Except as otherwise indicated, sequence of progress payments is to be regular, and each must be consistent with previous applications and payments; it is recognized that certain applications involve extra requirements, including initial application, application at times of Substantial Completion, and final payment application.
3. Contractor shall not "project" work completed beyond the date of Application for Payment submittal for the purpose of payment request.

B. Each Application for Payment shall be consistent with previous applications and payments as certified by the A/E and paid for by the Owner.

1. If the Contractor withholds any portion of a previous payment from a subcontractor or material supplier, other than normal retainage, the Contractor shall provide a letter to the A/E with the next Application for Payment stating the reasons for withholding the payment.

C. Payment Application Times: Progress payments will be based upon a monthly period, with the 24th day of each month being the cut-off date. The new payment period will then begin on the 25th of each month.

D. Draft Payment Application: Draft copies shall be provided to the A/E and Owner at least 48 hours prior to the last regular construction meeting of the month at which the payment request will be reviewed. The draft payment request shall be a copy of the previous month’s approved payment request, with proposed percentages and dollar amounts (rounded off to nearest whole dollar) hand written beside each line item, and a total percentage complete and dollar amount for the month. Once the amounts are reviewed and agreed to by the A/E and Owner, the Contractor shall prepare the actual payment request as required in this section based upon the amounts agreed to.

1. Have available for A/E review current Project Record Documents delineating any and all revisions since the previous application for payment.

E. Application Preparation: Complete every entry on the actual payment request form. The A/E will return incomplete applications without action.

1. Entries shall match data on the Schedule of Values and the Contractor's Construction Schedule. Use updated schedules if revisions were made.
2. Include amounts of Change Orders issued prior to the last day of the construction period covered by the application. If a Change Order includes more than one Change Order Proposal (COP) or Field Authorization (FA), list each COP or FA individually.

F. Transmittal: Submit 3 original signed copies (no photocopies of signatures are permitted) of each Application for Payment to the A/E by a method ensuring receipt within 48 hours.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information related to the application, in a manner acceptable to the A/E.

G. Initial Payment Application: The principal administrative actions and submittals which must precede or coincide with submittal of first payment application can be summarized as follows, but not necessarily by way of limitation:

1. Submit Statement of Intent to Pay Prevailing Wages on Public Works Contract on form issued by the State of Washington, Department of Labor and Industries. One is required from the Contractor and one from each of those subcontractors who will provide labor on the project site.

   When these forms have been filled in, the Contractor shall send them to the Industrial Statistician in Olympia for certification. After certification, three copies will be returned to the Contractor. The Contractor shall forward the Owner's copy directly to the PM (do not send through the A/E). The Contractor shall also post on the project site one certified copy of each Statement of Intent. For further information, phone the Industrial Statistician (360) 902-5335.

   Processing of an application will not begin until an approved copy is on file with the Owner for each classification of laborers, workers, or mechanics employed by the Contractor or Subcontractor that are included in an application for payment; no exceptions.

2. Submit and receive review comments for latest construction schedule.
3. Submit Schedule of Values, allocated to the various portions of the work; the schedule shall be used as a basis for the Contractor's Application for Payment.
4. List of Subcontractors, complete with phone numbers, business address and contact person.
5. List of major material suppliers and fabricators, complete with phone numbers, business address and contact person.
5. Contractor’s Progress Schedule (preliminary if not final).
6. Schedule of Unit Prices, as applicable.
7. Schedule of Submittals (preliminary if not final).
8. Listing of Contractor's staff assignments and principal consultants.
9. Copies of acquired building permits and similar authorizations and licenses from governing authorities for current performance of the work.
10. Initial progress report.
11. Initial settlement survey and damage report, if required.
12. Quality Control Plan.
13. Safety Plan.
14. MWBE participation listing.
15. Waste Management Plan.
16. List of emergency contact information.
17. Other documents as may be required in the Contract Documents.

H. Applications each Month During Construction:

1. Submit itemized application, in number of copies as specified herein, each with waivers of mechanics liens from principal subcontractors, sub-subcontractors and suppliers as specified below.

2. Applications are to be signed by a responsible officer of Contracting firm. Do not sign in black ink; no photocopies or signature permitted.
3. Application for Payment shall include the following:
   a. Application and Certificate for Payment on Contract.
   b. State of Washington Invoice Voucher.
   c. Invoice Voucher - Escrow.
   d. Certificate for Material Stored on Job Site.
   e. Invoices for materials stored off site, as applicable.
   f. Updated Construction and Submittal Schedules: If substantial changes have occurred in the Project Construction Schedule, or if enough changes have occurred that the schedule is rendered inaccurate or ineffective, submit with Application For Payment a revised updated Construction Schedule for evaluation and measurement of actual work-in-place with said application for payment, together with updated submittal schedule. If the Contractor does not submit a revised schedule with a payment request it is agreed by the Contractor that the project is still on schedule according to the last submitted schedule.
      1) If actual work completed is more than 14 days behind schedule, submit a recovery schedule per requirements of Section 01 32 16, Construction Progress Schedule, subparagraph 3.04C.4.b.
4. When A/E finds Application for Payment properly completed and correct, the A/E will sign and transmit all copies of Application for Payment to Owner for processing.
5. If A/E or Owner find Application for Payment improperly or incorrectly executed, an annotated copy will be returned for a NEW SUBMITTAL.
6. Only minor corrections are allowed, with approval of Owner.

I. Application at Time of Substantial Completion: See Section 01 77 00 for principal administrative actions and submittals which must precede or coincide with such special applications.

1.05 PAYMENT FOR STORED MATERIAL

A. See General Conditions for Washington State Facility Construction Article 6.03.

1.06 SUBSTANTIATING DATA

A. When A/E requires substantiating information, submit data in a timely manner justifying line item amounts in question.

1.07 APPLICATION FOR FINAL PAYMENT

A. Application for a FINAL pay request will be accepted for processing only after satisfactory completion of the following:

1. Punchlist items complete and accepted;
2. Agreement on all Change Order costs;
3. Required permits signed off;
4. Submittal of Record Documents (as-builts);
5. Submittal of O&M Manuals;
6. Submittal of Warranty Manuals;
7. All training has been provided to Owner’s designated staff and signed rosters of those attending submitted to the PM.
8. All security badges and building keys have been returned.
9. Other requirements as specified in Section 01 77 00, Closeout Procedures.

1.08 RELEASE OF RETAINAGE

A. Pursuant to the completion of Work performed in accordance with a public works contract and Final Acceptance by the Owner, the following requirements must be satisfied to allow the release of retained contract funds at the earliest possible date.

1. All Contract Closeout items have been reviewed by the A/E, any corrections made by the Contractor, and final copies received by the Owner.
2. The A/E maintains a Construction Completion Checklist of requirements for completing the project. When the A/E determines that the checklist has been completed, the A/E consults with PPD for concurrence that all requirements have been met for establishing Final Completion.
3. If there are no outstanding items required of the Contractor on the Construction Completion Checklist, the A/E provides a letter to the Owner with a copy to the Contractor that to the best of its knowledge, information, and belief, the Contractor has reached Final Completion on the project in conformance with the Contract Documents.
4. PPD sends the Owner its Notification of Project Completion for the Owner's signature and return to PPD.
5. Upon receipt of the signed Notification of Project Completion, PPD issues its Completion Notice.
6. PPD sends the Department of Revenue its Notice of Completion of Public Works Contract and sends the Contractor written notice of Final Acceptance.
7. Certificate of Payment of State Excise Taxes by Public Works Contractor. Following receipt of Owner's notice of completion and after determining that all taxes, increase and penalties due from Contractor have been paid, the Department of Revenue will issue this certificate to the Owner, releasing the state's lien on the retained percentage.
8. Certificate of Payment of Contributions, Penalties and Interest on Public Works Contract. Upon receiving a copy of the Owner's notice of completion from the Department of Revenue and determining that the Contractor is in compliance with the provisions of the Employment Security Act, the Employment Security Department will issue this certificate to the Owner, releasing its lien on the retained percentage.
9. Request for Release. This form must be completed by the Contractor and mailed to the Department of Labor and Industries, Industrial Insurance division, Contract Release Section, Olympia, Washington 98504. One copy of the Contractor's request for release, including attached list of Subcontractors, shall be transmitted to Owner.
10. Certificate of Release. Upon receipt of Contractor's request for release and verification from its records that the industrial insurance and medical aid premiums have been paid by Contractor and each Subcontractor, the Department of Labor and Industries will so note on its internet site. PPD will review L&I's internet site for status compliance. Once full compliance is noted, it is confirmation that L&I does not hold a lien against the project.
11. At the time PPD sends the Contractor written notice of Final Acceptance, it advertises the acceptance of the project which begins the forty five (45) day period for liens to be filed.
12. At the end of the forty five (45) day period, releases have been received, or confirmed, and there are no liens filed that have not been released, the retainage will be released.
    a. If the retainage was placed in an escrow account, PPD will notify the escrow company that the retainage may be released. No invoice billing from the Contractor for the retainage is required.
    b. If the Contractor has elected to not put the retainage in escrow, an invoice for the retainage amount must be submitted and processed to allow release of the retained money.

END OF SECTION 01 29 00

GUIDE SPECIFICATIONS

The following specification is intended to be used, generally verbatim, in the contract documents. ***[Specifier notes]*** shall be deleted during the editing process. Where [ ] appear in this document, this indicates requirements which are optional depending upon the project scope and conditions. Edit as appropriate for the project. The A/E consultant shall take ownership and responsibility for the contents of this section and is expected to modify other portions as necessary to accurately reflect conditions of the project. For draft copies during the design process, use Microsoft Word, Track Changes. Set criteria so that deletions show as strikethroughs. Deletions and additions are to be in red.

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY ***[Specifier modify as required]***

A. ***[Specifier delete or modify as required]*** The complexity of accomplishing a renovation project in and adjacent to an occupied and fully operational building requires that careful planning and coordination be developed and followed to accomplish the work. This planning and coordination shall minimize disruption to operations and allow involved parties to anticipate construction activity and to integrate other contract(s) with this Project.

B. Coordinate scheduling, submittals and work identified in the Contract to assure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items to be installed later.

C. Coordinate work between all Sections of Contract Documents to avoid conflicts and omissions. Take special care to coordinate work indicated as Architectural, Mechanical, Electrical and other major Divisions of the Contract Documents.

D. Responsibility

1. The Contractor shall be in charge of this Contract and the site, as well as the directing and scheduling of all Work. Contractor shall be on site at all times work of this Contract is in progress. Do not delegate responsibility for coordination to any subcontractor.
2. Anticipate interrelationship of all subcontractors and their relationship with the total Work.
3. Resolve differences or disputes between subcontractors and materials suppliers concerning coordination, interference, or extent of Work between Sections. Contractor's decisions, if consistent with Contract Document requirements, shall be final.
4. Final responsibility for the performance, interface, and completion of the Work and the Project in accordance with the Contract Documents shall be with the Contractor.

1.03 PROJECT PHASING & MILESTONES ***[Specifier modify as required]***

A. Interim project phases and milestones within these phases will be required by this Contract. Those requirements are graphically represented in the project schedule at the end of this section.

1. Prior to any work beginning on the site, the Contractor shall submit, and receive final approval on:
   a. Construction schedule;
   b. All required plans, such as, but not limited to, safety, demolition, quality control, and
   c. waste management;On all materials to be used on the project in accordance with Section

01 33 00.

B. Refer to Section 01 11 00 for specified Contractor's Working Hours on this project, including Working Hours specified for completing the work required by project phasing and milestones.

C. Progress Schedule: Refer to Section 01 32 16, Construction Progress Schedule.

1.04 SPECIAL COORDINATION

A. There are occupied spaces outside of the limits of construction. These spaces will not be vacated for construction during this contract. Any work in these surrounding areas must be coordinated with the Owner.

B. Additional special requirements and conditions apply to the work of this contract. Refer to Section 01 50 00 for detailed description of these additional requirements and conditions.

C. The Owner may require access to the site to perform work related or unrelated to the project. The Contractor shall coordinate with the Owner to accommodate such work within the contract time.

D. ***[Specifier delete or modify as required]*** Refer to Section 01 11 00 for a description of other Contractor work for the Owner that is expected to be occurring within the building or other adjacent location to the construction limits of this Project. Cooperate with the Owner Contractors during the duration of this Project to prevent impact to this or other Owner projects.

E. The Owner's custodial staff will typically be working during Contractor's normal working hours. Contractor shall coordinate with the Owner to accommodate such work within the contract time, including the use of any elevator, if the Contractor elects to utilize the elevator as indicated in Section 01 50 00.

1.05 CONSTRUCTION ORGANIZATION

A. On-Site Lines Of Authority & Communications: Refer to Section 01 31 15.

B. Intra-Project Communications: Comply with procedures for intra-project communications including:

1. Submittals.
2. Reports and records.
3. Recommendations.
4. Coordination drawings.
5. Schedules.
6. Resolution of conflicts.

C. Construction Mobilization
1. Cooperate with the Site Representative in allocation of mobilization areas of site; for field offices and sheds, for access, traffic and parking facilities.
2. During construction, coordinate use of site and facilities through Site Representative.
3. Comply with Architect and Site Representative's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.
4. Coordinate field engineering and layout work under instructions of Site Representative.

D. Coordination Of Reports/Activities: Coordinate both the procedural timing and the listing (naming and sequencing) of reports/activities required by provisions of this Section and other
   a. sections, to afford consistency and logical coordination between submitted reports or lists. Maintain coordination and correlation between separate reports by updating at monthly or shorter time intervals. Distribute each report and

updated report to entities involved in the work, including A/E and PM. In particular, provide close coordination of Progress Schedule, Schedule of Values (see Section 01 29 00), listing of subcontracts, schedule of submittals, progress reports, and payment requests.

E. Coordination Of Submittals

1. Schedule and coordinate submittals specified in the Contract Documents.
2. Coordinate work of various Sections having interdependent responsibilities for installing, connecting to and placing equipment in service.
3. Coordinate request for substitutions to assure compatibility of space, operating elements, and effect on work of other Sections.

F. Coordination & Pre-Installation Meetings: Refer to Section 01 31 19, Project Meetings.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

3.01 COOPERATION & COORDINATION OF WORK

A. The Contractor is responsible for the coordination of the work of all trades; coordinating the installation of their work and that of all subcontractors to ensure compliance with the Contract Documents and to expedite the progress of the Project. Contractor shall check specifications, addenda, and drawings covering all trades as the work progresses. Contractor shall promptly report to the Architect what they consider omissions, conflicts or points requiring clarification.

B. Contractor shall prepare and distribute to each entity performing work at project site, a written memorandum of instructions on required coordination activities, including required notices, reports and attendance at meetings.

C. It is the responsibility of the Contractor to ensure that the work of subcontractors complies with Conditions of the Contract, Division 1 - General Requirements, and the work of other Sections related to their own work. No additional payments or time extensions will be authorized for failure on the part of subcontractors to be familiar with and in compliance with the aforementioned specification divisions and sections.

D. Inclusion of portions of the work under particular divisions of the specifications or sections of the drawings does not in every case conform to the categories of work customarily subcontracted to particular crafts or trades. In such cases, the Contractor shall be responsible to inform bidders, subcontractors, crafts and trades, that work assigned to them is contained in sections other than the usual. In every case, the General Contractor shall be responsible to provide at its cost, all work required in the Contract Documents.

1. Provide project interface and coordination as required to properly and accurately bring together the several parts, components, systems, and assemblies and as required to complete the Work and the Project, pursuant to General Conditions for Washington State Facility Construction, Part 4 and Part 5.
2. Provide interface and coordination of all trades, crafts, and subcontracts as required to provide correct and accurate connection of abutting, adjoining, overlapping, and related Work, and provide all anchors, fasteners, accessories, appurtenances, and incidental

items as required to complete the Work properly, fully, and correctly in accordance with the Contract Documents.

3. Provide additional structural components, miscellaneous metal, bracing, blocking, backing, clips, anchors, fasteners, and installation accessories as required to properly anchor, fasten, or attach materials, equipment, appliances, hardware, systems, assemblies, cabinets, and architectural features to the structure.
4. Provide excavation and backfill, trenching and drilling for all trades as required for the installation of their Work.
5. Provide concrete foundations, pads, supports, bases, and grouting for all trades as required for the installation of their Work.
6. Provide caulking, sealing, and flashings as required to completely weatherproof the building and as required to insulate the building thermally and acoustically. Include caulking, sealing, flashings, and related work as required to prevent moisture intrusion, air infiltration, and light leakage.
7. Provide equipment, appliances, fixtures, and systems requiring plumbing and mechanical services, rough-in, and connections, or other utilities and services, with such services, rough-in, and final connections.
8. Provide equipment, appliances, fixtures, and systems requiring electrical and cabling services, rough-in, and connections, or other utilities and services, with such services, rough-in, and final connections.
9. Materials, equipment, component parts, accessories, incidental items, connections, and services required to complete the Work which are not provided by subcontractors shall be provided by the Contractor.

3.02 PROJECT COORDINATION & SCHEDULING CONTROL

A. The Contractor shall schedule and coordinate the work of all subcontractors on the project including their use of the site. Responsibility for coordination and close adherence to time schedules rests solely with the Contractor who shall maintain coordination and scheduling control at all times.

B. Each subcontractor responsible to the Contractor shall cooperate diligently with the Contractor in the execution of their work so as to cause no delay in the completion of the Project. This responsibility includes the completion of all work in a timely manner. All Contractors, Prime Contractor and Subcontractors, shall diligently comply with the following requirements:

1. Cooperate in planning and layout of the work well in advance of operations.
2. Inform other contractors of requirements at proper time to prevent delay or revisions.
3. Be informed on the requirements of other contractors and check own work for conflicts with the work of other contractors.
4. Insure delivery of materials and performance of work on coordinated schedule with other contractors.
5. Contractor shall ensure subcontractors and equipment suppliers are responsible for compatibility and completeness of the installation and operation of the equipment in their respective Specification Sections including conformance with code requirements.
6. Attend Pre-Installation meetings identified in Section 01 31 19.
7. Contractor shall be represented on the job site by his superintendent at all times when there is construction going on, including the work of his subcontractors, as well as his own.

C. Changing Subcontractors: The General Contractor shall be responsible for all the additional expenses incurred by changing subcontractors during the course of this project. These additional expenses include, but are not limited to, the engineering expenses for revised submittal, request for information, or any clarification or duplication that might occur due to the fact that the initial documents have been revised.

3.03 MECHANICAL AND ELECTRICAL COORDINATION

A. All mechanical subcontract work (insulation, plumbing, fire sprinkler, air distribution, sheet metal, steam, balancing and controls, etc.) on this project, shall be the sole responsibility of one Mechanical Subcontractor. In turn, this Mechanical Subcontractor shall answer to the General Contractor. This Mechanical Subcontractor shall be responsible for coordination between the trades above to make sure that all the interface between the different mechanical subs are in place, assuring that all the above systems are in proper working condition.

B. Coordination Of Space

1. Coordinate use of Project space, including structural and architectural elements, and sequence of installation of fire suppression, plumbing, HVAC, communications, security and all other electrical work which is indicated diagrammatically on Drawings. Follow routings shown for pipes, ducts and conduits as closely as practicable, with due allowance for available physical space; make runs parallel with lines of building. Utilize space efficiently to maximize accessibility for other installations, for maintenance and for repairs.
2. In finished areas, except as otherwise shown, conceal pipes, ducts, wiring and the like in the construction. Coordinate locations of fixtures and outlets with finish elements.

C. Resolve all “tight” or restricted conditions involving work of various sections in advance of installation of mechanical and electrical work.

D. Prior to proceeding with work in these areas, Contractor shall be responsible for preparing supplementary drawings for review showing all Work in “tight” areas, and provide minor adjustments and additional work necessary to overcome “tight” conditions, at no increase in Contract Sum. “Tight” areas shall be identified by the Contractor, however, the Owner reserves the right to require supplementary drawings for any areas affected by the construction activity whether or not identified as “tight” by the Contractor. (“tight” shall be defined here as “a condition so close in structure as to prevent passage; allowing little or no room for free motion or movement.”)

E. Equipment Connections: Refer to Section 01 11 00 and to General Requirements in the various Mechanical and Electrical Divisions. Work includes but is not limited to:

1. Provide motors and equipment for current characteristics as shown on Electrical drawings:

a. Electrical Contractor:

1) Electrical Contractor shall furnish and install all wiring except:

a) Temperature control wiring.
b) Equipment control wiring.
c) Interlock wiring.

2) The Electrical Contractor shall furnish and install all power wiring complete from power source to motor or equipment junction box, including power wiring through starters. After all circuits are completed, Electrical Contractor shall be responsible for all power wiring.

[Specifier – verify the following; Owner installs some controls]

b. Mechanical Contractor: Mechanical Contractor shall, regardless of voltage, furnish and install all temperature control wiring, all starters not factory mounted on equipment, and all interlock wiring and equipment control wiring for the equipment that the Mechanical Contractor furnishes.

3.04 JOB SITE FIELD MEASUREMENTS AND TEMPLATES

A. Obtain field measurements required for accurate fabrication and installation of Work included in this Contract. Exact measurements are the Contractor's responsibility.

B. Contractor shall be responsible for field verifying actual dimensions where "+/-" dimensions are indicated.

C. Furnish or obtain templates, patterns, and setting instructions as required for installation of all Work. Verify all dimensions in the field.

3.05 DIMENSIONS

A. The Structural Drawings are to be used in conjunction with the Architectural, Plumbing, Mechanical and Electrical Drawings. Primary structural elements are dimensioned on the structural plans and details. Not all secondary dimensions are shown, such as exact door and window locations, wall configurations, slab slopes and depressions, curbs, etc. Coordination of the structure with the dimensions as shown on the Drawings and architectural items to be embedded into, or attached to the structure, is the responsibility of the Contractor. Any dimensional discrepancies between the Architectural, Civil, Structural, Plumbing, Mechanical and Electrical drawings shall be reported to the Owner's Representative and A/E before proceeding with the work.

3.06 INTENT OF DRAWINGS

A. The work of the Contractor and subcontractors shall conform to the intent of the architectural and coordination drawings as reviewed by the A/E. Drawings are partly diagrammatic and do not intend to show in details all features of work. The Contractor shall carefully review the work to be performed by other trades, compare related drawings and shall thoroughly understand the building conditions affecting their work.

B. All changes required in the work caused by failure to do so shall be at no expense to the Owner.

3.07 INTERFERENCES & RIGHT-OF-WAY

A. Make proper provisions to avoid interferences. Where conflicts occur, architectural and structural has right-of-way over mechanical and electrical work; concealed mechanical work has right-of-way over concealed electrical work; exposed electrical fixtures have right-of-way over mechanical fixtures.

B. Submit conflicts which cannot be resolved by right-of-way to the A/E for direction.

C. Submit reflected ceiling coordination plans showing work by all applicable trades for review and approval by the Architect.

3.08 NOTIFICATION & CORRECTION OF DEFECTIVE WORK

A. Coordinate the Work of all subcontractors and make certain that, where the work of one trade is dependent upon the work of another trade, the work first installed is properly placed, installed, aligned and finished as specified or required to properly receive subsequent materials applied or attached thereto.

B. Direct subcontractors to correct defects in substrates they install when subcontracts of subsequent materials have a reasonable and justifiable objection to such surfaces. Promptly notify the Owner's Representative and Architect of any defects or imperfections in preparatory work which will in any way affect satisfactory completion of the work.

C. Under no condition shall a section of work proceed prior to preparatory work having been completed, cured, dried or otherwise made satisfactory to receive such related work. Do not force subcontractors to apply or install products to improperly finished product.

D. Correction of defective work shall be the responsibility of the Contractor or subcontractor providing the defective work. Correction of work due to underlying defects shall be the responsibility of the Contractor or subcontractor providing overlying work.

3.09 COORDINATING UTILITIES

A. Contractor shall be responsible for coordination of and shall cooperate with all utilities to be installed for service to the Project. Utilities may include, but are not limited to, natural gas, telephone, electrical, and cable television. The Contractor shall maintain communication with the utilities in order to coordinate time and requirements of the utilities' installation.

B. Contractor shall provide all work necessary to comply with the requirements of the Contract Documents for utility work that does not meet the Contract Document requirements, or for work that is disturbed by the utility installation.

3.10 COORDINATION DRAWINGS

A. Coordination Drawings - General

1. The purpose of coordination drawings is to resolve potential interdisciplinary dimensional interferences and conflicts prior to shop fabrication or field installation of components and systems. While the A/E has exercised the accepted standard of care in performing overall dimensional coordination in the preparation of the Construction Documents, additional factors influence coordination which the Contractor must address in the coordination drawings. These factors include, but are not limited to, specific means and methods, the sequence of work, the characteristics of the specific equipment to be installed (where the documents allow multiple options), and the bidding assumptions made by each Contractor.
2. Where work by separate entities requires off-site fabrication of products and materials which must be accurately interfaced and closely intermeshed to produce required results, prepare coordination drawings consisting of plans, sections and details to indicate how the work shown by separate shop drawings will be interfaced, intermeshed, and sequenced for installation; comply with submittal requirements of Section 01 33 00.
3. The Mechanical/Electrical coordination process shall be performed on site at the Mechanical subcontractors field office. The following parties shall be directly involved and participate, under the direction of the General Contractor, on regularly scheduled weekly basis: Contractor, Plumbing subcontractor, HVAC subcontractor, Fire Protection subcontractor, Electrical subcontractor, Automatic Temperature Control System subcontractor, and Low Voltage Electrical Systems subcontractor. Additional subcontractors and vendors shall participate at various times as required: Masonry and Structural Steel subcontractors, Drywall and Ceiling subcontractors, and others as required.
4. Each trade’s superintendent is expected to participate in the development of coordination drawings. All piping and equipment shall be shown, and all piping greater than 4 inches shall be indicated in double line fashion on the coordination drawings.
5. Coordination meetings shall be held on a minimum of once a week for the duration of the coordination process which shall commence immediately upon Notice to Proceed.
6. The Owner and General Contractor shall have full time onsite representation, and will participate in the resolution of conflicts that may arise from indicated routings or service requirements.
7. The Contractor and each applicable subcontractor shall sign drawings to indicate their participation in the coordination process and their agreement that the individual systems

and components can be installed as indicated in the drawings and in the conformance with the Contract Documents.

8. Upon completion of the Project, all coordination drawings shall be turned over to the Owner as a record document submittal.

B. Coordination Drawings – Drawing Criteria: Prepare coordination drawings per the following guidelines:

1. Sheet size same as Contract Drawings. Drawings at appropriate scale to depict necessary detail; but not less than 1/4" = 1'-0" for plans and elevations, 1/2" = 1'-0" for sections and details.
2. Drawings to contain elements of construction in their correct dimensional relationship, including but not limited to, floors, walls, ceilings including ceiling heights, roofs, columns, beams, soffits, openings, supports, hangers, equipment, fixtures, and other appurtenances. Develop drawings sequentially through Architectural, Structural, Civil, Fire Suppression, Plumbing, Mechanical, and all various Electrical trades.
3. Put signatures of Contractor and each subcontractor on each drawing to confirm their participation in coordination process and agreement that individual systems and components can be installed accordingly.

3.11 CLOSEOUT DUTIES

A. General

1. Coordinate completion and cleanup of work by the various trades in preparation for Substantial Completion.
2. After Owner occupancy of premises, coordinate access to site by the various trades involved for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.
3. Assemble and coordinate closeout submittals.

B. At Completion Of Work Of Each Subcontract: At completion of work of each subcontract, conduct inspection to assure that:

1. Work is acceptable.
2. Temporary facilities and debris have been removed from site.

C. At Substantial Completion

1. Conduct inspection and prepare list of work to be completed or corrected.
2. Assist A/E and Owner's Representative in inspection.
3. Supervise correction and completion of Work as established in A/E's inspection reports ("punch lists").
4. Obtain Certificate of Occupancy from governing authorities.

D. At Final Completion: Assist A/E and Owner's Representative in inspection.

END OF SECTION 01 31 00

GUIDE SPECIFICATIONS

The following specification is intended to be used, generally verbatim, in the contract documents. ***[Specifier notes]*** shall be deleted during the editing process. Where [ ] appear in this document, this indicates requirements which are optional depending upon the project scope and conditions. Edit as appropriate for the project. The A/E consultant shall take ownership and responsibility for the contents of this section and is expected to modify other portions as necessary to accurately reflect conditions of the project. For draft copies during the design process, use Microsoft Word, Track Changes. Set criteria so that deletions show as strikethroughs. Deletions and additions are to be in red.

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 GENERAL COMMUNICATION

A. Telephone communication and correspondence shall be between Contractor's Representative and A/E.

B. Subcontractors are not to contact members of the design team directly unless explicitly agreed to by Contractor, A/E and PM. All such contact and discussions are to be documented in writing by the subcontractor and submitted to the A/E and PM through the Contractor.

C. The General Contractor shall transmit problems or questions in writing using a Request for Information (RFI).

D. On-Site Lines of Authority & Communications: Establish on-site lines of authority and communications including attendance at Pre-Construction Meeting and Progress Meetings as required by the A/E and Owner's Site Representative. All on-site lines of authority and communications shall be established through the A/E.

[Specifier – delete paragraphs E and F if work occurs during normal 7:00 a.m. to 5:00 p.m. hours.]

E. The A/E, and PM will not typically be working during the Contractor's normal working hours as defined in Section 01 01 00. The Contractor shall anticipate that all communication and weekly construction meetings with these parties will occur between the hours of 8:00 a.m. and 5:00 p.m. Monday through Friday throughout the duration of the Project.

F. The Contractor shall incorporate any cost affect this may have on the progress of the Project into his Base Bid. No overtime payments will be authorized, or time delays allowed, for the Contractor or subcontractors to communicate with the A/E and PM outside of the Contractor's normal working hours.

1.03 EMERGENCY COMMUNICATION

A. An Emergency list will be established.

1. The Contractor shall provide a list of names, pagers, wireless and wired telephone numbers of staff who are capable of addressing an emergency issue that may occur outside of Contractor's normal working hours. The persons designated on the list shall be available at the project site within 30 minutes of being contacted. Provide two names for each of the following:

[Specifier modify as required]

a. General Contractor
b. Mechanical Subcontractor
c. Electrical Subcontractor
d. Fire Protection Subcontractor
e. Demolition Subcontractor

2. Submit the list to the A/E 5 working days prior to the Preconstruction Meeting. The A/E will include the same information for design team members and Owner representatives and distribute the list at the Preconstruction Meeting.

1.04 CORRESPONDENCE

A. All correspondence to and from Contractor will be routed through A/E with a copy to PM.

B. Include project title and project number on all correspondence.

1.05 REQUEST FOR INFORMATION (RFI)

A. It is the Contractor's responsibility to review Contract Documents in a timely manner so that the A/E shall have sufficient time to respond to a Request for Information prior to the start of actual construction of that part of the Work.

B. When field conditions or Contract Document contents require clarification or verification by the A/E or A/E's sub-consultants, a written RFI is to be submitted as follows:

1. Identify the nature and location of each clarification/verification using a RFI form; provide as a minimum the following information:

a. Project name and number;
b. Date;
c. Date response desired.
d. RFI number;
e. Subject;
f. Initiator of the question;
g. Indication of costs, if known;
h. Location on site;
I. Contract drawing reference;
j. Contract specification section and paragraph reference;
k. Descriptive text;
l. Space for reply on same page as questions; and
m. Single subject matter, 1 item each - architectural, civil, structural, mechanical, electrical

2. Number each RFI sequentially beginning with number 001 (RFI-001). Only one question per RFI.

C. Uses

1. The RFI form shall be used for interpretation or clarification of the Contract Documents only.
2. Do not use the RFI form for the following; the A/E will not reply and the RFI will be returned without action:

a. Product or material substitution.
b. Questions relating to construction means, methods, techniques, sequences, procedures, or safety precautions. These are the Contractor's responsibilities

exclusively.

c. Questions relating to construction schedule, coordination between trades, or division of work among subcontractors. These are Contractor's responsibilities exclusively.
d. Questions on contract administration procedural matters, unless they require interpretation or clarifications of the Contract Documents.
e. Dimensions or quantities which are shown on the Contract Documents, which can be measured or calculated from the information contained in the Contract Documents where such measurement or calculation is standard construction industry practice.
f. Confirmation of interpretations or clarifications previously provided by the A/E.
g. The Contractor shall not initiate requests for interpretations or clarifications of the Contract Documents which can be reasonably derived from a review of the Contract Documents.

D. Route: RFI's in same manner as correspondence

E. Clarifications may be discussed on-site or by telephone with A/E or A/E's Consultant with concurrence of the A/E. The essence of these discussions are to be incorporated into a RFI form and submitted for normal RFI processing.

F. Reply

1. The A/E will endeavor to reply to all RFI's promptly as his work schedule allows and generally no later than 7 working days from the day received. The consultant will expedite those RFI's indicated by the contractor as being critical to the construction process.
2. When an RFI involves a complex subject, extensive research or governmental agency contact, the A/E will inform the Contractor that additional time is required to prepare a reply. The Contractor shall cooperate and agree to reasonable additional time.
3. The reply shall be a clarification or an interpretation of the Contract Documents; the reply is not an authorization of change in the Contract Sum or Time.

1.06 NON-COMPLIANCE NOTICE (NCN)

A. Any work that is identified as not in compliance with the Contract Documents, either by oral discussion with the contractor, or written communication to the contractor, shall be removed and replaced without cost to the Owner, including removal of additional material necessary to confirm non-compliance. At its option, the Owner may accept written alternative solutions by the contractor and recommended by the A/E. The Contractor shall notify the A/E and Owner in writing immediately following oral discussion or receipt of any written communication if the contractor believes they are in compliance with the Contract Documents. The A/E will make a determination based on the Contract Documents. If the A/E finds the work is in non- compliance the A/E will issue a written Non-Compliance Notice (NCN). Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification. Upon receipt of the NCN, the Contractor shall take immediate action to correct work. Review corrections at progress meetings for closure.

B. If the Contractor fails or refuses to comply promptly after the final determination of the appropriate corrective action, the Owner may:

1. issue an order stopping all or part of the work until satisfactory corrective action has been taken. The Owner will not pay for non-complying work or follow on work until the non-complying work is corrected or replaced. If it becomes necessary to stop work due to non-correction or non-complying work, no delay claim, time extension, or compensation will be granted, or
2. thee Owner may elect to correct the non-compliant work and back charge the Contractor by a deductive Change Order

END OF SECTION 01 31 15

GUIDE SPECIFICATIONS

The following specification is intended to be used, generally verbatim, in the contract documents. ***[Specifier notes]*** shall be deleted during the editing process. Where [ ] appear in this document, this indicates requirements which are optional depending upon the project scope and conditions. Edit as appropriate for the project. The A/E consultant shall take ownership and responsibility for the contents of this section and is expected to modify other portions as necessary to accurately reflect conditions of the project. For draft copies during the design process, use Microsoft Word, Track Changes. Set criteria so that deletions show as strikethroughs. Deletions and additions are to be in red.

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section specifies administrative and procedural requirements for project meetings, including, but not limited to, the following:

1. Preconstruction meeting;
2. Progress meetings;
3. Monthly construction schedule meetings;
4. As-built update meeting;
5. Coordination meetings;
6. Pre-installation meetings prior to starting certain work;
7. Commissioning meetings;
8. Project closeout meetings;
9. Owner training meetings.

1.03 PRECONSTRUCTION MEETING

A. The Owner will schedule a preconstruction conference before starting construction, at a time convenient to the Contractor and the A/E, but no later than 15 days after the Notice To Proceed. The conference will be held at the Project Site or another convenient location as selected by Owner.

B. Attendance is required of the following:

1. A/E and A/E's consultants;
2. Owner's Representatives;
3. E&A Services Project Manager;
4. Contractor's Superintendent and Project Manager; Contractor's QC Representative if different individual than the Project Manager.
5. Major Subcontractors;
6. Others, as requested; e.g., Barrier-Free Facilities Program Manager.

C. Discussion will cover items of significance, including the following:

1. Communication chain and persons authorized to direct changes;
2. The Work;
3. Site Representative's roles;
4. Work hours, sequence, phasing, and occupancy;
5. Special project procedures;
6. Procedures and processing:

a. Application for payments;
b. Change Order Proposals (COP);
c. Field Authorizations (FA);
d. Change Orders (CO);
e. Requests for Information (RFI);
f. A/E Supplemental Instructions (ASI)
g. Field decisions;
h. Submittals;
i. Universal Design;
j. Others as appropriate.

7. Project record documents including review of as-builts on a regular basis during construction;
8. Construction facilities, and controls;
9. Temporary utilities;
10. Security procedures;
11. Housekeeping procedures;
12. Utility shutdowns / Outage Request Form;
13. Parking;
14. Equipment deliveries and priorities.
15. Schedule Review;
16. Contractor's Quality Control System:
    a. CQC Representative
    b. CQC daily report
17 Hazardous material abatement procedures, if any.
18. Use of site and premises by Owner and Contractor.
19. Others, as appropriate.

D. The A/E will:

1. Conduct the meeting to review contract administration requirements.
2. Record, produce, and distribute copies of the minutes to the PM and General Contractor within seven (7) days of the meeting.

E. The General Contractor shall be responsible to distribute copies to all other Contractor attendees.

1.04 PROGRESS MEETINGS

A. For purposes of coordination and scheduling after start of the work, weekly Progress Meetings will be held to enable an orderly review of the construction progress and to provide for systematic discussion and analysis of concerns that may arise relative to execution of the work.

B. Contractor, and Subcontractors as required, shall incorporate attendance at these meetings as part of the Base Bid of the project – no overtime payments will be authorized for Contractor or Subcontractors to attend weekly Progress Meetings or other special meetings if required.

C. Meeting Locations: ADA accessible Contractor's project field office or Owner provided meeting room, unless otherwise agreed.

D. Attendance: Representatives attending meetings are required to be qualified and authorized to act on behalf of their firms. Attendance shall include:

1. A/E and A/E's consultants, as appropriate;
2. Owner's Representatives;

3. E&A Services Project Manager;
4. Contractor's Superintendent, Project Manager, and QC Representative;
5. Subcontractors, as appropriate;
6. Suppliers, as appropriate;
7. Others, as appropriate; e.g., Barrier-Free Facilities Program Manager.

E. Agenda: Discussion will pertain to items, such as:

1. Attendees; list of attendees and company they represent;
2. Review and approve minutes of previous meeting; written corrections, additions and/or deletions to previous minutes acknowledged;
3. Review Short Interval Schedule;
4. Review Outages;
5. Review construction schedule; confirm current status of work;
6. Present corrective measures and procedures to regain project schedule, as applicable;
7. Present field observations, problems, and conflicts; discuss concerns pertaining to:
    a. Civil items.
    b. Structural items.
    c. Mechanical items.
    d. Electrical items.
    e. Architectural items.
8. Discuss problems impeding progress schedule;
9. Review Contractor's quality control system; discuss any concerns and corrective measures.
10. Review submittal schedules and logs, present methods to expedite as required;
11. Review off-site fabrication;
12. Review delivery schedules;
13. Review outstanding RFIs;
14. Review proposed changes for:
    a. Effect on construction schedule and on completion date.
    b. Effect on any other contracts of the project,
15. Review Change Order Proposal log and finalize prices;
16 Review draft of Application for Payment (at end of month);
17. Confirm status of the "as-built" drawings and review required revisions to Project Record Documents; see update requirements specified below;
18. Confirm status of shop drawing submittals and approvals.
19. Review project safety;
20. Review any outstanding Non-Compliance Notices;
21. Review any tenant impacts.
22. Review any other business.
23. Confirm next meeting date, location and time plus those requested to be in attendance.

F. A/E will:

1. Administer weekly Progress Meetings throughout work progress;
2. Record and distribute the following by e-mail within 3 working days after the meeting. Minutes, RFI, ASI, Submittal/Shop Drawing and Cost Change logs. Distribution to include all attendees other than those related to the General Contractor's contract. The General Contractor is responsible to distribute copies to all Contractor attendees.
3. Provide paper copies of the minutes, RFI, ASI, Submittal/Shop Drawing and Cost Change logs to attendees at the next meeting.
4. Ascertain that work is prosecuted consistently with contract documents and construction schedules.

G. At Contractor's option, weekly progress meetings can be held integrally with monthly CPM Scheduling meeting and As-Built Update meeting specified herein.

H. Contractor shall be responsible to provide the following at each meeting:

1. Current (and updated if necessary) construction schedule which includes the past week and 2 weeks 'look ahead'.
2. One set of record documents (drawings, specifications, COs, COPs, RFIs, FAs, etc.).
3. Current (and updated if necessary) submittal schedule.
4. Current (updated) set of "as-built" Project Record Documents.

1.05 MONTHLY CONSTRUCTION SCHEDULE MEETINGS, REPORTING

A. In addition to specific coordination meetings for each element of work, and other regular project meetings for other purposes, hold general scheduling meeting each month to review status according to recent updated schedule reports.

B. Require each entity then involved in planning, coordination or performance of work to be properly represented at each meeting. Review each entity's present and future needs including interface requirements, time, sequences, deliveries, access, site utilization, temporary facilities and services, hours of work, hazards and risks, housekeeping, change orders, and documentation of information for payment requests.

C. Discuss whether each element of current work is ahead of schedule, on time, or behind time in relation with updated progress schedule. Determine how behind-time work will be expedited, and secure commitments from entities involved in doing so.

D. Discuss whether schedule revisions are required to ensure that current work and subsequent work will be completed within Contract Time.

E. Review everything of significance which could affect progress of the work.

F. A/E will take meeting notes of each meeting and distribute copies to everyone in attendance. General Contractor shall distribute copies of meeting notes to all others affected by decisions or actions resulting from each meeting.

1.06 AS-BUILT UPDATE MEETING

A. Following each monthly scheduling meeting, Contractor shall meet with all major subcontractors whose work is in progress at the site, including but not limited to mechanical, plumbing, electrical, fire sprinkler, masonry, structural steel, civil, and as otherwise designated, to review and verify incorporation of all revisions of the previous month and transfer all non-recorded installed record information to the day-by-day working set of "Project Record Copy" blueprints, with all revisions clearly indicated in red pen. Where applicable, said information shall be obtained from generated coordination drawings; refer to Section 01 31 00. Refer also to Section 01 78 00, Closeout Submittals, for basic required information and other provisions related to 'as-built' requirements.

1.07 COORDINATION MEETINGS

A. Contractor shall hold weekly coordination meetings with his subcontractors and suppliers as deemed necessary by the Contractor for coordination of the work. Meetings shall be held on site. The Owner and the A/E will be available to attend such meetings upon request. Refer to Section 01 31 00 for additional information and requirements pertaining to coordination meetings.

B. The Contractor shall hold weekly coordination meetings with its prime subcontractors beginning the first week after the Notice to Proceed. The superintendent of the Contractor and prime subcontractors shall review the Contractor's schedule for the first three (3) months of work and thoroughly review the work required by the Contract Documents for that period. The Contractor shall submit Design Clarification Requests, Requests for Information, or any other type of information requests the Contractor may use, for the three (3) month work period during the first month after Notice To Proceed to minimize any conflicts that might occur when mobilization begins.

C. Project coordination meetings are in addition to specific meetings held for other purposes, such as regular progress meetings and special preinstallation meetings.

D. Request representation at each meeting by every trade currently involved in coordination or planning for the construction activities involved.

E. The Contractor shall continue to hold coordination meetings with its prime subcontractors on a regular weekly basis, and, beginning one month in advance of the next three (3) month work increment, review the Contractor's schedule and contract documents and submit Design Clarification Requests, Requests For Information, or any other type of information requests the Contractor may use. This process shall continue for each three (3) months or increments of 3 month work segments until the completion of the Project.

F. Record meeting results and distribute copies to A/E and Owner and to others affected by decisions or actions resulting from each meeting.

1.08 PRE-INSTALLATION MEETINGS ***[Specifier - delete or modify as required]***

A. General: Prior to commencement of work listed below or as otherwise determined by the A/E or Owner, the General Contractor or his general superintendent, the responsible foremen for the subcontractors performing said work, plus all associated sub-subcontractors, suppliers, fabricators, vendors, and others as appropriate, shall attend a meeting for the purpose of establishing a full understanding of the procedures and requirements for the orderly progress of the designated work.

B. All subcontractors and major suppliers are required to attend these pre-installation meetings prior to commencing work of their respective specifications Section, or as required by related work in other specification sections. Contractor may elect to group several Sections or Divisions to minimize the number of these meetings.

C. Require attendance of entities directly affecting, or affected by, work of the Section including A/E, Owner's Representatives, Contractor's Project Manager and Superintendent with Lead man performing the work, and/or the appropriate Subcontractors/Suppliers/Fabricators.

D. Contractor shall notify the A/E and PM of the Contractor's scheduled pre-installation meeting not less than seven (7) days prior to the scheduled start of any of the work listed below so that the A/E and PM may schedule their appropriate staff. All applicable submittals as well as the Subcontractor's safety plan and insurance certificates shall have been submitted to and reviewed by the A/E and PM prior to scheduling this meeting. Work requiring pre-installation meetings shall include, but not necessarily be limited to, the following.

[Specifier - edit as appropriate]

1. Landscaping
2. Cast-in-place concrete.
3. Precast concrete.

4. Interior masonry.
5. Exterior masonry.
6. Masonry cleaning/restoration
7. Structural steel.
8. Interior architectural woodwork/casework.
9. Waterproofing / water repellent treatment (each respective type).
10. Insulation.
11. Roofing (each respective type).
12. Firestopping and fireproofing.
13. Joint sealers.
14. Hollow metal doors and frames.
15. Aluminum windows/storefronts/curtain walls
16. Plaster.
17. Gypsum board assemblies.
18. Tile.
19. Acoustical ceilings.
20. Resilient flooring (each respective type).
21. Carpeting.
22. Painting.
23. HVAC sheet metal.
24. Plumbing
25. Fire sprinklers
26. Fire alarm
27. Non-typical specialty items
28. Balancing controls

E. Work Plan: Develop a written work plan for each definable segment of work. Complete the work plan prior to the pre-installation meeting, and this shall serve as the basis for discussion and contract compliance. Include a review of contract requirements to assure that materials and equipment delivered and assembled for construction conform to contract requirements and that control testing, including procedures, are finalized. Examine work areas, upon which new work is to be placed, to verify the substrate for the new phase of work.

F. Agenda

1. Review technical contract requirements with any options. Contractor to submit any options and resolve with Owner any conflicts, interference, or compatibility problems.
2. Insurance and certifications.
3. Schedule. Include the work on the three (3) week Short Interval Schedule.
4. Review requirements as relates to:
    a. Schedule.
    b. Submittals and mock-ups - status of approval; review contract requirements. Note: All submittals pertaining to a pre-installation meeting shall have been reviewed by Architect/Engineer and returned to Contractor.
    c. Tolerances.
    d. Manufacturer’s requirements.
    e. Weather limitations.
5. Materials - available and ready for use.
6. Persons responsible for work.
7. Quality control methods:
    a. Testing/Inspection requirements - required inspections and tests, who samples and how often? Criteria for performance of work.
    b. Acceptability of substrates - criteria for approving substrate.
    c. Required performance results.
    d. Recording requirements.
8. Applicable governing rules and regulations.
9. Temporary facilities and controls:

a. Safety, environmental controls, security, noise.
b. Space and access limitations.

10. Protection of work, curing periods and related subjects.
11. Other business

G. A/E will record, reproduce and distribute copies of minutes prior to the next meeting or within seven (7) days of each meeting to all meeting participants.

[Specifier – verify if needed]

1.09 COMMISSIONING MEETINGS

A. Refer to respective sections of the various general, mechanical and electrical Divisions of the Project Manual for associated commissioning meeting requirements.

1.10 PROJECT CLOSEOUT MEETINGS

A. For the purpose of attaining project closeout, commencing immediately following established date of Substantial Completion, Contractor's project manager and superintendent and all subcontractors who have outstanding punch list items associated with their work, or as otherwise requested and including all subcontractors involved in the building systems commissioning process, shall attend weekly closeout meetings which shall be held at the jobsite.

B. Such meetings shall be held to review and discuss the resolution of all punch list items in order to attain Final Completion. Closeout meetings shall continue on a weekly basis until all punch list items have been resolved and Final Completion is attained.

1.11 TRAINING MEETINGS FOR OPERATING INSTRUCTIONS OF OWNER'S PERSONNEL

A. Refer to Section 01 77 00 for training requirements related to operating instructions of Owner's personnel.

1.12 ADDITIONAL MEETINGS

A. As the construction progresses, additional meetings may be required. These may be called at the direction of or by the A/E or PM.

END OF SECTION 01 31 19

GUIDE SPECIFICATIONS

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PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. This section supplements General and Supplemental Conditions requirements and specifies administrative and procedural requirements for preparation of a preliminary Construction Schedule, Contractor's final master Construction Schedule, hereinafter called the Construction Schedule, Short Interval Schedules ('look-ahead'), and monthly updates.
2. The provisions and requirements of this Section supersede those contained in Article 3.02 of the General Conditions, as supplemented, where said provisions or requirements are in conflict.

B. Definitions:

"Day", as used throughout the Contract unless otherwise stated, means "calendar day".

1.02 SYSTEM DESCRIPTION

A. System Requirements: The purpose of the schedules and reports is to:

1. Ensure adequate planning and execution of the work by the Contractor so that it is completed within the milestone dates and total number of working days allowed in the Contract.
2. Establish the standard against which satisfactory completion of the project shall be judged.
3. Assist the A/E and Owner's Representative in monitoring progress.
4. Assess the impact of any changes to the Contract.
5. Support the basis for progress payments.

B. Float or Slack Time in the Schedule:

1. Float time is defined as the amount of time between the earliest start date and the latest start date or between the earliest finish date and the latest finish date of an activity or chain of activities on the 'Critical Path Method' (CPM) Construction Schedule.
2. Joint Ownership of Float: The Contractor's construction schedule will begin with the date of issuance of Notice to Proceed and conclude with the date of Substantial Completion of the Project, which is the Time of Completion indicated in the Bid Proposal. Float or slack time within this construction schedule is not for the exclusive use or benefit of either the Owner or the Contractor, unless otherwise identified in these Contract Documents, but is a jointly owned project resource available to both parties as needed to meet Contract milestones and the Contract Substantial Completion date. Any float time to activities not on the critical path shall belong jointly to the Contractor and Owner, and may be used by the Contractor and Owner throughout the construction process. However, the Contractor and Owner can mutually reserve and apportion float time according to the needs of the Project.

3. Limited Damage for Delay:
   a. No time extensions will be granted nor delay damages paid until a delay occurs that impacts the project's critical path, consumes all available float or contingency time available, and extends the work beyond the specified contract completion date.
   b. Any float time remaining at the established date of Substantial Completion shall belong to the Owner, and may be used by the Owner in determining if additional contract days are to be awarded for changes in the Contract or for delays to the Contract caused by the Owner. The Contractor shall not be entitled to any adjustment in the Contract Time, the Contract Schedule, or the Contract Price, or to any additional payment of any sort by reason of the Owner's use of any float time remaining between established date of Substantial Completion and the final completion date.
4. Non-Sequestering of Float: Pursuant to the float-sharing requirements of these Contract Documents, the use of float suppression or float hiding techniques such as preferential sequencing or logic, special lead/lag restraints, using multiple critical paths, scheduling activities which can be done concurrently as sequential activities on the critical path or artificially inflating the duration of activities on the critical path are prohibited and the use of float time disclosed or implied by the use of alternate scheduling techniques shall be shared to the proportionate benefit of the Owner and the Contractor. Sequestering of float shall be cause for rejection of Contractor's schedule submittal.
5. Float Developed by Accelerated Actions of Owner or A/E: Float may be added to the Construction Schedule through the expedited activities of the Owner or the Architect. The Construction Schedule must show all scheduled Owner or A/E activities which can affect the critical path including submittal review, delivery of Owner provided items, testing or permit compliance reviews or inspections. Times for these activities on the Construction Schedule must reflect the maximum time or latest date of delivery/arrival indicated in the Specifications or Drawings. If no duration or delivery date is shown or specified, the schedule is to indicate reasonable dates and duration for those items. If A/E or Owner create float by doing activities ahead of schedule, this time will be identified each month and may be used to offset delays which may be caused by A/E, Owner or other delay occurrences outside of the Contractor's control.

C. If the Contractor should desire or intend to complete the Work earlier than any required Milestone or Completion date, the Owner or A/E shall not be liable to the Contractor for any costs or other damages should the Contractor be unable to complete the Work before such Milestone or Completion date.

1.03 SUBMITTALS

A. General: Comply with pertinent provisions of Section 01 33 00.

B. All schedule submittals, including schedule updates, will be reviewed jointly by the A/E and the Contractor. Such review of the Contractor's schedules shall not constitute an approval or acceptance of the Contractor's construction means, methods, or sequencing or its ability to complete the Work in a timely manner. Neither the Owner's nor the A/E's review will relieve the Contractor of the sole responsibility for the accuracy, adequacy, or completeness of the schedule, the logic of the schedule, and/or completion of the Contract requirements in accord with such schedule. Neither Owner's nor A/E's review shall constitute acknowledgment that the relationships between various work items or activity durations are reasonable or appropriate.

C. Preliminary Progress Schedule:

1. Submit the Preliminary Progress Schedule to the Architect within fourteen (14) days after the Notice to Proceed.

2. Re-submit the Preliminary Progress Schedule to the Architect until the schedule meets all requirements of this Section.
3. Each submittal shall be in the form of one electronic copy and three hard copy prints.

D. Progress Schedule:

1. Within forty-five (45) days after issuance of Owner's written Notice to Proceed, and before any further progress payment need be made, the Contractor, after consultations and sign-offs with its major Subcontractors and Suppliers of any tier has been performed, shall submit a complete Contractor's Construction Schedule to the Owner and A/E for Owner's and A/E's review.
2. Initial submittal shall be in the form of one electronic copy and one hard copy print.
3. The Owner and A/E will review the substance of Contractor's Construction Schedule and return to the Contractor with comments within ten (10) days. Within ten (10) days following return of reviewed Construction Schedule, the Contractor shall meet with the A/E to discuss Owner's and A/E's Schedule review comments and revisions to the Schedule.
    a. Within ten (10) days following said meeting, Contractor shall submit a final Construction Schedule implementing all revisions as directed in the above noted meeting.
4. When submitting the final schedule, the Contractor shall include its cover letter of transmittal and include a statement that the schedule has been completed and concurred with by its subcontractors.
5. Progress Payment will be withheld until Contractor's Construction Schedule has been submitted in final form and content satisfactory to the A/E and Owner.

E. Periodic Updates to Progress Schedule:

1. Submit an Updated Progress Schedule with each request for a monthly progress payment as required in Part 3 of this Section.
2. Each submittal shall be in the form of one electronic copy and one hard copy print.

F. Distribution: Copies of reviewed schedule and every revision thereof shall be submitted to the A/E, the Owner, and to everyone whose time performance is essential to achieving the progress shown on the schedule.

1.04 QUALITY ASSURANCE

A. Experience of Scheduler:

1. Employ a scheduler who is thoroughly trained and experienced in compiling construction schedules, in analyzing schedules by use of the Critical Path Method, and in preparing and issuing periodic reports as required.
2. Provide references from a minimum of three past projects of work similar to this project, with similar scheduling requirements.
3. Replace any scheduler whom the Owner deems incompetent.

4. If Contractor does not have the qualified scheduling personnel, he shall retain an outside consultant specializing in CPM scheduling to prepare and maintain the progress schedule.
5. Submit names and experience of proposed employee or consulting firm to Owner prior to submission of preliminary schedule.
6. Upon review of Contractor's scheduler/consultant, the Contractor shall conduct a meeting with the A/E and Owner, Contractor Project Superintendent and Contractor's subcontractors to explain the scheduling system, monitoring system and demonstrate the use of the schedule during the project.

B. ***[Specifier modify as required]*** The Owner may contract for independent certified CPM scheduler assistance throughout the project in reviewing and providing recommendations regarding the draft and regular updates of the Contractor's schedule.

C. Coordination with Subcontractors and Suppliers:

1. The scheduler shall prepare the Project Schedules and their updates in cooperation with major subcontractors and suppliers.
2. In scheduling work of subcontractors and deliveries by suppliers, the Contractor represents that he has agreement regarding schedule with those supplying materials and performing the work.

D. Reliance Upon the Reviewed Schedule:

1. The Progress Schedule, as reviewed by the A/E, will be an integral part of the Contract and will establish interim completion dates for the various activities under the Contract.
2. Should any activity on the critical path not be completed within 15 calendar days after the stated scheduled date, the Owner shall have the right to require the Contractor to expedite completion of the activity by whatever means appropriate and necessary, without additional compensation to the Contractor. In addition, Contractor shall submit a "Recovery Schedule" which shall logically demonstrate method or methods Contractor proposes to initiate to get back on schedule within thirty (30) days of said date, i.e., additional tradespersons, shifts, work days, or crews.
3. In addition to above, should any activity be 15 days or more behind schedule, the Owner shall have the right to perform the activity or have the activity performed by whatever method the Owner deems appropriate.
4. Costs incurred by the Owner and the A/E in connection with expediting construction activity under this Article shall be the responsibility of the Contractor.
5. It is expressly understood and agreed that failure by the Owner to exercise the option either to order the Contractor to expedite an activity or to expedite the activity by other means shall not be considered to set a precedent for any other activities.

PART 2 – PRODUCTS

2.01 CONSTRUCTION PROGRESS SCHEDULE REQUIREMENTS

A. Critical Path Network Analysis Diagram:

1. Prepare and maintain a computer generated progress schedule using Microsoft Project software consisting of a network analysis system generally known as the Critical Path Method (CPM). Software version shall match versions owned by Owner and, where applicable, independent scheduler.
2. Comply with "The Use of CPM in Construction--A Manual for General Contractors" published by the Associated General Contractors of America, Inc..
3. Graphically show the order and interdependence of all activities necessary to complete the Work, and the sequence in which each such activity is planned to be accomplished.
4. Commence progress schedule preparation immediately following Notice of Award of the Contract.

5. Key the progress schedule to the Schedule of Values (Section 01 29 00) in order to aid analysis of monthly payment requests.

B. Required Data: Show complete sequence of construction by activity, indicating critical path of activities, including but not limited too:

1. Date for Notice to Proceed;
2. Date for Substantial Completion;
3. Project mobilization;
4. Operating constraints and sequences specified by Owner;
5. Shop Drawing, product data, samples, mock-up submittals and reviews, by specification section;
6. Date for final color selections to not affect the Critical Path;
7. Provide demolition schedule as indicated in the Construction Documents;
8. Planned versus actual status for each Work activity;
9. Material procurement - fabrication, delivery to job site, and installation - of equipment and critical materials;
10. Fabrication of special material and equipment, its installation and testing;
11. Utility shutdowns, road closures, etc.;
12. Any intermediate (milestone) completion dates identified in the Contract Documents; include coordination activities as milestones, such as utility tie-ins, outages, Owner furnished items, City inspections, etc.;
13. Delivery windows for all Owner furnished items. Establish earliest and latest delivery dates in consultation with the manufacturer;
14. Pre-Installation Meetings;
15. Contractor transfer of any existing Owner equipment;
16. Show interrelationships and dependencies including activities of separate contractors;
17. Long lead items;
18. Testing, commissioning, Owner training sessions, and other close out activities;
19. Show Field Authorizations (FA) and Change Orders (CO) when they impact the critical path of the schedule;
20. Punch list;
21. Punch list corrections.
22. Final cleanup.
23. All activities by the A/E that affect progress, required dates for completion, or both, for all and each part of the Work.

C. Number and Duration of Activities on the Network Analysis:

1. Treat each trade or type of work as a separate activity or set of activities on the network analysis. Each activity shall be coded for responsibility (Contractor, Owner, A/E, etc.), Subcontractor, Discipline (Fire Suppression, Plumbing, Mechanical, Automation, Electrical, Communications, Roofing, etc.). Each project phase (i.e., 1, 1-A, 2, etc.) shall be scheduled separately.
2. At a minimum treat each section of the technical specifications as one or more trades or types of work.
3. Treat submittal, fabrication, delivery, installation, and startup as separate activities for each trade, type of work and item of equipment, including any items procured under any early procurement contracts transferred and/or assigned by Owner, required for performance of Work. The fabrication and delivery activities shall have the appropriate logic ties to submittal/review and construction activities.
4. Submittal and review activities for shop drawings, samples, etc., shall allow reasonable durations for preparation of submittals, submittal review, revisions and re-submittal review. Refer to Section 01 33 00 for specified durations for processing submittals by the Architect and its Consultants, or the Owner and its Consultants, as applicable. Shorter review times for critical submittals may be negotiated on an individual basis. Re- submittals shall have the same review times allotted as the initial submittals. Re- submittal of shop drawings or samples necessitated by required corrections shall not be

cause for extension of time. If certain submittals are critical, they shall be so identified at the time of submission to assure priority treatment. The submittal activities shall have the appropriate logic ties to delivery and construction activities.

5. No activity or task shall be longer than 15 calendar days duration, with shorter durations if they affect other activities. The activities shall show early and late start, early and late finish, and float dates. Break down major tasks into sub-tasks or by area to meet this criteria.
5. Where activities extend more than 15 days divide activities into logical component activities.
6. Show on the diagram, as a minimum for each activity, preceding and following event numbers, description of each activity, cost, and activity duration in calendar days.

D. Cost Loaded Schedule: All construction activities which occur on-site shall be cost loaded.. Show dollar value of activities correlated to the Schedule of Values

E. Mathematical Analysis:

1. Furnish the mathematical analysis of the network diagram by computer printout, including a tabulation of each activity. Show the following information as a minimum for each activity:
   a. Preceding and following event numbers.
   b. Activity description.
   c. Estimated duration of activities.
   d. Earliest start date and earliest finish date (by calendar date).
   e. Latest start date and latest finish date (by calendar date).
   f. Slack or Float (in calendar days).
   g. Monetary value of each activity.
   h. Percentage of activity completed.
   i. Contractor's earnings based on portion of activity completed.
2. The means used in making the mathematical computation shall be capable of compiling the total value of completed and partially completed activities and be capable of accepting modifications reviewed for time and logic adjustment.

F. Baseline Schedule: The initial Schedule when reviewed by the A/E and Owner shall be identified as the Baseline Schedule and shall be known as Revision 0. Each subsequent reviewed change to the Schedule shall be as a Revision numbered in sequence (Revision 1, 2, 3, etc.). The Baseline Schedule shall be submitted with no progress percentages applied to activities. The first update shall include the preliminary schedule activities and remaining activities updated as of the second monthly pay request.

PART 3 – EXECUTION

3.01 PRELIMINARY CONSTRUCTION SCHEDULE

A. General:

1. Prepare and submit the Preliminary Progress Schedule to the Architect within 14 days after the Notice of Award, showing all elements itemized in 2.01B above.
2. The schedule shall have been developed by the Contractor in conjunction with its Subcontractors. Major subcontractors greater than 20 percent of the contract are required to review and sign off on the progress schedules as a condition to the Owner authorizing progress payment approval.

B. Re-submittal: Re-submit the Preliminary Construction Schedule to the A/E until the schedule meets all requirements of this section.

C. Scope of Preliminary Construction Schedule: The Preliminary Progress Schedule shall detail, at a minimum, all work which will be accomplished in the first 60 calendar days following the Notice to Proceed. The general approach of the balance of the work shall be indicated.

D. Limitation on Construction:

1. Mobilization and submittals can be in process during the review period.
2. No construction work shall be permitted until the Preliminary Construction Schedule is submitted and reviewed.

E. Initial Progress Payment: The first pay request will be based on the update of the preliminary schedule.

3.02 COMPLETE CONSTRUCTION SCHEDULE

A. General: Submit the complete (Master) Construction Schedule to the A/E within forty-five (45) days following the Notice to Proceed.

B. Subcontractor Participation:

1. Involve all major subcontractors in preparation of the Master Construction Schedule.
2. Obtain approval of the schedule from each major subcontractor and submit in writing together with the final Construction Schedule.

C. Start-Up and Testing: Include adequate time for start-up and testing of the complete facility.

D. Progress Payments:

1. Shall be withheld in the absence of a reviewed Construction Schedule.
2. No adjustment or extension of time shall be granted for failure to meet the activity dates as shown. Failure to comply with these requirements shall be cause for rejection of any progress payments presented thereafter, until such time as these requirements are met.

E. Distribution: Copies of reviewed preliminary Construction Schedule and every reviewed revision thereof shall be submitted to the A/E, the Owner, and to everyone whose time performance is essential to achieving the progress shown on the schedule.

3.03 SHORT INTERVAL SCHEDULE

A. Prepare a 3-week Short Interval (“look-ahead”) Schedule. Show one (1) prior week of actual progress (planned vs actual performance). Forecast two (2) weeks of start and completion dates for each activity, task or event in comparison to the prepared schedule.

1. Activities in the Short Interval Schedule shall relate directly to activities in the Construction Schedule. Each activity shall be coded with the same ID number, specification number, or other reference the contractor uses on the Construction Schedule. The Short Interval Schedule will have more detail, but each of the details must be related to the Construction Schedule coding.
2. Indicate start, on-going, intermittent and completion for each activity, task, or event.
3. The schedule shall show critical path work, as defined by the Construction Schedule, that has been affected by any changed conditions authorized through a change order or field order.

B. Distribute paper copies of the Short Interval Schedule to all attendees at each weekly Progress Meeting.

3.04 UPDATES

A. General:

1. The scheduler shall attend all meetings concerning project progress, alleged delays, or time impact.
2. The schedule shall be modified to reflect the original Contract completion date, subject to review by the Owner. Prior to submittal of the schedule update, the Contractor shall submit an advanced worksheet indicating the intended report status. The Owner, A/E and Contractor shall then meet and agree upon the completion status of the work in progress, and any major logic changes proposed by the Contractor.
3. Maintain the Construction Schedule at the project meeting location and update weekly by drawing a line vertically through the corresponding progress of each task on the schedule as of the date of that project meeting. The line shall be in varying colors so that differentiation between weeks is readily apparent.

B. Weekly Meetings:

1. Update the reviewed Construction Schedule at each weekly Project Meeting.
2. Indicate "actual" progress in percent complete for each activity.
3. At each project meeting discuss the Short Interval Schedule. Any deviation from the planned schedule shall be explained by Contractor, with corrective measures, if necessary, to bring progress of Work back in line with the Contract Completion date.

C. Monthly Update:

1. If substantial changes have occurred in the Construction Schedule, or if enough changes have occurred that the schedule is rendered inaccurate or ineffective, submit with the next application for payment a revised updated Construction Schedule showing the original baseline schedule and revised schedule on the same copy for evaluation and measurement of actual work-in-place.
2. If the contractor does not submit a revised schedule with a payment request, it is agreed by the Contractor that the project is still on schedule according to the last submitted schedule.
3. The Contractor shall maintain an ID system so that if the logic changes, or other tasks are inserted, the original task and any inserted task always maintain the originally assigned ID number.
4. Contractor shall submit an updated schedule at the monthly progress meeting following either one of the following two occurrences:
    a. Upon completion of a major milestone; or,
    b. When the actual work completed is more than two (2) weeks behind schedule. Should the schedule show the project completion to be more than two weeks behind, the Contractor shall submit a written explanation and recovery schedule outlining corrective action taken or proposed to bring events back on schedule within a 30 day period.
5. Show changes occurring since previous schedule submission, such as:
    a. Any major changes in scope, including authorized Field Orders or Change Orders;
    b. Contractor reorganization of his work sequence unrelated to changes in scope;
    c. Activities modified since previous submission;
    d. Revised projections for progress and completion, as applicable; and
    e. Any other identifiable changes.
6. Provide narrative report as needed to define:
    a. Problem areas, anticipated delay, and impact of these on schedule; and
    b. Corrective action recommended and its effect.

D. Subcontractor Participation:

1. Involve all major subcontractors in preparation of the Periodic Updates of the Construction Schedule.
2. Obtain approval of the schedule from each major subcontractor and submit in writing together with the Periodic Updates of the Construction Schedule.

E. Change Orders:

1. Authorized changes to the work shall be included in the schedule network as they occur in the same format and level of detail as contained in the current updated schedule. Enough activities shall be included to adequately describe the work. Code the activities in such a way that they can be identified to the specific Change Order. Insert the Change Order Activities in the network with appropriate logic ties to original network activities.
2. Utilize the time impact analysis submitted with the change order to demonstrate the effect of delays on the overall project schedule.

3.05 TIME EXTENSIONS

A. The Contractor shall notify the Owner and Architect in writing within seven (7) days of the event of any event which could delay performance or supplying of any item of the work affecting the critical path. Contractor shall indicate the expected duration of the delay, the anticipated effect of the delay on the Contractor's Construction Schedule, and the action being taken to correct the delay situation.

B. Extensions of time to the Contractor's Contract may be granted only for delays to activities on the critical path that actually delay the Project Completion beyond the date of Substantial Completion, or for delays to activities that transform that activity onto the critical path, and as a result cause a final completion date beyond the contracted final completion date.

C. Following receipt of an executed Change Order extending the Contract Time, the activity data and logic relationships shall be incorporated into the current detailed CPM schedule during the next scheduled progress update, as outlined above in Paragraph F "Change Orders" above. In the event the Contractor is entitled to a change in the Contract Time, the adjustment to the contract Time shall be as defined in the General Conditions.

3.06 ABNORMAL INCLEMENT WEATHER

A. The Contractor shall not be entitled to an extension of time for inclement weather except under the provisions of Paragraph 3.05A.6 of the General Conditions, as supplemented.

B. Except for site work which may critically affect the Contract Time, no extension of time will be made for abnormal inclement weather after the principle portions of the Work are sufficiently closed-in (exterior walls up and roof in place) so as to permit any structure, or major portion thereof which is part of the Work, to be adequately heated so as to allow the various trades to perform their work.

C. If the total calendar days lost due to abnormal inclement weather, from the start of the Work at the Project site by the Contractor until the principle portions of the Work are enclosed, exceeds the total number of days to be expected for the same period, a time extension, if granted, shall only be the number of calendar days needed to equal the excess number of calendar days lost due to such abnormal inclement weather.

3.07 AS-CONSTRUCTED PROGRESS SCHEDULES

A. General:

1. At the completion of the project submit an as-constructed progress schedule.
2. The contractor's project manager and project scheduler must certify the progress schedule as representing the way in which the project was actually constructed.

END OF SECTION 01 32 16

GUIDE SPECIFICATIONS

The following specification is intended to be used, generally verbatim, in the contract documents. ***[Specifier notes]*** shall be deleted during the editing process. Where [ ] appear in this document, this indicates requirements which are optional depending upon the project scope and conditions. Edit as appropriate for the project. The A/E consultant shall take ownership and responsibility for the contents of this section and is expected to modify other portions as necessary to accurately reflect conditions of the project. For draft copies during the design process, use Microsoft Word, Track Changes. Set criteria so that deletions show as strikethroughs. Deletions and additions are to be in red.

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes administrative and procedural requirements for submittals required for performance of the Work, including the following:

1. Shop Drawings.
2. Product Data.
3. Samples.

The individual submittal requirements of certain submittals are specified in applicable sections for each unit of work.

B. Refer to other Division 01 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to, the following:

1. Permits.
2. Applications for Payment.
3. List of subcontractors.

C. Shop drawings, product data, samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate, for those portions of the Work for which submittals are required, how Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents.

1.03 DEFINITIONS

A. Shop Drawings: Shop drawings include specially prepared technical data for this project, including drawings, diagrams, performance curves, data sheets, schedules, templates, patterns, reports, calculations, instructions, measurements and similar information not in standard printed form for general application to several projects. Reproduction of Contract Document drawings are not considered to be shop drawings unless approved by the A/E.

B. Product Data: Product data includes standard printed information on materials, products and systems, not specially prepared for this project, other than the designation of selections from among available choices printed therein.

C. Samples: Samples include both fabricated and unfabricated physical examples of materials, products, and units of work; both as complete units and as smaller portions of units of work; either for limited visual inspection or (where indicated) for more detailed testing and analysis.

D. Field Samples: Field samples are full-size physical examples erected on-site to illustrate finishes, coatings, or finish materials. Field samples are used to establish the standard by which the Work will be judged.

E. Mockups: Mockups are full-size assemblies for review of construction, coordination, testing, or operation; they are not Field Samples.

F. Coordination Drawings: Coordination Drawings show the relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in the space provided or to function as intended.

1. Preparation of Coordination Drawings is specified in Section 01 31 00 and may include components previously shown in detail on Shop Drawings or Product Data.

1.04 SUBMITTAL PROCEDURES

A. Provide a submittal on every product and material used in the Project. Before submittal of shop drawings, brochures, and lists, Contractor shall carefully review same for proper identification, completeness, correctness, dimensions, and technical applicability to the Contract Document requirements and note all corrections, items needing clarification, additional comments, and the like. Upon thorough review and subsequent acceptance by the Contractor, if so accepted, Contractor is to note its approval together with said notes or amendments thereto for compliance with the Contract Documents by suitable stamp, date and the signature of the Contractor or its authorized representative. Submittals will be returned to the Contractor without action by the A/E if the items submitted are not stamped, signed, and identified as approved or approved as noted or other similar language indicating approval by the Contractor, or if the submittal is obviously not thoroughly reviewed.

B. Submission of shop drawings and samples shall be accompanied by one original and one copy of a transmittal letter containing Project name, Contractor's name, number of drawings and samples, titles and other pertinent data.

C. Many products are specified by one or more named products/manufacturers. In those circumstances where Contractor submits an unnamed, non-prior approved product/manufacturer during this ‘shop drawing’ phase, said submittal shall be submitted in conformance with product substitution requirements of Section 01 61 00, Article 2.03.

D. Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.
    a. The Contractor shall provide submittals requiring coordination with other submittals to the A/E at one time. The A/E will review submittals as received, provide comments, and return them to the Contractor. If the Contractor did not submit all submittals requiring coordination at the same time, and a later submittal identifies conflicts, the Contractor will be responsible for all costs associated with changes necessary to properly coordinate the installation of the materials.
3. To avoid the need to delay installation as a result of the time required to process submittals, the Contractor shall anticipate the review times noted in this section and anticipate the possibility of a resubmittal or rejected submittal and the effect that action would have on the Project schedule.

a. All required submittals shall be initially received by the A/E within 60 days ***[Specifier modify to suit job conditions]*** following the Notice to Proceed date, or sooner as required by the following submittal review times, to meet the Construction Schedule need for materials related to the submittals. Submittals received after these time periods shall not be a cause for delay claims to the Project. A/E will not accelerate review time for submittals received after the indicated time periods, regardless of any potential impact to the Contractor's schedule.
b. Submittals requiring color selection and material selection are interdependent on receiving all submittals at the same time that have such selection requirements. Allow 20 working days from the date of receipt of the last such submittal by the Contractor for the A/E to complete color selections and mail out from the A/E's office.
c. For all other submittals, allow 10 working days after receipt by the A/E to complete the initial review and mail out from the A/E's office.
d. If the A/E must delay processing a submittal to permit coordination with subsequent submittals, the 10 working days will begin upon receipt of the last such coordination submittal from the Contractor.
e. If several submittals are provided by the Contractor at the same time, allow 20 working days after receipt by the A/E to complete the initial review and mail out from the A/E's office. Provide an "Order of Priority List" to the A/E with the submittal.
f. If an intermediate submittal is necessary, process the same as the initial submittal.
g. Allow 10 working days for reprocessing each submittal after receipt.

E. Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block. Consecutively number each submittal beginning with the number 001.

1. Provide adequate space for the Contractor's stamp and approval, plus a space approximately 4 by 5 inches each on the label or beside the title block on Shop Drawings to record the A/E's review and approval markings and the action taken.
2. Include the following information on the label or title block for processing and recording action taken.
    a. Project name and job number.
    b. Date.
    c. Name and address of the A/E.
    d. Name and address of the Contractor, subcontractor, supplier and manufacturer as appropriate.
    e. Number and title of appropriate Specification Section.
    f. Drawing number and detail references, as appropriate.

F. Package each submittal appropriately for transmittal and handling. Transmit each submittal from the Contractor to the A/E using a transmittal form. Submittals received from sources other than the Contractor will be returned through the Contractor without action.

1. Address no more than one topic or related topics on a single transmittal (i.e. mechanical items shall not be submitted under same transmittal with electrical items).
2. Record relevant information, deviations, and requests for data, including minor variations and limitations from the Contract Documents.
3. Shop drawings, product data, samples, and mock-up as required for submissions by the technical specification sections are to be submitted for A/E's review/approval. The number of submittals required is noted in the parenthesis.
    a. Shop Drawings: (6) sets; provide one (1) additional set for Structural, Mechanical, Electrical and Elevator submittals
    b. Product Data: (6) copies; provide one (1) additional copy for Structural, Mechanical, Electrical and Elevator submittals
    c. Samples: (3) samples
    d. Mock-ups: As required by any technical specification section.
    e. Demonstrations: As required by any technical specification section.

f. Reference applicable mechanical and electrical technical specifications' sections for additional submittal requirements.

4. Material and Color Submittal: Submit samples of actual colors of materials.
5. Number submittals as follows: Numerical Order, Spec Section, Revision Letter.
6. In the event of the need to "revise and resubmit" a submittal, resubmit same in acceptable form/content, clearly identifying deviations from previous submittal content.

1.05 SHOP DRAWINGS

A. Submit drawings drawn to accurate scale. Do not reproduce Contract documents or copy standard information for use as Shop Drawings. Standard information prepared without specific references to the project is not a Shop Drawing.

B. Include fabrication and installation drawings, setting diagrams, schedules, patterns, templates, and similar drawings. Include the following information:

1. Dimensions;
2. Identification of products and materials included;
3. Compliance with specified standards;
4. Notation of coordination requirements;
5. Notation of dimensions established by field measurements; and
6. Any deviation from contract drawings or specifications;
7. Date when review has to be finalized to meet schedule.

C. Except for templates, patterns and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2" x 11", but no larger than 24" x 36".

D. Shop drawings shall clearly indicate the correct configurations and relative sizes, materials, metal gauges, etc. of the various components and the proposed methods of fabrication, required clearances, supports and any other pertinent data.

E. All items shown on shop drawings that do not conform to plans and specifications shall be specifically noted as such (flagged) and brought to the A/E's attention. In any case, the A/E's stamp of review shall not include approval of unauthorized changes in the Contract Documents, except where specific written approval is given.

F. Contractor is responsible for obtaining and distributing required prints of shop drawings to its subcontractors and material suppliers after as well as before final review by the A/E. Prints of reviewed shop drawings shall be made from returned transparencies which carry the Contractor's and A/E's appropriate stamps. A/E / Owner and applicable consultants and governing agencies will retain copies of each shop drawing submittal. Reproducible transparency and all remaining prints not otherwise retained will be returned to Contractor.

G. At A/E's discretion, the prints distributed by the A/E including the one print returned to the Contractor (in addition to the original transparency) may consist of copies made from the marked-up and stamped transparencies.

1.06 PRODUCT DATA

A. Product data includes Material Safety Data Sheets (MSDS), manufacturer's printed installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams and performance curves.

1. Where product data must be specifically prepared because standard printed data is not suitable, submit as Shop Drawings.

B. Mark each copy to show applicable choices and options and indicate the applicable information on selected products. Include the following information:

1. Manufacturer's printed recommendations.
2. Compliance with recognized trade association standards;
3. Compliance with recognized testing agency standards;
4. Application of testing agency labels and seals;
5. Notation of dimensions verified by field measurement;
6. Notation of coordination requirements; and
7. Any deviation from Contract Drawings or Specifications;
8. Date when review has to be finalized to meet schedule.

C. The Contractor is responsible for providing certification that all construction materials used on the Project are 100% free of asbestos and lead.

1.07 SAMPLES AND MOCK-UPS

A. Submit samples and mock-ups that are identical with the material or product proposed. Samples include partial sections of components, cuts or containers of materials, color range sets, and swatches showing color, texture and pattern.

1. Package samples to facilitate review. Prepare samples to match the A/E's sample. Include the following:
   a. Generic description of the sample;
   b. Sample source;
   c. Product name or name of manufacturer;
   d. Compliance with recognized standards;
   e. Availability and delivery time; and
   f. Specification section.

B. Submit samples and mock-ups for review of kind, color, pattern, and texture, for a comparison of these characteristics before the actual component installation and after final submittal.

1. Where variation in color, pattern, texture or other characteristics are inherent in the material, submit not less than four (4) units to show approximate limits of the variations.

C. Where samples are for selection of appearance characteristics from a range of standard choices, submit a full set of choices for the material or products.

D. Maintain sets of approved samples and mock-ups, at the project site, for quality comparisons throughout the course of construction.

E. Demolish and remove all samples and mock-ups, at the project site, for quality comparisons throughout the course of construction.

1.08 A/E's ACTION

A. Except for submittals for record, information or similar purposes, A/E will review each submittal, mark to indicate action taken, and return promptly.

B. A/E review of submittals does not release Contractor from a proper installation, compliance with applicable codes, or coordination of the Work.

C. The A/E will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be marked to indicate the action taken.

D. The following is a copy of the A/E's review stamp ***(Specifier modify as needed)*** :

ARCHITECT'S REVIEW	RESPONSE REQUIRED OF
	CONTRACTOR

____No Exceptions Taken ____Rejected

____Confirm and Verify

____Note Markings ____Comments Attached

____Resubmit

Architect's review is for general conformance with the design concept and contract documents. Markings or comments shall not be construed as relieving the Contractor from compliance with the project plans and specifications, nor departures therefrom. The Contractor remains responsible for details and accuracy, for confirming and correlating all quantities and dimensions, for selecting fabrication processes, for techniques of assembly, for coordination of his work with that of other trades, and for performing his work in a safe manner.

By:_____ Date:_____

A. The A/E will distribute, as a minimum, the reviewed submittals as follows:

(1) copy to A/E file; along with (1) sample

(1) copy to A/E subconsultants. For those submittals requiring review by A/E subconsultant (i.e., Structural, Mechanical, Electrical, Elevator, etc.)
(1) copy to PM; along with (1) sample

Remainder of copies submitted by the Contractor

END OF SECTION 01 33 00

GUIDE SPECIFICATIONS

The following specification is intended to be used, generally verbatim, in the contract documents. ***[Specifier notes]*** shall be deleted during the editing process. Where [ ] appear in this document, this indicates requirements which are optional depending upon the project scope and conditions. Edit as appropriate for the project. The A/E consultant shall take ownership and responsibility for the contents of this section and is expected to modify other portions as necessary to accurately reflect conditions of the project. For draft copies during the design process, use Microsoft Word, Track Changes. Set criteria so that deletions show as strikethroughs. Deletions and additions are to be in red.

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 PRELIMINARY WORK

A. Prior to the start of and during the course of above and below groundwork, the Contractor shall make a thorough survey of the entire worksite to determine all potential hazards and notify the Owner in writing of any such hazards prior to the commencement of work. Contractor personnel shall be made aware of those hazards and shall be instructed in procedures and the use of equipment for their protection. The Contractor shall verify the location, condition, and whether it is active or inactive of all utilities on and near the worksite and take precautions to protect all people working on the project, the general public, and the property.

B. Submit a site-specific safety plan in accordance with Supplemental Conditions section 5.07. Submit to allow review and re-submittal with modifications prior to beginning any work.

1.03 IMMINENT DANGER

A. The Contractor shall be wholly responsible for all accidents or death occurring at any time during the progress or completion of this project which may happen to any person employed to perform work on this project; or for any injury or death its work, operations, or persons performing work on this project may cause to any person not employed in the work of this project; or for any damage its work, operations, or persons performing work on this project may cause to the work being constructed, or to any existing public or private property, either on or adjoining the project site or along any routes of travel. Completion of this project includes any time work is being performed on this project, even after final acceptance by the Owner.

1.04 SAFETY

A. The Contractor shall ensure that all persons, while on the work site, comply with the requirements of WA State Department of Labor and Industries, Division of Occupational Safety and Health (DOSH), these requirements, and the safety precautions contained in the several Specification Sections. The Contractor shall promptly and fully comply with, execute and, without separate charge thereof to the Owner, shall enforce compliance with the provisions of the latest adopted Washington Industrial Safety and Health Act, with particular attention paid but not limited to Chapter 296-155, WAC Safety Standards for Construction Work; Chapter 296-24 WAC General Safety and Health Standards; Chapter 296-27 WAC Recordkeeping, Chapters 296-800 through 296-901 WAC Core Rules and others, Chapter

296-350 WAC Administrative rules and Chapter 296-360 WAC Discrimination regarding Administrative Safety and Health Act Chapter 49-17 RCW, and any addenda thereto.

B. The Contractor shall immediately advise the Owner of inspections conducted by DOSH at the work site, and shall transmit copies of reports, citations and violations to the Owner and A/E.

C. Entry Into Permit-Required Confined Spaces:

1. Entry into confined spaces such as steam tunnels, storm sewers, and as otherwise defined in Section 296-809-20002 of Chapter 296-809 WAC, Confined Spaces, shall be performed in conformance with permit entry procedures set forth in Section 296-809-500 and Section 296-809-30004.
2. Employee training for employees entering a confined space shall conform to WAC Section 296-809-400.
3. It is recommended that when entry into a confined space is anticipated, a specialized consultant be contacted.

1.05 SAFETY RESPONSIBILITIES

A. Contractor shall be responsible to:

1. Ensure compliance with these requirements, DOSH requirements, and other safety requirements.
2. Authorize immediate action to correct substandard safety conditions.
3. Review and act to ensure compliance with safety procedures with its supervisors, subcontractors, and suppliers.
4. Make thorough daily safety inspections of the work site and immediately act to eliminate unsafe acts and unsafe conditions.
5. Investigate worksite accidents and recommend immediate corrective action.
6. Assist in the preparation of accident investigation and reporting procedures.
7. Responsibility for the control, availability, and use of safety equipment, including employee personal protective equipment.
8. Submit two (2) copies of site-specific safety plan to Owner.

1.06 REQUEST FOR VARIANCES

A. Requests for variances to deviate from DOSH requirements must follow the current established procedures by that Agency.

1.07 FAILURE TO COMPLY

A. If work on the project is stopped due to the Contractor’s failure to comply with the requirements of DOSH or other applicable safety requirements, no part of the time loss due to any such suspension of operations or stop orders shall be made the subject of a claim for extension of time or for increased cost or damage by the Contractor.

END OF SECTION 01 35 20

GUIDE SPECIFICATIONS

The following specification is intended to be used, generally verbatim, in the contract documents. ***[Specifier notes]*** shall be deleted during the editing process. Where [ ] appear in this document, this indicates requirements which are optional depending upon the project scope and conditions. Edit as ap- propriate for the project. The A/E consultant shall take ownership and responsibility for the contents of this section and is expected to modify other portions as necessary to accurately reflect conditions of the project. For draft copies during the design process, use Microsoft Word, Track Changes. Set criteria so that deletions show as strikethroughs. Deletions and additions are to be in red.

PART 1 - GENERAL

1.01 SUMMARY

A. The _____ Building is a contributing, character-defining structure in the National Register Washington State Capitol Historic District. As such the highest level of preservation of historic materials shall apply to this structure and the work of this contract. In addition to all other requirements, all work of this contract shall be performed in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring and Reconstructing Historic Buildings*.

B. This Section includes general protection, salvage and treatment procedures for **[designated historic spaces, areas, rooms, and surfaces in][entire]** Project and the following specific work including, but not limited to, the following:

1. **[Revise to suit Project]**

C. Related Sections include the following:

1. Section 01 45 23 – Historic Preservation Inspection Services
2. Section 01 50 00 – Temporary Facilities and Controls
3. Section 01 74 19 – Construction Waste Management and Disposal
4. Section 02 40 00 – Building Remodel Selective Demolition
5. **[Section XX XX XX – Title]**

D. General Requirements: It shall be understood that the Work of this Section seeks to pre- serve the character of the historic building by leaving in place as much of the original material- als as possible and, where removals are necessary, by saving historic building components, fixtures and fittings for subsequent reinstallation.

1.02 REFERENCES <***Specifier: Verify links are up to date***>

A. National Park Service Preservation Tech Note Number 2, *Specifying Temporary Protection of Historic Interiors During Construction and Repair*, by Dale H. Frens, AIA, 1993.

B. National Park Service Preservation Tech Note Number 3, *Protecting a Historic Structure during Adjacent Construction,* by Chad Randl, 2001.

C. NFPA 241, *Standard for Safeguarding Building Construction and Demolition Operations*, National Fire Protection Agency, Quincy, MA. (800) 344-3555.

1.03 DEFINITIONS **[Revise to suit Project]**

A. "Consolidate": To strengthen loose or deteriorated materials in situ.

B. "Dismantle": To disassemble and detach items by hand from existing construction to the limits indicated, using small hand tools and small one-hand power tools, so as to protect nearby

historic surfaces: and legally dispose of dismantled items off-site, unless indicated to be salvaged or reinstalled.

C. "Existing to Remain": Existing items that are not to be removed or dismantled. Take precautions to protect materials noted.

D. “Historic”: Spaces, areas, rooms, surfaces, materials, finishes, and overall appearance which are important to the successful **[preservation] [rehabilitation] [restoration] [and] [reconstruction]** as determined by Architect/Engineer. The designation “HF” and words such as “historic,” “historic fabric,” “historic materials,” “historic building materials,” or words of similar meaning shall be understood to mean that the material or feature is considered to have aspects that require preservation and all work impacting the material or feature shall conform to the *Secretary of the Interior’s Standards for the Treatment of Historic Properties*.

E. "Historic Preservation Specialist" or “Conservator”: A person retained by the Owner to provide guidance for compliance with the *Secretary of the Interior’s Standards for the Treatment of Historic Properties*.

F. "In-Kind": Match existing in all physical and visual aspects including material, form, color, texture and workmanship.

G. “Match”: To blend with adjacent construction and manifest no apparent difference in material type, species, cut, form, detail, color, grain, texture or finish as approved by Architect/Engineer.

H. "Preserve": To apply measures necessary to sustain the existing form, integrity, and materials of a historic property. Work may include preliminary measures to protect and stabilize the property.

I. “Protect”: Take all necessary precautions to keep historic materials of the building from damage or injury. Provide temporary guards and covering as needed. Materials should be in the same condition and same location in the building upon completion of the project as when they were when the project began.

J. “Reconstruct”: To remove existing item, replicate damaged or missing components, and reinstall in original position.

K. “Refinish”: To remove existing finishes to base material and apply new finish to match original or as otherwise indicated.

L. “Reinstall”: To protect removed or dismantled item, repair and clean as indicated for reuse, and reinstall in original position, or where indicated.

M. "Remove": To detach or dismantle items from existing construction, label, package, and deliver them to Owner ready for reuse or storage, or as indicated for reinstallation.

N. "Repair": To correct damage and defects, retaining existing materials, features and finishes while employing s little new material as possible. Includes patching, piecing-in, splicing, consolidating, or otherwise reinforcing or upgrading materials with appropriate and approved materials and methods.

O. “Replace”: To remove, duplicate, and reinstall entire item with new material. The original item is the pattern for creating duplicates unless noted otherwise.

P. “Replicate” or “Reproduce”: To fabricate a new item in exact detail, materials and finish to the original, and in either the same or similar material as the original, unless otherwise indicated.

Q. “Restore”: To consolidate, replicate, reproduce, repair, and refinish as required to achieve the indicated results.

R. “Retain”: To keep existing items that are not to be removed or dismantled.

S. "Reversible": New construction work, treatment, or processes that can be removed or undone in the future without damaging historic materials, unless otherwise indicated.

T. "Salvage": To protect removed or dismantled items and deliver them to the Owner, ready for reuse as indicated.

U. "Stabilize": To provide structural reinforcement of unsafe or deteriorated items while maintaining the essential form as it exists at present; also, to reestablish a weather-resistant enclosure.

V. "Strip": To remove existing finish down to base material, unless otherwise indicated.

1.04 MATERIALS OWNERSHIP

A. Historic items, relics and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, **[insert description of items,]** antiques, and other items of interest or value to the Owner that may be encountered during removal and dismantling work remain the Owner's property. Carefully dismantle and salvage each item or object as indicated.

B. Coordinate with Owner's **[historic preservation representative] [and] [archaeologist]**, who will establish special procedures for dismantling, salvage and storage.

1.05 SUBMITTALS

A. Historic Treatment Program: Prepare a written plan for historic treatments for the Project, including each phase or process, including removal of historic materials, and protection of surrounding materials during operations. Describe in detail the materials, methods, and equipment to be used for each phase of work. Show compliance with indicated methods and procedures specified in this and other Sections. Include the following:

1. Dust and Noise Control: Include locations of proposed temporary dust- and noise-control partitions. Coordinate with Egress Plan for means of egress from occupied areas with continuing on-site operations and other known work in progress.
2. Debris Hauling: Include plans clearly marked to show debris hauling routes, turning radii, debris chutes if applicable, and locations and details of temporary protective barriers.

B. Construction Schedule for Historic Treatments: Indicate for entire Project the following for each activity to be performed in historic spaces, areas and rooms, and on historic surfaces:

1. Detailed sequence of historic treatment work, with starting and ending dates, coordinated with Owner's continuing operations and other known work in progress.
2. Utility Services: Indicate how long utility services will be interrupted. Coordinate shutoff, capping, and continuation of utility services.
3. Use of elevators and stairs.
4. Coordination of Owner's and other's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
5. Equipment data, if applicable: List gross loaded weight, axle-load distribution, and wheel-base dimension data for mobile and heavy equipment proposed for use. Do not use such equipment without Contractor's professional engineer's certification that the structure can support the imposed loadings without damage.

C. Protection Plan:

1. Contractor shall prepare a Protection Plan. This Protection Plan shall provide for protection of all pivotal, primary and secondary elements and spaces identified in the report included at the end of this section **[*Specifier, obtain report from PM*]**, and shall include:
   a. Types of protection to be employed, including detailed description of materials to be used and where they are to be used.

b. Duration of protection for each location/application.
c. Description of clean-up of historic fabric.

2. Such Protection Plan shall be reviewed by the Historic Preservation Specialist and approved by the Architect/Engineer and the Owner.
3. Contractor may propose temporary removal, packaging and storage of historic components, fixtures and fittings otherwise designated to remain (e.g., doors) as a means of protection. Any such proposal shall be accompanied by a removals plan, to be reviewed and approved by Owner prior to any temporary removal.

D. Fire Prevention Plan: Prepare a written plan for preventing fires during the Work, including placement of fire extinguishers, fire blankets, rag buckets, and other fire-prevention devices during each phase or process. Coordinate plan with Owner's fire-protection equipment and requirements. Include each fire watch's training, duties, and authority to enforce fire safety.

E. Egress Plan: Prepare a written egress plan for the Project, including floor diagrams and other signage to be displayed during the Work. Revise egress plans as required throughout the Project for continued safe access of building occupants and workers.

F. Access Plan: Indicate methods and procedures for access, such as scaffolding, aerial lifts, ladders, etc. Coordinate with egress plan, use of elevators or stairs, and Owner's continuing occupancy of all or portions of the building. Coordinate any disruptions of use in construction schedule.

G. Removals Plan: Contractor shall produce a written Removals Plan that details procedures, materials and sequences of operations necessary to carefully remove, package, and store historic building components, fixtures and fittings. Such Removals Plan shall be reviewed by the Historic Preservation Specialist and approved by the A/E and Owner. The Removals Plan shall include procedures to assure a standard of care by each trade or type of removal to assure:

1. Verification that historic items proposed for removal are properly documented prior to removal.
2. Verification of proposed tagging and labeling measures.
3. Verification of proposed packaging techniques and storage procedures.
4. Verification that all historic and non-historic items removed have been documented by the Owner for storage or disposal prior to any materials being removed from the site.

H. Inventory of Salvaged Items: After removal or dismantling work is complete, submit a list of items that have been salvaged.

I. Preconstruction Documentation: Record existing conditions of historic materials, adjoining construction and site improvements. Include finish surfaces that might be misconstrued as damage, and where documentation is necessary for reconstruction or reinstallation. Coordinate with selective demolition operations. Document through photographs and/or videotape.

J. Project Record Documents: See Article 1.07 below for requirements.

K. Qualification Data: For **[historic treatment specialist] [historic removal and dismantling specialist] [historic removal and dismantling specialist's field supervisors] [historic removal and dismantling specialist's workers] [and] [industrial hygienist].**

Retain Quality Assurance article below if specialists are required for this or other Sections. Revise to suit Project.

1.06 QUALITY ASSURANCE

A. Historic Treatment Specialist Qualifications: An experienced firm regularly engaged in historic treatments similar in nature, materials, design, and extent to this work as specified in each section, and that has completed a minimum of [**five**] <**Insert number**> recent projects with a record of successful in-service performance that demonstrate the firm's qualifications to perform this work.

1. Field Supervisor Qualifications: Full-time supervisors experienced in historic treatment work similar in nature, material, design, and extent to that indicated for this Project. Supervisors shall be on Project site during times that historic treatment work is in progress. [**Supervisors shall not be changed during Project except for causes beyond the control of the specialist firm]**.
2. Worker Qualification: Persons who are experienced in historic treatment work of types they will be performing.
3. Alternative Methods and Materials: If alternative methods and materials to those indicated are proposed for any phase of work, provide a written description including evidence of successful use on other, comparable projects, and program of testing to demonstrate effectiveness for use on this Project.

B. Historic Removal and Dismantling Specialist Qualifications: A qualified historic treatment specialist. General selective demolition experience is not sufficient experience for historic removal and dismantling work.

C. Industrial Hygienist Qualifications: Certified as Industrial Hygienist by the American Board of Industrial Hygiene; having a bachelor's degree in industrial hygiene, public health, biological science, occupational health, or environmental and safety discipline; and experienced in work of types specified.

Mockups for removal and dismantling work can be used to establish cleanliness or stand-of-care requirements for an area of work considered typical, or to prequalify individual workers. Revise to suit Project.

D. Mockups: Prepare mockups of specific historic treatment procedures specified in this Section to demonstrate aesthetic effects and to set quality standards for materials and execution.

Retain one or more of subparagraphs below for large-scale mockups. Revise to suit Project.

1. Typical Removal Work: Remove typical [**wall area**] <**Insert description**> as shown on Drawings.
2. Typical Dismantling Work: Dismantle typical **[historic light fixture] <Insert description>** as shown on Drawings.

Retain one or more subparagraphs below for limited mockups. Revise to suit Project.

3. Typical Removal Work: Remove an **[approximately 50-sq. ft. (4.6-sq. m)] <Insert dimension>** area of typical **[wall] <Insert description>**, but not less than **[10] <Insert number>** adjacent whole **[masonry] <Insert item>** units.
4. Typical Dismantling Work: Dismantle an **[approximately 50-sq. ft. (4.6-sq. m)] <Insert dimension>** area of typical **[composition tile from mosaic tile substrate] <Insert description>**, but not less than **[10] <Insert number>** adjacent whole **[composition tile] <Insert item>** units.

Retain "Exploratory Dismantling" subparagraph for mockups of extremely sensitive work and where concealed conditions are not assured. Change the term "dismantling" to "removal" for less critical conditions. Revise to suit Project.

5. Exploratory **[Dismantling][Removal]**: **[Dismantling][Removal]** of <**Insert description**>. Perform **[dismantling][removal]** in the presence of Architect/Engineer.
    a. Follow the procedure specified in "Historic Removal and Dismantling" Article.
    b. **[Dismantle][Remove] [approximately 1-sq. ft. (0.09-sq. m)] <Insert dimension>** of **<Insert item>**.
    c. **<Insert additional provisions as needed>**
    d. Continuation of the **[dismantling][removal]** may be suspended by Architect/Engineer for re-evaluation.
6. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect/Engineer specifically approves such deviations in writing.

E. Regulatory Requirements: Comply with notification regulations of authorities having jurisdiction before beginning removal and dismantling work. Comply with hauling and disposal regulations of authorities having jurisdiction.

F. Standards: Comply with ANSI/ASSE A10.6.

Retain preconstruction conference for larger projects, sensitive work and other instances where a meeting may be necessary. Revise to suit Project.

G. Historic Treatment Preconstruction Conference: Conduct conference at [**Project site**] <**Insert location**>.

1. General: Review methods and procedures related to historic treatment including, but not limited to, the following:
    a. Review manufacturer's written instructions for precautions and effects of historic treatment procedures on materials, components, and vegetation.
    b. Review and finalize historic treatment construction schedule. Verify availability of materials, equipment, and facilities needed to make progress and avoid delays.
    c. Review qualifications of personnel assigned to the work and assign duties.
    d. Review material application, work sequencing, tolerances, and required clearances.
    e. Review areas where existing construction is to remain and requires protection.
2. Removal and Dismantling:
    a. Inspect and discuss condition of construction to be removed or dismantled.
    b. Review requirements of other work that relies on substrates exposed by removal and dismantling work.

Delete Article below if using Section 01 78 39 - Project Record Documents. Coordinate text below with the work in that Section.

1.07 PROJECT RECORD DOCUMENTS

A. Keep accurate records and document the selective demolition and construction work related to historic materials, fixtures, and finishes throughout the Project. On-going photographic and descriptive documentation of affected historic materials is a requirement under this contract. General documentation procedures may be as follows:

1. Photographic documentation of removed or dismantled items:
    a. Documentation shall clearly show the location of all historic fabric to be disturbed or removed from its original location in the structures, or in the landscape.
    b. Clearly label and log each item. Coordinate with the inventory of salvaged items.
    c. Document temporary protection, including covering or crates, and, if removed from Work area, note location of temporary storage.

2. Photographic documentation, general:
   a. Mark historic fabric to be disturbed with alpha-numeric identification, unless already identified.
   b. Photograph prior to disturbing.
   c. Photograph as needed during the removal process. The number of photographs required is directly dependent upon the uniqueness of the feature, complexity of the work, and/or difficulties encountered. Coordinate with the Owner.
   d. Use digital camera technology and clearly label and log each item. All digital photographs shall be electronically date-stamped. Make hard copy prints of all digital images, in duplicate.
   e. Place photographs in approved file system at the jobsite and send all digital images to the Owner's representative.
   f. Make photographs available to construction personnel and the Owner.
   g. The use of digital cameras is authorized, provided photographs can be viewed at the jobsite, upon request, on a computer screen not smaller than 15" diagonal measure and photographic printing capabilities are provided.
   h. Make copies of all selected photographs available to the Owner for the Owner's exclusive use.

3. Descriptive records:
   a. The purpose for maintaining written records is to show, illustrate, or describe historic fabric, items, material, facilities, features, styles, and workmanship relating to a bygone era. Present or future historians must be able to evaluate, interpret, replicate, or restore all or portions of these structures and/or changes made to portions thereof.
   b. Maintain a detailed written daily log describing work performed, difficulties encountered, and problems resolved as relates to the historic fabric of these structures and surrounding historic landscape. Included shall be descriptions of existing construc- tion details, types of material, fasteners, and methods employed in the historic construction, and to what extent authorized changes were made.
   c. Included in the daily log shall be detailed dimensioned sketches/drawings as may be required to add meaning to the written and/or photographic log/records and to allow the Contractor to accurately reproduce the structures. The Owner may request certain specific sketches/drawings be made for inclusion into the written record.
   d. Maintain records in an approved file system at the jobsite and make such available to construction personnel and the Owner.

4. At final acceptance, provide all records to the Owner assembled in the following format:
   a. Photographs shall be filed in three-ring binders, protected, and placed within clear polypropylene see-through archival print preservers, sized to match photograph size. Clearly label and number each photograph. Each three-ring binder shall have a descriptive photograph index for rapid locating of individual photographs within the binder.
   b. Digital images (and negatives if used) shall become the property of the Owner. (Place negatives into an approved file system, clearly labeled, dated, and sequenced for rapid identification and retrieval. Do not intermix negatives or separate from the sequences in which the photographs were taken.)
   c. Neatly typed descriptive records, sketches, and drawings shall be filed within three-ring binders or other approved filing/organizing system. File in a logical chronological manner, consistent with the order of actual work performed. Provide descriptive index for rapid location of records within filing system.
   d. Digital photographs shall be downloaded onto a CD. Additionally, a hard copy of each index shall be placed with each CD and a stick-on label placed on the outside of each CD jacket identifying the contents of each CD.

B. Record Documents: Include modifications to manufacturer's written instructions and procedures, as documented in the historic treatment preconstruction conference and as the Work progresses.

1.08 STORAGE AND PROTECTION OF HISTORIC MATERIALS

A. General: Protect all historic materials from general abuse, rough handling, tool marks, paint splattering, punctures, penetrations, saw marks, and related damage.

B. Removed or Dismantled and Salvaged Historic Materials:

1. Clean only loose debris from salvaged historic items unless more extensive cleaning is indicated.
2. Pack or crate items after cleaning; cushion against damage during handling. Label contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area **[on-site] [off-site] [as designated by Owner] [or] [as indicated on Drawings]**.
5. Protect items from damage during transport and storage.
6. Do not dispose of items removed from existing construction without prior written consent of Owner.

C. Historic Materials for Reinstallation:

1. Clean and repair historic items as indicated to functional condition adequate for intended reuse, using approved and specified materials and methods.
2. Pack or crate items after cleaning and repairing; cushion against damage during handling. Label contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

D. Existing Historic Materials to Remain: Protect historic materials indicated to remain against damage and soiling during construction. When permitted by Owner, items may be dismantled and taken to a suitable, protected storage location during construction work, and reinstalled in their original locations after historic treatment construction in the vicinity is complete.

E. Storage and Protection: When taken from their existing locations, catalog and store historic materials within a weathertight enclosure where they are protected from wetting by rain, snow, condensation, or ground water, and temperature variations. Secure stored materials to protect from theft.

1. Identify each item with a non-permanent mark to document its original location. Indicate original locations on plans, elevations, sections, or photographs by annotating the identifying marks.
2. Stone and brick may be stored outside. Protect from freeze-thaw effects and vandalism.

1.09 PROJECT CONDITIONS

Retain "General Size Limitation" paragraph below to reduce the likelihood of damage to historic fabric from carelessness.

A. General Size Limitation in Historic Spaces: Materials, products, and equipment used for performing the Work and for transporting debris, materials, and products shall be of sizes that clear surfaces within historic spaces, areas, rooms, and openings, including temporary protection, by [**12 inches (300 mm)**] <**Insert dimension**> or more.

B. Owner will occupy portions of building immediately adjacent to removal and dismantling area. Conduct removal and dismantling work so Owner's operations will not be disrupted

Revise to suit Project. Insert other limitations as necessary, such as when specific areas or adjacent floors will be occupied.

C. Conditions existing at time of inspection for bidding purpose will be maintained by the Owner as far as practical.

1. **[Before removal and dismantling, Owner will remove the following items:]**
   a. **<Insert items to be removed by Owner>**.

D. Notify Architect/Engineer of discrepancies between existing conditions and Drawings before proceeding with removal and dismantling work.

Retain one of three "Hazardous Materials" paragraphs below to suit Project. Expand scope of this Article specifically to include asbestos, PCBs, or other hazardous materials as required. Coordinate statements with General and Supplementary Conditions.

E. Hazardous Materials: It is **not** expected that hazardous materials will be encountered in the Work.

1. Hazardous materials **[testing was conducted for <Insert items> and reported that none exist] [will be removed by Owner before start of the Work] [have been removed by Owner under a separate contract]**.
2. If materials suspected of containing hazardous materials are encountered, do not disturb. Immediately notify Architect/Engineer and Owner. Owner will test and, if required, remove hazardous materials under separate contract.
   a. In the case of potential asbestos, stop work in the area of potential hazard, shut off fans and other air handlers ventilating the area, and rope off area until the questionable material is identified. Re-assign workers to continue work in unaffected areas. Resume work in the area of concern after safe working conditions are verified.

F. Hazardous Materials: It is unknown whether hazardous materials will be encountered in the Work.

1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect/Engineer and Owner. Owner will test and, if required, remove hazardous materials under a separate contract.
   a. In the case of potential asbestos, stop work in the area of potential hazard, shut off fans and other air handlers ventilating the area, and rope off area until the questionable material is identified. Re-assign workers to continue work in unaffected areas. Resume work in the area of concern after safe working conditions are verified.

G. Hazardous Materials: Hazardous materials are present in construction affected by removal and dismantling work. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.

1. **[Hazardous material remediation is specified elsewhere in the Contract Documents].**
2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.
3. If unanticipated asbestos is suspected, stop work in the area of potential hazard, shut off fans and other air handlers ventilating the area, and rope off area until the questionable material is identified. Re-assign workers to continue work in unaffected areas. Resume work in the area of concern after safe working conditions are verified.

H. Storage or sale of removed or dismantled items on-site is not permitted unless otherwise indicated

PART 2 - PRODUCTS

2.01 PROTECTION MATERIALS

A. General:

1. Use materials specified, or as approved in Historic Treatment Plan.
2. Do not use materials that will stain or leave residue on historic materials.
3. Materials for protection shall be compatible with and disposed of in accordance with Section 01 74 19, Construction Waste Management and Disposal.

B. Protection Materials **[Revise to suit Project]**

1. Polyethylene sheets: **[4 mil.]** <**Insert thickness**>, fire retardant.
2. Lumber: Species to be selected by Contractor, sized to fit field conditions, FSC certified.
3. Plywood: **[3/4-in.]** <**Insert thickness**>, FSC certified.
4. Preservation tape: Scotch 4811 by 3M.
5. Safe-release tape: 3M Blue painter's tape.

Products below are for packing and cushioning historic materials and objects to be dismantled and stored.

6. Polyurethane foam sheets: 2 in. and 4 in. thick, as required.
7. Polyester urethane foam: Ethafoam 220, 2 in. thick.
8. Polyethylene foam sheets: Ethafoam 222 ½ in. thick and Volara 1/8 in. thick.
9. Polyethylene sheeting: DuPont "Tyvek", non-printed rolls (no labels).

PART 3 - EXECUTION

3.01 HISTORIC REMOVAL AND DISMANTLING EQUIPMENT

A. Removal Equipment: Use only hand-held tools except as follows or unless otherwise approved by Architect/Engineer on a case-by-case basis:

1. **[Light jackhammers are allowed subject to Architect/Engineer's approval]**.
2. Large air hammers are not permitted.

B. Dismantling Equipment: Use manual, hand-held tools, except as follows or otherwise approved by Architect on a case-by-case basis:

1. Hand-held power tools and cutting torches are permitted only as submitted in the historic treatment program. They must be adjustable so as to penetrate or cut only the thickness of material being removed.
2. Pry bars more than 18 inches (450 mm) long and hammers weighing more than 2 lbs. (0.9 kg) are not permitted for dismantling work.

3.02 EXAMINATION

A. Prior to start of Work, examine each work area with the Owner and Architect/Engineer to determine with mutual agreement, which items, features, and materials are to be retained and protected. Physically and visibly mark such items, features, and materials as directed. Physically and visibly mark as directed such items, features, and materials as are mutually agreed to be removed and replaced with new materials. Carefully remove, label, document, catalog, and safely store original elements that are required to be retained, reinstalled, reused, or placed in long term storage,

B. Preparation for Removal and Dismantling: Examine construction to be removed or dismantled to determine best methods to safely and effectively perform removal and dismantling work. Examine adjacent work to determine what protective measures will be necessary. Make explorations, probes, and inquiries as necessary to determine condition of construction to be removed or dismantled and location of utilities and services to remain that may be hidden by construction that is to be removed or dismantled.

1. Do not disturb sound original material, which is in place or is found at the site, unless specific agreements between the Owner and Architect/Engineer have been reached
2. Verify that affected utilities have been disconnected and capped.
3. Inventory and record the condition of items to be removed and dismantled for salvage or reinstallation.
4. Before removal or dismantling of existing elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproductions.
5. As required, engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures as a result of removal and dismantling work.

C. Survey of Existing Conditions: Record existing conditions by use of **[measured drawings] [preconstruction photographs] [and] [preconstruction videotapes] <Insert requirement>**.

1. Comply with requirements specified in **[this Section] [and] [Division 01 Section "Photographic Documentation"]**.
2. Perform surveys as the Work progresses to detect hazards resulting from historic treatment procedures.

D. Bring any pre-existing damage to the attention of the Owner before proceeding with the installation of protection. Contractor shall document all such pre-existing damage and shall be responsible for the cost of any repair of damage **not** documented prior to installation of protective material which is revealed upon removal of protection.

1. In the event of new damage, inform Owner immediately and describe nature and extent of damage and proposed method of repair. Do not attempt repairs without an approved repair plan.

3.03 PROTECTION, GENERAL

A. Comply with temporary barrier requirements in Division 01 Section "Temporary Facilities and Controls".

B. Comply with manufacturer's written instructions for precautions and effects of products and procedures on adjacent building materials, components, and vegetation.

C. Ensure that supervisory personnel are on-site and on duty when historic treatment work begins and during its progress.

D. Protect persons, motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm resulting from historic treatment procedures.

1. Use only proven protection methods, appropriate to each area and surface being protected.
2. Provide barricades, barriers, and temporary directional signage to exclude public from areas where historic treatment work is being performed
3. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during course of historic treatment work

4. Contain dust and debris generated by removal and dismantling work and prevent it from reaching the public or adjacent surfaces.
5. Provide shoring, bracing, and additional support as necessary. Do not overload structural elements.
6. Protect floors and other surfaces in work areas and along routes of travel from damage, wear, and staining
7. **[Provide supplemental sound-control treatment to isolate removal and dismantling work from other areas of the building.]**

E. Temporary Protection of Historic Materials:

1. Protect existing materials during installation of temporary protections and construction. Do not deface or remove existing materials, unless indicated otherwise.
2. Attachments of temporary protection to existing construction shall be reviewed by Architect/Engineer and approved by Owner prior to installation. Secure protection adequately to maintain safe environment for workers and other individuals using building. Do not attach protection materials directly to historic components, fixtures and fittings unless indicated otherwise.

F. Utility and Communications Services:

1. Notify Owner, Architect/Engineer, authorities having jurisdiction, and entities owning or controlling wires, conduits, pipes, and other services affected by the historic treatment work before commencing operations.
2. Disconnect and cap pipes and services as required by authorities having jurisdiction, as required for the historic treatment work.
3. Maintain existing services unless otherwise indicated; keep in service and protect against damage during operations. Provide temporary services during interruptions to existing utilities.

G. Existing Drains: Prior to the start of work or any cleaning operations, test drains and other water removal systems to ensure that drains and systems are functioning properly. Notify Owner immediately of drains or systems that are stopped or blocked. Do not begin Work of this Section until the drains are in working order.

1. Provide a method to prevent solids including stone or mortar residue from entering the drains or drain lines. Clean out drains and drain lines that become blocked or filled by sand or any other solids because of work performed under this Contract.
2. Protect storm drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.

H. Existing Roofing: Prior to the start of work in an area, install roofing protection.

I. Site Protection: Protect landscape work adjacent to or within work areas as follows. **[Coordinate work with Division 01 Section "Temporary Tree and Plant Protection"]**.

1. Provide barriers to protect tree trunks, and roots below tree canopies.
2. Bind spreading shrubs.
3. Use coverings that allow plants to breathe and remove coverings at the end of each day. Do not cover plant material with a waterproof membrane for more than 8 hours at a time.
4. Set scaffolding and ladder legs away from plants.
5. Do not allow storage of materials within the drip lines of trees.

J. Where automatic sprinkler system exists and is functional, maintain it without interruption while operations are being performed. If operations are performed close to automatic sprinkler heads, shield the individual heads temporarily with guards.

3.04 PROTECTION DURING APPLICATION OF CHEMICALS

A. Comply with requirements in Division 1 Section "Temporary Facilities and Controls."

B. Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm or damage resulting from applications of chemical cleaners and paint removers.

C. Cover adjacent surfaces with protective materials that are proven to resist chemical cleaners selected for Project unless chemicals being used will not damage adjacent surfaces as indicated in historic treatment program. Use covering materials and masking agents that are waterproof, UV-resistant, and will not stain or leave residue on surfaces to which they are applied. Apply protective materials according to manufacturer's written instructions. Do not apply liquid masking agents or adhesives to painted or porous surfaces. When no longer needed, promptly remove masking materials to prevent staining.

D. Do not apply chemicals during winds of sufficient force to spread them to unprotected surfaces.

E. Neutralize and collect alkaline and acid wastes, and legally dispose of off Owner property.

F. Collect and dispose of runoff from chemical operations by legal means and in a manner that prevents soil contamination, soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interior.

3.05 PROTECTION DURING USE OF HEAT-GENERATING EQUIPMENT

A. General: Follow Project fire prevention plan, accepted industry standards, and the following provisions.

B. Heat-Generating Equipment and Combustible Materials: Comply with the following procedures while performing work with heat-generating equipment or highly combustible materials, including welding, torch-cutting, soldering, brazing, paint removal with heat, or other operations where open flames or implements utilizing high heat or combustible solvents and chemicals are anticipated.

Retain one of the two following subparagraphs. Revise to suit Project.

1. The Washington State Capitol Campus is a smoke-free environment. Prohibit the use of all tobacco products by personnel performing work on or near historic structures.

2. [Obtain Owner's approval for operations involving use of [open-flame or] welding or other high-heat equipment. Notify Owner [at least 72 hours] <Insert requirement> before each occurrence, indicating location of such work.]

3. [Use of open-flame equipment is not permitted.]

4. As far as practical, restrict heat-generating equipment to shop areas or outside the building.

5. Do not perform work with heat-generating equipment in or near rooms or in areas where flammable liquids or explosive vapors are present or thought to be present. Use a combustible gas indicator test to ensure that the area is safe.

6. Use fireproof baffles to prevent flames, sparks, hot gases, or other high-temperature material from reaching surrounding combustible material.

7. Prevent the spread of sparks and particles of hot metal through open windows, doors, holes, and cracks in floors, walls, ceilings, roofs, and other openings.

8. Fire Watch: Before working with heat-generating equipment or highly combustible materials, station personnel to serve as a fire watch at each location where such work is performed. Fire-watch personnel shall have the authority to enforce fire safety. Station fire watch according to NFPA 51B, NFPA 241, and as follows.
   a. Train each fire watch in the proper operation of fire-control equipment and alarms.

b. Prohibit fire-watch personnel from other work that would be a distraction from fire-watch duties.
c. Cease work with heat-generating equipment whenever fire-watch personnel are not present.
d. Have fire watch perform final fire-safety inspection each day beginning no sooner than [**30 minutes**] <**Insert time**> after conclusion of work at [**each area of**] Project site to detect hidden or smoldering fires and to ensure that proper fire-prevention is maintained.
e. Maintain fire-watch personnel at [**each area of**] Project site until [**60 minutes**] <**Insert time**> after conclusion of daily work.

9. When heating equipment is required for construction, supply vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic controls. The use of gasoline-burning space heaters, or salamander-type heating units is prohibited.

C. Sprinklers: Where sprinkler protection exists and is functional, maintain system without interruption while Work is being performed. If operations are performed close to sprinkler heads or other components, shield temporarily with guards.

1. Remove temporary guards at the end of work shifts, whenever operations are paused, and when nearby work is completed.

D. Fire Extinguishers and Fire Blankets: Furnish and maintain fire extinguishers and fire blankets at work areas. Maintain each as suitable for the type of fire risk in each work area. Ensure that nearby personnel and the fire watch are trained in fire-extinguisher and blanket operation.

E. Flammable Material Storage and Disposal:

1. Store flammable liquids in approved, safety cans in small amounts. Store rags containing oils or solvents in covered metal containers. Clearly label all safety cans and containers.
2. Any chemicals, liquids or compressed gases, and rags containing oils or solvents used on site shall be removed from the work area at the end of each workday, and stored in a separate protected area.

F. Clean-Up: Maintain the work area free of combustibles, including, rubbish, paper, waste, etc., within area of operations.

1. Furnish and maintain rag buckets for disposal of rags with combustible liquids, oils or solvents.
2. If combustible material cannot be removed, supply fireproof blankets to cover such materials.
3. Take precautions to avoid accidental spillage. Any spillage of liquid materials must be reported to the Owner immediately and cleaned in the proper manner respective to the type of material discharged.

3.06 HISTORIC TREATMENT, GENERAL

A. The principal aim of preservation work is to halt the process of deterioration and stabilize the item's condition, unless otherwise indicated. Repair is required where specifically indicated. The following procedures shall be followed:

1. Retain as much existing material as possible; repair and consolidate rather than replace.
2. Use additional material or structure to reinforce, strengthen, prop, tie, and support existing material or structure.
3. Use the gentlest means and methods available and use reversible processes wherever possible.

4. Use traditional replacement materials and techniques. New work shall be distinguishable to the trained eye, on close inspection, from old work.
5. Use repair and replacement materials that match remaining historic construction in all physical and visual aspects including material, form, color, texture and workmanship, unless otherwise indicate
6. Record the work before the procedure with preconstruction photos and during the work with periodic construction photos. Photographic documentation is specified above.

B. Changes to distinctive interior materials, features, and spatial relationships shall be minimized.

C. Alterations shall not destroy historic materials or features. New work shall be compatible in material, features, size, scale, and proportion to the property and environment.

1. New construction and materials shall be added in such a manner that, if removed in the future, the essential form and integrity of the historic materials would be unimpaired.

D. Obtain Architect/Engineer and Owner's review and written approval before making changes or additions to construction or removing historic materials not indicated in the Project Documents.

E. Notify Owner's Representative of visible changes in the integrity of material or components whether due to environmental causes including biological attack, UV degradation, freezing, or thawing; or due to structural defects including cracks, movement, or distortion.

1. Do not proceed with the work in question until directed by Owner.

F. Where missing features are indicated to be repaired or replaced, provide features whose designs are based on accurate duplications rather than on conjectural designs, subject to the approval of Architect/Engineer and Owner.

G. Where Work requires existing features to be removed, cleaned, and reused, perform these operations without damage to the material itself, to adjacent materials, or to the substrate.

H. Identify new or replacement materials and features with inconspicuous, permanent marks to distinguish them from original materials. Record the legend of identification marks and the locations of these marks on Record Drawings.

I. When cleaning, match samples of existing materials that have been cleaned and identified for acceptable cleaning levels. Avoid over-cleaning to prevent damage to existing materials during cleaning.

3.07 HISTORIC REMOVAL AND DISMANTLING, GENERAL

A. Perform work according to the historic treatment program [**and approved mockups]**.

1. Provide supports or reinforcement for existing construction that becomes temporarily weakened by the Work, until the Work is completed.
2. Perform cutting by hand or with small power tools wherever possible. Cut holes and slots neatly to size required. Avoid over-cuts and minimum disturbance of adjacent work.
3. Do not operate air compressors inside building, unless approved by Owner in each case.
4. Do not drill or cut columns, beams, joints, girders, structural slabs, or other structural supporting elements, without having Contractor's professional engineer's written approval for each location before such work is begun.

B. Water-Mist Sprinkling: Use water-mist sprinkling and other wet methods to control dust only with adequate, approved procedures and equipment that ensure that such water will not create a hazard or adversely affect other building areas or materials. Obtain prior approval of

Architect/Engineer as some historic materials may be easily damaged by wet methods to control dust.

C. Unacceptable Equipment: Keep equipment that is not permitted for historic removal or dismantling work away from the vicinity where such work is being performed.

3.08 SPECIAL REMOVAL PROCEDURES

A. General: Exercise extreme caution in removing historic elements and materials of any kind attached to historic elements that are indicated to remain. Proceed as follows:

1. Use only dismantling tools and procedures specified above.
2. Unfasten items to be removed, in the opposite order from which they were installed.
3. Unbolt bolted connections.
4. Unscrew screw connections.
5. Support each item as it becomes loosened to prevent stress and damage to the historic surface.
6. Do not pry apart members whose finish will be damaged by chipping, scratching, crazing, or cracking, or whose structural integrity will thereby be impaired.
7. Do not use oversized power tools to remove wall or floor areas for installation of new equipment.
8. Do not remove nails from woodwork from the finished or exposed side. Drive nails through or pull from back side such that the nail head does not splinter the finished face.
9. When prying cannot be avoided, protect finished surfaces and materials scheduled to remain or be reinstalled. Use sacrificial wood blocks, surface protection such as 16ractictive carpeting or other approved means agreed to by the Owner.
10. Utilize blocks, steel plates, or other approved methods to spread loads to larger areas, to avoid stone/flatwork damage.
11. If the work cannot proceed without some limited damage to the historic fabric, then the Contractor and the Owner shall clearly define and mutually agree to all methods which may damage historic fabric, prior to proceeding with the work. The Owner or designated representative reserves the right to reject inappropriate methods not in conformance with accepted and recognized historic preservation or rehabilitation standards and/or 16racticees.
12. When conflicts arise regarding what may constitute appropriate methods, the specifications shall prevail.

B. Anchorages:

1. Remove anchorages associated with removed items.
2. Dismantle anchorages associated with dismantled items.
3. In non-historic surfaces, patch holes created by anchorage removal or dismantling according to the requirements for new work, or as otherwise indicated.
4. In historic surfaces, patch or repair holes created by anchorage removal or dismantling according to Section specific to the historic surface being patched, or as otherwise indicated.

Revise paragraphs below to suit project.

C. Masonry:

1. Comply with Division 04 Section **[“Maintenance of Unit Masonry”] [“Unit Masonry Restoration”] [“Stone Maintenance”] [“Stone Restoration”]**.
2. Remove masonry carefully and erect temporary bracing and supports as needed to prevent collapse of materials being removed.
3. Dismantle top edge and sides before removing wall. Stop removal work and immediately inform Architect/Engineer if any structural elements above or adjacent to the work show signs of distress or dislocation during any phase of removal work.

4. Remove wall in easily manageable pieces.
5. During removal, Contractor is responsible for the stability of the partially remaining wall. Notify Architect/Engineer of the condition of temporary bracing for wall if Work is temporarily stopped during the wall's removal.

D. Loose Plaster:

1. Comply with Division 09 Section **["Maintenance of Plaster and Gypsum Board"] ["Plaster Restoration"]**.
2. Identify loose, non-historic plaster and separate it from its substrate by tapping with a hammer and prying with a chisel or screwdriver. Do not use pry bars. Leave sound, firmly adhered plaster in place. Do not damage, remove, or dismantle historic plasterwork except where indicated or where it is an immediate hazard to personnel and as approved by Architect/Engineer.

3.09 BIRD- **[BAT] [RAT]** EXCREMENT REMOVAL

Handling of bird excrement (guano) during historic treatment work requires special attention. Depending on the quantity, it may be considered a hazardous material. Revise article title and content for bat or rat excrement or similar material. Verify that the level of hazard and appropriate procedures are identified and either included as part of the removal work or referenced to requirements prepared by professionals who are experts in hazardous removal of heavy accumulations of excrement.

A. General: Before disturbing accumulated excrement, employ a qualified industrial hygienist to perform tests, make recommendations, and observe the work. Follow procedures required by authorities having jurisdiction and recommended by industrial hygienist.

1. Removing Excrement: **[Revise subparagraphs below to suit Project]**

a. Have excrement removal work performed by a qualified excrement removal specialist.
b. Remove exterior excrement accumulations while building windows and other openings are closed or sealed off.
c. Remove interior excrement while other parts of the building are sealed off from work area and with windows and other openings to exterior areas accessible to the public closed or sealed off.
d. Before removal, treat excrement to kill pathogens. Dampen excrement to prevent particles becoming airborne.
e. Use only nonmetallic tools such as plastic spatulas and brushes with natural fiber or nylon bristles.
f. Collect excrement debris as it is removed and legally dispose of off-site.
g. Repeat removal procedure above where required to produce cleaning effect established by mockup.

2. Removing Excrement Stain: Clean as required in section pertaining to substrate material.

3.10 REMOVAL OF PROTECTION MATERIALS

A. Notify Owner at least one week prior to removal of protection.

B. Remove and dispose of all protective materials as directed and in accordance with Division 01 "Construction Waste Management and Disposal".

C. Coordinate with Owner for observation and documentation of any damage which has occurred since the protection was installed.

3.11 FINAL INSPECTION AND CLEAN UP

A. Coordinate with Owner for observation and documentation of any damage which has occurred since the protection was installed.

B. Perform final cleaning as specified.
C. Repair any damages occurred through the course of the Work at no additional cost to the Owner.

Retain Article below if Drawings do not show all historic removal and dismantling notes and lists. Revise to suit Project.

3.12 HISTORIC REMOVAL AND DISMANTLING SCHEDULE

A. Existing Items to Be **[Removed] [Dismantled]**: <**Insert description of items**>.

B. Existing Items to Be **[Removed] [Dismantled] [and]** Salvaged: <**Insert description of items**>.

C. Existing Items to Be **[Removed] [Dismantled] [and]** Reinstalled: <**Insert description of items**>.

D. Existing Items to Remain: <**Insert description of items**>.

Retain Article below if Drawings do not show all historic removal and dismantling notes and lists. Insert list of historic elements to receive treatment. Indicate zone or area designations, if applicable. Revise to suit Project.

3.13 HISTORIC TREATMENT SCHEDULE

A. Spaces, areas, rooms, and surfaces requiring special care and treatment to ensure successful [**preservation**] [**rehabilitation**] [**restoration**] [**and**] [**reconstruction**] are [**indicated on Drawings**] [**and**] [**generally described below:**]

1. <**Insert location, applicable treatment, and zone or area designations**>.

END OF SECTION 01 35 91

GUIDE SPECIFICATIONS

The following specification is intended to be used, generally verbatim, in the contract documents. ***[Specifier notes]*** shall be deleted during the editing process. Where [ ] appear in this document, this indicates requirements which are optional depending upon the project scope and conditions. Edit as appropriate for the project. The A/E consultant shall take ownership and responsibility for the contents of this section and is expected to modify other portions as necessary to accurately reflect conditions of the project. For draft copies during the design process, use Microsoft Word, Track Changes. Set criteria so that deletions show as strikethroughs. Deletions and additions are to be in red.

PART 1 - GENERAL

1.01 SUMMARY

A. Washington State Department of Enterprise Services (DES) is required to comply with applicable Federal and State laws and regulations, particularly 36 CFR 800 (as amended December 19, 2014), of the regulations that implements Section 106 of the National Historic Preservation Act of 1966, and Title 27 Revised Code of Washington, Chapter 27.44 Indian Graves and Records, Chapter 27.53 Archaeological Sites and Resources, and Title 68 Chapter 60.050 Protection of Historic Graves, as well as Governor's Executive Order Number 05-05 Archaeological and Cultural Resources.

B. Section Includes: General administrative and procedural requirements for unanticipated discovery of cultural resources, including prehistoric and historic archaeological resources and human remains.

C. Related Sections include the following:

1. Section 01 45 23 – Historic Preservation Inspection Services
2. Section 01 50 00 – Temporary Facilities and Controls
3. Section 31 00 00 – Earthwork
4. Section 32 00 00 – Exterior Improvements
5. **[Section XX XX XX – Title]**

1.02 INTRODUCTION

A. A cultural resource discovery could consist of, but is not limited to, the following:

1. Prehistoric features such as storage pit features, postmolds, hearths, occupational surfaces, middens, and anthropogenic soil horizons.
2. Prehistoric artifact concentrations such as projectile points and waste flakes/ debitage.
3. Historic features, such as trails, roads, canals, wells, cisterns, foundations, and trash pits at least 50 years in age.
4. Historic artifact concentrations, such as glass bottles, tin cans (e.g. hole-in-top cans), tableware, dishware, architectural debris (e.g. bricks, mortar, window glass), hardware (e.g. square nails), and farm implements at least 50 years in age.

B. Evidence of a burial site could consist of, but is not limited to, the following:

1. Any human remains, including articulated or disarticulated bones, teeth, hair, preserved soft tissue, etc.
2. Artifacts which could be burial goods, such as projectile points, knives, ornaments (made of teeth, claws, talons, glass beads, shell, etc.), bone needles, pipes, and pottery.
3. Burial pit or grave shaft outlines in the soil.
4. Headstones or footstones.
5. Coffin wood fragments and coffin hardware.

C. In the event that skeletal remains or archaeological materials are encountered during construction activities, the following provisions serve as the plan for dealing with any unanticipated discoveries of human skeletal remains, artifacts, sites, or any other cultural

resources during the project. This plan is intended to provide direction and guidance to project personnel concerning the procedures to be followed should an unanticipated discovery occur.

D. Initial Determination of No Effect: The Department of Enterprise Services has obtained an initial determination from the Department of Archaeology and Historic Preservation that no historic properties are anticipated, or likely to be affected by the work included in this Project, however, unanticipated discoveries may occur. Contractor to follow procedures outlined in this Section should the discovery of cultural or archaeological resources occur.

1.03 DEFINITIONS

A. Archaeological Resources: Archaeological resources are the physical evidence of past human activity, including evidences of the effects of that activity on the environment. Archaeological resources represent both prehistoric and historic time periods. They are found above and below ground and under water.

B. Archaeologically Sensitive Areas: Areas that have the potential to contain significant (National Register eligible) archaeological resources. If National Register eligible or listed archaeological resources could not be avoided, an appropriate mitigation strategy would be developed in consultation with the state historic preservation officer and, if necessary, associated American Indian tribes.

C. Non-Sensitive Areas: Areas with little, if any, potential of containing significant (National Register eligible) archaeological resources.

D. Archaeological Monitor: Representative designated to oversee construction activities that could disturb archaeological resources.

1.04 REFERENCES <***Specifier: Verify links are up to date***>

A. Archaeological Resources Protection Act (ARPA) of 1979 (P.L. 96-95; 93 Stat. 712): Defines archaeological resources as any material remains of past human life or activities that are of archaeological interest and at least 100 years old; Section 4 of the statute describes the requirements that must be met before Federal authorities can issue a permit to excavate or remove any archaeological resource on Federal or Indian lands; the curatorial requirements of artifacts, and other materials excavated or removed.

B. The National Historic Preservation Act of 1966 (as amended December 19, 2014), 36 CFR 800 for regulations that implement Section 106.

C. Title 27 Revised Code of Washington, Chapter 27.44 Indian Graves and Records.

D. Title 27 Revised Code of Washington, Chapter 27.53 Archaeological Sites and Resources.

E. Title 27 Revised Code of Washington, Title 68 Chapter 60.050 Protection of Historic Graves.

F. State of Washington, Office of the Governor, Executive Order 05-05 Archaeological and Cultural Resources.

Retain "Submittals," "Quality Assurance," and "Permits" paragraphs below if working in archaeologically sensitive areas.

1.05 SUBMITTALS

A. Daily Work Schedule: Submit a daily work schedule detailing all construction work in archaeologically sensitive areas.

1. Include all work that is to occur within the area and notate on Drawings, including the following:
   a. Start and end dates of ground-disturbing construction.
   b. Locations of temporary facilities, such as barriers, field offices, staging areas, sanitary facilities, borrow pits, and haul and access routes.

c. Types of ground-disturbing construction, such as clearing, topsoil stripping, structure or trench excavation, landscaping, and post-construction clean up.
d. Methods and equipment used for each type of construction.
e. Plans for relocating work in the event of temporary work stoppages at each archaeologically sensitive area.

2. Submit to Architect/Engineer and Owner no less than thirty (30) days prior to start of any ground disturbing site work.

B. Qualification Data: For Archaeological Monitor.

1.06 QUALITY ASSURANCE

A. Archaeological Monitor Qualifications: A qualified professional or firm regularly engaged in archaeological monitoring services similar in nature and extent of work specified for this Project, and that has a minimum of <**five (5) years**> experience in archaeological monitoring work.

B. Pre-Construction Conference: Contractor to meet with Owner's Representative, State Historic Preservation Officer, **[and]** Architect/Engineer **[and Archaeological Monitor]** to discuss daily work schedule, and equipment and special methods to be used in archaeologically sensitive areas.

1.07 PERMITS

A. A permit is required for any alteration to an archaeological site, including, but not limited to the following: Excavation, shovel testing, coring, trenching, tree removal, adding fill, building on, soil compacting, using heavy equipment on, or other types of activities that would change or potentially impact the site. Alterations also include formal archaeological excavation, removal and collection of archaeological materials, and the excavation and removal of Native American human remains.

B. Permits are issued by the Department of Archaeology and Historic Preservation. See the Department of Archaeology and Historic Preservation's web site, and Washington Administrative Code 25-48-060 for complete permit requirements.

C. Failure to obtain a permit or comply with permit conditions results in monetary fines and penalties, including the responsibility for investigative costs, and site restoration and mitigation costs.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 PLANS AND PROCEDURES FOR UNANTICIPATED DISCOVERY OF CULTURAL RESOURCES DURING CONSTRUCTION:

A. Procedures for the Discovery of Human Skeletal Material: Any skeletal remains that are discovered during this project shall at all times be treated with dignity and respect. The affected Indian Tribe(s) are to be determined by the Department of Archaeology and Historic Preservation (DAHP) and Governor's Office of Indian Affairs (GOIA). The Indian Tribe(s) so identified are listed at the end of this Section.

B. If the Contractor, or subcontractors, believes that he or she has made an unanticipated discovery of human skeletal remains, all work adjacent to the discovery shall cease. The Engineering & Architectural Services (PPD) Project Manager shall be notified.

C. If the PPD Project Manager believes that the discovery is a cultural resource and could be archaeologically significant, the Contractor shall take appropriate steps to protect the discovery site. The area of work stoppage shall be adequate to provide for the security, protection, and integrity of the human skeletal remains, in accordance with Washington State

Law. At a minimum, the immediate area shall be secured to a distance of thirty (30) feet from the discovery. Vehicles, equipment, and unauthorized personnel shall not be permitted to traverse the discovery site.

D. The PPD Project Manager will immediately notify the local law enforcement having jurisdiction and the State Historic Preservation Officer (SHPO) from the Department of Archaeology and Historic Preservation.

E. It is acknowledged that any find of Native American human skeletal remains may be in whole or in part a burial of ancestry. It is further acknowledged that affected Indian Tribe(s) are very concerned about such burials, and that the find must be treated confidentially. The Sheriff's office may arrange for a representative of the county coroner's office to examine the discovery and will determine whether it should be treated as a crime scene or as a human burial site of ancestry.

F. With elimination of the site as a crime scene, the Department of Enterprise Services and Department of Archaeology and Historic Preservation shall continue to maintain the remains and any associated funerary objects in place, unwashed, unexamined, and undisturbed until their final disposition to the Tribe. Due consideration and honor shall be given, to the fullest extent possible, requests of the Tribe to leave the remains and/or other cultural materials undisturbed and in place. All attempts to accommodate Tribal requests to conduct ceremonies or other traditional cultural activities with respect to the human remains at the place of discovery shall be considered to the maximum practical extent.

G. If disinterment of Native American human remains becomes necessary, DES will consult with the SHPO to determine the final custodian of the human skeletal remains for re-interment. Should the human skeletal remains be repatriated to the tribe, associated such remains, and grave goods shall be placed in plain paper bags in lots as large as possible. The Tribe will take receipt of the remains, funerary items within seven (7) days after the Tribe submits a request for repatriation. At the time of transfer, a brief description of the remains and grave goods transferred shall be provided to the Tribe and the Tribe shall confirm receipt of the same.

3.02 PLANS AND PROCEDURES FOR UNANTICIPATED DISCOVERY OF ARCHAEOLOGICAL RESOURCES:

A. If the Contractor, or its subcontractors, believes that he or she has inadvertently uncovered any prehistoric or historic archaeological resource, all work adjacent to the discovery shall cease. The PPD Project Manager shall be notified.

B. If the PPD Project Manager believes that the discovery is an archaeological resource and could be significant, the Contractor shall take appropriate steps to protect the discovery site. The area of work stoppage shall be adequate to provide for the security, protection, and integrity of the archaeological discovery. At a minimum, the immediate area of the discovery shall be secured to a distance of thirty (30) feet. Vehicles, equipment, and unauthorized personnel shall not be permitted to traverse the discovery site. Work in the immediate area shall not resume until treatment of the discovery has been completed.

C. The PPD Project Manager will immediately contact the State Historic Preservation Officer (SHPO) from the Department of Archaeology and Historic Preservation and the Representative from the Indian Tribe to seek consultation regarding the discovery. If the designated representatives determine that the discovery is an eligible cultural resource, they will consult to determine appropriate treatment of it. Treatment measures may include protection in place or data recovery such as mapping, photography, limited probing and sample collection, or other activity deemed appropriate.

D. Procedures For Additional Compensation: Additional compensation and/or time extensions to the Contractor's contract resulting from delays and disruption of the Work due to the unanticipated discovery of cultural resources are to be negotiated in accordance with **Part 7** of the General Conditions for Washington State Facility Construction.

Retain "Barricades" and "Archaeological Monitoring" paragraphs below if working in archaeologically sensitive areas.

3.03 BARRICADES

A. Comply with requirements specified in Division 01 Section "Temporary Facilities and Controls". The immediate area shall be secured a distance of thirty (30) feet from the discovery.

3.04 ARCHAEOLOGICAL MONITORING

A. An Archaeological Monitor shall observe all ground-disturbing work, including construction of temporary facilities, at all archaeologically sensitive areas. As new ground is broken, the Archaeological Monitor will examine excavated materials, using construction layout centerline and perimeter staking as a reference point to record locations of findings.

B. If the Archaeological Monitor believes that he or she has inadvertently uncovered any cultural or archaeological resource, all work adjacent to the discovery shall cease. The PPD Project Manager shall be notified, and procedures shall be followed as specified above.

CONTACT INFORMATION

<Insert Project Manager>

Engineering and Architectural Services
Washington State Department of Enterprise Services
P.O. Box 41476
Olympia, Washington 98504-1476
Tel: <**Insert**>
Email: <**Insert link**>

<**Insert Name or**> State Historic Preservation Officer
Washington State Department of Archaeology and Historic Preservation
1110 S. Capitol Way, Suite 30
P.O. Box 48343
Olympia, WA 98504-8343
Tel: (360) 586-3065
Email: <**Insert link**>

Indian Tribe(s) ***[Specifier – Insert appropriate Tribal contact information]***

<Insert Name>
<Insert Contact Info>

<Insert Name>
<Insert Contact Info>

END OF SECTION 01 35 93

GUIDE SPECIFICATIONS

The following specification is intended to be used, generally verbatim, in the contract documents. ***[Specifier notes]*** shall be deleted during the editing process. Where [ ] appear in this document, this indicates requirements which are optional depending upon the project scope and conditions. Edit as appropriate for the project. The A/E consultant shall take ownership and responsibility for the contents of this section and is expected to modify other portions as necessary to accurately reflect conditions of the project. For draft copies during the design process, using Microsoft Word, Track Changes. Set criteria so that deletions show as strikethroughs. Deletions and additions are to be in red.

PART 1 - GENERAL

1.01 DESCRIPTION

A. Under General Conditions for Washington State Facility Construction, Article 5.02 C., the Contractor is to comply and give notices required by various authorities having jurisdiction. Except where otherwise expressly required by applicable Laws and Regulations, neither the Owner nor A/E shall be responsible for monitoring the Contractor's compliance with those requirements. The Contractor is responsible for keeping building department, fire department, and other authorities completely informed of any changes in the work in a timely manner. This includes contract modifications, amendments, additions, shop drawings, and the like, current as of the Contract Document date.

B. The Contractor is responsible for gaining approval as required for Owner occupancy within contract schedule requirements.

C. Make any and all adjustments or modifications as required to conform to ordinances, and regulations.

1.02 COMPLIANCE REQUIREMENTS

A. Referenced codes establish minimum requirement levels. Where provisions of various codes or standards conflict, the more stringent provisions govern. Promptly submit to A/E written notice of observed contract document variations from legal requirements.

B. Compliance requirements include, but are not limited to the following:
[Specifier modify edition dates, etc. as required]
1. International Building Code, Washington State Amendments, as adopted by the Authorities Having Jurisdiction (AHJ); Barrier-Free Code Washington Administrative Code (WAC) 51-50; ANSI 117.1; ADA Accessibility Guidelines (ADAAG), whichever is most stringent.
2. The Life Safety Code NFPA 101.
3. Fire Doors/Windows, NFPA 80.
4. Rules and Regulations for the State Board of Health.
5. Department of Labor and Industries Regulations.
    a. In particular, note requirements of the Hazard Communication Standard, WAC 296-62-054 through -05427.
6. Department of Ecology Regulations.
    a. In particular, note requirements of Emission Standards - Volatile Organic Compounds, WAC 173-490.
7. Mechanical, Plumbing & Fire Suppression Work:
    a. International Mechanical Code.
    b. International Plumbing Code.
    c. National Fire Protection Association Codes.

d. International Fire Code.

8. Electrical Work:
   a. Underwriters' Laboratories (UL).
   b. National Manufacturers' Association.
   c. National Fire protection Association, National Electric Code (NEC), National Electric Safety Code.
9. Environmental Requirements: All work to be performed in compliance with applicable provisions of chapters 43.21C RCW and 90.50 RCW as amended, 70.105 RCW, Hazardous Waste Management Act of 1976, and other applicable federal, state, and local statues, ordinances and regulations dealing with prevention of environmental pollution and the preservation of public natural resources that affect or are affected by this project, as well as applicable provisions of Title 39 RCW and Chapter 60.28 RCW are referred to the attention of the Contractor and are incorporated herein.
10. Factory Mutual (FM).
11. Industrial Risk Insurers (IRI).
12. Energy Requirements:
    a. Comply with insulation and energy conservation requirements of State of Washington.
13. Remediation Requirements: Reference technical specifications for additional regulations concerning abatement and remediation of hazardous materials.
14. Occupational Safety and Health Administration (OSHA)
15. Washington Industrial Safety and Health Act (WISHA)
16. AHJ Codes, Standards & Ordinances.

C. Drawings and Specifications govern whenever Drawings and Specifications require higher standards than are required by governing codes, regulations, and the like.

1.03 SUBMITTALS

A. For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established in conjunction with compliance with standards and regulations bearing upon performance of the Work prior to Final Completion.

END OF SECTION 01 41 00

GUIDE SPECIFICATIONS

The following specification is intended to be used, generally verbatim, in the contract documents. ***[Specifier notes]*** shall be deleted during the editing process. Where [ ] appear in this document, this indicates requirements which are optional depending upon the project scope and conditions. Edit as appropriate for the project. The A/E consultant shall take ownership and responsibility for the contents of this section and is expected to modify other portions as necessary to accurately reflect conditions of the project. For draft copies during the design process, using Microsoft Word, Track Changes. Set criteria so that deletions show as strikethroughs. Deletions and additions are to be in red.

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. See other sections of the specifications for additional definitions.

1.02 DEFINITIONS

A. General: Basic contract definitions are included in the General Conditions for Washington State Facility Construction. The following supplements Part 1 of those Conditions and expands on definitions and intent of language generally used in the Contract Documents.

B. “Accepted”: Means accepted by the A/E when used in conjunction with the A/E’s duties and responsibilities as stated in the Conditions of the Contract.

C. “Approved”: Where used in conjunction with A/E’s response to submittals, requests, applications, inquires, reports, and claims by Contractor, the meaning of the term “approved” will be held to limitations of A/E’s responsibilities and duties as specified in General and Supplementary Conditions. Where the terms “or approved” or “as approved” or “for approval” are used, the A/E is the sole judge of the quality and suitability of the proposed substitutions. In no case will “approval” by A/E be interpreted as a release of Contractor from responsibilities to fulfill requirements of the Contract Documents. Whenever a material, article or piece of equipment is identified on the Drawings or in the Project Manual by reference to manufacturer’s or vendor’s names, trade names, catalog numbers, or the like, and followed by the wording “or approved”, “or approved substitute” or “equivalent, as approved”, it is so identified for the purpose of establishing a standard, and any material, article, or piece of equipment of other manufacturers or vendors which will perform adequately the duties imposed by the general design will be considered equally acceptable provided the material, article, or piece of equipment so proposed is, in the opinion of the A/E, of equivalent substance, quality, appearance or function and has been approved by the A/E in writing prior to bid opening in conformance with the provision of Section 01 61 00, Common Product Requirements, Article 2.03. It shall not be purchased or installed by the Contractor without A/E’s and Owner’s prior written approval.

D. “A/E”, “Consultant”: Means the design firm identified in the Contract Documents.

E. “As required”: Means as required to suitably complete the work and at the direction of the A/E.

F. ” Authority Having Jurisdiction” (AHJ): Means any person which has responsibility related to issuing final occupancy and permits for this Project.

G “Concealed”: Means spaces out of sight. Such as above ceilings, below floors, between double walls, furred-in areas, pipe and duct shafts, and similar spaces.

H. “Conditions” or “General Conditions”: Means General Conditions for Washington State Facility Construction.

I. “Coordinate”: Means the Contractor is to coordinate scheduling, submittals, and work of various sections of the specifications, drawings and construction of all trades to assure efficient and orderly sequence of interdependent construction elements for a complete and operating installation.

J. “Demolish”: Means to tear down and remove completely, including any anchors, unless noted otherwise, without damaging adjacent surfaces that all to remain.

K. "Directed": Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean directed by the A/E, requested by the A/E, and similar phrases. However, no such implied meaning will be interpreted to extend A/E’s responsibility into Contractor’s area of construction supervision.

L. “Engineer”: Where the term engineer is used, it means either:
1. Consultant in its respective discipline to the A/E or Owner as listed in the Project Manual.
2. Consultant to the Contractor, retained by contractor to perform services required by construction activities.

M. “Experienced”: When used with respect to any trade performing services for the project, means having a minimum of 5 successfully completed previous projects similar in size and scope to this project, being familiar with the special requirements indicated, and aware of and compliance with AHJ requirements.

N. “Exposed”: Means open to view and not covered or concealed.

O. “First Class Workmanship”: Means to
1. Verify before installing any material that the receiving surface is plumb, level, true to line, and straight to achieve tolerances identified. Surfaces not meeting these criteria are to be identified to the contractor and corrected before proceeding.
. 2. New work is to be tight, straight, even, and smooth with respect to the new work and interfacing with adjoining surfaces.

P. "Furnish": Means to supply and deliver to the Project Site, ready for unloading, unpacking, assembly, installation, and similar operations.

Q. “General” or “General Requirements”: The provisions or requirements of Division 1 Sections. General Requirements apply to entire work of Contract and where so indicated, to other elements of work which are included in the Project.

R. "Indicated": The term "indicated" refers to graphic representations, notes, or schedules on the Drawings, or other paragraphs or Schedules in the Project Manual (Specifications and Detail Book), and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the reader locate the reference. Location is not limited and is applicable where reasonably implied and necessary in conformance with work specified, drawn, or required for completion.

S. “Inspection”: As used in reference to actions of the A/E or his/her consultants, shall mean to review or observe the Work, but not to “inspect” the Work as the Contractor or Authority Having Jurisdiction will inspect.

T. "Install": Means operations at the Project Site including the actual unloading, unpacking, assembly, erecting, placing, anchoring, applying, working to dimension, finishing, curing,

protecting, cleaning, and similar operations to permanently affix to project, as applicable in each case.

U. "Installer": An installer is the Contractor, or another entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier, to perform a particular construction activity, including installation, erection, application, or similar operations. Installers are required to be experienced in the operations they are engaged to perform.

V. “Install in Accordance with Manufacturer’s Instructions and Directions”: Throughout the Documents, although it may not be specifically stated, the Contractor is to install all work in accordance with Manufacturer’s literature, unless otherwise noted or directed, for the best results. Where more than one Manufacturer is involved in the work, or its component parts, the Contractor shall follow each Manufacturer’s literature.

1. In the event of conflict between the Manufacturer’s literature, or its literature and the Contract Documents, the Contractor shall submit the discrepancy or conflict to the A/E for resolution and written instruction prior to proceeding with any work.
2. No Manufacturer preparatory steps or installation procedures may be omitted. If the Contract Documents generalize the installation procedure, but do not necessarily mention all procedures, those procedures are not exempt from being completed by the Contractor unless they are specifically modified or stated as being exempt.

W. “Owner”: Means the “State of Washington, Department of Enterprise Services, acting through the Division of Engineering and Architectural Services (PPD)”.

1. PPD will be represented by a Project Manager (PM) who has been involved with the design and is responsible for managing the A/E Agreement and Construction Contract.
2. PPD may assign a project specific Site Representative to be present on-site during construction. This “Site Rep” will observe and report daily activities to the Owner and provide assistance to assure Owner impacts, project access, construction quality and construction related responses are addressed. As an agent of the Owner, the Site Rep may expedite Owner decisions.
   a. The Site Representative will make daily visits to the site to review the progress of the work and its conformance with the Contract Documents. The Site Representative will bring relevant issues to the attention of the Contractor’s QA Representative, A./E, and PM. The Site Representative will coordinate with other General Administration staff on Owner related issues.
   b. The Site Representative will participate in the pre-construction meeting, quality control meetings, progress meetings, pre-installation meetings, and closeout/punch list meetings in addition to walk-throughs.

X. “Patch”: Means to cut out to nearest joint and replace with like kind material.

Y. “Product”: Means materials, systems and equipment provided by the Contractor for use in the Work.

Z. “Project Manual”: Means the volume(s) included as part of the Project Documents.

AA. "Project Site" is the space available to the Contractor for performing construction activities, either exclusively or in conjunction, with others performing other work as part of the Project. The extent of the Project Site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built.

AB. "Provide": Means to furnish, coordinate, and install, complete, in place and ready for the intended use.

AC. "Regulations": Means laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

AD. “Remove”: Means to detach items from the existing construction and legally dispose of off- site unless indicated to be “removed and salvaged” or “removed and reinstalled”.

AE. “Repair”: Means to perform minor corrections and patching of all indicated materials.

AF. “Replace”: Means to provide new material to match adjacent materials, unless noted otherwise.

AG. “As Required”: Means to complete the work in a first-class workmanship manner.

AH. “Remove and Salvage”: Means to remove, clean, and pack or crate item to protect against damage, identify contents of packed item, and deliver to Owner’s designated storage area.

AI. “Remove and Reinstall”: Means to remove, clean, service, and otherwise prepare the item to be reused; restore if the item is historic; store and protect against damage and reinstall in the same location or as otherwise indicated.

AJ. “Satisfactory”: Means “satisfactory to the A/E and Owner”; the A/E shall be the sole judge of the acceptability of a product or an installation.

AK. “Selected”: Means “selected by the A/E and Owner” and is not necessarily limited to a manufacturer’s standard line of colors, finishes or details.

AL “Similar”, “Similar to”: Where the words “similar” or “similar to” are used:

1. Where it occurs in the Contract Documents, shall mean that a portion of the Work shall have common features and be visually consistent with, but may not necessarily be identify to, related portions of the Work. Contractor shall correlate similar conditions of the Work. The Contractor shall identify any uncertainties to the A/E. Do not proceed without A/E’s direction.
2. Where it is followed by a manufacturer’s name and product, model, or type number, such manufacturer, product, model or type number shall be considered as the standard of quality for the item or product work specified, in a general and technical sense, not meaning “identical”, and the provisions pertaining to “or approved” shall apply to any other proposed material, article, or piece of equipment of other manufacturers or vendors.

AM. "Testing Agencies": Means an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

AN. “Trades”: Means any person or group of people which provides services to or work on the Project. Using terms such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.

AO. “Verify”: Means the Contractor is to verify existing conditions and coordinate any variations from what is shown in the Contract Documents with the A/E.

1.03 SPECIFICATION AND DRAWING FORMAT AND CONTENT EXPLANATION

A. The General Conditions, Supplemental Conditions, and Division 01 of these specifications shall be a part of technical Divisions and Sections the same as if they were specifically called for in each section.

B. Wording of these Specifications: These Specifications are of the abbreviated or streamlined type and may include incomplete sentences. Words such as “shall,” “the Contractor shall,” “shall be,” and similar mandatory phrases, are included by inference.

C. Tense, Gender, Singular, Plural: Present tense words include future tense. Words in masculine gender include feminine and neuter genders. Words in the singular include plural. Plural words include singular.

D. All, Entire, and the Like: For brevity throughout the documents, these words may be omitted. Read their implications into all work, as the following parenthetical insertion exemplifies: “Balance and adjust (all) dampers.”

E. Specification by Reference: Any material specified by reference or number, symbol or title of a specified standard, such as commercial standard, ANSI and ASTM documents, Federal Specifications, trade association standard, or the like, shall comply with the following:

1. The latest revision requirements thereof;
2. Any amendment or supplement thereto in effect on date of the Project Manual, except as modified;
3. When building code requirements refer to a different issue of standards specifications, such issue governs.

F. Drawings are in part diagrammatic and do not necessarily show complete details of construction, work or materials, performance or installation. They do not necessarily show how construction details, other items or work, fixtures, and equipment may affect any particular installation. The Contractor is required to ascertain and correlate the work to bring the parts together into a satisfactory and completed whole.

1. Where on any of the drawings a portion of the work is drawn out and the remainder is indicated in outline, the parts drawn out shall apply also to all other portions of the work.
2. Wherever a detail is referenced and developed for a specific condition, same or similar detail shall apply to identical or similar conditions elsewhere on project even though not specifically referenced.

1.04 INDUSTRY STANDARDS

A. Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Comply with the standards in effect as of the date of the Contract Documents.

C. Where compliance with 2 or more standards is specified and the standards established differ or have conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer to the A/E before proceeding.

1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum acceptable. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or

maximum, as appropriate, for the context of the requirements. Refer uncertainties to the A/E for a decision before proceeding.

D. Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Contractor shall obtain copies directly from the publication source and have them available at the job site all reference standards which are referenced in the technical specifications of the Project Manual or on the Drawings.

E. Graphic Standards: Symbols used in the Contract Documents, except as otherwise noted, are those symbols recognized in the construction industry for purposes indicated.

F. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. The following acronyms or abbreviations, as referenced in the Contract Documents, are defined to mean the associated names. Names and addresses are subject to change and are believed, but are not assured, to be accurate and up to date as of the date of the Contract Documents. The following list may not be complete or may have additional listings not used in the Contract Documents. Refer to Gales Research Company "Encyclopedia of Associations", available in most libraries, for any missing names.

AA	Aluminum Association 900 19th St., NW, Suite 300 Washington, DC 20006
AABC	Associated Air Balance Council 1518 K St., NW Washington, DC 20005
AAMA	American A/Eural Manuf's Assoc. 1540 E. Dundee Road, Suite 310 Palatine, IL 60067
ADC	Air Diffusion Council One Illinois Center, Suite 200 111 East Wacker Drive Chicago, IL 60601-4298
AAN	American Association of Nurserymen 1250 Eye St., NW, Suite 500 Washington, DC 20005
AASHTO	American Association of State Highway and Transportation Officials 444 North Capitol St., Suite 249 Washington, DC 20001
AATCC	American Association of Textile Chemists and Colorists P.O. Box 12215 Research Triangle Park, NC 27709
ABMA	American Bearing Manufacturers. Assoc 1101 Connecticut Ave., NW, Suite 700
HEI	Heat Exchange Institute c/o Thomas Associates, Inc. 1300 Sumner Ave. Cleveland, OH 44115-2851
HI	Hydronics Institute P.O. Box 218 35 Russo Place Berkeley Heights, NJ 07922
HI	Hydraulic Institute 9 Sylvan Way Parsippany, NJ 07054-3802
IBD	Institute of Business Designers 341 Merchandise Mart Chicago, IL 60654
ICEA	Insulated Cable Engineers Assoc, Inc. P.O. Box 440 South Yarmouth, MA 02664
IEC	International Electrotechnical Comm. (Available from ANSI) 1430 Broadway New York, NY 10018
IEEE	Institute of Elect & Electronic Eng 345 E. 47th St. New York, NY 10017
IESNA	Illuminating Engineering Society of North America 345 E. 47th St. New York, NY 10017

	Washington, DC 20036
ACI	American Concrete Institute P.O. Box 19150 Detroit, MI 48219
ACIL	American Council of Independent Laboratories 1629 K St., NW Washington, DC 20006
ACPA	American Concrete Pipe Assoc. 8300 Boone Blvd., Suite 400 Vienna, VA 22182
ADC	Air Diffusion Council One Illinois Center, Suite 200 111 East Wacker Dr Chicago, IL 60601-4298
AFBMA	Anti-Friction Bearing Manufacturers Assoc. (Now ABMA)
AFPA	American Forest and Paper Assoc. (American Wood Council of the) 2nd Floor, 1250 Connecticut Ave., NW Washington, DC 20036
AGA	American Gas Assoc. 1515 Wilson Blvd Arlington, VA 22209
AHA	American Hardboard Assoc. 1210 W. Northwest Highway Palatine, IL 60067
AI	Asphalt Institute P.O. Box 14052 Lexington, KY 40512-4052
AIA	The American Institute of Architects 1735 New York Ave., NW Washington, DC 20006
AIA	American Insurance Assoc. 1130 Connecticut Ave., NW, Suite 1000 Washington, DC 20036
AIHA	American Industrial Hygiene Assoc. 2700 Prosperit Ave., Suite 250 Fairfax, VA 22031
AISC	American Institute of Steel Construction One East Wacker Dr., Suite 3100 Chicago, IL 60601-2001
AISI	American Iron and Steel Institute
IGCC	Insulating Glass Certification Council C/o ETL Testing Laboratories, Inc. P.O. Box 2040 Route 11, Industrial Park Cortland, NY 13045
ILI	Indiana Limestone Institute of America Stone City Bank Building, Suite 400 Bedford, IN 47421
IRI	Industrial Risk Insurers P.O. Box 5010 85 Woodland St Hartford, CT 06102-5010
ISA	Instrument Society of America P.O. Box 12277 67 Alexander Dr. Research Triangle Park, NC 27709
LIA	Lead Industries Association, Inc. 295 Madison Ave. New York, NY 10017
LPI	Lightning Protection Institute 3365 N. Arlington Heights Rd., Suite J Arlington Heights, IL 60004
MCAA	Mech Contractors Assoc of America 1385 Piccard Dr. Rockville, MD 20850-4329
ML/SFA	Metal Lath/Steel Framing Assoc. (A Division of the National Association of A/Eural Metal Manufacturers) 600 S. Federal St., Suite 400 Chicago, IL 60605
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry 127 Park St., NE Vienna, VA 22180
NAA	National Arborist Assoc. Route 101, P.O. Box 1094 Amherst, NH 03031-1094
NAAMM	National Association of A/Eural Metal Manufacturers 600 S. Federal St., Suite 400 Chicago, IL 60605
NAIMA	North American Insulation Manufacturers Assoc. 44 Canal Center Plaza, Suite 310

1101 17th St., NW
Washington, DC 20036-4700

ALI Associated Laboratories, Inc.
c/o HOH Chemicals
500 S. Vermont St.
Palatine, IL 60067

ALSC American Lumber Standards Committee
P.O. Box 210
Germantown, MD 20875

AMCA Air Movement and Control Assoc.
30 W. University Dr.
Arlington Heights, IL 60004-1893

ANSI American National Standards Institute
11 West 42nd St., 13th Floor
New York, NY 10036

AOAC AOAC International
2200 Wilson Blvd., Suite 400
Arlington, VA 22201-3301

AOSA Association of Official Seed Analysts
California State Seed Laboratory
1220 N St.
Sacramento, CA 95814

APA American Plywood Assoc.
P.O. Box 11700
Tacoma, WA 98411

API American Petroleum Institute
1220 L St., NW
Washington, DC 20005

ARI Air-Conditioning and Refrigeration Institute
4301 Fairfax Dr., Suite 425
Arlington, VA 22203

ARMA Asphalt Roofing Manufacturers Assoc.
6000 Executive Dr., Suite 201
Rockville, MD 20852-3803

ASA Acoustical Society of America
500 Sunnyside Blvd.
Woodbury, NY 11797

ASC Adhesive and Sealant Council
1627 K St., NW, Suite 1000
Washington, DC 20006-1707

Alexandria, VA 22314

NAPA National Asphalt Pavement Assoc.
NAPA Building
5100 Forbes Blvd.
Lanham, MD 20706-4413

NAPF National Association of Plastic

Fabricators (Now DLPA)

NBHA National Builders Hardware Assoc.
(Now DHI)

NCRPM National Council on Radiation Protection and Measurements
7910 Woodmont Ave., Suite 800
Bethesda, MD 20814

NEC National Electrical Code (from NFPA)

NECA National Electrical Contractors Assoc.
3 Bethesda Metro Center, Suite 1100
Bethesda, MD 20814

NEII National Elevator Industry, Inc.
185 Bridge Plaza, North
Fort Lee, NJ 07024

NEMA National Elect Manufacturers Assoc.
2101 L St., NW, Suite 300
Washington, DC 20037

NETA International Electrical Testing Assoc.
P.O. Box 687
Morrison, CO 80465

NFPA National Fire Protection Assoc.
One Batterymarch Park
P.O. Box 9101
Quincy, MA 02269-9101

NFPA National Forest Products Assoc.
(Now AFPA)

NHLA National Hardwood Lumber Assoc.
P.O. Box 34518
Memphis, TN 38184-0518

NLGA National Lumber Grades Authority
4400 Dominion St., Suite 103
Burnaby, BC V5G 4G3

ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers 1791 Tullie Circle, NE Atlanta, GA 30329
ASME	American Society of Mech Engineers 345 East 47th St. New York, NY 10017
ASPE	American Society of Plumb Engineers 3617 Thousand Oaks Blvd., Suite 210 Westlake, CA 91362
ASSE	American Society of Sanitary Engineering P.O. Box 40362 Bay Village, OH 44140
ASTM	American Society for Testing and Materials 1916 Race St. Philadelphia, PA 19103-1187
ATIS	Alliance for Telecommunications Industry Solutions 1200 G St., NW, Suite 500 Washington, DC 20005
AWI	Architectural Woodwork Institute P.O. Box 1550 13924 Braddock Rd., No. 100 Centerville, VA 22020
AWS	American Welding Society 550 LeJeune Rd., NW Miami, FL 33126
AWPA	American Wood Preservers' PO Box 286 Woodstock, MD 21163-0286
AWWA	American Water Works Assoc. 6666 W. Quincy Ave. Denver, CO 80235
BHMA	Builders' Hardware Manuf Assoc. 355 Lexington Ave., 17th Floor New York, NY 10017
NMCA	National Concrete Masonry 2302 Horse Pen Road Herndon, VA 22071-3406
NPA	National Particleboard Assoc. 18928 Premiere Ct. Gaithersburg, MD 20879
NPCA	National Paint and Coatings Assoc. 1500 Rhode Island Ave., NW Washington, DC 20005
NRCA	National Roofing Contractors Assoc. 10255 W. Higgins Rd., Suite 600 Rosemont, IL 60018-5607
NSF	National Sanitation Foundation 3475 Plymouth Rd. P.O. Box 130140 Ann Arbor, MI 48113-0140
NTMA	National Terrazzo and Mosaic Assoc. 3166 Des Plaines Ave., Suite 132 Des Plaines, IL 60018
NWMA	National Woodwork Manuf. Assoc. (Now NWWDA)
NWCB	Northwest Wall & Ceiling Bureau 1032-A N.E. 65th Street Seattle, WA 98115
NWWDA	National Wood Window and Door Assoc. 1400 E. Touhy Ave., #G54 Des Plaines, IL 60018
PATMI	Power Actuated Tool Manufacturers' Institute, Inc. 1000 Fairgrounds Rd., Suite 200 St. Charles, MO 63301
PCA	Portland Cement Assoc. 5420 Old Orchard Rd. Skokie, IL 60077
PCI	Precast/Prestressed Concrete Institute 175 W. Jackson Blvd. Chicago, IL 60604
PDI	Plumbing and Drainage Institute c/o Sol Baker 1106 W. 77th St., South Dr. Indianapolis, IN 46260

BIFMA	The Business and Institutional Furniture Manufacturer's Association 2680 Horizon Dr., SE, Suite A1 Grand Rapids, MI 49546-7500
CAGI	Compressed Air and Gas Institute c/o Thomas Associates, Inc. 1300 Sumner Ave. Cleveland, OH 44115-2851
CAUS	Color Association of the United States 409 W. 44th St. New York, NY 10036
CBM	Certified Ballast Manufacturers Assoc. 1422 Euclid Ave., Suite 402 Cleveland, OH 44115-2851
CCC	Carpet Cushion Council P.O. Box 546 Riverside, CT 06878
CFFA	Chemical Fabrics & Film Assoc, Inc. c/o Thomas Associates, Inc. 1300 Sumner Ave. Cleveland, OH 44115-2851
CGA	Compressed Gas Assoc. 1725 Jefferson Davis Highway Suite 1004 Arlington, VA 22202-4100
CISCA	Ceiling and Interior Systems. Construction Assoc 579 W. North Ave., Suite 301 Elmhurst, IL 60126
CISPI	Cast Iron Soil Pipe Institute 5959 Shallowford Rd., Suite 419 Chattanooga, TN 37421
CRI	Carpet and Rug Institute P.O. Box 2048 Dalton, GA 30722
CRSI	Concrete Reinforcing Steel Institute 933 N. Plum Grove Rd. Schaumburg, IL 60173
CTI	Ceramic Tile Institute of America 12061 West Jefferson Blvd. Culver City, CA 90230
DHI	Door and Hardware Institute 14170 Newbrook Dr. Chantilly, VA 22021-2223
PEI	Porcelain Enamel Institute 102 Woodmont Blvd., Suite 360 Nashville, TN 38205
RFCI	Resilient Floor Covering Institute 966 Hungerford Dr., Suite 12-B Rockville, MD 20805
RMA	Rubber Manufacturers Assoc. 1400 K St., NW Washington, DC 20005
SDI	Steel Door Institute 30200 Detroit Rd Cleveland, OH 44145
SGCC	Safety Glazing Certification Council c/o ETL Testing Laboratories Route 11, Industrial Park Cortland, NY 13045
SHLMA	Southern Hardwood Lumber Manufacturers Assoc. (Now HMA)
SIGMA	Sealed Insulating Glass Manuf Assoc. 401 N. Michigan Ave. Chicago, IL 60611
SMACNA	Sheet Metal and Air Conditioning Contractors National Assoc. 4201 Lafayette Center Dr. Chantilly, VA 22021
SPRI	Single Ply Roofing Institute 20 Walnut St. Wellesley Hills, MA 02181
SSPC	Steel Structures Painting Council 4516 Henry St. Pittsburgh, PA 15213
SSPMA	Sump and Sewage Pump Mfg Assoc. P.O. Box 647 Northbrook, IL 60065-0647
STI	Steel Tank Institute 570 Oakwood Rd. Lake Zurich, IL 60047
TCNA	Tile Council of North America 100 Clemson Research Blvd Anderson, SC 29625

DIPRA	Ductile Iron Pipe Research Assoc. 245 Riverchase Parkway East, Suite O Birmingham, AL 35244
DLPA	Decorative Laminate Products Assoc. 13924 Braddock Rd. Centreville, VA 22020
ECSA	Exchange Carriers Standards Assoc. (Now ATIS)
EIA	Electronic Industries Assoc. 2001 Pennsylvania Ave., NW Washington, DC 20006-1813
EJMA	Expansion Joint Manufacturers Assoc. 25 N. Broadway Tarrytown, NY 10591
ETL	ETL Testing Laboratories, Inc. P.O. Box 2040 3933 Route 11, Industrial Park Cortland, NY 13045
FCIB	Floor Covering Installation Board 310 Holiday Ave. Dalton, GA 30720
FM	Factory Mutual Systems 1151 Boston-Providence Turnpike P.O. Box 9102 Norwood, MA 02062
FTI	Facing Tile Institute P.O. Box 8880 Canton, OH 44711
GA	Gypsum Association 810 First St., NE, Suite 510 Washington, DC 20002
GANA	Glass Assoc. of North America 3310 S.W. Harrison St. Topeka, KS 66611-2279
TIMA	Thermal Insulation Manuf Assoc. (This Organization is now defunct. See NAIMA)
UL	Underwriters Laboratories 333 Pfingsten Rd. Northbrook, IL 60062
UNI	Uni-Bel PVC Pipe Assoc. 2655 Villa Creek Dr., Suite 155 Dallas, TX 75234
WCLIB	West Coast Lumber Inspection Bureau P.O. Box 23145 Portland, OR 97281
WLPDIA	Western Lath, Plaster, Drywall Industries Assoc. (Formerly California Lath & Plaster Assoc.) 8635 Navajo Rd. San Diego, CA 92119
WRI	Wire Reinforcement Institute 1101 Connecticut Ave. NW, Suite 700 Washington, DC 20036-4303
WSC	Water Systems Council 600 S. Federal St., Suite 400 Chicago, IL 60605
WWPA	Western Wood Products Assoc. Yeon Building 522 SW 5th Ave. Portland, OR 97204-2122
W.W.P.A	Woven Wire Products Assoc. 2515 N. Nordica Ave. Chicago, IL 60635

G. Federal Government Agencies: Federal government agency names and titles of general standards are frequently abbreviated. The following acronyms or abbreviations, as referenced in the Contract Documents, are defined to mean the associated names. Names and addresses are subject to change and are believed, but are not assured, to be accurate and up to date as of the date of the Contract Documents. The following list may not be complete or may have additional listings not used in the Contract Documents. Refer to Gales Research Company “Encyclopedia of Associations”, available in most libraries, for any missing names.

ADAAG ADA Accessibility Guidelines
Access Board
1331 F Street NW, Suite 1000
Washington, DC 20004-1111

CE Corps of Engineers
(U.S. Department of the Army)
Chief of Engineers - Referral
Washington, DC 20314

CFR Code of Federal Regulations
(Available from the Government Printing Office)

N. Capitol St. between G and H St., NW
Washington, DC 20402
(Material is usually first published in the "Federal Register")

CPSC Consumer Product Safety Commission
5401 Westbard Ave.
Bethesda, MD 20207

CS Commercial Standard
(U.S. Department of Commerce)
Government Printing Office
Washington, DC 20402

DOC Department of Commerce
14th St. and Constitution Ave., NW
Washington, DC 20230

DOT Department of Transportation
400 Seventh St., SW
Washington, DC 20590

EPA Environmental Protection Agency
401 M St., SW
Washington, DC 20460

FAA Federal Aviation Administration
(U.S. Department of Transportation)
800 Independence Ave., SW
Washington, DC 20590

FCC Federal Communications Commission
1919 M St., NW
Washington, DC 20554

FDA Food and Drug Administration
5600 Fishers Lane
Rockville, MD 20857

FHA Federal Housing Administration
(U.S. Department of Housing and Urban Development)
451 Seventh St., SW
Washington, DC 20201

FS Federal Specification (from GSA)
Specifications Unit (WFSIS)
7th and D St., SW
Washington, DC 20407

GSA General Services Administration
F St. and 18th St., NW
Washington, DC 20405

MIL Military Standardization Documents
(U.S. Department of Defense)
Naval Publications and Forms Center
5801 Tabor Ave.
Philadelphia, PA 19120

NIST National Institute of Standards and Technology
(U.S. Department of Commerce)
Gaithersburg, MD 20899

OSHA Occupational Safety and Health Administration
(U.S. Department of Labor)
200 Constitution Ave., NW
Washington, DC 20210

PS Product Standard of NBS
(U.S. Department of Commerce)
Government Printing Office
Washington, DC 20402

REA Rural Electrification Administration
(U.S. Department of Agriculture)
14th St. and Independence Ave., SW
Washington, DC 20250

USDA U.S. Department of Agriculture
Independence Ave.
Washington, DC 20250

USPS U.S. Postal Service
475 L'Enfant Plaza, SW
Washington, DC 20536

END OF SECTION 01 42 00

GUIDE SPECIFICATIONS

The following specification is intended to be used, generally verbatim, in the contract documents. ***[Specifier notes]*** shall be deleted during the editing process. Where [ ] appear in this document, this indicates requirements which are optional depending upon the project scope and conditions. Edit as appropriate for the project. The A/E consultant shall take ownership and responsibility for the contents of this section and is expected to modify other portions as necessary to accurately reflect conditions of the project. For draft copies during the design process, use Microsoft Word Track Changes. Set criteria so that deletions show as strikethroughs. Deletions and additions are to be in red.

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. Relate Work Specified Elsewhere

1. Testing Laboratory Services Provided by Owner: Section 01 45 29

[Specifier – edit as appropriate; include second paragraph "1." for projects involving cleaning and/or restoration work on Historical Buildings.]

1. Historic Preservation Inspection Services: Section 01 45 23
2. Unit Masonry Restoration: Section 04 01 20.91
3. Repointing Campus Historical Buildings: Section 04 01 20.92
4. Stone Masonry Cleaning & Poulticing: Section 04 01 40.52
5. Stone Restoration: Section 04 01 40.91

1.02 SUMMARY

A. The Contractor is responsible for quality control and shall establish and maintain an effective quality control system in compliance with these specifications. The Contractor Quality Control (CQC) system shall consist of plans, procedures, and organization necessary to provide materials, equipment, workmanship, fabrication, construction, and operations, both on-site and off-site, that complies with contract requirements and is keyed with the construction schedule. The Contractor shall review and certify as correct and complete, and in compliance with contract requirements, all shop drawings and lists of materials, fixtures, and equipment as required by technical specifications.

[Specifier – delete or modify the following paragraph if not applicable.]

B. Work under this Contract involves a historically significant structure on the National Register of Historic Places and is part of the Washington State Capitol Campus Historic District. In addition to other requirements, Work of this Contract including Contractor's quality control system shall be performed under the guidelines of the *Secretary of the Interior's Standards for the Treatment of Historic Properties*.

C. Quality Control is the sole responsibility of the Contractor. Quality Assurance is the responsibility of the A/E.

D. Recurring Deficiencies: If recurring deficiencies indicate that the CQC System is not adequate, corrective action shall be taken as directed by A/E. Progress payments may be withheld until such corrective action has been completed per the General Conditions, Section 6.05.

1.03 DEFINITIONS

A. Definable Feature of Work: A "definable feature of work" is a task which is separate and distinct from other tasks and has separate control requirements. It could be identified by

different trades or disciplines, or it could be work by the same trade in a different environment. Although each Section of the specifications may generally be considered as a definable feature of work, there is frequently more than one definable feature under a particular Section.

1.04 QUALITY CONTROL SYSTEM

A. The 3-phase inspection system shall include the following minimum requirements:

1. Preparatory Inspection: This shall be an integral part of pre-installation meeting for designated portion of work, as set forth in Section 01 31 19, be performed prior to beginning any such work, and shall include:

a. A review of applicable specifications.
b. A review of the contract plans.
c. A check to assure that all materials and/or equipment have been tested, submitted and approved.
d. A check to assure that provisions have been made to provide control inspection and testing.
e. Examination of the work area to assure that all required preliminary work has been completed and is in contract compliance.
f. A physical examination of required materials, equipment and sample work to assure that they conform to approved shop drawings or submitted data and are properly stored.
g. Discussion of procedures for constructing the work, including repetitive deficiencies, construction tolerances and workmanship standards specified in the documents.

2. Initial Inspection: This shall be performed as soon as work begins on a definable feature of work and the following shall be accomplished:

a. A check of preliminary work to ensure that it is in contract compliance. Review of the preparatory meeting minutes.
b. Verification of full contract compliance and verify required control inspection and testing is underway.
c. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare work with sample panels, etc., as appropriate.
d. Resolve all differences.
e. This inspection phase should be repeated for new crew on site performing the work or any time standards are not being met.

3. Follow-Up Inspection: These should be performed daily to assure continuing compliance with contract requirements, including control testing, until completion of the particular feature of work. The Owner or Owner's representative may require joint State-Contractor inspections at any time and on a periodic basis to evaluate the effectiveness of the quality control system.

B. As-Builts: The Contractor shall maintain full size marked-up drawings, survey notes, sketches, nameplate data, pricing information, description, and serial numbers of all installed equipment as well as other information depicting as-built conditions. This information shall be updated daily and be maintained in a current condition at all times until completion of work and shall be available for review by Owner or Owner's representative at all times. Upon completion of the work, this information shall be furnished to the Owner in conformance with requirements of Section 01 78 00, Close-Out Submittals.

C. Tests: All operation and acceptance tests, where specified, are to be performed to verify control measures are adequate. These tests are to be documented (see example test form; Form 01 45 16-F2) and a copy provided to the Owner.

1.05 QUALITY CONTROL ORGANIZATION

A. The Contractor shall identify a Quality Control (QC) organization, describing lines of authority and acknowledgment that the QC staff shall implement the inspection program. The staff

shall include a full time, on-site representative who shall report to the Project Manager or someone higher in the Contractor's organization. Project Manager in this context shall mean the individual with responsibility for the overall management of the project including quality and production and shall be subject to approval by the Owner.

[Specifier – include the following subparagraphs "1." And "2." for projects involving cleaning and/or restoration work on Historical Buildings; edit as necessary.]

1. It is the intent of this project to preserve the existing structure and its historic materials to the greatest extent possible. The gentlest means possible shall be used to perform the work and the greatest care shall be taken to assure that historic materials are not damaged in the process of the work.
2. Due to the historic significance of this building, the Quality Control (QC) organization shall be staffed by personnel familiar with the historic performance and characteristics of ***(specifier identify the materials)***. The QC organization project manager shall have the following qualifications:

    a. Actively involved in not less than 3 projects of similar size and scope involving historic masonry projects within the last 10 years.

        1) Submit list of historic projects including name, location, cost, Owner/Architect/ Engineer's name and phone number.
        2) Contractor may not change QC project manager without written approval of the Owner.

B. The Contractor's site representative shall be on the work site during progress of the work with complete authority to take action necessary to ensure compliance with the Contract Documents. Additional staff, if needed, for the QC organization is to be at a satisfactory level as required to perform the activities outlined in this Section, subject of Owner's approval.

C. Contractor shall submit full resumes giving experience and qualifications of all personnel proposed for Contractor's Quality Control (QC) organization. Owner shall reserve the right to reject any person proposed for Contractor's Quality Control (QC) organization based on Owner's review of each resume.

1.06 CONTRACTOR QUALITY CONTROL PLAN

A. Quality Control Plan: The Contractor shall submit its quality control plan to the A/E for review prior to the start of construction. Allow 15 working days after receipt in the A/E's office for A/E and Owner review and comments. The plan shall include the following elements:

1. A statement of how the plan will operate and a supporting organization chart to show the individual on the Contractor's staff responsible for implementing and controlling the plan and staffing of the testing and inspection activities.
2. Identify a Contractor Quality Control Representative, if other than the Contractor's superintendent, who shall be on the site at all times during progress of the work with complete authority to take action necessary to assure compliance with the contract documents.
3. A staffing plan for Contractor inspectors which is consistent with the scope and Construction Schedule for the project.
4. Resume(s) of proposed inspector(s) showing their experience and qualifications for the proposed inspection activities. Experience must be of the same type as will be required for this project.
5. A coordination plan showing how the efforts of the Contractor's quality control staff will be coordinated with the A/E, retained special inspectors, and engineers.
6. Procedures for scheduling, reviewing, certifying and managing submittals.
7. Methods to be used for documenting the 3-phase inspection system.
8. Procedures for tracking contractor identified construction deficiencies and NCN's, from identification through corrective action and establishing verification that deficiencies have been corrected.

9. Copy of Contractor's Quality Control Daily Report (see example daily report form following this Section; Form 01 45 16-F1). Report shall include entries for identifying weather conditions (temperature, dry, wet, amount of rain), trade activities (classification of workers within the trade, staffing number for each trade, what work trade was performing on the project), equipment on site (rented and contractor owned, what equipment was being used for each day), important communications with A/E, Owner, Inspectors, Supplier or specific Trade, factual record containing specification reference for the work being performed, and quality control activities. The report shall include entries for the Quality Control Representative's signature certifying that all materials and supplies incorporated into the work are in compliance with the Contract Documents and A/E approved modifications. This report will not be accepted as the daily quality control report unless it also incorporates the specific requirements of this Section.
10. Copy of inspection form for the different activities which will be inspected including but not limited to the following:
    a. For concrete elements inspection forms shall include pre-placement, placement, and post-placement inspection items:
        1) Foundation inspection.
        2) Slab on grade inspection.
            a) Subgrade preparation.
            b) Reinforcing.
            c) Concrete placement/curing.
    b. Structural steel inspection.
    c. Welding inspection.
    d. The Contractor shall prepare inspection forms with check-off items for key construction elements to be signed off by the Contractor's inspectors and reviewed from time to time by the A/E.
11. Procedure for tracking and inspecting "As-Built" plans.

[Specifier – include the following Paragraph "B." for projects involving cleaning and/or restoration work on Historical Buildings; edit as necessary.]

B. Quality Control Plan for Historical Restoration Work: In addition to quality control plan specified above for work of this Project in general, Contractor shall also submit to the A/E for review prior to the start of construction a quality control plan specifically formulated for historical restoration work. See Section 01 35 91. Allow 15 working days after receipt in the A/E's office for review, comments, modifications, and acceptance of the plan. Plan shall include, but not be limited to, the following elements:
[Specifier – include the following for unit masonry restoration work (refer to A/E specification); edit as necessary.]
    1. Indicate methods for surveying original layout and collecting datum points for unit masonry.
    2. Indicate methods for maintaining original line and levels when resetting unit masonry.
    3. Indicate methods for shoring and providing a safe working environment
    4. Indicate method for protecting openings in exterior walls from bat and other mammal infiltration.
    5. Indicate methods for removal of damaged mortar joints and masonry units.
    6. Indicate method for cleaning masonry units – removing mortar and sealant.
    7. Indicate methods of storing, stacking and protecting masonry units throughout the course of the work.
    8. Indicate precautions to be taken against theft and/or vandalism of stored materials.
    9. Indicate methods for accessing pointing work and for protecting adjacent areas during this work, including adjacent building materials, landscaping, etc.
    10. Indicate methods of mixing and storing pointing mortars.
    11. Indicate methods for removing excess mortar from masonry surfaces.
    12. Indicate methods for final pointing.

[Specifier – include the following for stone masonry restoration work (refer to A/E specification); edit as necessary.]

1. Indicate methods for providing a safe working environment.
2. Indicate methods for removal of damaged mortar joints.
3. Indicate method for cleaning stone masonry.
4. Indicate precautions to be taken against theft and or vandalism of stored materials.
5. Indicate methods for accessing pointing work and for protecting adjacent area's during this work, including adjacent building materials, landscaping and the like.
6. Indicate methods for mixing and storing pointing materials.
7. Indicate methods for removing excess mortar from stone masonry surfaces.
8. Indicate methods for final pointing/tooling.
9. Indicate methods for waterproofing open joint areas.

[Specifier – include the following for stone masonry cleaning and poulticing work (refer to A/E specification); edit as necessary.]

1. Indicate methods for storing, transporting and mixing chemicals.
2. Indicate methods for protecting adjacent surfaces not being cleaned during cleaning.
3. Indicate method for protecting surrounding areas from excessive run-off during cleaning.
4. Indicate methods for providing access to areas to be poulticed, including safety precautions and fall protection to be used.
5. Indicate methods for protecting areas below those being poulticed.
6. Indicated methods for applying poultice materials.
7. Indicate methods for removing poultice.
8. Indicate methods cleaning up poultice materials.

1.07 COORDINATION MEETING / ACCEPTANCE OF PLAN

A. Before start of construction, the Contractor shall meet with the Owner and A/E representatives to discuss the QC Plan. During the meeting, a mutual understanding of the system details shall be developed. Acceptance of the QC Plan is conditional and will be predicated on satisfactory performance during construction. The Owner shall be notified of any changes to the plan, and those changes are subject to review and acceptance by the Owner.

1.08 CONTRACTOR'S PRE-INSTALLATION QUALITY CONTROL

A. Well in advance of the installation of every major unit of work, which requires coordination with other work, the Contractor shall ensure that the unit of work can be installed and function as intended and required in conjunction with other work which has preceded or will follow. In the event of conflict, the Contractor shall determine corrective action required, inform the A/E, and proceed with the A/E's concurrence.

B. See Section 01 61 00, COMMON PRODUCT REQUIREMENTS for further requirements.

C. Perform inspection of all products and equipment immediately following delivery to the Project site to determine conformance with the Contract Documents and any evidence of damage.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.01 QUALITY ASSURANCE - CONTROL OF INSTALLATION

A. Maintain quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, both on and off-site to produce work of specified quality.

B. Comply with manufacturers' instructions, including each step-in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from A/E before proceeding.

D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Perform work by persons qualified to produce workmanship of specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

3.02 TOLERANCES

A. Maintain quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of the highest quality.

B. Comply with manufacturer's tolerances. Should manufacturer's tolerances conflict with Contract Documents, request clarification from A/E before proceeding.

C. Adjust Products to appropriate dimensions, position before securing Products in place.

3.03 REFERENCES & STANDARDS

A. For products and workmanship specified by association, trade, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard by date of issue of Contract Documents, except where a specific date is established by code.

C. Obtain copies of standards and instructions where required by product specification sections.

D. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the A/E shall be altered from the Contract Documents by mention or inference otherwise in any reference documents.

E. Assure manufacturer's instructions are adhered to obtain specified warranties.

3.04 MANUFACTURER'S CERTIFICATES

A. When required by individual Specification Sections, submit manufacturers' certificate, in duplicate, that products meet or exceed specified requirements.

3.05 MOCK-UPS

A. Tests will be performed under provisions identified in this Section and identified in the respective product Specification Sections.

B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

C. Accepted mock-ups shall be a comparison standard for the remaining Work. Retain in a secure area if the mock-up is not incorporated into the project. If incorporated, the location shall be documented for future reference.

D. Where mock-up has been accepted by A/E and is not being incorporated into the project or identified to be retained for future reference, remove mock-up and clean area.

3.06 MANUFACTURER'S FIELD SERVICES

A. When specified in respective Specification Sections, require supplier and manufacturer to provide qualified personnel to observe field conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to make appropriate recommendations.

B. Representative shall submit written report to A/E listing observations and recommendations. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturer's written instructions.

3.07 REPORTING

A. The QC representative shall maintain in an appropriate format a daily record of all inspections and tests performed for each shift of Subcontractor operations. These records shall provide factual evidence that continuous QC inspections and tests have been performed, including any defects, causes for rejection, proposed remedial action and corrective actions taken.

3.08 TRANSMITTAL OF DOCUMENTATION

A. Submit copies of previous weeks Contractor's handwritten Contractor Quality Control Daily Reports and Contractor's Quality Control Test Report forms to the A/E and Owner at each weeks progress meeting.

3.09 NON-COMPLIANCE OF WORK

A. See Section 01 31 15 Communication.

END OF SECTION 01 45 16

Report Number: _____ Date: _____ Project No.: _____

Location of Work: _____

[ ]	AM			Max _____					
[ ]	PM	Weather _____	Temp	Min _____		Wind _____		Rain _____	inches

1. Contractor / Subcontractor Activity:

	Work in Progress	Contractor / Subcontractor	Scheduled Activity ID#	Equipment	Craft	Time Worked
A.						
B.						
C.						
D.						
E.						
F.						
G.						
H.						
I.						
J.						
K.						
L.						

2. List specific inspection performed (pre-installation, initial, and follow-up) and results of these inspections (include corrective actions):

_____

_____

_____

_____

_____

3. List type and location of test performed and results of these tests:

_____

_____

_____

_____

_____

4. List work done under Change Order Proposal:

5. List any instructions given by Owner on construction deficiencies, re-testing required, etc., with action to be taken:

6. Activity Safety Inspection: (Note safety violations and corrective action taken. Indicate phase of work where violations occurred.)

7. Upcoming Work: (Indicate next major phase of work anticipated and approximate date of Preparatory Inspection meeting to cover this work.)

8. Indicate items of construction equipment, other than hand tools, at the job site and whether or not used:

9. Remarks: (Cover any conflicts in plans, specifications, or instructions or any delay to the job attributable to weather conditions.)

_____

_____

_____

_____

_____

10. CERTIFICATION: I certify that the above report is complete and correct and that I, or my authorized representative, have inspected all work performed this day by the Contractor and each subcontractor and have determined that materials, equipment and workmanship are in compliance with the plans and specifications, except as may be noted above.

_____
Contractor's Quality Control Representative

Contractor's Quality Control Test Report

Test Report Number: _____ Date: _____ Project No.: _____

Location of Test: _____

DESCRIPTION OF ITEM, SYSTEM OR PART OF SYSTEM TESTED:

_____

_____

_____

_____

_____

DESCRIPTION OF TEST:

_____

_____

_____

_____

_____

NAME AND TITLE OF PERSON IN CHARGE OF PERFORMING TESTS FOR CONTRACTOR:

NAME _____

TITLE _____

SIGNATURE _____

I HEREBY CERTIFY THAT THE ABOVE-DESCRIBED ITEM, SYSTEM OR PART OF SYSTEM HAS BEEN TESTED AS INDICATED ABOVE AND FOUND TO BE ENTIRELY SATISFACTORY AS REQUIRED IN THE CONTRACT SPECIFICATIONS.

SIGNATURE OF CONTRACTOR
QUALITY CONTROL INSPECTOR _____

REMARKS:

_____

_____

_____

_____

_____

GUIDE SPECIFICATIONS

The following specification is intended to be used, generally verbatim, in the contract documents. ***[Specifier notes]*** shall be deleted during the editing process. Where [ ] appear in this document, this indicates requirements which are optional depending upon the project scope and conditions. Edit as appropriate for the project. The A/E consultant shall take ownership and responsibility for the contents of this section and is expected to modify other portions as necessary to accurately reflect conditions of the project. For draft copies during the design process, use Microsoft Word, Track Changes. Set criteria so that deletions show as strikethroughs. Deletions and additions are to be in red.

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. Relate Work Specified Elsewhere
[Specifier – insert as appropriate.]
1. Section 01 35 91 – Protection, Salvage and Treatment Procedures for Historic Building Materials
2. Section 02 40 00 – Building Remodel Selective Demolition
3. Section 04 01 00 – Maintenance of Masonry
4. Section 04 01 20 - Unit Masonry Restoration
4. Section 04 01 20 - Repointing Campus Historical Buildings
5. Section 04 01 40 - Stone Restoration
5. Section 04 01 40 - Stone Masonry Cleaning & Poulticing
6. Section 05 01 00 – Maintenance of Metal
7. Section 09 01 20 - Plaster Repair/Restoration.
8. **[Section XX XX XX - Title]**.

1.02 SUMMARY

A. The Owner may select and employ a Historic Preservation Representative (HP Representative) having expertise in historic preservation to conduct on-site observations and inspections as specified herein, to ensure on the Owner's behalf that the Work is carried out in conformance with the Contract Documents.

1.03 DEFINITIONS

A. Definable Feature of Work: A "definable feature of work" is a task which is separate and distinct from other tasks and has separate control requirements. It could be identified by different trades or disciplines, or it could be work by the same trade in a different environment. Although each Section of the specifications may generally be considered as a definable feature of work, there is frequently more than one definable feature under a particular Section.

B. Historic Preservation Representative (HP Representative): A qualified individual having the expertise in historic preservation and/or materials conservation to oversee construction activities.

1.04 REFERENCES

A. National Park Service *Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring and Reconstructing*

Historic Buildings.

B. ASTM International, ASTM E329 “Standard Specification for Agencies Engaged in Construction Inspection, Testing or Special Inspection”.

1.05 QUALITY ASSURANCE

A. Pre-Construction Meeting: HP Representative shall conduct and document a pre-construction meeting with the Owner, Architect/Engineer, Contractor, applicable Subcontractors, and other historic preservation officers present. The purpose of this meeting is to ensure that all parties have a clear understanding of the Work to be performed and the role of the HP Representative.
   1. Contents of the meeting shall include:
      a. Delineation of responsible parties and lines of communication pertaining to historic preservation issues.
      b. Review of Contract Documents and requirements.
      c. Review of work plans and discussion of construction methods and materials.
      d. Preliminary schedule for site visits.
   2. The HP Representative shall prepare meeting minutes for distribution to attending parties. Meeting minutes shall include:
      a. Presentation of the results of the meeting
      b. List of key contact personnel, including emergency contact information
      c. Specific issues discussed regarding contract requirements and construction methods and materials, as well as resolution of those issues
      d. Schedule regarding expected frequency of site visits.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 PREPARATORY PHASE

A. The HP Representative shall conduct and document a pre-construction meeting as specified above in Paragraph 1.05 “Quality Assurance.”

3.02 INITIAL CONSTRUCTION PHASE

A. The initial construction phase shall consist of an evaluation of an initial representative portion of each definable feature of the Work (e.g. field mockups, etc.) The HP Representative shall observe the initial representative portion of work, while in progress, with the Contractor’s superintendent and/or job foreman involved. The purpose of this phase is to provide early verification that the work is carried out in conformance with the Contract Documents. This phase shall include:
   1. Examination of the quality of the workmanship.
   2. Verification of material conformation to the Contract Documents.
   3. Evaluation of required testing and inspection procedures.
   4. Possible rework of areas in question.
   5. Review of potential adjustments to working procedures and other issues.

B. At the completion of the initial phase for each definable feature of work, the HP Representative will submit a site visit report to all parties involved, detailing:
   1. Findings regarding workmanship and materials.
   2. Rework issues.
   3. Unresolved conflicts.
   4. Pertinent information on Contractor and Subcontractor conformation to Contract Documents.

5. Details of site conversations with superintendent or foreman of work crews, including any discussions of problems with materials, workmanship issues, or difficulties in executing Project requirements.
6. In the event that a variance with the Contract Documents is deemed acceptable, the HP Representative shall document this procedure.

3.03 FOLLOW-UP CONSTRUCTION PHASE

A. The follow-up construction phase shall consist of ongoing inspection of definable features of work until completion, to ensure the continuing conformance of the work to the Contract Documents. The frequency of these site evaluations shall be determined during the preparatory phase but may be influenced by conditions found during construction. This phase shall include:
   1. Ensuring that the Work is in compliance with the Contract Documents.
   2. Verifying that the workmanship conforms to the standards established during the preparatory and initial phases.
   3. Ensuring that materials utilized throughout the Project are in conformance with established standards.
   4. Ensuring that any rework items have been corrected and documented.

B. At the completion of each site visit, the HP Representative will submit a site visit report detailing the following:
   1. Conforming sections of work.
   2. Ongoing rework issues.
   3. Material compliance and/or nonconformance and Contractor and/or Subcontractor workmanship.
   4. Details of onsite conversations with Contractor and Subcontractor representatives including discussion of ongoing workmanship or material problems, along with continuing Project specification problems.

3.04 COMPLETION PHASE

A. The completion phase shall consist of the final completion inspection. The HP Representative will verify that each definable feature of work is substantially complete, in conformance with Contract Documents, and the quality of work is acceptable.

B. The HP Representative will issue a final report which will document resolutions to any previous noncompliance and/or nonconformance issues, resolutions to any material submittal issues, and certify all workmanship.

   1. The final completion report will not be issued until all outstanding issues have been addressed and resolved to the satisfaction of the HP Representative.

END OF SECTION 01 45 23

GUIDE SPECIFICATIONS

The following specification is intended to be used, generally verbatim, in the contract documents. ***[Specifier notes]*** shall be deleted during the editing process. Where [ ] appear in this document, this indicates requirements which are optional depending upon the project scope and conditions. Edit as appropriate for the project. The A/E consultant shall take ownership and responsibility for the contents of this section and is expected to modify other portions as necessary to accurately reflect conditions of the project. For draft copies during the design process, use Microsoft Word, Track Changes. Set criteria so that deletions show as strikethroughs. Deletions and additions are to be in red.

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Work includes, but is not limited to, the following:

1. Cooperation with independent Inspection Agency (IA) employed by Owner under separate contract to perform specified services including, but not limited to:
    a. Exterior waterproofing and moisture protection.
    b. Roof repairs in conjunction with installation of Fall Protection System.

1.03 RELATED SECTIONS

A. Coordinate related work specified in other parts of the Project Manual including, but not limited to:
[Specifier – Edit to fit project requirements]

1. Section 07 12 00 – Built-up Bituminous Waterproofing.
2. Section 07 13 00 – Sheet Membrane Waterproofing.
3. Section 07 14 00 – Fluid-Applied Waterproofing.
4. Section 07 16 00 – Cementitious and Reactive Waterproofing.
5. Section 07 17 00 – Bentonite Waterproofing.

1.04 PROCEDURE

A. Under this Contract an independent agency employed by the Owner will perform monitoring, inspections, and tests of waterproofing and associated work.

1. Contractor shall cooperate with and allow full access to site by inspecting and testing agency for performance of specified inspection services.
2. Employment of Waterproofing Inspection Services does not relieve Contractor of obligations to perform any work under this Contract.

1.05 NON-COMPLIANCE OF WORK

A. See Section 01 31 15 Communication.

1.06 NOTIFICATION OF NON-COMPLIANCE

A. Anything found by the IA or Site Representative that is thought to be in non-compliance when they are on-site shall be immediately reported to the Contractor, A/E, PM and/or IA/Site Representative.

B. If a laboratory test result indicates material on-site did not conform to the Contract Documents, the IA shall make an effort to immediately contact the Contractor by phone. The IA shall also fax a copy of the Non-Conformance to the Contractor, A/E and the Project Manager.

PART 2 – PRODUCTS

2.01 CONTRACTOR RESPONSIBILITIES

A. Cooperate with Agency personnel. Provide required access to work.

B. Facilitate inspections and tests.

C. Provide for test sample storage, as required.

D. Notify Inspection Agency at least 5 full working days prior to starting work under Section **[07 12 00] [07 13 00] [07 14 00] [07 16 00] [07 17 00]**.

E. Repair and patch, water-tight, area impacted by testing at no additional cost to Owner.

2.02 DUTIES OF INSPECTION AGENCY

A. Inspection shall be paid for by Owner. A partial list of required work is indicated for informational purposes only. The Inspectors work will include, but may not be limited to, the following:

1. Examination of substrates prior to waterproofing.
2. Interim inspections as work progresses.
3. Monitoring of environmental/weather conditions.
4. Monitoring of methods and materials for conformance to Contract Documents and good waterproofing practices whether or not specifically indicated by Contract Documents.
5. Monitoring of Contractor's water testing procedures and results.
6. Performing such tests and laboratory services as may be needed to verify waterproofing conformance to Contract Documents and weather-tightness.

B. Promptly submit after each visit written report to A/E, Contractor, Owner and others as appropriate. Inform A/E and Contractor immediately by phone of any work in non-compliance.

C. Perform, at Contractor's expense, additional inspections and tests requested by A/E or Owner when initial testing shows non-compliance with Contract Documents.

D. Limitations of Inspection Agency:

1. Agency is not authorized to:
   a. Add, alter, revise, or revoke requirements of Contract Documents.
   b. Approve or accept any portion of the Work.
   c. perform any duties of the Contractor.

PART 3 – EXECUTION

3.01 WATERPROOFING INSPECTION

A. Waterproofing inspection shall be performed by the Testing Laboratory to determine compliance with the Contract Documents.

END OF SECTION 01 45 24

GUIDE SPECIFICATIONS

The following specification is intended to be used, generally verbatim, in the contract documents. ***[Specifier notes]*** shall be deleted during the editing process. Where [ ] appear in this document, this indicates requirements which are optional depending upon the project scope and conditions. Edit as appropriate for the project. The A/E consultant shall take ownership and responsibility for the contents of this section and is expected to modify other portions as necessary to accurately reflect conditions of the project. For draft copies during the design process use Microsoft Word, Track Changes. Set criteria so that deletions show as strikethroughs. Deletions and additions are to be in red.

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Testing and Inspection Service: The Owner may select and employ one or more Independent Testing Agencies, Engineering Services or Special Inspectors, hereinafter called Owner's Testing Representative (OTR), to conduct tests and inspections as specified, requested by the Owner, or required by Authorities Having Jurisdiction (AHJ). The OTR will provide inspector(s) approved by the AHJ. For the purpose of this specification section, all references made herein to OTR shall be those tests or inspections which will be conducted by an inspector provided by the Owner.

B. Soils Engineer: Owner will employ and pay for services of Soil Engineer to monitor the geotechnical aspects of construction as required.

C. Tests and inspections which are normally associated with obtaining permit approval by AHJ shall be provided and paid for by the Contractor.

D. In general, materials, quantities and extent of tests are identified in the respective specification sections.

1.03 QUALITY ASSURANCE - INDEPENDENT TESTING AGENCY

A. Qualifications:

1. Agency employed by Owner shall be a testing laboratory qualified by the United States Bureau of Standards, to provide inspection and material testing services for the general construction quality control, and which will meet basic requirements of ASTM E329 "Standards of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction".
2. Meet "Recommended Requirements for Independent Laboratory Qualification" published by American Council of Independent Laboratories.
3. Authorized to operate in the State of Washington.

B. Testing Equipment: Calibrated at reasonable intervals by devices of accuracy traceable to either:

1. National Bureau of Standards.
2. Accepted values of natural physical constants.

C. Certification: The OTR will submit to A/E and Local Building Department certification of meeting the above qualifications. Inspector(s) performing welding inspection shall be AWS certified.

1.04 DUTIES OF OWNER'S TESTING AGENCY

A. The OTR will be available during Contractor's normal working hours and identified overtime, second shift and out of area activity as scheduled by the Contract Documents.

B. The OTR shall conduct testing and inspection services, interpret them, and evaluate the results for compliance with the Specifications. Testing and inspection services which are performed shall be in accordance with applicable standard methods of ASTM or other procedures specified.

C. Continuous and special inspections shall be performed by the OTR as required by Contract Documents and governing authorities.

D. The Inspectors are not authorized to do the following:

1. Release, revoke, alter or enlarge on requirements of Contract Documents.
2. Approve or accept any portion of the work, unless otherwise specifically noted.
3. Perform any duties of the Contractor.
4. Stop Work.

1.05 CONTRACTOR'S RESPONSIBILITIES

A. It is the Contractor's responsibility to initiate and coordinate all required tests and inspections including conformance with requirements of all applicable public agencies and authorities. Inspection of the work shall not relieve the Contractor from any obligation to fulfill this contract. Contractor shall be responsible for coordinating the testing requirement with the OTR and provide the OTR no less than two (2) working days advance notification to schedule tests.

B. For the purpose of inspection, the OTR shall at all times have free access to all parts of the work and to the shops where the work is in preparation, and the Contractor shall at all times provide and maintain proper facilities and safe access for such inspection. The Contractor shall cooperate with OTR personnel, and furnish access, tools, samples, certifications, test reports, design mixes, equipment, storage, and assistance as requested by the OTR. The Contractor shall:

1. Make available to the OTR or Soils Engineer safe access and working environment, and adequate quantities of samples of materials proposed to be used which require testing.
2. Provide to the OTR the approved design mix to be used for concrete, mortar, grout, and other materials mixes which require testing by the testing laboratory.
3. Furnish copies of product test reports performed by Contractor as required by Contract Documents.
4. Furnish incidental facilities necessary for the following:
    a. To obtain and handle samples at the project site or at the source of the product to be tested.
    b. To facilitate inspections, geotechnical monitoring, and tests.
    c. For storage and curing of the test samples.
    d. Electrical power and water required for testing procedures.
5. Provide incidental labor, when requested, to facilitate testing and inspections.

C. Where defective work requires redesign of portions of construction, such redesign costs shall be back charged to the Contractor by a deductive Change Order.

D. All costs associated with Contractor scheduled testing outside its normal working hours which is not identified in the Contract Documents, insufficient advance notice to the OTR of cancellation of a test or inspection to allow rescheduling of the OTR's workload, and for re-

testing of non-conforming material, will be back charged to the Contractor by a deductive Change Order.

1.06 TEST AND INSPECTION REPORTS

A. Copies of tests, special sampling operations and inspection reports shall be distributed by the OTR at weekly intervals, except as noted under NOTIFICATION OF NON-COMPLIANCE. All reports will be signed by a Registered Engineer. Such reports shall include all tests made, regardless of whether such tests indicate that the material is satisfactory or unsatisfactory. Samples taken but not tested shall also be reported.

B. The OTR will:

1. Obtain and handle samples at project site or at source of product to be tested.
2. Furnish laboratory test reports of materials and construction as required; include:
   a. Date issued.
   b. Project title and number.
   c. Testing laboratory or engineering firm name, address, and telephone number.
   d. Name and signature of representative.
   e. Description of method of test.
   f. Identification of sample and portion of the work tested.
   g. Description of location in the work of the sample.
   h. Time and date of obtaining sample.
   i. Time and date of test of sample.
   j. Weather and climatic conditions.
   k. Results of tests and compliance with Contract Documents.
   l. Evaluation of results tests, including recommendations for action, when requested by A/E or Structural Engineer.

C. The OTR will furnish "Inspection at Site" reports for each site visit documenting activities, observations, and inspections of work being inspected include:

1. Date issued.
2. Project title and number.
3. Testing Laboratory or engineering firm name, address, and telephone number.
4. Name and signature of representative.
5. Observations on weather and climatic conditions.
6. Time and date.
7. Conditions and/or status of the work being inspected.
8. Actions taken.
9. Recommendations or evaluation of the work.

D. The OTR will distribute test and inspection reports as follows: ***[Specifier modify as required]***

1. A/E: 2 copies;
2. Structural Engineer: 2 copies.
3. Soil Consultant: 1 copy;
4. Owner: 2 copies;
5. Contractor: 1 copy;
6. Olympia Building Department: 2 copies.

1.07 NON-COMPLIANCE OF WORK

A. See Section 01 31 15 Communication.

1.08 NOTIFICATION OF NON-COMPLIANCE

A. Anything found by the OTR or Site Representative that is believed to be in non-compliance when they are on-site shall be immediately reported. The OTR shall notify the Contractor, A/E, Site Representative, and/or Project Manager. If the Site Representative believes there is a non-compliance the Site Representative shall notify the Contractor, OTR and A/E if they are on-site, and Project Manager. The Project Manager shall notify the OTR and A/E if they are not on site.

B. If a laboratory test result indicates material on-site did not conform to the Contract Documents, the OTR shall make an effort to immediately contact the Contractor by phone. The OTR shall also fax a copy of the Non-Conformance to the Contractor, A/E and the Project Manager.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

3.01 DETAILED SITEWORK INSPECTION & TESTING REQUIREMENTS

A. Special Inspection & Structural Observation Requirements - General

1. Special inspection and structural observation requirements and programs shall be in accordance with the following provisions of the IBC, as adopted and amended by the State of Washington and AHJ:

   a. Section 109 Inspections.
   b. Chapter 17 Structural Tests and Special Inspections.
   c. Section 1709 Structural Observations as amended by WAC 51-50-1709.

2. Structural Notes may also have additional provisions pertaining to special inspection and are incorporated as if specified herein.

B. Geotechnical Inspections

1. General:
   a. During excavations or fill operations and preparation for building foundations, placement of subsurface drainage systems, utility bedding, or other major excavations, the Contractor shall notify the A/E and facilitate inspection of site by Owner's Geotechnical Testing Agency to ascertain that conditions encountered are in conformance with the contract documents for depth of foundation, influence of groundwater, and requirements for drainage for foundations, excavations, cut, fill and slopes.
   b. Placement and compaction of all structural fill shall be inspected by Owner's Testing Agency.
2. OTR Inspections:
   a. Inspect and approve native and imported structural backfill materials proposed for the various conditions of work for conformance with specifications.
   b. Determine whether weather conditions are detrimental to site grading cut and fill work.
   c. Observe and approve all subgrades for suitability for receiving any backfill.
   d. Observe subgrade compaction procedures of subgrades under future paving and slab areas to evaluate the subgrade performance, the effectiveness of the procedure, and to recommend adjustments in the procedure as field conditions dictate.
   e. Observe and approve precautionary measures taken by the Contractor for protection of exposed sloped subgrades and recommend necessary adjustments in such measures as field conditions dictate. Determine whether replacement or

reconditioning and recompaction of subgrade materials which become soft/wet is necessary due to wet weather conditions.

f. Determine whether previously frozen and thawed subgrade soils at excavations are suitable for new work to be placed thereon.

3. Compaction Tests:

a. Within the provisions of the technical specifications (Divisions 31 and 32) for earthwork testing and sampling, Contractor shall cooperate with the OTR for performing testing or sampling for verification of conditions as noted above. Moisture Density tests, in-place density tests, and other tests may be performed as required by the Contract Documents or IBC, as adopted by local AHJ , and to verify Contractor's earthwork operations.

b. Conform to referenced ASTM D1557, ASTM D2922, ASTM D3017, ASTM D4318 and ASTM C136, as applicable. Take in-place density tests for the following, of frequencies set forth in Civil Drawings or applicable Sections of Division 31:

1) Compacted fills, subgrades, sub-bases and base courses.
2) Utility trench bottoms, backfill of utility trenches under all future concrete slabs on grade, foundation walls, and asphalt paving.
3) Fills under grade beams and pile caps and backfill of new building walls.

C. Structural Cast-In-Place Concrete

1. General: Testing will be performed by the OTR as required by IBC, adopted by local AHJ, and these Specifications. Tests and inspections may include, but not necessarily be limited to, the following:

a. Inspection of reinforcing steel and embedded items in place. Verify proper placement of reinforcing bars, fabric, and spirals prior to placement of concrete check condition of surfaces of reinforcing and embedded items for bond integrity with concrete; verify placement locations, sizes and anchorage of all items embedded in concrete.

b. Concrete formwork including configuration, form and steel cleanliness. Inspect erected formwork for conformance with approved drawings, for design and seal of form joints, and for type and location of form ties.

c. Reinforced concrete inspection and material testing shall be made in accordance the ACI 301 Chapter 16, Testing, and Chapter 17, Evaluation and Acceptance of Concrete, and appropriate ASTM Standards.

2. Testing: Test materials for compliance with Specifications. Review and check proposed mix designs. Conduct tests of concrete in accordance with the following procedures:

a. Sampling Fresh Concrete: ASTM C172, except modified for slump to comply with ASTM C94.

b. Slump: ASTM C143; one test for each concrete load at point of discharge and one test for each set of compressive strength test specimens.

c. Air Content: ASTM C173, volumetric method and ASTM C231 pressure for normal weight concrete; one for each set of compressive strength test specimens.

d. Concrete Temperature: Test hourly when air temperature is 40 degrees F and below, and when 80 degrees F and above; and each time a set of compression test specimens made.

e. Compression Test Specimen: ASTM C31; one set of 6 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens except when field-cured test specimens are required.

f. Compressive Strength Tests: ASTM C39; one set for each 100 CY or fraction thereof, of each concrete class placed in any one day or for each 5,000 SF of surface area placed; 2 specimens tested at 7 days, 1 specimen tested at 14 days, 2 specimens tested at 28 days, and one specimen retained in reserve for later testing if required.

1) When frequency of testing will provide less than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.
2) When total quantity of a given class of concrete is less than 50 CY, strength test may be waived by Owner if, in his judgment, adequate evidence of satisfactory strength is provided.
3) When strength of field-cured cylinders is less than 85% of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
4) Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive strength by more than 500 psi.

3. Test Results: Test results will be reported in writing by the OTR and expedited to Contractor, A/E, , Structural Engineer, Owner, and Local Building Department. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials: compressive breaking strength and type of break for both 7-day tests and 28-day tests.
4. Additional Tests: The OTR will make additional tests of in-place concrete, as directed by A/E, when test results indicate specified concrete strengths and other characteristics have not been attained in the structure. OTR may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42, or by other methods as directed. Contractor shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable concrete is verified.
5. Patching: Where core test results are satisfactory, fill core holes with non-shrink patching grout to meet or exceed the strength of the adjoining concrete, and finish to match adjoining concrete surface.

D. Mortar

1. General: OTR to test exact proportions of mortar mixes specified under Section 04 05 00 using the same aggregate and other materials furnished by Contractor proposed to be used on the work; material samplings shall comply with ASTM C780, Article 9, "Sampling".
2. Pre-Construction Evaluation of Mortars:
   a. Provide pre-construction evaluation of mortars in compliance with ASTM C780 using test methods and procedures specified therein in Annexes A1 through A7, inclusive.
   b. Under test method Annex A6, test mortar mixes for compliance with specified compressive strengths.
   c. Should test specimens fail to meet specified compressive strengths, immediately notify A/E and Contractor.
3. Construction-Site Evaluation of Mortars:
   a. Sample and test mortar specimens in accordance with ASTM C1019 for compliance with specified compressive strengths as indicated on Structural Drawings.
   b. Should test specimens fail to meet specified compressive strengths, immediately notify A/E and Contractor; perform further testing of construction-site mortar when so directed by A/E.

E. Reinforced Concrete Unit Masonry

1. General: Periodic special on-site inspection/observation by the OTR is required during placement of reinforced and/or fully grouted concrete masonry. Tests will be performed as required by IBC, as adopted by the local AHJ and these specifications.

2. Inspections: Will include, but not necessarily be limited to, the following:
   a. Check reinforcing steel in place.
   b. Inspect all cells and clean-outs.
   c. Inspect grouting operation.
   d. Refer to Structural Notes for additional inspection requirements.
3. Testing: Will include, but not necessarily be limited to, the following:
   a. Test materials for compliance with specifications.
   b. A set of five masonry prisms shall be built and tested in accordance with IBC Section 2105.3 prior to the start of construction. Materials used for the construction of the prisms shall be taken from those specified to be used in the Project. Prisms shall be constructed under the observation of the engineer or special inspector or an approved agency and tested by an approved agency.
   c. A set of three (3) prisms shall be built and tested during construction in accordance with IBC Section 2105.3 for each 5,000 square feet of wall area, but not less than one (1) set of three (3) prisms for the Project.
   d. Make report of test results in writing and expedited to Contractor, A/E, Owner, Structural Engineer and Local Building Department. Include in test reports the project identification name and number, date, name of subcontractor, name of testing service, and identification letter.

F. Exterior Masonry Veneer

1. OTR to inspect and approve substrates for application of masonry veneer materials.
2. Furnish continuous (full time) inspection during application of masonry veneer materials.

G. Welding: Verify conformance with applicable Sections of Division 5. All welding shall be subject to special inspection.

H. Structural Steel Framing & Fabrications

1. General: Tests will be performed by the OTR as required by IBC, Chapter 17, as adopted by AHJ and these specifications.
2. Shop Bolted Connections: Inspect in accordance with AISC specifications.
3. Shop Welding: Inspect and test during fabrication of structural steel assemblies, as follows:
   a. Verify use of "Washington Association of Building Officials" (WABO) certified welders, and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
   b. Perform visual inspection of all welds including fillet welds.
   c. Perform tests of complete penetration welds as required by technical specifications as follows. Inspection procedures listed are to be used at Testing Laboratory's option.
      1) Radiographic Inspection: ASTM E94 and ASTM E142; minimum quality level "2-2T".
      2) Ultrasonic Inspection: ASTM E164.
4. Field Bolted Connections: Inspect in accordance with AISC specifications.
5. Field Welding: Inspect and test during erection of structural steel as follows:
   a. Verify use of "Washington Association of Building Officials" (WABO) certified welders, and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies and submit copies of such reports to Contractor, A/E, Owner, Structural Engineer and Local Building Department.
   b. Perform visual inspection of all welds including fillet welds.
   c. Perform tests of full penetration welds as required by technical specifications as follows:

1) Radiographic Inspection: ASTM E94 and ASTM E142; minimum quality level "Z-2T".
2) Ultrasonic Inspection: ASTM E164.

6. Testing Program Summary: Testing agency special inspector shall submit a summary of the proposed testing program for review and approval; submit directly to Contractor, A/E, Owner, Structural Engineer and Local Building Department.

I. Metal Deck & Shear Studs

1. General: Tests will be performed by the OTR as required by IBC, as adopted by AHJ, and if required by specific technical specification sections.
2. Tests and Inspections: Will include, but not necessarily be limited to, providing inspection during welding as required. Inspection of welds shall be done visually, except as indicated otherwise.

J. Structural Metal & Light gauge Framing: Inspection by the OTR at jobsite as required during high tensile bolting and welding to assure specification and IBC, or as adopted by the AHJ, for compliance.

K. Roofing & Waterproof Membranes

1. OTR to inspect and approve substrates for application of waterproofing and roofing materials, inspect all joints and flashings.
2. Furnish continuous (full time) inspection during application of waterproofing and roofing materials, including roofing related sheet metal flashings and counter flashings.

L. Water Repellent Application

1. OTR to inspect and approve substrates for application of water repellent materials.
2. Furnish continuous (full time) inspection during application of water repellent materials.

M. . Miscellaneous

1. General: Provide other special inspections required by IBC as adopted by AHJ for structural or other work, or as requested by Owner.
2. Additional Testing Services: Additional testing which may be performed by the Owner's OTR, if any, are specified elsewhere in Contract Documents.

3.02 MECHANICAL & ELECTRICAL WORK SUBCONTRACTS

A. Inspection and tests required for Fire Suppression, Plumbing, Mechanical and Electrical Systems Work are covered under Sections of Divisions 21 through 28 respectively and will not be performed by Owner’s OTR.

END OF SECTION 01 45 29

GUIDE SPECIFICATIONS

The following specification is intended to be used, generally verbatim, in the contract documents. ***[Specifier notes]*** shall be deleted during the editing process. Where [ ] appear in this document, this indicates requirements which are optional depending upon the project scope and conditions. Edit as appropriate for the project. The A/E consultant shall take ownership and responsibility for the contents of this section and is expected to modify other portions as necessary to accurately reflect conditions of the project. For draft copies during the design process, use Microsoft Word, Track Changes. Set criteria so that deletions show as strikethroughs. Deletions and additions are to be in red.

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes requirements for construction facilities and temporary controls, including temporary utilities, support facilities, security and protection. Nothing in this section is intended to limit types and amounts of temporary work required, and no omission from this Section will be recognized as an indication that such temporary activity is not required for successful completion of the work and compliance with the requirements of the Contract Documents.

B. Unless otherwise noted, the temporary utilities described herein shall be provided by the Contractor. Work and requirements include, but are not necessarily limited to, the following:

1. Provide temporary devices, equipment, power and other utilities as needed for use, convenience and safety of personnel engaged in the work of the Contract. Installations of temporary utilities is to be safe, non-hazardous and sanitary; they are to be protective of persons and property and be free of deleterious effects.
2. Locate temporary utilities where required or as directed or approved by Owner and A/E.
3. Make all service connections to existing services in approved manner, in accordance with code requirements, and with prior approval of Owner.
4. Install extensions and branches, as required.
5. Maintain and protect temporary utilities.
6. Remove from site upon completion of the Project or when directed.

1.03 SUBMITTALS

A. Within 15 calendar days of the Notice To Proceed, the Contractor shall submit to the A/E and Owner a schedule with dates and a location sketch indicating implementation and termination of each temporary utility.

B. Within 15 calendar days of the Notice To Proceed, the Contractor shall submit to the A/E and Owner a list of the General, Mechanical, and Electrical Contractor principal staff assignments, including the Superintendent and other personnel that will be in attendance at the site. Identify individuals, list their addresses and telephone numbers, and their duties and responsibilities.

1. Submit separate emergency contact list in accordance with Section 01 13 15, Communication.

C. Within 15 calendar days of the Notice To Proceed, the Contractor shall submit to the A/E a Fencing Plan indicating layout of construction fence and gates around its staging area(s).

1. Indicate how building entrances are maintained for occupants and visitors, and if overhead work is going to occur, overhead protection. Fencing shall not have any direct attachment to any buildings.

1.04 QUALITY ASSURANCE

A. Comply with industry standards and applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:

1. Building code requirements: Local and state.
2. Health and safety regulations.
3. Utility company regulations.
4. Police, fire department, and rescue squad rules.
5. Environmental protection regulations.

B. Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

C. Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Relocate temporary services and facilities as the Work progresses. Do not overload facilities or permit them to interfere with progress. Take necessary fire-prevention measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on-site.

1.05 WORKING HOURS

A. Refer to SUMMARY OF WORK for a description of the Contractors normal working hours.

1.06 SPECIAL CONDITIONS

A. The Contractor is responsible for providing and maintaining controls using methods, equipment and temporary construction as necessary to protect against unfavorable conditions during the construction of the project. Following are requirements related to restrictions and other physical conditions that will affect the Contractor's methods of work.
[Specifier edit the following list as required]

1. Varying types of temporary dust barriers shall be required to isolate construction areas from non-construction areas and provide for sound attenuation.
2. Circulation through areas under construction shall be required to maintain egress or other circulation paths through the building. Contractor shall be required to keep these areas available for such uses during the course of construction.
3. Availability of on-site storage is minimal. Contractor shall account for bringing materials in and disposing of materials on a regular basis.
4. Construction access is limited, both for location and height restrictions.
5. The Contractor shall provide exhausting for any vehicles or equipment which will be in a space where exhaust fumes can accumulate. Exhaust ducting must be routed to open air space in a manner acceptable to the Owner which will not restrict normal daily activities. The Contractor shall provide temporary exhausting, or other proven method of controlling other odor causing activities, such as, but not limited to, welding or demolition.
6. The use of jackhammers or other similar equipment that causes excessive vibration is not permitted, unless an exception is requested by the Contractor and approved by the Owner.
7. Demolition shall occur in a controlled manner to avoid excessive dust, noise and vibration generation.
8. Avoid use of tools and equipment that leak or leave waste material behind. In cases where minor leakage is unavoidable (generators, compressors, etc.), drip pans shall be provided.

9. Provide protection for any historical elements that may exist and are to remain or be reused.
10. Contractor shall be required to give the Owner ample notice to relocate tenants that will be in the path of construction activity. Responsibility for relocating tenants within the limits of construction will be the Owner's.

1.07 EXISTING WORK

A. Existing construction and equipment not scheduled to be removed shall be kept in its original condition. If damaged, replace at no additional cost to the Owner.

B. Repair damaged surfaces to match adjacent finish.

1.08 PROTECTION OF EXISTING UTILITIES

A. Known utilities of record are shown on the Contract Drawings but are not to be considered as As-Built. The Contractor shall consider that the actual As-Built location may be within a tolerance of five (5) feet vertically or five (5) feet either side horizontally of that indicated in the documents. The Contractor shall take the following steps:

1. Notify Owner in writing, on each occasion, of the intent to work near existing utility services or structures or when a new excavation or saw cutting operation is about to begin. Submit procedure for approval to assure safe and continuous operation of the services.
2. Proceed with sufficient caution within the As-Built tolerance area to preclude damaging any known utilities. In the event unidentified utilities are encountered, notify Owner's Representative immediately.
3. In the event unknown utilities are damaged during construction, temporary services and/or repairs shall be made immediately by the Contractor to maintain continuity of services. Costs for temporary and/or permanent repairs will be accounted for through a Change Order.

1.09 CONSTRUCTION OPERATIONS IN OR AROUND A PUBLIC BUILDING

[Specifier – Edit as appropriate, depending on an occupied or vacant facility]

A. State facilitates typically are open to the public Monday through Friday from 6:00 a.m. to 6:00 p.m., with some areas operational twenty-four (24) hours a day. Employees including those with disabilities have access to the building twenty-four (24) hours a day. Consideration and concern for the safety of workers and the public shall be in the Contractor's mind at all times.

[Specifier – Edit as appropriate, depending on occupancy conditions]

B. Contractor shall recognize that the public as well as the employees can be expected to be on the project site during the course of the project. Certain areas within the limits of construction may be vacated by the Owner prior to the NTP. When vacated, these areas will be available for Contractor use throughout the duration of the project. Access through these areas by the Owner shall be provided where indicated, both during and outside the Contractor's normal working hours. Disturbance of building occupants shall be kept to an absolute minimum. Regular and emergency egress and accessible routes of travel shall be maintained at all times and shall be kept free of construction materials and debris. Any periods of interruption shall be coordinated with the Owner and shall not commence without the Owner's prior written approval. In general, notification must be given seven (7) days in advance and be indicated on the CPM schedule.

C. Contractor shall be limited to staging areas and routes into and out of the project area as designated in the Contract Documents and which do not block accessible entrances or

accessible parking. Storage of construction debris and stockpiled materials shall only be permitted in those areas indicated and within the construction area in a manner that does not obstruct or cause potential harm to anyone using identified paths through the construction area. Care must be taken that no hazardous or dangerous materials or debris be left in accessible areas. All construction materials shall be stored in secured areas.

D. A portion of the work may require the Contractor to work outside the identified limits of construction. Contractor shall be required to coordinate all such work with the Owner and notify the Owner a minimum of (2) weeks in advance. Such notification shall include an identification of the area which the Contractor will require to perform the work, a description of the work to be performed, and a duration (in calendar days) until the work is completed.

1. Work in these areas will affect the Owner's normal operations and require coordination. The Owner will be responsible for temporarily relocating people. The Contractor shall be responsible for the protection of any equipment or furniture in these locations during construction.

E. At all times during the project the Contractor shall provide a safe, non-hazardous pathway for the designated primary and temporary emergency egress routes. The pathway shall be a minimum 4 feet wide and clearly marked at 10-foot intervals by directional painted arrows, cones and tape, or other commonly recognized and identifiable means. The pathway shall be a non-slip surface, either modifying the existing surfaces as necessary or providing a slip resistant plywood surface. Any exterior pathways shall be maintained so water does not pond on the route and no trip hazards exist.

F. Security.

1. Maintenance of Security:
   a. It is the Contractor's responsibility to provide adequate security to protect the building and work site from unauthorized entry. Contractor shall be solely responsible for any theft, damage, or injury caused by a breach of such security.
   b. Initiate security program promptly after job mobilization, when enclosure fence, gates, and temporary enclosures are installed.
   c. Maintain security program throughout construction period, until Owner occupancy or Owner acceptance precludes the need for Contractor security.
2. Entrance Control:
   a. Provide control of all persons and vehicles entering and leaving Project site.
   b. Allow entrance only to authorized persons with proper identification.
   c. Owner's access to construction site shall be allowed at all times.
3. Identification Badges and Access Keys:
   a. Project buildings have secured areas, or are completely secured, requiring the Contractor and all workers under its responsibility to wear identification badges at all times and access the facility by key, or card key. The Owner will provide identification badges, which will also act as card key access where the Owner has those capabilities.
   b. Work at certain facilities or within certain areas of a facility shall require all workers pass a clearance security check and wear photo ID badges. For such projects, submit within 7 calendar days of the Notice To Proceed the name and driver's license number of each employee to work at the project site. Following a clearance security check, the Contractor and Owner will make arrangements for a photo ID badge to be made. This process can take up to 7 working days.
   c. Work can only be performed by workers having ID badges. Sharing or use of a person's ID badge by another person will result in both parties being denied access for further work on the project. At the end of the project, all ID badges are to be returned to the Owner.

d. A maximum of 5 non-assigned badges will be issued by the Owner for Contractor use throughout the project. These badges are for Contractor personnel who may only be involved for a short period of time or who may not be known at beginning of project.
e. The Owner will provide keys to the Contractor where card key access is not available. The Contractor shall sign a receipt for received keys.
f. At the end of the project, all keys and card keys shall be returned to the Owner. The Contractor shall obtain a signed receipt from the Owner for all returned items and forward the original receipt to E&A Services project manager.
g. Failure by the Contractor to return all ID badges and keys will require the contractor to reimburse the Owner for all costs associated with the item that has not been returned. For ID badges, the cost is $100.00 each. For actual keys, the cost to the Contractor shall be for re-keying the entire facility the keys provided access to. A unilateral deductive Change Order will be written to the Contract.

G. Emergency Procedures.

1. For emergencies requiring ambulance, fire department or police assistance, dial 9-1-1 from regular phones or verify the process for Owner system phones. This phone number shall be posted at all Contractor phones.
2. Should the Contractor find it necessary to call for police assistance or protection in the exercise of its responsibilities, or in the event of other emergencies, call 9-1-1 first, then contact Owner. The contact number and name will be provided at the Preconstruction Meeting

H. Fire Safety.

[Specifier – Edit as appropriate for building location other than Olympia]

1. Conduct operations in a manner that is fire-safe for the work area and adjacent areas. Maintain the premise clear of rubbish, debris, or other materials constituting a potential fire hazard. Maintain a proper fire separation between work area and any adjacent occupied areas. The local fire codes are incorporated herein by reference; adhere to all applicable provisions as determined by the local fire department. Contractor shall notify the Fire Department at commencement of construction.
2. Obtain permits as necessary, including but not limited to:
   a. Cutting, Welding, Soldering, or any other type of open flame. Confirm with the local Fire Department if a Burn Permit is required on any open flame work, including soldering.
   b. Storage of flammable materials (propane, butane, etc.) and/or compressed gasses.
3. Where significant or continued non-compliance with fire safety is noted, Owner reserves the right to stop the work at no extra cost or extension of time, pending remedial action. Reimburse Owner as appropriate, for any fines or penalties levied by the local fire department.
4. Report all construction fires and/or hazardous spills immediately by calling 9-1-1 and notifying the Owner Representative.
5. Contractor shall maintain all hallways, corridors, and/or adjacent egress areas free of construction materials, equipment, and rubbish at all times. Do not impair floor to floor fire separation. Submit an RFI for any clarifications needed regarding existing fire separations.
6. Provide temporary portable fire extinguishers for project as required by code. Permanently assigned fire extinguishers located in buildings do not alleviate Contractor's responsibility to provide standby extinguishers for project and "Fire Watch" needs.
   a. A "Fire Watch" is to continue at least 30 minutes after "Hot Work" or cutting, welding or soldering procedures have stopped. A "Fire Watch" shall include monitoring of floors directly above and below "Hot Work" areas. "Hot Work" denotes any open flame procedure for the heating of materials during application processes.

b. Provide combustible and finished surfaces, equipment, electric cables, and personnel with protection to prevent damage or injury from molten metal, falling sparks, and welding arcs. Whenever practical, perform cutting and welding operations off-site.

7. Provide and install temporary exit signs to mark pathway, as needed, to insure a clear direction for emergency exit travel in occupied areas adjacent to the construction project. Review the temporary exiting routes and signage with Owner's Representative prior to making the changes.

I. Fire Protection Systems

1. Building and/or parking areas are either partially or fully protected with different types of fire suppression and smoke or ionization detection systems.
2. The Contractor shall cover existing fire detection devices. As a minimum, the cover is to be within the Project area and closely adjoining spaces to protect the detection devices from dust, debris, and potential false alarms.
3. The Owner and AHJ shall be notified seven (7) days in advance of work involving the disconnection or impairment of the fire alarm or protection systems.
4. If the Contractor causes a false alarm by failing to properly submit an Outage Request, submitting an inaccurate Outage Request, or accidentally discharges any protection system where the Fire Department responds, a unilateral deductive Change Order for $500.00 will be written against the Contract to cover charges to the Owner from the Fire Department, and Owner costs for responding to the alarm.
5. The Contractor is to be fully familiar with and aware of all equipment that is being used on the project and the effect it could have on the systems.

J. Service Outages

1. Continuity of equipment and utility services to Owner property around the Project shall be maintained at all times. Equipment or utility shutdowns required to facilitate construction work shall be accomplished in accordance with the following requirements:
   a. Service outages and interruptions shall be indicated on the overall construction schedule as well as the interval schedule.
   b. Confirm all requests for equipment and utility outages in writing to the Owner on the Owner's Outage Request Form not less than four (4) working days prior to the proposed outage date. Any changes made to the original outage will require the outage be cancelled and a new outage form be filled out and submitted. The 4-day notification period will start over again with the newly prepared outage form.
2. Service outages to existing equipment and utilities shall be kept to an absolute minimum. Any outages required in the course of construction, whether for temporary services, cutovers, or testing shall be closely coordinated with the Owner and A/E. All service outages and electrical tie-ins will be required to be made between 6:00 p.m. Sunday and 4:00 a.m. Monday, unless otherwise indicated. The Contractor is responsible to reimburse the Owner for back charges of missed outages or re-connect stand-by time of Owner staff.
3. Do not proceed with any work requiring a service outage until confirmation is received from the Owner. Unless otherwise specifically indicated, written permission from the Owner takes a minimum of two (2) working days and a maximum of seven (7) working days from the time of request by the Contractor. Failure of the Contractor to submit outage requests which allow adequate time for Owner review and action shall not be grounds for requesting additional time or compensation.
4. Materials & equipment required for the work to be accomplished during an outage shall be complete and available on the job for review by the Owner at the time of the outage request. If the Contractor is not adequately prepared, the shutdown request will not be granted and must be rescheduled.
5. Only Owner's personnel will shut down and restart equipment and utilities. Owner will inspect the installation prior to restarting and will not restart if an unsafe condition exists. In the event Contractor's work is not completed during the time scheduled for the

shutdown, Owner may elect to restart the equipment or utility services. In that event, additional outage requirements shall be rescheduled in accordance with the preceding requirements. Restarting shall not be construed as acceptance of the work as complete.

[Specifier – coordinate this paragraph with Section 01 11 00, 1.07]

a. Owner's personnel required to complete utility outages, restarts and inspections will not typically be working during the Contractor's normal working hours as defined in Section 01 11 00. Contractor shall incorporate any affect that this may have on the progress of the project as part of the Base Bid. No overtime payments will be authorized for contractor or subcontractors to coordinate such work with Owner's personnel outside of Contractor's normal working hours nor will time delays be recognized due to the unavailability of these parties to complete these tasks during Contractor's normal working hours.

6. Include in the bid all costs associated with equipment and utility outages. Owner will make no extra payment for overtime work, schedule changes or failure to complete utility connections within authorized shutdown periods.

K. Material Storage

1. Confine storage to the designated areas. Maintain the storage areas in a clean and orderly manner.
2. Storage of materials on any existing structure shall not exceed the following:
   a. Roof: 25 lbs. per square foot
   b. Framed Floors: 100 lbs. per square foot
   c. Slab-on-Grade Floors: 100 lbs. per square foot
3. Contractor shall be responsible for making provisions for any additional storage areas needed that cannot be accommodated within the limits of construction.

[Specifier – This Article 1.10 is unique only to the OB2 building and can be deleted if the project is elsewhere. If the project is in OB2, review paragraphs "A." through "E." and modify as needed.]

[1.10 OPERATION OF THE STATE DATA CENTER

A. The WA Tech State Data Center (SDC), located at 1500 Jefferson St. SE, Olympia, WA, is a one-of-a-kind facility which operates twenty-four (24) hours a day, seven (7) days a week. It is intended that the work in this contract shall be completed in such a manner to allow WA Tech to maintain normal operations in the State Data Center.

B. WA Tech maintains rigid control of access to the State Data Center. It is anticipated that Contractor access to these areas shall not be required to complete the work of this project. However, during the course of the project, should access become necessary, Contractor shall be required to obtain prior approval from WA Tech for access to these areas.

C. Vibrations caused by certain construction activities can be extremely detrimental to the continued operations of certain equipment within the SDC area. Care shall be taken to minimize structure borne vibrations during construction.

D. Any work required by this project requiring access to or temporary interruptions in the security envelope at these areas must be coordinated in advance with the SDC Facilities Manager.

E. Outage requests required by the Project which may affect SDC operations require a ninety (90) day advance request and review period.**]**

1.11 SPECIAL REQUIREMENTS

A. Coordination: In addition to the requirements stated elsewhere in these specifications, Contractor shall coordinate the following with the Owner:

1. All room, system or condition surveys requiring access to spaces other than public corridors or garage spaces shall be identified at least three (3) working days in advance of their occurrence for Owner's review.
2. Pedestrian access and emergency egress routes shall be maintained throughout the Contract duration. Locations of these routes and relocation of these routes for construction purposes shall be identified at least three (3) working days prior to their being physically established. The conditions proposed for the access routes shall be clearly detailed by the Contractor for Owner's review.

PART 2 – PRODUCTS

Not Used.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Use qualified personnel for installation of temporary work. Locate temporary installations where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify as required.

B. Provide each temporary installation ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until they are no longer needed or are replaced by authorized use of completed permanent installations.

3.02 TEMPORARY UTILITIES

A. If the Contractor decides to use any of the equipment or materials installed under this contract for heating, power, lighting, or any other project need while the Project is still under construction, warranty on those materials shall not begin until Substantial Completion.

B. Engage the appropriate local utility company to install temporary service as needed or connect to existing service when it is on a public right-of-way, or the Owner when it will be connected to systems within the Owner's property lines. Where the utility company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with utility company recommendations.

1. Arrange with utility company and Owner for a time when service can be interrupted, if necessary, to make connections for temporary services.
2. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.
3. Obtain easements to bring temporary utilities to the site where the Owner's easements cannot be used for that purpose.
4. The Contractor may use existing Owner power, heat and water, and Owner will pay all consumption costs. The Owner has a number of agreements in place with outside entities related to conservation of resources. In using Owner services, the Contractor shall take reasonable measures to conserve usage. Should these existing systems be less than adequate for construction purposes, Contractor shall provide additional means as necessary at no additional cost to the Owner. Any damage to existing systems as a result of the Contractor's use shall be immediately repaired at the Contractor's expense.

Temporary Water. The Contractor may use existing Owner water. Supplement as required. Provide additional piping, hoses, etc. as required. The contractor is to confirm the source of

any existing water to be used with the Owner prior to either connecting to, or opening, any source. Water lines may be unmarked and may relate to potable water, fire suppression systems, irrigation, or other service. Failure to confirm with the Owner the proper source could cause false alarms.

C. Temporary Electric Power. The Contractor may use existing Owner power, if it is appropriate. The Contractor is to determine, with the Owner, the source and voltage prior to making any connections. The Contractor is to confirm the source of power with the Owner prior to making any connections. The Contractor may be required to separately meter utility use. When the work is to be performed, the Owner is to be notified so they may observe any modifications being made. If existing power is inadequate for any reason, the Contractor is to provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload-protected disconnects, automatic ground-fault interrupters, and main distribution switch gear.

1. If the Contractor provides its own distribution system, overhead wiring shall be installed where least exposed to damage and the vertical clearance is adequate for any Owner related service or delivery vehicles.
2. No arc welders of heavy usage equipment are to be connected to the Owners system. The Contractor shall provide separate gas generators for this purpose.

D. Temporary Lighting. The Contractor may use existing Owner lighting. Where lighting is inadequate, supplement as follows:

1. Install and operate temporary lighting that will fulfill security and protection requirements without operating the entire system. Provide temporary lighting that will provide adequate illumination for construction operations and traffic conditions.
2. Provide a minimum of 5 foot-candles, higher if required by codes or regulations, of illumination in all building work areas where construction work is being accomplished; increase illumination to a minimum of 50 foot-candles for painting and other interior fine finish work. Provide additional illumination as directed for proper installation and inspection of interior finish work. Permanent lighting equipment may be used after it is installed provided that any damaged components are replaced, and that all components are cleaned prior to acceptance of the project.
3. Provide temporary lighting as required for Owner use during non-construction times where construction has caused existing lighting to be temporarily out-of-service or blocked by construction staging materials. Temporary lighting must provide illumination levels equal to pre-construction conditions.
4. Remove temporary lighting and power equipment and accessories and their connections at completion of the work or sooner if approved or directed.

[Specifier –Use for an existing facility - Edit as appropriate]

E. Temporary Heat. The Contractor may use existing Owner heating systems subject to compliance with provisions specified below. Where existing systems are inadequate, provide temporary heat required by construction activities for curing or drying of completed installations or for protection of installed construction from adverse effects of low temperatures or high humidity. Select safe equipment that will not have a harmful effect on workmen, completed installations, or elements being installed. Coordinate ventilation requirements to produce the ambient condition required and minimize consumption of energy.

1. No “salamander” type heaters are permitted in occupied facilities, or where the use is detrimental to finishes.
2. The existing heating system may be used in lieu of the temporary equipment in conformance with the following requirements:
    a. The responsibility for the heating system and its full operation is to be coordinated by the Contractor with the Owner until final acceptance of the building.
    b. Provide air filters on any building fan equipment used for temporary heat.

c. Return air dampers to be closed; unit to run with 100% outside air.

[or]

c. Ensure that procedures, engineering controls, and other appropriate controls are utilized to maintain acceptable indoor air quality for building occupants during the course of construction. Properly filter or completely seal off return air to prevent construction dust from entering occupied areas or getting into the HVAC system.
   1) Seal off all ventilation system ducting which is not actively required for temporary heating in construction spaces.
d. Filters for any heating or air handling equipment, or similar equipment operated during construction, shall be replaced by the Contractor prior to the Owner re- occupying the space, at no additional cost to Owner.
e. Re-lubricate all equipment used.
f. All testing, balancing and filter changes, etc., noted in mechanical specifications are still required in addition to any cleaning, changing of filters, etc., performed during temporary operations.
g. Should the Owner determine ducts are getting too dirty during construction, the Contractor shall clean inside of ducts by power vacuuming.

3. Pay all costs until final acceptance. Should Owner occupy part of the facilities during construction, the cost of contractor provided utilities will be apportioned upon agreed unit costs or the Contractor may be required to separately meter utility use.

[OR]

[Specifier – Use for a new facility in conjunction with second "G" below - Edit as appropriate]

F. Temporary Heat & Ventilation

1. Furnish by methods approved by Architect, temporary heat and ventilation including fuel and power and attendance as required for the work when no other heat or ventilation is available.
2. Provide facilities and temporary units as required to comply with requirements. Provide temporary heat and ventilation required to:
   a. Maintain adequate environmental conditions to facilitate progress of the work.
   b. Meet specified minimum conditions for installation of materials.
   c. Protect materials and finishes from damage due to temperature or humidity.
3. Provide adequate forced ventilation of enclosed areas to:
   a. Cure installed materials.
   b. Disperse humidity.
   c. Prevent hazardous accumulations of dust, fumes, vapors, or gases.
4. Portable heaters: Use standard approved units complete with controls; the use of "salamanders" will not be permitted, except in exceptional cases when prior approval of Architect is obtained and proper ventilation in conjunction with said use is provided, as approved.
5. Non-availability of temporary heat when required for said work is cause for stoppage of affected work.
6. Include all costs for temporary heat in bid items.
7. See technical divisions for temperatures required for work of the various trades.
8. Indoor Air Quality and Dust Control: Refer to Section 01 81 19, Indoor Air Quality.

[Specifier – Use for an existing facility in conjunction with first "F." above - Edit as appropriate]

G. Temporary Ventilation.

1. Ventilate enclosed areas to exterior to achieve curing of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases. Where/when toxic or volatile materials are used, Contractor shall provide containment within specific work zones and 100% ventilation in an effort to maintain indoor air quality.
2. Indoor Air Quality and Dust Control: Refer to Section 01 81 19, Indoor Air Quality.

[OR]

[Specifier – Use for a new facility in conjunction with second "F." above - Edit as appropriate]

G. Use Of Permanent Systems For Maintaining Proper Conditions Within Building

1. After the permanent heating system is sufficiently installed, it may be used in lieu of the temporary equipment upon approval by Mechanical Engineer and in conformance with the following requirements for said use:
    a. The responsibility for the heating system and its full operation remains with the Contractor until final acceptance of the building.
    b. Provide air filters on any building fan equipment used for temporary heat.
    c. Return air dampers to be closed; unit to run with 100% outside air.
    d. Filters for any heating or air handling equipment, or similar equipment operated during construction, shall be replaced by the Contractor before Owner occupies the space at no additional cost to Owner.
    e. Re-lubricate all equipment used.
    f. All testing, balancing and filter changes, etc., noted in mechanical specifications are still required in addition to any cleaning, changing of filters, etc., performed during temporary operations.
    g. Should the Owner determine ducts are getting too dirty during construction, Contractor shall clean inside of ducts by power vacuuming.
2. Pay all costs until final acceptance. Should Owner occupy part of facilities during construction, the cost of contractor provided utilities will be apportioned upon agreed unit costs or the Contractor may be required to separately meter utility use.
3. All heating system equipment warranties shall commence at Substantial Completion, regardless of when put into operation.
4. Indoor Air Quality and Dust Control: Refer to Section 01 81 19, Indoor Air Quality

H. Temporary Telephones and Fax Machine. The Contractor may request the use of existing Owner wiring system to arrange for its individual needs. The Owner will not pay for any costs the Contractor may be required to pay for rewiring or extending wiring to locations for the Contractors use. The Contractor is to arrange for its own direct billing of local and long-distance service and pay for all local and long distance service.

1. Provide separate lines for voice and for fax, using the project local area code. Provide a telephone and fax machine.
2. At the telephone, post a list of important telephone numbers.
3. The Contractor's Superintendent shall be required to carry a cellular phone with a local area code related to the project area code throughout the duration of the project. The phone shall be always on, except when the Superintendent is at the site office and available to the connected phone.

I. Temporary Toilets. Contractor shall provide temporary sanitary facilities, including temporary toilets, wash facilities, and drinking water fixtures. Comply with regulations and health codes for the type, number, location, operation, and maintenance of fixtures and facilities. Install where facilities will best serve the Project's needs.

[Specifier – delete if not required]

J. Temporary Storm Sewer. If storm sewers are available, provide temporary connections to provide drainage that can be discharged lawfully, or other storm drainage accommodations as indicated on the Civil documents. Provide drainage ditches, dry wells, stabilization ponds, and similar facilities as indicated on the Civil documents or as required by the agencies having jurisdiction.

1. Filter out excessive amounts of soil, construction debris, chemicals, oils, and similar contaminants that might clog sewers or pollute waterways before discharge.
2. Maintain temporary drainage facilities in a clean, sanitary condition. Following heavy use, restore normal conditions promptly.

3.03 TEMPORARY SUPPORT FACILITIES

A. Maintain support facilities until near Substantial Completion. Remove prior to Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to the Owner.

[Specifier - select which of the Para. "B" and "C" options below is appropriate]

B. Field Office. The Owner shall designate a space in the area of the Project for the Contractor to utilize as a temporary field office for Contractor personnel.

C. At the time of bid, this space has not been designated. However, the Contractor may assume that it is in reasonable proximity to the work area. The Owner will identify an accessible room (as required) for weekly Progress Meetings of sufficient size to accommodate table(s) and chairs for up to (15) attendees.

[OR]

B. Field Office. The Contractor shall provide a prefabricated or mobile unit to accommodate:
   1. With the capability to accommodate ADA access if needed.
   2. An office for the Contractor.
   3. A separate area of adequate size for weekly Progress Meetings of sufficient size to accommodate table(s) and chairs for up to (15) attendees and a lay-out table of adequate size to accommodate the construction documents. Space shall be wheelchair accessible.
   4. Locate field offices, storage sheds, and other temporary construction and support facilities for easy access and within the limits of construction and staging area.

C. Provide noncombustible construction for offices, shops, and sheds located within the construction area or within 30 feet of building lines. Comply with requirements of NFPA 241.

[OR]

B. Field Office. The Contractor shall provide a prefabricated or mobile unit to accommodate the Contractor's needs.
   1. With the capability to accommodate ADA access if needed.
   1. Locate field offices, storage sheds, and other temporary construction and support facilities for easy access and within the limits of construction and staging area.
   2. The Owner will identify a room for weekly Progress Meetings within the facility of sufficient size to accommodate table(s) and chairs for up to (15) attendees.

C. Provide noncombustible construction for offices, shops, and sheds located within the construction area or within 30 feet of building lines. Comply with requirements of NFPA 241.

D. Temporary Enclosures. Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities.

   1. The Contractor shall be responsible for the determination and maintenance of proper security measures for the job site temporary facilities for the duration of the construction Project including, but not limited to:
      a. Locks on all construction equipment boxes, temporary storage and office facilities, and construction equipment (vehicles, cranes, dozers, forklifts, etc.).
      b. Temporary construction cores for all exterior and storage room doors, locksets or cylinders.
      c. Where materials and equipment must be stored, and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism. Contractor is responsible for any theft or vandalism of its materials and equipment.
      d. The Contractor shall hold the Owner harmless from all damage, vandalism, stolen equipment or supplies on the Project Site for whatever reason, or from injury to or death of unauthorized persons trespassing on Project Site because of inadequate

security measures until the Owner releases the Contractor from security responsibilities in writing or at Final Completion, whichever occurs first.

2. Where heat is needed and the permanent building enclosure is not complete, provide temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
3. Install tarpaulins securely, with incombustible wood framing and other materials. Close openings of 25 sq.ft. or less with plywood or similar materials.
4. Close openings through floor or roof decks and horizontal surfaces with load bearing, wood-framed construction.
5. Where temporary wood or plywood enclosure exceeds 100 sq.ft. in area, use UL-labeled, fire-retardant-treated material for framing and main sheathing.

E. Chain Link Fence. Provide temporary six (6) foot high, or higher if indicated or needed by the contractor to limit access, chain link fence panels with top rail securely fastened to tubular metal posts set in heavy concrete bases to prevent easy relocation. As a minimum, provide around contractor staging area, and pedestrian pathways to Project site, or as otherwise indicated. Do not attach construction fencing to the building or permanent site improvement.

[Specifier - select which of the options below is appropriate]

F. Temporary Lifts, Hoists, Towers, or Crane. Temporary construction lifts, hoists, towers, or cranes, if determined by the Contractor to be necessary to accomplish the work required by this contract, shall be the responsibility of the Contractor. The locations for this equipment shall be within the limits of construction. Do not attach any supports to the building.

1. Structural support required for temporary lifts, hoists, towers, or cranes shall be provided by the Contractor. Structural support shall be designed by a licensed structural engineer and shall be submitted for review in accordance with Section 01 33 00, Submittal Procedures.
2. Placement of temporary construction lifts, hoists, towers or cranes outside of the limits of construction shall not be permitted.

[OR]

F. Temporary Lifts and Hoists. Provide facilities for hoisting materials and personnel. Truck cranes and similar devices used for hoisting materials are considered “tools and equipment” and not temporary facilities.

G. Temporary Elevator. The Contractor may elect to utilize an existing Owner designated elevator or provide his own alternate means of vertical transportation. The following conditions shall apply to each option:

1. Should the Contractor elect to utilize an existing Owner designated elevator, the following conditions shall apply:
   [Specifier – edit as appropriate.]
   a. If the building is occupied, the existing service elevator or designated elevator is used by the Owner for freight, mail, other daily deliveries and custodial use. The uses of the elevator by the Owner during Contractor’s normal working hours shall have priority over the Contractor’s use throughout the duration of the project.
   b. Any damage or interruption in the continuous operation of the elevator during Contractor’s normal working hours shall be addressed immediately by the Contractor. Contractor is to schedule use of the elevator to allow adequate time to accomplish any required repairs prior to the Owner’s next regular work shift.
   c. Damage or service interruptions requiring assistance from elevator maintenance personnel shall be initiated by the Contractor and shall be completed by the elevator maintenance staff under the State maintenance agreement. The emergency telephone in the service elevator may be used to contact DCF Customer Service where an attendant is able to contact a representative from the maintenance staff.

1) Assessment of the liability for the costs incurred to address the repairs shall be discussed at the Progress Meeting immediately following the repair. Damage that is a result of normal wear and tear will be repaired at State expense. Damage attributable to Contractor misuse/abuse shall be paid for by the Contractor.

d. Contractor shall inspect the elevator cab interior, along with the frames and doors at each floor, at the end of each working shift in which the service elevator is used by the Contractor. Contractor to prepare a written report, signed by the Contractor and on-site Owner's Representative, recording the results of this inspection and verifying that the elevator is in normal working condition. Copies of this record are to be kept on-site by the Contractor and shall be made available for inspection by Owner and A/E upon request.

e. The Contractor shall become familiar with the operations and weight restrictions of the elevator. Contractor use of the elevator shall be limited to ninety (90) percent of the rated capacity of the elevator. Contractor use of the elevator implies that the Contractor is aware of the operating procedures and is operating the elevator within the limits of weight restrictions as noted in this Section.

f. Protective materials shall be provided by the Contractor at the cab interior and the door frames on each floor. This protection shall consist of rigid insulation covered with plywood on all walls with provisions made for access to the elevator controls. The doors on each floor shall be covered with plastic sheeting or plywood for protection. These materials shall be attached in a manner which is not detrimental to the existing cab and/or jamb finishes. Protective materials may be left in place during the duration of the project. Removal of protection at the completion of the project, and repair/painting of any damage to existing surfaces caused during construction, shall be the responsibility of the Contractor.

g. The Contractor shall be responsible for pre-scheduling use of the elevator to the fullest extent possible. Use of the elevator shall be identified on the look-ahead schedule discussed at each progress meeting during the Construction Phase. The Owner shall be responsible for conveying this information to the tenants. This will allow tenants to anticipate and plan around times when the Contractor will require use of the elevator.

h. The Contractor is to consolidate need for elevator use to a shorter, concentrated block of time rather than intermittent uses over a longer period of time. Coordinate use with other Owner uses to minimize impact on Owner and/or tenants' normal operations throughout construction.

i. The Owner has noted that higher than average use is expected during the following times:
   1) The Legislative Session, which typically runs from January to March or April.
   2) The last week of each month due to material deliveries and other government functions. Scheduling of Contractor use of the elevators during these times shall be minimized.

j. The elevator has been fitted with an Owner installed key-operated door override. The override acts to hold the elevator doors in an open position to allow adequate time for movement of construction debris and carts in and out of the cab. Use of this feature by the Contractor shall be restricted to those times when materials are being actively loaded or unloaded. The Owner will provide two keys for the hold-open switch to the Contractor at the beginning of the Construction Phase. The Contractor shall be responsible for ensuring that all construction personnel using the service elevator are familiar with the requirements of this section. The keys shall be returned to the Owner upon completion of the project.

k. A dedicated elevator operator shall not be required. However, the Contractor shall be responsible for monitoring all construction related use of the elevator, whether by Contractor or by Subcontractors.

l. Contractor to submit a written report, for the State's review and concurrence, prior to the start of the Construction Phase which clearly states the condition of the motor, hoist cables, doors, and jambs. This report will be used as a baseline for evaluation of

conditions at the conclusion of the contract, or in response to damage during the project. The report shall include photographs taken two or three days before installing protective material at the elevator to document the pre-construction status. These photographs shall include the walls, ceiling, floor and door of the cab interior along with outside faces of doors and jambs at each floor level.

m. An on-site meeting shall be required prior to the Contractor's first use of the elevator to discuss these issues. The meeting will be attended by the Contractor, Owner, and A/E. At the meeting, the Owner will document the pre-use condition and will familiarize the Contractor with the operating characteristics of the elevator.

n. The Owner reserves the right to retract the availability of the elevator for Contractor use at any time during the project if the conditions of use as outlined above are not followed by the Contractor. No additional time or expenses will be authorized for developing alternate means of vertical transportation if the Owner retracts this privilege due to Contractor's non-compliance with conditions as outlined in this section.

2. Should the Contractor elect to provide alternate means of vertical transportation, the following conditions shall apply:

   a. The type of vertical transportation shall be determined by the Contractor.

   b. The location of the alternate means of vertical transport must be within the limit of construction area. The specific location shall be determined by the Contractor. Any vertical transportation system provided by the contractor shall not attach to the building unless approved by the Owner.

   c. The cost for the alternate means of vertical transport, including but not limited to installation, operation and removal, shall be the responsibility of the Contractor and shall be included in the base bid of the project.

H. Project Identification and Temporary Signs.

1. Project Identification Signs: The Site Representative will coordinate the procurement and placement of the project sign with the Capitol Campus Sign Shop, which shall have a maximum size of 4' x 8'. Prevailing standards will be incorporated, including use of non-gendered graphics and text, and which will include the following information:

   a. Department of Enterprise Services Logo and name.
   b. Project Name.
   c. Schedule (Start to Final Completion).
   d. Project Lead (Office of Capitol Planning & Management).
   e. Project Manager (PPD PM).
   f. Designer (A/E of record).
   g. Contractor (awarded).
   h. Budget (Contract award amount including bid and alternates used).

2. Temporary Signs: Temporary signs for directional information, or required because of union regulations, are acceptable. Contractor shall prepare such signs as required to provide directional information to construction personnel and visitors. Support on posts or framing of preservative-treated wood or steel. Do not permit installation of unauthorized signs.

3. Contractor will be allowed one (1) separate sign placed on their temporary field office structure, limited to a maximum 3' x 3' size.

I. Temporary Exterior Lighting. Install exterior yard and sign lights so signs are visible when Work is being performed.

J. Collection and Disposal of Waste. Refer to Section 01 74 19, Construction Waste Management and Disposal.

[OR]

[Specifier – use this paragraph "J" if separate Section 01 74 19 is not included.]

J. Collection and Disposal of Waste. Collect and dispose of waste from construction areas and elsewhere daily. Comply with requirements of NFPA for removal of combustible waste material and debris. Strictly enforce requirements. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 deg F. Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material lawfully. On-site containers and dumpsters for collection of waste materials, debris, and rubbish will be permitted only in the Contractor's approved areas and must be provided by the Contractor. The type of dumpster and method of disposal shall be determined by the Contractor.

1. Clearance restrictions at the site may prohibit the use of large and/or front-end loaded dumpsters.
2. Contractor shall supply their own cleaning equipment, dumpsters and barrels. No use of similar Owner items is permitted.

K. Stairs. Until permanent stairs are available, provide temporary stairs where ladders are not adequate. Cover finished, permanent stairs with a protective covering of plywood or similar material so finishes will be undamaged at the time of acceptance.

L. Traffic Maintenance and Control. Whenever the Contractor's operations affect public vehicular or pedestrian traffic including accessible routes for people with disabilities, the Contractor shall be responsible for the installation and maintenance of any and all traffic and pedestrian control devices including flaggers, signage, temporary barriers and other measures as deemed necessary by the authority having jurisdiction.

1. Right-of-Way. Strict attention should be paid to maintaining fire lanes, roadways, walkways, accessible routes of travel including entrances and loading areas with a minimum interruption, with appropriate safety measures, and as required by Owner, Department of Labor and Industry, Police Department, and Fire Department. Obtain written approval to restrict any public or private street, sidewalk, lane or alley from Owner. Restrictions include partial or full lane closures, parking restrictions, sidewalk closures, detours, complete street closures, shoulder work, and pedestrian rerouting, as well as the placing of building materials or equipment on public right-of-way. At least one accessible route of travel for people with disabilities is required to be maintained at all times to the building and the path around the building. Requirements as follows:
    a. Obtain Owner's written approval for any work as indicated below:
        1) 5 days' notice for partial closure of an arterial street and complete closure of any local access street, alley or sidewalk.
        2) 3 days' notice for restriction of any parking.
        3) 2 weeks notice for complete closure of any arterial street.
    b. The actual time and date of all closures will be subject to approval by Owner. Closures normally will be scheduled for nights, weekends, holidays, breaks, or other low intensity use periods. Normally, no work will be scheduled in the public use areas between the hours of 7 a.m. to 9 a.m. and 3 p.m. to 6 p.m.
    c. The duration of all closures shall be held to a reasonable minimum.
    d. Include in the bid all costs associated with equipment and utility shutdowns. Owner will make no extra payment for overtime work, schedule changes or failure to complete utility connections within authorized shutdown periods.
    e. Design and usage of traffic control devices shall conform to the specifications contained in the Manual on Uniform Traffic Control Devices (MUTCD) from the U.S. Department of Transportation, Federal Highway Administration.
    f. Unless a section of street is to be completely closed to vehicular traffic, work shall be accomplished with minimum disruption to the flow of traffic. Schedule and layout work areas to maintain the maximum number of traffic lanes normally available to be opened in the direction of the heaviest flow of traffic during peak hours.

g. Clean pedestrian and driving surfaces daily or more often as required to keep the paths clean. Clean spillage from trucks immediately. Keep adjacent areas clean.

2. Vehicular Access to the Project Area shall be limited as follows:
[Specifier – a. through f. are examples, modify as required; text in [ ] is specific to Capital Campus OB-2 or DOT buildings]

[a. Interior areas shall be accessed by the ramp from 14th Street to the OB-2 Service Level garage. Egress is through the OB-2 garage, down a ramp into the NRB (Natural Resources Building) tunnel which travels east and exits onto Jefferson Street. Access into and out of these areas is one-way traffic only but is generally open 24 hours per day.]

[b. Access to the OB-2 Service Level garage shall be limited to vehicles not exceeding 27-feet in length and 13-feet in height due to height restrictions and turning limitations. No vehicles exceeding these limits shall be permitted in the garage. Contractor shall be responsible for any damage caused by Contractor's or subcontractor's vehicles exceeding these limits.]

c. Do not park vehicles in traffic lanes. [Loading and unloading of tools and material will be allowed at the loading docks, however, the loading dock will also be used by the tenants during Contractor's normal working hours and its use must be coordinated with the Owner. Coordinate with Owner a minimum of three (3) days in advance.]

d. Conduct operations in such a manner to avoid unnecessary interference to existing pedestrian and vehicle traffic. Provide flaggers and traffic control signs and devices as necessary and/or as required by Owner. Follow construction traffic routes as specified by Owner or provide traffic plan detailing proposed method of delivery, storage, equipment.

e. [Vehicle deliveries shall be prohibited from entering the Plaza Garage. The height and clearance restrictions in the Plaza Garage are not sufficient for vehicles other than passenger vehicles.]

1) Limit vehicle deliveries during Owner peak traffic hours of 7:00 a.m. to 9:00 a.m. and 3:00 p.m. to 6:00 p.m.

f. [Access to and within OB-2 is extremely limited.] Interfering with existing traffic and pedestrian patterns is not permitted during construction except as permitted by the drawings.

1) Do not remove or alter any exiting vehicular traffic control, parking, building, or any other signs or devices without obtaining approval from Owner and/or the AHJ.
2) Do not install any of the above-mentioned type of signs without approval of Owner and/or the AHJ.

g. The Contractor shall review delivery routes to the construction site and staging areas to determine any limitations for height or length of delivery vehicles. The Contractor shall be responsible for any damage repair costs caused by either Contractor or subcontractor's vehicles or deliveries to the Contractor or subcontractors.

3. Contractor Parking. Parking is limited to the Contractor's staging area or streetside metered parking. The Contractor may purchase parking permits from the Owner for any available parking in Owner parking areas. Contractor shall pay meter fee and/or pay to obtain permits for parking.

a. Service stalls shall not be used for contractor staff parking. Service stalls are designated for temporary service workers such as a Quest or other communications vehicle, an Owner vehicle, or other short term service parking. Contractor staff shall register with Owner for assigned parking at a space available basis at the prevailing fee per month.

b. Parking by the Contractor is not permitted in any stalls designated as "RESERVED", ADA, or otherwise marked, regardless of what time of day. Parking citations and/or impounding of vehicles may result from failure to comply with these regulations and will be the sole responsibility of the Contractor.

c. The Project 'staging area' is not intended to be used for Contractor staff parking in general.

M. Temporary Equipment

1. Thermometer:
   a. Maintain one twelve-inch minimum size high/low register outdoor thermometer. Mount at convenient location not in direct sunlight. Contractor to record daily, high and low temperatures and include on Contractor's Quality Control Daily Report form; refer to Section 01 45 16.
   b. Thermometer Range: Minus 60 to plus 110F.
2. Protective Headgear: Provide for visitor's use ten (10) new adjustable WISHA approved hard hats.

N. Construction Aids

1. Provide construction aids and equipment required by personnel to facilitate the execution and inspection of the work.
   a. Include scaffolds, staging, ladders, stairs, ramps, runways, platforms, railings, hoists, cranes, chutes, protective enclosures, and other such facilities and equipment.
   b. Refer to respective Sections for particular requirements for each trade.
2. Maintain all facilities and equipment in a first-class condition.
3. Comply with all applicable requirements specified in Project Manual. Install in accordance with "Quality Assurance" provisions, Specifications and Manufacturer's instructions. Where these may be in conflict, the more stringent requirements govern.
4. Relocate construction aids as required by:
   a. Construction progress.
   b. Storage requirements.
   c. Accommodation of Owner's legitimate requirements.
   d. Accommodation of any other Contractor employed at site.
5. Completely remove temporary materials, equipment and services when construction needs can be met by use of permanent construction, or at Project completion.
6. Clean and repair damage caused by installations or by use of temporary facilities and clean site areas affected by temporary installations. Restore damaged vegetation.
7. Restore existing permanent facilities used for temporary purposes to be specified or to original conditions.

O. Cleaning: Refer to Section 01 74 00 Cleaning, for cleaning during construction and final cleaning.

3.04 PROTECTION OF EXISTING FACILITIES AND OCCUPANTS

[Specifier – Portions of this Article are unique only to the East Campus Plaza area OB2 building and can be deleted if the project is elsewhere. Otherwise, review and modify as needed.]

A. Contractor shall plan their work to ensure that they complete construction in accordance with the Contract Time allowed while complying with the access and time restrictions established.

B. Building shall remain accessible to all abled and disabled pedestrian traffic. Contractor shall maintain required means of fire egress throughout the Contract duration.

[C. Contractor shall provide exterior grade plywood as required to protect newly installed roofing membrane and concrete slabs from the work of all follow-on trades.]

[D. Areas beneath OB-2 plaza are to remain occupied at all times. These areas house offices, storage, cafeteria, computer operations, and parking. At all times during the Project, Contractor shall temporarily cover any existing horizontal structural deck surfaces exposed by

demolition which have not been permanently covered by the installation of new roofing membrane. It is Contractor's responsibility to maintain a watertight condition until the new watertight roofing is applied. Failure to do so will require Contractor to provide the following:]

[OR]

D. Weather Protection: The Contractor shall be responsible for maintaining occupied spaces in a watertight condition that will be affected by the Project work. At all times during the project, the Contractor shall temporarily cover any existing horizontal or vertical surfaces exposed by demolition which have not been finished by the installation of permanent new material. Failure to do so will require the contractor to provide the following:

1. Contractor shall provide and install 6 mil plastic sheeting and tape to cover all building elements including, but not limited to, furniture, files, office equipment, fixed and portable computer equipment, building mechanical and electrical equipment, food service equipment, foods, and food preparation and servicing areas, as applicable.
2. Plastic sheeting shall be tented over equipment to allow for continuous operation of equipment (do not block air intakes or exhausts). While allowing for operation or access to equipment, protect from dust, debris and water intrusion.
3. This action shall not relieve the Contractor from their responsibility for damage resulting from moving the equipment, dropping or moving construction materials, utility failures or other actions committed or caused by the Contractor in the process of construction.
4. Sheeting shall be installed under areas where demolition or construction activities or testing will expose interior space below to potential airborne dust, loosened building debris, or water intrusion.
5. Material shall be promptly removed after exposure to hazards has passed. Remove all tape residue and repair any damage caused by installation and removal of sheeting material.

E. Indoor Air Quality and Dust Control: Refer to Section 01 81 19, Indoor Air Quality.

F. Dustproof Partitions and Dust Propagation Prevention

1. The Contractor shall be responsible for protecting areas outside of the limits of construction from the environment within the limits of construction for the duration of construction. Contractor shall install and maintain dust-proof enclosures and other equipment as required to separate the work area from occupied areas or equipment. Dustproof partitions shall extend floor-to-ceiling, or to structure above where area above the finished ceiling is a return air plenum, providing an air-tight enclosure at each location. Provide partitions with double chamber passageway doors or flaps.
   a. The Contractor shall submit a temporary dust partition plan, dust evacuation plan and construction sequence plan. This plan shall be approved by the Owner and A/E before construction is permitted to begin.
2. All material used for dust propagation prevention shall be fire-retardant type. Plastic sheeting, if used, shall be a minimum of 6 mils thick.
3. Provide temporary dust-proof partitions, sealing of existing doors and all other penetrations of the contractor's work area. to confine dust or debris-producing activities for all dust or moisture-producing operations. Include use of portable air filtration equipment in confined spaces where extensive off-gasing and/or dust is expected. Confinement to the immediate work area is mandatory. Type and location of protective measures shall be proposed by the Contractor in accordance with the proposed work plan and be coordinated with the Owner. The building outside of the limits of construction shall be maintained in current operational condition throughout the duration of the project.
4. Provide negative air machines with venting to the exterior, to assure negative air pressure within the construction work area.
5. All cutting, grinding, sanding, sweeping and other dust producing activities shall be accomplished wet. Particular attention must be taken to ensure that the HVAC system does not become contaminated or spread dust. Dust spreading from the point of origin

(including floor and ceiling plenums) must be minimized, even within confines of dust- proof partitions.

6. Removal of material shall be accomplished in units as large as possible to minimize the dust created by breaking material into smaller pieces.
7. Field cutting of material installed by this project shall be sequenced and located to minimize the impact of dust.
8. Contractor shall provide dust protection around any staging area outside the Limits of Construction that is within an enclosed building or parking area if area is used for cutting materials. Contractor shall be responsible for damage to parked cars or the building mechanical system caused by dust created in this area.

G. Odor Control: Project products will contain solvents that when used inside a building, or if used outside can be drawn into the building through the air intake systems. Both situations will be sensitive to occupants within the building. The Contractor shall provide a written procedure for the control of emissions prior to any use. Isolate and vent to the outside if within a building or provide preventative measures for being drawn into air intakes for areas where solvents are to be used.

H. Noise and Vibration Control

1. The following environmental performance standards are to be considered a minimum level of requirement for this project, unless local AHJ requirements are more restrictive. The maximum allowable noise levels as measured at the property line of noise impacted uses or activities shall not exceed the following levels:

Maximum Sound Level (dB(A))	Duration of Any One-Hour Period (min)	Applicable Hours**
47	Continually	10 p.m. – 7 a.m.
52	15	
57	5	15*
62	1	10 p.m. – 7 a.m.

* Total not to exceed 15 minutes in any one hour.
** The lower noise levels apply on all hours of weekends and holidays.

2. Maintain the level of construction noise inside adjacent buildings and/or rooms from exceeding 85 dBA during the periods the Contractor is working. Contractor shall meet this criterion by erecting barriers between equipment or job and such interior areas, or by providing equipment noise attenuators.
3. Machinery and Equipment – General: Electric-driven is preferred in place of gas- or diesel-powered machinery. If noise levels on any equipment cannot reasonably be brought down to criteria, either that equipment will not be allowed on the job or use times will have to be scheduled subject to approval of the Owner. Conformance to this specification shall be included in the Contract price and no compensation shall be allowed for special equipment, overtime, etc., that may be required.
4. Outdoor Vehicle and Internal Combustion Engine Noise: Notwithstanding the exterior noise level requirements specified in paragraph “1.” above, the noise level of each piece of vehicle and internal combustion engine noise shall not be greater than 85 dBA at a distance of 50 feet as measured under noisiest operating conditions. Rubber-tired equipment shall be used whenever possible instead of equipment with metal tracks. Mufflers for stationary engines shall be equipped with noise attenuators of hospital-area quality for silencing. Construction traffic plan shall be approved by the Owner. Routing shall be through the nearest exit, subject to approval of Owner.
5. Equipment:

a. Air Compressors: Equip air compressors with isolating spring base for vibration and silencing packages for noise reduction. Electric-driven preferred.
b. The use of core-drilling or saw cutting equipment, or electric driven drills, is required for all demolition. Scabblers and Roto Hammers are permitted. Other pneumatic tools are not allowed without prior approval.

[Specifier – coordinate the following with Owner and with requirements of Section 01 73 29, Cutting & Patching.]

[OR]

b. Jack Hammers and Roto Hammers: May be used where no other alternative is available, if permitted by the Owner. The use of core-drilling or saw cutting equipment or electric driven drills is preferred. [Time of use subject to approval by Owner's Representative.] [All use of air hammers and other noisy or vibrating equipment to occur prior to 8 a.m. and after 5 p.m., subject to approval by Owner.]
    1) The Contractor may request that heavy-duty jack hammers be permitted where no other alternative is available. Requests for prior approval shall be submitted following the same procedures outlined in the Service Outage sections. Request must state the reason that other means are not feasible, the duration of proposed hammering and the noise level & vibration expected by this work.
    2) The Contractor shall anticipate that the time required for Owner review may be a minimum of (30) days. Owner review may not result in method being approved. Contractor shall not proceed with proposed method until receiving written permission from the Owner. If permitted, Owner may restrict the hours when use of such equipment will be permitted. No additional cost will be approved for time claimed due to this review request, whether the request is ultimately accepted or denied.
c. Arc Welders: No arc welders are to be connected to Owner's utilities, unless approved by the Owner. Provide separate gas generators for arc welders.
d. Limited Hours of Use Within Buildings: Within occupied facilities, noise producing equipment used is subject to approval of Owner and shall be, in general, allowed only before 7 a.m. and after 6 p.m. Specific scheduling is required, with two (2) weeks advance notice required and approval by Owner.

I. Pollution Control

1. Provide methods, means, and facilities required to prevent contamination of soil, water, and atmosphere. Allow no discharge of noxious substances from construction operations.
2. Provide equipment and personnel and perform emergency measures required to contain any spillages. Remove contaminated soils and liquids.
    a. Excavate and dispose of all contaminated earth off-site in compliance with laws and regulations.
    b. Replace with suitable compacted fill and topsoil. Provide Owner with receipt of soil acceptability prior to installation.
3. Take special measure to prevent harmful substances from entering public waters.
    a. Prevent disposal of wastes, effluents, chemicals, and other such substances in or adjacent to bodies of water, or in sanitary or storm sewers.
    b. When any runoff contains hazardous chemicals, collect and dispose of legally. Submit proposed collection methods to A/E and Owner for approval by Owner.
4. Provide systems for control of atmospheric pollutants in accordance with Federal/State/ Local published rules and regulations.
    a. Prevent toxic concentrations of chemicals.
    b. Prevent harmful dispersal of pollutants into the atmosphere.

J. Tree, Plant & Lawn Protection

1. Preserve and protect existing trees, plants and lawns at the site which are designated to remain, and those adjacent to the site.

a. Historic or other highly significant trees as identified by the Owner shall have a specific tree protection plan in place prior to construction. This plan shall be approved by the DES horticulturist or a certified arborist. Any variances to this plan shall be approved by the DES horticulturist or a certified arborist.

2. No storage or traffic shall be permitted within the drip or root zone of any planting.
3. Carefully supervise excavating, grading and filling, and subsequent construction operations, to prevent damage.
   a. All work within the branch spread of trees shall be done by hand. When roots are encountered during excavation, the Owner shall be immediately notified. Do not further expose or cut until a determination is made by the A/E or Site Representative. Where roots are to be cut, pruned cleanly. Protect all exposed roots with moist organic mulch or burlap; backfill as soon as possible.
   b. Under no circumstances shall the Contractor, for his convenience or ease of construction, remove existing trees designated to remain.
   c. Fertilize all trees where roots have been exposed.
4. If branches or roots need to be removed due to construction, use a certified arborist approved by the Owner to perform such work.
5. Any damaged plant material that is to remain shall be replaced with the same species and equal size, or repair in accordance with arborist requirements, at no cost to the Owner. Damage is defined as changes to the tree appearance which were not originally there.
   a. Trees which cannot be suitably replaced greater than six (6) inch caliper shall be paid for at the rate of $150.00 per square inch of cross-sectional area measured three (3) feet above existing grade. This amount shall be credited to the Owner.
   b. Damaged and destroyed trees shall be removed from the site, the stumps grubbed, and the ground surface repaired, all at Contractor's expense.
6. Do not drive heavy equipment directly over lawn areas; protect with boards and/or plywood to prevent rutting and need for restoration. Remove protection at the end of each workday so as to maintain healthy growth and reapply as necessary. Any damaged lawn areas shall be restored to an 'as-is' condition.

K. Landscape Maintenance and Restoration

1. If a landscaped area is indicated to be a construction staging/parking area, protect surface adequately to avoid damage. Restore to existing condition using the following requirements:
   a. Remove all construction equipment, building material, debris, and remnants of destroyed sod or plantings before commencing landscape restoration.
   b. Rough grade the site according to the existing conditions or specified grading plan.
   c. Till or hand pick (except under trees) soil to a depth of 8 inches. Remove any rocks over 1 inch in diameter, torn roots and debris.
   d. Amend soil, if topsoil does not exist or was removed, with 4 inches of organic material and till to a depth of 12 inches.
   e. Fine grade the area according to existing conditions or to exact grading specifications.
   f. Replace materials to match original conditions.
2. Tree and Shrub Planting
   a. Location and spacing of trees, shrubs and groundcover according to existing conditions shall be determined in the field with the A/E and Owner. Do not plant material without an approval or in field locating.
   b. Standard planting procedure shall consist of:
      1) Preparing a hole for the plant of 1-1/2 times the diameter of the rootball to be planted.
      2) Do not dig the hole any deeper than the rootball to assure proper surface grade. Bottom of hole shall have loss material amended with organic material.
      3) The plant shall be planted at the proper depth.

4) The hole shall be backfilled with existing loose soil taken from the excavation of the hole and watered in until the proper grade is achieved.
5) Remove any strings and/or ties around base of trunk after planting.
6) Remove wire cage, if present, prior to backfilling.
7) Stake tree as low as possible to the ground following industry standard staking guidelines; refer also to Planting Standard 32 90 00.

3. Final Landscape Inspection: Final inspection shall take place at the completion of the work to verify conformance to the specifications and/or original conditions.
4. The Contractor shall maintain its staging area by mowing or trimming grass and other growth to a height no greater than six (6) inches.

[Specifier Note: Verify with Project Manager if the following is applicable.]

L. Bat Infestation: Once any opening large than 1/4" is made in the wall surface, the entire open area shall be fully covered in a manner that will preclude bat infiltration.
1. Materials: Open weave sun protection fabric of the type used in greenhouses. Openings not greater than 1/16" or approved equal.
2. Covering shall be installed at the end of each day's work and removed as required to perform work the following day.
3. Contractor shall consult with Owner and pest service to ensure that all steps necessary are taken to ensure against bat infiltration.
4. Protection shall remain in place until wall all openings are completely sealed.

3.05 OPERATION, TERMINATION, AND REMOVAL

A. Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.

B. Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.
1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
2. Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

C. Unless the A/E requests that it be maintained longer, remove each temporary facility when the need has ended, when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
1. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where the area is intended for landscape development, remove all materials placed by the contractor that do not comply with requirements for fill or subsoil in the area. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at the temporary entrances, as required by the governing authority.
2. At Substantial Completion, clean and restore permanent facilities used during the construction period to its original condition.

END OF SECTION 01 50 00

OUTAGE AND B&G SUPPORT REQUEST FORM

Must be received by Customer Service Center **two working days** prior to outage.
DO NOT BEGIN WORK UNTIL YOU HAVE BEEN NOTIFIED FOR APPROVAL OF THIS REQUEST.
If you have any questions, contact: *CUSTOMER SERVICE CENTER* AT 725-0000.

OUTAGE NUMBER:

Building Name: _____ WR Number: _____

Date of Application: ____/____/____ Requester's Name: _____

Agency:_____ Phone #: _____ Pager #: _____

Date Requested for Outage From: ____/____/____ To: ____/____/____

Time Requested for Outage From: ____:____ To: ____:____ **(use 24 hr. clock time)**

CHECK AS APPROPRIATE: ☐ Regular Hours ☐ After Hours ☐ Weekend ☐ Holiday

Describe the work to be performed (reason for outage): _____

List areas, portions of building(s), grounds, systems, etc., which will be affected: _____

Will permits be required? _____ IF YES, B&G must be contacted and specific approval for

work must be obtained. Drawings showing the location must be submitted with this application.

CAPITAL PROJECTS ONLY: Project Name & Number: _____

Contractor(s): _____ Phone #: _____

Property Manager/Site Observer _____ Phone #: _____

Date & Time Received _____ ***Received By (initial)*** _____

APPROVAL and VERIFICATIONS:

B&G Zone Coordinator: _____ Life Safety: _____

Tenant Agencies Contacted: _____ _____

_____ _____

GUIDE SPECIFICATIONS

The following specification is intended to be used, generally verbatim, in the contract documents. ***[Specifier notes]*** shall be deleted during the editing process. Where [ ] appear in this document, this indicates requirements which are optional depending upon the project scope and conditions. Edit as appropriate for the project. The A/E consultant shall take ownership and responsibility for the contents of this section and is expected to modify other portions as necessary to accurately reflect conditions of the project. For draft copies during the design process, use Microsoft Word, Track Changes. Set criteria so that deletions show as strikethroughs. Deletions and additions are to be in red.

PART 1 - GENERAL

1.01 SUMMARY

A. The scope of work includes all labor, materials, tools, equipment, facilities, transportation and services necessary for, and incidental to performing all operations in connection with protection of existing trees and other plants as shown on the drawings and as specified herein.

1. Provide preconstruction evaluations
2. Provide tree and plant protection fencing.
3. Provide protection of root zones and above ground tree and plants
4. Provide pruning of existing trees and plants.
5. Coordinate with the requirements of Section Planting Soil for modifications to the soil within the root zone of existing trees and plants.
6. Provide all insect and disease control.
7. Provide maintenance of existing trees and plants including irrigation during the construction period as recommended by the arborist report.
8. Provide maintenance of existing trees and plants including irrigation during the post construction plant maintenance period.
9. Remove tree protection fencing and other protection from around and under trees and plants.
10. Clean up and disposal of all excess and surplus material.

1.02 RELATED DOCUMENTS AND REFERENCES

A. `Related Documents:

1. Drawings and general provisions of contract including general and supplementary conditions and Division 01 specifications apply to work of this section.
2. Section - Planting Soil
3. Section - Irrigation
4. Section - Planting
5. Section - Lawn

B. References: The following specifications and standards of the organizations and documents listed in this paragraph form a part of the specification to the extent required by the references thereto. In the event that the requirements of the following referenced standards and specification conflict with this specification section the requirements of this specification shall prevail. In the event that the requirements of any of the following referenced standards and specifications conflict with each other the more stringent requirement shall prevail.

1. ANSI A 300 (Part 5) – Standard Practices for Tree, Shrub and other Woody Plant Maintenance, most current editions

2. Pruning practices shall conform with recommendations “Structural Pruning: A Guide for The Green Industry”; Published by Urban Tree Foundation, Visalia, California; most current edition.
3. Glossary of Arboricultural Terms, International Society of Arboriculture, Champaign Il, most current edition.

1.03 DEFINITIONS: All terms in this specification shall be as defined in the “Glossary of Arboricultural Terms” or as modified below.

A. Owner’s Representative: The person appointed by the Owner to represent their interest in the review and approval of the work and to serve as the contracting authority with the Contractor. The Owner’s Representative may appoint other persons to review and approve any aspects of the work.

B. Reasonable and reasonably: When used in this specification is intended to mean that the conditions cited will not affect the establishment or long-term stability, health or growth of the plant. This specification recognizes that plants are not free of defects, and that plant conditions change with time. This specification also recognizes that some decisions cannot be totally based on measured findings and that profession judgment is required. In cases of differing opinion, the Owner’s Representative expert shall determine when conditions within the plant are judged as reasonable.

C. Shrub: Woody plants with mature height approximately less than 25 feet.

D. Tree and Plant Protection Area: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and defined by a circle centered on the trunk with each tree with a radius equal to the crown dripline unless otherwise indicated by the owner’s representative.

E. Tree: Single and multi-stemmed plants, including palms with anticipated mature height approximately greater than 25 feet or any plant identified on the plans as a tree.

1.04 SUBMITTALS

A. Arborist Report: Prior to the start of construction, submit, for approval by the Owner’s Representative, the report of a consulting arborist who is a registered Consulting Arborist® (RCA) with American Society of Consulting Arborists or an ISA Board Certified Master Arborist, which details the following information for all trees to remain within the area designated on the drawings as the Tree and Plant Protection Area. The report shall include the following:

1. A description of each tree to remain indicating its genus and species, condition including any visible damage to the root system or soil within the root zone, tree diameter at breast height (dbh) and approximate height, size and any visible disease, insect infestations and or branch and trunk structural deficiencies.
2. The report shall note all trees or parts of trees, which are considered a hazard or significant or extreme risk level. Include the International Society of Arboriculture hazard evaluation sheet for each tree, which may reasonably be identified as a potential hazard tree.
3. Recommendations as to treatment of all insects, disease and structural problems encountered.
4. Recommendations for fertilizer treatments, if any.
5. A plan of the site showing the location of all trees included in the report.

B. Product Data: Submit manufacturer product data and literature describing all products required by this section to the Owner’s Representative for approval. Provide submittal four weeks before the start of any work at the site.

C. Qualifications Submittal: For each applicable person expected to work on the project, provide copies of the qualifications and experience of the Consulting arborist, proof of either the registered Consulting Arborist® (RCA) with American Society of Consulting Arborists or an ISA Board Certified Master Arborist and any required Herbicide/Pesticide license to the Owner's Representative, for review prior to the start of work.

1.05 QUALITY ASSURANCE

A. Contractor qualifications:
   1. All pruning, branch tie back, tree removal, root pruning, and fertilizing required by this section shall be performed by or under the direct supervision of ISA Certified Arborist Submit aforementioned individual's qualifications for approval by the Owner's Representative.
   2. All applications of pesticide or herbicide shall be performed by a person maintaining a current state license to apply chemical pesticides valid in the jurisdiction of the project. Submit copies of all required state licensing certificates including applicable chemical applicator licenses.

B. Pre-Construction Conference
   1. Schedule a pre-construction meeting with the Owner's Representative at least seven (7) days before beginning work to review any questions the Contractor may have regarding the work, administrative procedures during construction and project work schedule. The following persons shall attend the preconstruction conference:
      a. General Contractor.
      b. Consulting Arborist.
      c. Subcontractor assigned to install Tree and Plant Protection measures.
      d. Earthwork Contractor.
      e. All site utility Contractors that may be required to dig or trench into the soil.
      f. Landscape subcontractor.
      g. Irrigation subcontractor
   2. Prior to this meeting, mark all trees and plants to remain and or be removed as described in this specification for review and approval by the Owner's Representative.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Mulch
   1. Mulch shall be coarse, ground, from tree and woody brush sources. The minimum range of fine particles shall be 3/8 inch or less in size and a maximum size of individual pieces shall be approximately 1 to 1-1/2 inch in diameter and maximum length of approximately 4 to 8 inches. No more that 25% of the total volume shall be fine particles and no more than 20% of total volume be large pieces.
   2. It is understood that Mulch quality will vary significantly from supplier to supplier and region to region. The above requirements may be modified to conform to the source material from locally reliable suppliers as approved by the Owner's Representative.
   3. Submit supplier's product data that product meets the requirements and two gallon sample for approval.

B. Wood Chips: Wood chips from an arborist chipping operation with less than 20% by volume green leaves. Chips stockpiled from the tree removal process may be used.

C. Tree Protection Fencing:

1. Plastic Mesh Fence: Heavy - duty orange plastic mesh fencing fabric 48 inches wide. Fencing shall be attached to metal “U” or “T” post driven into the ground of sufficient depth to hold the fabric solidly in place without sagging. The fabric shall be attached to the post using attachment ties of sufficient number and strength to hold up the fabric without sagging. The Owner’s Representative may request, at any time, additional post, deeper post depths and or additional fabric attachments if the fabric begins to sag, lean or otherwise not present a sufficient barrier to access.
2. Chain Link Fence: 6 feet tall metal chain link fence set in metal frame panels on movable core drilled concrete blocks of sufficient size to hold the fence erect in areas of existing paving to remain.
3. Gates: For each fence type and in each separate fenced area, provide a minimum of one 3-foot-wide gate. Gates shall be lockable. The location of the gates shall be approved by the Owner's Representative.

D. Tree Protection Sign: Heavy-duty cardboard signs, 8.5 inches x 11 inches, white colored background with black 2 inch high or larger letters block letters. The signs shall be attached to the tree protection fence every 50 feet o.c. The tree protection sign shall read “Tree And Plant Protection Area- Keep Out”.

E. Tree Growth Regulator (TGR): Cambistat 25C, or approved.

F. Matting: Matting for vehicle and work protection shall be heavy duty matting designed for vehicle loading over tree roots, Alturnamats as manufactured by Alturnamats, Inc. Franklin, PA 16323 or approved equal.

G. Geogrid:
1. Geogrid shall be woven polyester fabric with PVC coating, Uni-axial or biaxial geogrid, inert to biological degradation, resistant to naturally occurring chemicals, alkalis, acids.
2. Geogrid shall be Miragrid 2XT as manufactured by Ten Cate Nicolon, Norcross, GA. http://www.tencate.com or approved equal.

H. Filter Fabric:
1. Filter Fabric shall be nonwoven polypropylene fibers, inert to biological degradation and resistant of naturally occurring chemicals, alkalis and acids.
2. Mirafi 135 N as manufactured by Ten Cate Nicolon, Norcross, GA. http://www.tencate.com or approved equal.

PART 3 - EXECUTION

3.01 SITE EXAMINATION

A. Examine the site, tree, plant and soil conditions. Notify the Owner’s Representative in writing of any conditions that may impact the successful Tree and Plant Protections that is the intent of this section.

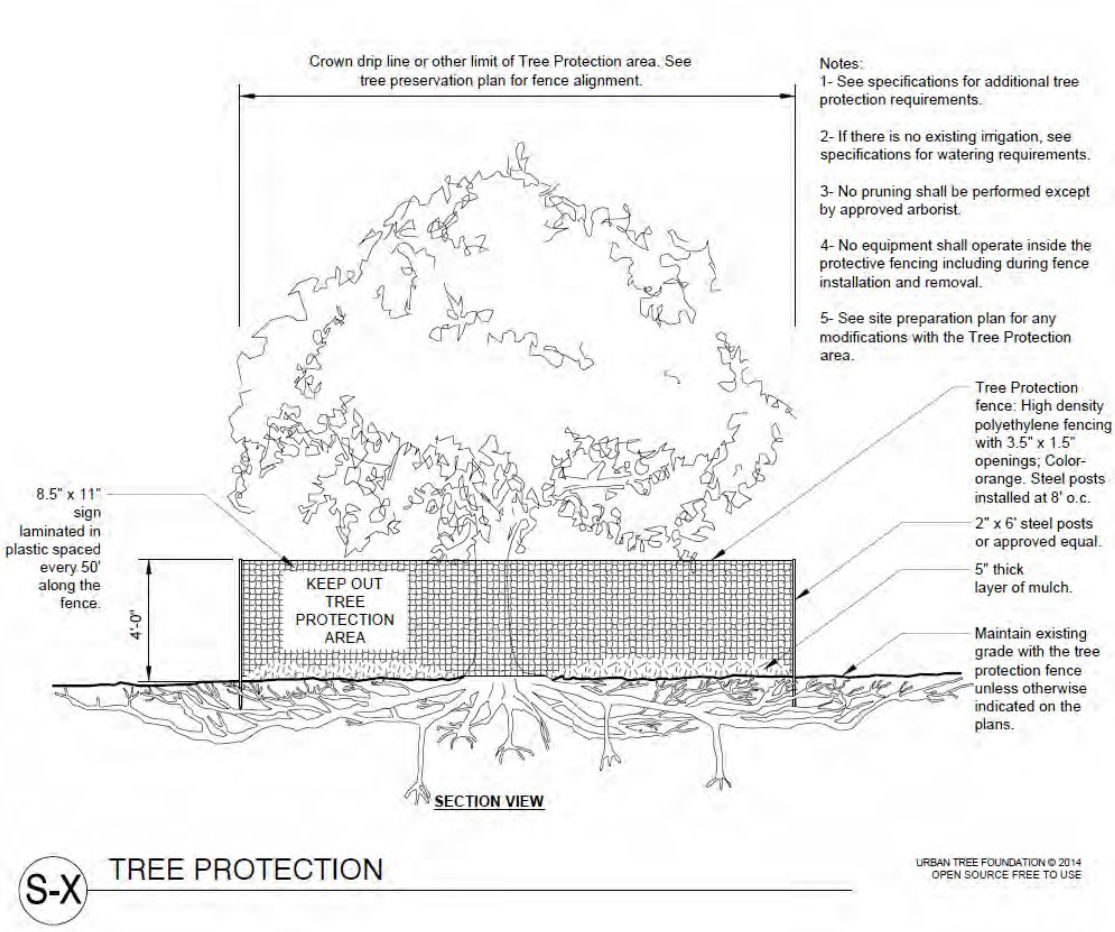
3.02 COORDINATION WITH PROJECT WORK

A. The Contractor shall coordinate with all other work that may impact the completion of the work.

B. Coordinate the relocation of any irrigation lines currently present on the irrigation plan, heads or the conduits of other utility lines or structures that are in conflict with tree locations. Root balls shall not be altered to fit around lines. Notify the Owner’s Representative of any conflicts encountered.

3.03 TREE AND PLANT PROTECTION AREA: The Tree and Plant Protection Area is defined as all areas indicated on the tree protection plan. Where no limit of the Tree and Plant Protection area

is defined on the drawings, the limit shall be the drip line (outer edge of the branch crown) of each tree.



3.04 PREPARATION:

A. Prior to the preconstruction meeting, layout the limits of the Tree and Plant Protection Area and then alignments of required Tree and Plant Protection Fencing and root pruning. Obtain the Owner's Representative's approval of the limits of the protection area and the alignment of all fencing and root pruning.

B. Flag all trees and shrubs to be removed by wrapping orange plastic ribbon around the trunk and obtain the Owner's Representative's approval of all trees and shrubs to be removed prior to the start of tree and shrub removal. After approval, mark all trees and shrubs to be removed with orange paint in a band completely around the base of the tree or shrub 4.5 feet above the ground.

C. Flag all trees and shrubs to remain with white plastic ribbon tied completely around the trunk or each tree and on a prominent branch for each shrub. Obtain the Owner's Representative's approval of all trees and shrubs to be remain prior to the start of tree and shrub removal.

D. Prior to any construction activity at the site including utility work, grading, storage of materials, or installation of temporary construction facilities, install all tree protection fencing, Filter Fabric, silt fence, tree protection signs, Geogrid, Mulch and or Wood Chips as shown on the drawings.

3.05 SOIL MOISTURE

A. Volumetric soil moisture level, in all soils within the Tree and Plant Protection Area shall be maintained above permanent wilt point to a depth of at least 8 inches. No soil work or other activity shall be permitted within the Tree and Plant Protection Area when the volumetric soil moisture is above field capacity. The permanent wilt point and field capacity for each type of soil texture shall be defined as follows (numbers indicate percentage volumetric soil moisture).

Soil type	Permanent wilt point v/v	Field capacity v/v
Sand, Loamy sand, Sandy loam	5-8%	12-18%
Loam, Sandy clay, Sandy clay loam	14-25%	27-36%
Clay loam, Silt loam	11-22%	31-36%
Silty clay, Silty clay loam	22-27%	38-41%

1. Volumetric soil moisture shall be measured with a digital, electric conductivity meter. The meter shall be the Digital Soil Moisture Meter, DSMM500 by General Specialty Tools and Instruments, or approved equivalent meter.

B. The Contractor shall confirm the soil moisture levels with a moisture meter. If the moisture is too high, suspend operations until the soil moisture drains to below field capacity.

3.06 ROOT PRUNING:

A. Prior to any excavating into the existing soil grade within 25 feet of the limit of the Tree and Plant Protection Area or trees to remain, root prune all existing trees to a depth of 24 inches below existing grade in alignments following the edges of the Tree and Plant Protection Area or as directed by the Owner's Representative. Root pruning shall be in conformance with ANSI A300 (part 8) latest edition.
   1. Using a rock saw, chain trencher or similar trenching device, make a vertical cut within 2 feet of the limit of grading.
   2. After completion of the cut, make clean cuts with a lopper, saw or pruner to remove all torn root ends on the tree side of the excavation, and backfill the trench immediately with existing soil, filling all voids.

3.07 INSTALLATION OF GEOGRIDS, FILTER FABRIC, MATTING, WOOD CHIPS AND OR MULCH

A. Install Geogrids, Filter Fabric, matting, Wood Chips and or Mulch in areas and depths shown on the plans and details or as directed by the Owner's representative. In general, it is the intent of this specification to provide the following levels of protection:
   1. All areas within the Tree and Plant Protection area provide a minimum of 5 inches of Wood Chips or Mulch.
   2. Areas where foot traffic or storage of lightweight materials is anticipated to be unavoidable provide a layer of Filter Fabric under the 5 inches of Wood Chips or Mulch.
   3. Areas where occasional light vehicle traffic is anticipated to be unavoidable provide a layer of Geogrids under 8 inches of Wood Chips or Mulch.
   4. Areas where heavy vehicle traffic is unavoidable provide a layer of Geogrids under 8 - 12 inches of Wood Chips or Mulch and a layer of matting over the Wood Chips or Mulch.

B. The Owner's Representative shall approve the appropriate level of protection.

C. In the above requirements, light vehicle is defined as a track skid steer with a ground pressure of 4 psi or lighter. A heavy vehicle is any vehicle with a tire or track pressure of greater than 4 psi. Lightweight materials are any packaged materials that can be physically

moved by hand into the location. Bulk materials such as soil, or aggregate shall never be stored within the Tree and Plant Protection Area.

3.08 PROTECTION:

A. Protect the Tree and Plant Protection Area at all times from compaction of the soil; damage of any kind to trunks, bark, branches, leaves and roots of all plants; and contamination of the soil, bark or leaves with construction materials, debris, silt, fuels, oils, and any chemicals substance. Notify the Owner's Representative of any spills, compaction or damage and take corrective action immediately using methods approved by the Owner's Representative.

3.09 GENERAL REQUIREMENTS AND LIMITATIONS FOR OPERATIONS WITHIN THE TREE AND PLANT PROTECTION AREA:

A. The Contractor shall not engage in any construction activity within the Tree and Plant Protection Area without the approval of the Owner's Representative including: operating, moving or storing equipment; storing supplies or materials; locating temporary facilities including trailers or portable toilets and shall not permit employees to traverse the area to access adjacent areas of the project or use the area for lunch or any other work breaks. Permitted activity, if any, within the Tree and Plant Protection Area maybe indicated on the drawings along with any required remedial activity as listed below.

B. In the event that construction activity is unavoidable within the Tree and Plant Protection Area, notify the Owner's Representative and submit a detailed written plan of action for approval. The plan shall include: a statement detailing the reason for the activity including why other areas are not suited; a description of the proposed activity; the time period for the activity, and a list of remedial actions that will reduce the impact on the Tree and Plant Protection Area from the activity. Remedial actions shall include but shall not be limited to the following:

1. In general, demolition and excavation within the drip line of trees and shrubs shall proceed with extreme care either by the use of hand tools, directional boring and or Air Knife excavation where indicated or with other low impact equipment that will not cause damage to the tree, roots or soil.
2. When encountered, exposed roots, 1 inch and larger in diameter shall be worked around in a manner that does not break the outer layer of the root surface (bark). These roots shall be covered in Wood Chips and shall be maintained above permanent wilt point at all times. Roots one inch and larger in diameter shall not be cut without the approval of the owner's representative. Excavation shall be tunneled under these roots without cutting them. In the areas where roots are encountered, work shall be performed and scheduled to close excavations as quickly as possible over exposed roots.
3. Tree branches that interfere with the construction may be tied back or pruned to clear only to the point necessary to complete the work. Other branches shall only be removed when specifically indicated by the Owner's Representative. Tying back or trimming of all branches and the cutting of roots shall be in accordance with accepted arboricultural practices (ANSI A300, part 8) and be performed under supervision of the arborist.
4. Matting: Install temporary matting over the Wood Chips or Mulch to the extent indicated. Do not permit foot traffic, scaffolding or the storage of materials within the Tree and Plant Protection Area to occur off of the temporary matting.
5. Trunk Protection: Protect the trunk of each tree to remain by covering it with a ring of 8 foot long 2-inch x 6 - inch planks loosely banded onto the tree with 3 steel bands. Staple the bands to the planks as necessary to hold them securely in place. Trunk protection must be kept in place no longer than 12 months. If construction requires work near a particular tree to continue longer than 12 months, the steel bands shall be inspected every six months and loosened if they are found to have become tight.

6. Air Excavation Tool: If excavation for footings or utilities is required within the Tree and Plant Protection Area, air excavation tool techniques shall be used where practical or as designed on the drawings.
   a. Remove the Wood Chips from an area approximately 18 inches beyond the limits of the hole or trench to be excavated. Cover the Wood Chips for a distance of not less than 15 feet around the limit of the excavation area with Filter Fabric or plastic sheeting to protect the Wood Chips from silt. Mound the Wood Chips so that the plastic slopes towards the excavation.
   b. Using a sprinkler or soaker hose, apply water slowly to the area of the excavation for a period of at least 4 hours, approximately 12 hours prior to the work so that the ground water level is at or near field capacity at the beginning of the work. For excavations that go beyond the damp soil, rewet the soil as necessary to keep soil moisture near field capacity.
   c. Using an air excavation tool specifically designed and manufactured for the intended purpose, and at pressures recommended by the manufacturer of the equipment, fracture the existing soil to the shape and the depths required. Work at rates and using techniques that do not harm tree roots. Air pressure shall be a maximum of 90-100 psi.
      1) The air excavation tool shall be “Air-Spade” as manufactured by Concept Engineering Group, Inc., Verona, PA (412) 826-8800, or Air Knife as manufactured by Easy Use Air Tools, Inc. Allison Park, Pa (866) 328-5723 or approved equal.
   d. Using a commercial, high-powered vacuum truck if required, remove the soil from the excavation produced by the Air Knife excavation. The vacuum truck should generally operate simultaneously with the hose operator, such that the soil produced is picked up from the excavation hole, and the exposed roots can be observed and not damaged by the ongoing operation. Do not drive the vacuum truck into the Tree and Plant Protection Area unless the area is protected from compaction as approved in advance by the Owner’s Representative.
   e. Remove all excavated soil and excavated Wood Chips, and contaminated soil at the end of the excavation.
   f. Schedule the work so that foundations or utility work is completed immediately after the excavation. Do not let the roots dry out. Mist the roots several times during the day. If the excavated area must remain open overnight, mist the roots and cover the excavation with black plastic.
   g. Dispose of all soil in a manner that meets local laws and regulations.
   h. Restore soil within the trench as soon as the work is completed. Utilize soil of similar texture to the removed soil and lightly compact with hand tools. Leave soil mounded over the trench to a height of approximately 10% of the trench depth to account for settlement.
   i. Restore any Geogrids, Filter Fabric, Wood Chips or Mulch and or matting that was previously required for the area.

3.10 TREE REMOVAL:

A. Remove all trees indicated by the drawings and specifications, as requiring removal, in a manner that will not damage adjacent trees or structures or compacts the soil.

B. Remove trees that are adjacent to trees or structures to remain, in sections, to limit the opportunity of damage to adjacent crowns, trunks, ground plane elements and structures.

C. Do not drop trees with a single cut unless the tree will fall in an area not included in the Tree and Plant Protection Area. No tree to be removed within 50 feet of the Tree and Plant Protection Area shall be pushed over or up rooted using a piece of grading equipment.

D. Protect adjacent paving, soil, trees, shrubs, ground cover plantings and understory plants to remain from damage during all tree removal operations, and from construction operations. Protection shall include the root system, trunk, limbs, and crown from breakage or scarring, and the soil from compaction.

E. Remove stumps and immediate root plate from existing trees to be removed. Grind trunk bases and large buttress roots to a depth of the largest buttress root or at least 18 inches below the topmost roots whichever is less and over the area of three times the diameter of the trunk (DBH).

1. For trees where the stump will fall under new paved areas, grind roots to a total depth of 18 inches below the existing grade. If the sides of the stump hole still have greater than approximately 20% wood visible, continue grinding operation deeper and or wider until the resulting hole has less than 20% wood. Remove all wood chips produced by the grinding operation and back fill in 8-inch layers with controlled fill of a quality acceptable to the site engineer for fill material under structures, compacted to 95% of the maximum dry density standard proctor. The Owner's Representative shall approve each hole at the end of the grinding operation.
2. In areas where the tree location is to be a planting bed or lawn, remove all woodchips and backfill stump holes with planting soil as defined in Specification Section Planting Soil, in maximum of 12-inch layers and compact to 80 - 85% of the maximum dry density standard proctor.

3.11 PRUNING:

A. Within six months of the estimated date of substantial completion, prune all dead or hazardous branches larger than 2 inch in diameter from all trees to remain.

B. Implement all pruning recommendations found in the arborist report.

C. Prune any low, hanging branches and vines from existing trees and shrubs that overhang walks, streets and drives, or parking areas as follows:

1. Walks - within 8 feet vertically of the proposed walk elevation.
2. Parking areas - within 12 feet vertically of the proposed parking surface elevation.
3. Streets and drives - within 14 feet vertically of the proposed driving surface elevation.

D. All pruning shall be done in accordance with ANSI A300 (part 1), ISA BMP Tree Pruning (latest edition, and the "Structural Pruning: A Guide for the Green Industry", Edward Gilman, Brian Kempf, Nelda Matheny and Jim Clark, 2013 Urban Tree Foundation, Visalia CA.

E. Perform other pruning task as indicated on the drawings or requested by the Owner's Representative.

F. Where tree specific disease vectors require, sterilize all pruning tools between the work in individual trees.

3.12 WATERING

A. The Contractor shall be fully responsible to ensure that adequate water is provided to all plants to be preserved during the entire construction period. Adequate water is defined to be maintaining soil moisture above the permanent wilt point to a depth of 8 inches or greater.

B. The Contractor shall adjust the automatic irrigation system, if available, and apply additional water, using hoses or water tanks as required.

C. Periodically test the moisture content in the soil within the root zone to determine the water content.

3.13 WEED REMOVAL

A. During the construction period, control any plants that seed in and around the fenced Tree and Plant Protection area at least three times a year.
   1. All plants that are not shown on the planting plan or on the Tree and Plant Protection Plan to remain shall be considered as weeds.

B. At the end of the construction period provide one final weeding of the Tree and Plant Protection Area.

3.14 INSECT AND DISEASE CONTROL

A. Monitor all plants to remain for disease and insect infestations during the entire construction period. Provide all disease and insect control required to keep the plants in a healthy state using the principles of Integrated Plant Management (IPM). All pesticides shall be applied by a certified pesticide applicator.

3.15 CLEAN-UP

A. During tree and plant protection work, keep the site free of trash, pavements reasonably clean and work area in an orderly condition at the end of each day. Remove trash and debris in containers from the site no less than once a week.
   1. Immediately clean up any spilled or tracked soil, fuel, oil, trash or debris deposited by the Contractor from all surfaces within the project or on public right of ways and neighboring property.

B. Once tree protection work is complete, wash all soil from pavements and other structures. Ensure that Mulch is confined to planting beds.

C. Make all repairs to grades, ruts, and damage to the work or other work at the site.

D. Remove and dispose of all excess Mulch, Wood Chips, packaging, and other material brought to the site by the Contractor.

3.16 REMOVAL OF FENCING AND OTHER TREE AND PLANT PROTECTION

A. At the end of the construction period or when requested by the Owner's Representative remove all fencing, Wood Chips or Mulch, Geogrids and Filter Fabric, trunk protection and or any other Tree and Plant Protection material.

3.17 DAMAGE OR LOSS TO EXISTING PLANTS TO REMAIN

Note to specifier: *This clause is not written to cover high value heritage trees. A specification to address high value heritage trees should be added here if any exist on the project.*

A. Any trees or plants designated to remain, and which are damaged by the Contractor shall be replaced in kind by the Contractor at their own expense. Trees shall be replaced with a tree of similar species and of equal size or 6-inch caliper whichever is less. Shrubs shall be replaced with a plant of similar species and equal size or the largest size plants reasonably available whichever is less. Where replacement plants are to be less than the size of the plant that is damaged, the Owner's Representative shall approve the size and quality of the replacement plant.
   1. All trees and plants shall be installed per the requirements of Specification Section Planting.

B. Plants that are damaged shall be considered as requiring replacement or appraisal in the event that the damage affects more than 25 % of the crown, 25% of the trunk circumference, or root protection area, or the tree is damaged in such a manner that the tree could develop into a potential hazard. Trees and shrubs to be replaced shall be removed by the Contractor at his own expense.

1. The Owner's Representative may engage an independent arborist to assess any tree or plant that appears to have been damaged to determine their health or condition.

C. Any tree that is determined to be dead, damaged or potentially hazardous by the Owner's arborist and upon the request of the Owner's Representative shall be immediately removed by the Contractor at no additional expense to the owner. Tree removal shall include all cleanup of all wood parts and grinding of the stump to a depth sufficient to plant the replacement tree or plant, removal of all chips from the stump site and filling the resulting hole with topsoil.

D. Any remedial work on damaged existing plants recommended by the consulting arborist shall be completed by the Contractor at no cost to the owner. Remedial work shall include but is not limited to: soil compaction remediation and vertical mulching, pruning and or cabling, insect and disease control including injections, compensatory watering, additional mulching, and could include application tree growth regulators (TGR).

E. Remedial work may extend up to two years following the completion of construction to allow for any requirements of multiple applications or the need to undertake applications at required seasons of the year.

END OF SECTION 01 56 39

GUIDE SPECIFICATIONS

The following specification is intended to be used, generally verbatim, in the contract documents. ***[Specifier notes]*** shall be deleted during the editing process. Where [ ] appear in this document, this indicates requirements which are optional depending upon the project scope and conditions. Edit as appropriate for the project. The A/E consultant shall take ownership and responsibility for the contents of this section and is expected to modify other portions as necessary to accurately reflect conditions of the project. For draft copies during the design process, use Microsoft Word, Track Changes. Set criteria so that deletions show as strikethroughs. Deletions and additions are to be in red.

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. For requirements peculiar to a given product, material, or piece of equipment, see appropriate technical specification Section.

1.02 DEFINITIONS

A. Definitions used in this Section are not intended to change the meaning of other terms used in the Contract Documents.

1. Product: "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from the Contractor's previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
2. "Named Products" are items identified by the manufacturer's product name, including such items as a make or model number or other designation, shown or listed in the manufacturer's published product literature, that is current as of the date of the Contract Documents.
3. "Materials" are products that must be shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.
4. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections, such as wiring or piping.

1.03 SUBMITTALS

A. See Section 01 33 00 for submittal requirements.

B. Proposed Product List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

1. Submit list of all proposed color and finish selections for Architect's review and acceptance no later than 45 days after Notice to Proceed.
2. During construction, other materials not involving finishes or design considerations may be submitted not less than 30 days prior to date required for ordering materials. Obtain approval before ordering. Materials entered into the work without approval may require removal and replacement with specified or approved materials at no additional cost to Owner.
3. See Article 2.03 below for product options and any proposed product substitutions.

C. Long-Lead-Time Items

1. Provide copies of purchase orders for long-lead-time items to the Architect within twenty (20) days after receipt of Notice to Proceed.

2. Forward copies of acknowledgment, production and shipping schedules to Architect as they are received for all required items.

D. Submit three (3) copies in conformance with provisions of Article 2.03 below.

1.04 QUALITY ASSURANCE

A. To the fullest extent possible, provide products of the same kind from a single source.

B. When the Contractor is given the option of selecting between two or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options. Compatibility is a basic general requirement of product/material selections.

C. Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products that will be exposed to view in occupied spaces or on the exterior. Locate required product labels and stamps on a concealed surface or, where required for observation after installation, on an accessible surface that is not conspicuous.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. All access routes, staging areas, loading restrictions, and other uses of the building shall be coordinated and approved by the A/E and Owner prior to the start of work. Ease of access to the building is limited and should be verified prior to moving materials.

B. Deliver, store, and handle products according to the manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.

1. Deliver products to the site in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing to prevent damage, deterioration, loss or theft. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage. Where appropriate, submit MSDS for all delivered products.
2. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.
3. Coordinate delivery with installation time to assure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
    a. Store with lids sealed, outside of building, all glues, adhesives, sealers, caulking, mastics, cleaners, paints, thinners and related flammable and hazardous materials.
4. Inspect products upon delivery to ensure compliance with the Contract Documents and to ensure that quantities are correct and that products are undamaged and properly protected. Reject damaged and defective items.
5. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units. Store and protect in accordance with manufacturers' instructions, with seals and labels intact and legible.
6. Store heavy materials away from the Project structure in a manner that will not endanger the supporting construction.
7. Store products subject to damage by the elements above ground, under cover in a weathertight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.
8. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
9. Prevent contact with material that may cause corrosion, discoloration, or staining.

10. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

1.06 JOB CONDITIONS

A. Pre-Installation Conferences

1. At each meeting review progress of other work and preparations for particular work under consideration, including requirements of Contract Documents, options, related change orders, purchases, deliveries, shop drawings, product data, quality control samples, possible conflicts, compatibility problems, time schedules, weather limitations, temporary facilities, space and access limitations, structural limitations, governing regulations, safety, inspection and testing requirements, required performance results, recording requirements, and protections.
2. Record attendees, signification discussions of each conference, and agreements and disagreements, along with final plan of action; distribute record of meeting promptly to everyone concerned including A/E and Owner.
    a. Do not proceed with the work if associated pre-installation conference cannot be concluded successfully.
    b. Instigate actions to resolve impediments to performance of the work and reconvene conference at earliest date feasible.
3. Discuss any pertinent issues at the weekly Progress Meetings; see Section 01 31 19 Project Meetings.

PART 2 - PRODUCTS

2.01 GENERAL PRODUCT REQUIREMENTS

A. Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, new at the time of installation.

1. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and the intended use and effect.
2. Standard Products: Where available, provide standard products of types which have been produced and used previously and successfully on other projects and in similar application.
3. Color and Appearance Consistency of Finish Materials: All finish materials of their respective kinds, in regard to construction phasing, shall be consistent in color and appearance throughout the total Project and shall be purchased out of one dye lot, production run, batch, etc., as applicable, for the total Project for each respective material.

B. Additional Requirements: Material and equipment incorporated into the work:

1. Shall conform to applicable specifications and standards.
2. Shall comply with size, make, type and quality specified or as specifically approved in writing by Architect.
3. Shall be free of ASBESTOS, FORMALDEHYDE and LEAD.
4. Manufactured and Fabricated Products:
    a. Design, fabricate, and assemble in accordance with first-class "Workmanship" as defined in these Contract Documents.
    b. Manufacture like parts of duplicate units to standard sizes and gauges; parts to be interchangeable.
    c. Two or more items of the same kind to be identical and by same manufacturer (whether furnished under one Section or more).
    d. Products shall be suitable for service conditions.
    e. Adhere to indicated equipment capacities, sizes, and dimensions unless variations are specifically approved in writing

f. Except where field finishing is specified or otherwise required, products and fabricated items shall be pre-finished off-site.

5. Do not use materials and equipment for other than designed or specified purposes and uses.

C. Nameplates: Except as otherwise indicated for required approval labels, and operating data, do not permanently attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products which will be exposed to view either in occupied spaces or on exterior of the work.

1. Labels: Locate required labels and stamps on a concealed surface or, where required for observation after installation, on an accessible surface which, in occupied spaces, is not conspicuous.
2. Equipment Nameplates: Provide permanent nameplate on each item of service- connected or power-operated equipment. Indicate manufacturer, product name, model number, serial number, capacity, speed, ratings and similar essential operating data. Locate nameplates on an easily accessed surface which, in occupied spaces, is not conspicuous.

2.02 PRODUCT SELECTION

A. The Contract Documents and governing regulations govern product selection. Procedures governing product selection include the following:

1. Proprietary Specification Requirements. Where only a single product or manufacturer is named, or indicates “no equals”, “no substitutions”, or “no exceptions”, provide the product indicated. Notify A/E if it is discovered that the named product does not comply with the contract documents or is not appropriate for the function intended.
2. Semi proprietary Specification Requirements. Where two or more products or manufacturers are named, or indicates “no equals”, “no substitutions”, or “no exceptions”, provide one of the products indicated. Notify A/E if it is discovered that none of the named products complies with the contract documents or is not appropriate for the function intended.
3. Nonproprietary Specification Requirements. Where the Specifications list products or manufacturers or indicates “or approved equal” or “other acceptable”, comply with Contract Document provisions concerning PRODUCT SUBSTITUTION to obtain approval for use of another product.
4. Descriptive Specification Requirements. Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.
5. Performance Specification Requirements. Where Specifications require compliance with performance requirements, provide products that comply with these requirements and are recommended by the manufacturer for the application indicated. Submit manufacturer's recommendations contained in published product literature or by the manufacturer's certification of performance for approval by A/E.
6. Visual Matching. Where matching an established sample is required, the A/E’s decision will be final on whether a proposed product matches satisfactorily.
   a. Where there is no product available within the specified category which matches satisfactorily and also complies with other specified requirements, comply with the provisions of the Contract Documents concerning "substitutions" for selection of a matching product in another product category.
7. Visual Selection. Where specified product requirements include the phrase "...as selected from manufacturer's standard colors, patterns, textures ..." or similar phrases, select a product and manufacturer that complies with other specified requirements. The A/E will select the color, pattern, and texture from the product line selected.

2.03 PRODUCT SUBSTITUTION

A. General Provisions

1. The requirements for substitutions do not apply to specified Subcontractor options on products and construction methods. Revisions to Contract Documents, where requested by Owner or Architect, are "changes" not "substitutions".
2. Subcontractor's determination of and compliance with governing regulations and orders issued by governing authorities do not constitute "substitutions" and do not constitute a basis for change orders, except as provided for in contract documents. Otherwise, the Subcontractor's requests for changes in products, materials and methods of construction required by contract documents are considered requests for "substitution" and are subject to requirements hereof.
3. If a bidder or Contractor desires approval of some material or product other than that specified, it shall submit a written request for approval of the substitute item in accordance with the following requirements:
    a. All such requests must be made on the SUBSTITUTION REQUEST FORM at end of this Section. Where specifications specify a product color and/or pattern, Contractor shall include a sample of proposed product/item at a size appropriate to make an evaluation with the specified product.
    b. No request for approval will be considered unless submitted in accordance with this Section.
    c. Final decision as to whether an item is an equal or satisfactory substitution rests with Owner.
4. Every substitution request must state whether the item offered is equal or equivalent to the specified product. The substitute material or product must be accompanied by its reference in the Contract Documents and complete catalog, technical and other information. If applicable, include samples showing comparison of physical and other pertinent characteristics as required to establish equivalence of acceptability for the proposed application. Where specific test results are required by the Contract Documents, the comparison data for the proposed item shall be based upon the same test methods as those specified, or they shall be correlated to clearly demonstrate comparability. The same guarantee described for the specified product is required for the substitution.

B. Substitutions – During Bidding Period: During the Bid period, submit substitution requests for approval of substitute materials or products, for all items indicated as proprietary or "approved equal" semi-proprietary. All requests shall be received by A/E no later than seven (7) days, or as indicated elsewhere in the Contract Documents, prior to scheduled time for receipt of bid in order to receive consideration. Bidders will be informed by addendum of additional materials and products approved for use. No other form of approval will be given during the bid period and bidders shall not rely upon any approval not incorporated into the Contract Documents in this manner.

C. Substitutions – After Starting Work: After Contract Award, requests for approval of substitute materials or products for all items indicated as proprietary, semi-proprietary or "approved equal" will not be considered, unless one or more of the following conditions exists. With its request, Contractor shall indicate which condition it believes applies.

1. Unavailability. A substitution is required because the specified item is not available, due to factors beyond the control of Contractor. (Unavailability due to late order is not cause for substitution requests).
2. Unsuitability. Subsequent information or changes disclose inability of the specified item to perform as intended.
3. Regulatory Requirements. Final interpretation of Code, regulatory requirements, safety requirements, or insurance requirements necessitate a change due to inability of the specified item to conform.

4. Warranty. Manufacturer or fabricator cannot certify or warrant performance of specified item as required.
5. Owner's Benefit. In the judgment of the Contractor, acceptance of the proposed substitution is clearly in Owner's best interest because of cost, quality, or other consideration. In requesting a substitution under this clause, Contractor shall furnish substantiation of any such reason and proposed credit.

D. Substitution requests for approval of substitute materials or products for all items **not** followed by restrictive language will be considered if the Contractor submits information and documentation as required by 2.03C above. The proposed product or material shall be equal or equivalent to the specified item and shall be subject to the same redesign and coordination as all substituted items.

1. Substitution requests submitted for an unnamed, non-prior approved product/ manufacturer where such products are specified by the listing of three or more named approved products/manufacturers, shall be accompanied with a check in the amount of $100, made payable to the A/E for additional time required to research and evaluate such unnamed product/manufacturer. Such payment will only afford review of such a submittal and does not guaranty said proposed substitute product/ manufacturer will be approved.

E. In making request for approval of substitute materials, the Bidder/Contractor shall represent that it has investigated the proposed product and, in its opinion, it is equal or superior in equivalence in all respects to that specified. Also, Contractor shall coordinate all trades including changes thereto as may be required, that it waives all claims for additional costs which subsequently become apparent as a consequence of the substitution, and that it will bear all costs related hereto, including costs of A/E's services for redesign, if deemed necessary.

F. Substitutions will not be considered if they are indicated or implied on Shop Drawings or other project data submittals, without proper notice shown on the SUBSTITUTION REQUEST FORM at the end of this Section. Submissions received that include products or manufacturers not listed in the specifications or approved on the form during the bid period will be returned and marked “Revise and Resubmit”.

G. Action By A/E

1. During Bidding Period: If the A/E approves any proposed substitution, such approval will be set forth in an Addendum. Bidders shall not rely upon approvals made in any other manner.
2. After Start of Work:
   a. Within one week of receipt of Contractor's request for substitution, the A/E will request whatever additional information or documentation may be needed for their evaluation of the request.
   b. Within two weeks of receipt of request, or within one week of receipt of requested additional information or documentation (whichever is later), the A/E will notify the Contractor of either their acceptance or rejection of the proposed substitution.
      1) Rejection will be the endorsement on the form provided by the Contractor and will include statement of the reasons for rejection (non-compliance with the requirements for requested substitutions, or other reasons as detailed).
      2) Acceptance will be the endorsement on the form provided the Contractor.

PART 3 - EXECUTION

3.01 INSPECTIONS & ACCEPTANCE OF SUBSTRATES

A. Installer's Inspection of Conditions

1. Require Installer of each major unit of work to inspect substrate to receive the work, and conditions under which the work will be performed, and to report (in writing to Contractor) unsatisfactory conditions.
2. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.
3. Application over a substrate or under a condition is prima facie evidence of acceptance of same.

B. Contractor's Inspection. Inspect each item of material or equipment immediately prior to installation and reject damaged and defective items.

3.02 GENERAL INSTALLATION PROVISIONS

A. Manufacturer's Instructions: Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.

1. When Contract Documents require installation of work to comply with Manufacturer's printed instructions, obtain and distribute instructions to concerned parties, including A/E, and field office, before starting that particular work.
2. Until project is complete, maintain at jobsite one (1) set of complete installation and maintenance instructions for materials and equipment.
3. Handle, install, connect, clean, condition and adjust products in accordance with Manufacturer's recommendations, directions and specified requirements.
    a. Should job conditions or specified requirements conflict with Manufacturer's instructions, consult with A/E for further instructions.
    b. Do not proceed with work without clear instructions.
4. Perform work in accordance with Manufacturer's instructions. Do not omit any preparatory step or installation procedure unless it is:
    a. Verified with and accepted by A/E in writing.
    b. Specifically modified or exempted by Contract Documents.
    c. Perform additional requirements that are specified which are greater than the manufacturer's requirements and do not have a deleterious affect on the product being installed.

B. Owner-Furnished Products

1. Refer to Drawings and/or Section 01 11 00 for identification of Owner furnished products.
2. Owner's Responsibilities:
    a. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
    b. Arrange and pay for product delivery to site.
    c. On delivery, inspect products jointly with Contractor.
    d. Submit claims for transportation damage and replace damaged, defective, or deficient items.
    e. Arrange for manufacturers' warranties, inspections, and service.
3. Contractor's Responsibilities:
    a. Review Owner reviewed shop drawings, product data, and samples.
    b. Receive and unload products at site; inspect for completeness or damage jointly with

c. Owner.
d. Handle, store, install and finish products.
e. Repair or replace items damaged after receipt.

C. Attachment & Connection Devices & Methods

1. Provide attachment and connection devices and methods necessary for anchoring work securely and properly in place as it is installed; install true to line and level, accurately located and aligned with other Work, and within recognized industry tolerances if not otherwise indicated.
2. Allow for expansions and building movements.
3. Provide uniform joint widths in exposed work, organized for best possible visual effect. Refer questionable visual-effect choices to A/E for final decision.

D. Precautions

1. Acclimate product to room conditions as required by standard specifications and/or as recommended by manufacturer.
2. Install work during conditions of temperature, humidity, exposure, forecasted weather, and status of project completion which will ensure best possible results for each unit of work, in coordination with entire work.
3. Isolate each unit of work from non-compatible work, as required to prevent deterioration.
4. Re-check measurements and dimensions of the work, as an integral step of starting each installation.
5. Coordinate enclosure (closing-in) of work with required inspections and tests, so as to avoid necessity of uncovering work for that purpose.

E. Mounting Heights: Except as otherwise indicated in the Contract Documents, mount individual units of work at industry recognized standard mounting heights, for applications indicated. Refer questionable mounting height choices to A/E for final decision.

F. In-Place Protection

1. General
   a. During handling and installation of work at project site, clean and protect work in progress and adjoining work on a basis of perpetual maintenance.
   b. Apply suitable protective covering on newly installed work where reasonably required to ensure freedom from damage or deterioration at time of Substantial Completion; otherwise, clean and perform maintenance on newly installed work as frequently as necessary through remainder of construction period.
   c. Adjust and lubricate moving components to ensure operability without damaging effects. Contractor is responsible for function, condition and unblemished appearance of all work on Project, and any item or work judged defective by A/E shall be subject to replacement at no additional cost to Owner.
2. To extent possible through reasonable control and protection methods, supervise performance of work in a manner and by means which will ensure that none of the work, whether completed or in progress, will be subjected to harmful, dangerous, damaging, or otherwise deleterious exposures during construction period.

G. Replacement: Components with damage affecting appearance, function or structural characteristics will not be accepted; repair and/or replace all such items on the Project as directed at no additional expense to Owner.

END OF SECTION 01 61 00

SUBSTITUTION REQUEST FORM

TO: [Design Firm]
[Address]
[City, Zip Code]

ATTN: Project Manager

PROJECT NAME: _____

CONTRACTOR: _____

We hereby submit for consideration, the following product instead of the specified items for above project:

SECTION PARAGRAPH SPECIFIED ITEM

_____ _____ _____

Proposed substitution: _____

Attach complete dimensional information and technical data, including laboratory tests, if applicable.

Include complete information on changes to Drawings and Specifications which proposed substitution will require for its proper installation.

Submit with request all necessary samples and substantiating data to provide equal quality, performance, and appearance to that specified. Clearly mark Manufacturer's literature to indicate equality or equivalence in performance. Indicate differences in quality of materials and construction.

Fill in blanks below:

A. Does the substitution affect dimensions shown on Drawings:

____No ____Yes. If yes, clearly indicate changes:

_____

B. Will the undersigned pay for changes to the building design, including engineering and detailing costs caused by requested substitution?

_____

C. What effect does substitution have on other trades, other Contracts, and contract completion date?

_____

D. What effect does substitution have on applicable code requirements?

_____

E. Differences between proposed substitution and specified item.

_____

F. Manufacturer's warranties of the proposed and specified items are:

Same _ Different (explain) _____

G. List of names and addresses of 3 similar projects on which product was used, date of installation, and A/E's name and address. (Attach list with requested information)

H. Cost impact: _____

Undersigned attests function and quality are equal or equivalent to specified items.

CERTIFICATION OF EQUAL OR EQUIVALENT PERFORMANCE AND ASSUMPTION OF LIABILITY FOR EQUAL OR EQUIVALENT PERFORMANCE

_____ Date _____
Signature

_____
Firm

_____

_____

_____
Address

_____ _____
Telephone Fax

Signature must be by person having authority to legally bind Contractor to the above terms.

For Use by A/E: ____**Accepted** ____**Not Accepted**

____**Accepted As Noted** ____**Received Too Late**

END OF FORM

GUIDE SPECIFICATIONS

The following specification is intended to be used, generally verbatim, in the contract documents. ***[Specifier notes]*** shall be deleted during the editing process. Where [ ] appear in this document, this indicates requirements which are optional depending upon the project scope and conditions. Edit as appropriate for the project. The A/E consultant shall take ownership and responsibility for the contents of this section and is expected to modify other portions as necessary to accurately reflect conditions of the project. For draft copies during the design process, use Microsoft Word, Track Changes. Set criteria so that deletions show as strikethroughs. Deletions and additions are to be in red.

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. General: This Section specifies administrative and procedural requirements for field-engineering services including, but not limited to, the following:

1. Utility verification
2. Work layout and control

1.03 SUBMITTALS

A. Submit a certificate signed by the land surveyor or professional engineer certifying the location and elevation of improvements.

B. Submit a record of Work performed and record survey data as required under provisions of Sections 01 33 00 and 01 78 00.

1.04 QUALITY ASSURANCE

A. Engage a land surveyor registered in Washington State to perform required land surveying services. The same firm shall provide the project record document for that work.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify layout information shown in the Documents, in relation to the property survey and existing benchmarks, before proceeding to lay out the Work. Locate and protect existing benchmarks and control points. Preserve permanent reference points during construction.

1. Do not change or relocate benchmarks or control points without prior written approval. Promptly report lost or destroyed reference points or requirements to relocate reference points because of necessary changes in grades or locations.
2. Promptly replace lost or destroyed Project control points. Base replacements on the original survey control points.

B. Establish and maintain a minimum of 2 permanent benchmarks on the site, referenced to data established by survey control points.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

C. The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction.

1. Prior to construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping.

3.02 PERFORMANCE

A. The Contractor shall include in his Bid retaining and paying all associated costs for the following:

1. Registered land surveyor for project layout;
2. Registered land surveyor to complete as-built survey at completion of the project.

B. Work from established lines and levels. Establish benchmarks and markers to set lines and levels for the construction and elsewhere as needed to locate each element of the Project. Calculate and measure required dimensions within indicated or recognized tolerances. Do not scale Drawings to determine dimensions.

1. Advise entities engaged in construction activities of marked lines and levels provided for their use.
2. As construction proceeds, check every major element for line, level, and plumb.

C. Locate and lay out site improvements, including pavements, stakes for grading, fill and topsoil placement, utility slopes, and invert elevations.

D. Locate and lay out batter boards for structures, building foundations, column grids and locations, floor levels, and control lines and levels required for mechanical and electrical work.

E. Furnish information necessary to adjust, move, or relocate existing structures, utility poles, lines, services, or other appurtenances located in or affected by construction. Coordinate with local authorities having jurisdiction.

F. At the completion of work, complete an as-built site survey covering the same site area, extent of detail, and scale as included in the Contract Documents; also including all changes and improvements resulting from work under this contract. Provide final Project Record Document in accordance with Section 01 78 00.

END OF SECTION 01 71 23

GUIDE SPECIFICATIONS

The following specification is intended to be used, generally verbatim, in the contract documents. ***[Specifier notes]*** shall be deleted during the editing process. Where [ ] appear in this document, this indicates requirements which are optional depending upon the project scope and conditions. Edit as appropriate for the project. The A/E consultant shall take ownership and responsibility for the contents of this section and is expected to modify other portions as necessary to accurately reflect conditions of the project. For draft copies during the design process, use Microsoft Word, Track Changes. Set criteria so that deletions show as strikethroughs. Deletions and additions are to be in red.

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. General Contractor is responsible for all cutting, fitting, and patching, required to complete the Work and to:

1. Make its several parts fit together properly;
2. Join new work to existing work;
3. Uncover portions of the Work to provide for installation of any ill-timed work;
4. Remove and replace defective work;
5. Remove and replace work not conforming to requirements of Contract Documents;
6. Remove samples of installed work as specified for testing;
7. Provide routine penetrations of non-structural surfaces for installation of piping, duct work, and electrical conduit.

[Specifier – Include for remodel projects requiring selective demolition]

B. In addition to selective structure demolition specified in Section 02 41 19 and that specifically shown, cut, move or remove items necessary to provide access or to allow alterations and new work to proceed. Include such items as:

1. Removal of abandoned items and items serving no useful purpose, such as abandoned piping, conduit and wiring, and miscellaneous brackets, hardware and the like.
2. Cleaning of surfaces, and removal of surface finishes as needed to install new work and finishes.
3. Repair or removal of hazardous or unsanitary conditions.

C. Conduct X-ray or “sono” testing, whichever provides the most accurate detailed information, prior to any cutting to locate existing utilities not shown on the plans.

D. For additional requirements for cutting and patching see respective Specification Sections.

1.03 DEFINITIONS

A. "Cutting and patching" includes cutting into existing construction to provide for the installation or performance of other work and subsequent fitting and patching required to restore surfaces to their original condition.

1. "Cutting and patching" is performed for coordination of the work, to uncover work for access or inspection, to obtain samples for testing, to permit alterations to be performed or for other similar purposes.
2. Cutting and patching performed during the manufacture of products, or during the initial fabrication, erection or installation processes is not considered to be "cutting and

patching" under this definition. Drilling of holes to install fasteners and similar operations are also not considered to be "cutting and patching".

3. "Selective Demolition" is recognized as related-but-separate categories of work, which may or may not require cutting and patching as defined in this Section.
4. See respective Specification Sections for additional definitions and requirements pertaining to Cutting and Patching.

1.04 SUBMITTALS

A. Submit written request to Owner and A/E a minimum of 48 hours in advance of executing any cutting and alteration affecting:

1. The work of the Owner or any separate Contractor;
2. Structural value or integrity of any element of Project;
3. Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems;
4. Efficiency, operational life, maintenance, or safety of existing operational elements;
5. Visual quality of sight-exposed elements.
6. Exterior weather protective finish.
7. Historical elements defined in the Contract Documents.

B. Include with Request:

1. Project identification;
2. Description of affected work and products to be used;
3. Necessity for cutting;
4. Effect on work of Owner or any separate Contractor;
5. If structural modifications is a contractor alternative to work shown in the Contract Documents, the Contractor shall retain and submit calculations of a Washington State registered structural engineer that the proposed work will not change the load-carrying capacity or load-deflection ratio of the structural element;
6. Weatherproof integrity of Project;
7. Description of proposed work designating extent of cutting, patching or alteration. Include the following:
    a. name trades to be executing the Work;
    b. products proposed to be used;
    c. extent of refinishing to be done;
    d. alternatives to cutting and patching;
    e. where cutting and patching involves adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with the original structure.
    f. cost proposal (when applicable);
    g. written permission of any separate Contractor whose work will be affected;
    h. list of utilities that will be disturbed or otherwise affected by Work. Indicate duration of disruption.

C. Should work conditions or schedule indicate change of products from original installation, submit substitution request as specified in Section 01 61 00.

D. Submit written notice to A/E designating date and time work will be uncovered.

E. Approval by the A/E to proceed with cutting and patching does not waive the A/E's right to later require complete removal and replacement of unsatisfactory work.

1.05 QUALITY ASSURANCE

A. Requirements For Structural Work: Do not cut-and-patch structural work in a manner resulting in reduction of load-carrying capacity or load/deflection ratio; submit proposed cutting and patching of structural elements to Architect for structural approval before proceeding.

B. Operational & Safety Limitations: Do not cut-and-patch operational elements and safety-related components in a manner resulting in reduction of capacities to perform in manner intended, including energy performance, or resulting in decreased operational life, increased maintenance, or decreased safety.

C. Visual Requirements: Do not cut-and-patch work which is exposed on exterior or exposed in occupied spaces of buildings, in a manner resulting in reduction of visual qualities or resulting in substantial evidence of cut-and-patch work, both as judged solely by Architect. Remove and replace work judged by Architect to be cut-and-patched in a visually unsatisfactory manner.

1.06 WARRANTY

A. Replace, patch, and repair material and surfaces cut or damaged by methods and with materials in such a manner as not to void any warranties required or existing.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible if identical materials are unavailable or cannot be used. Use materials whose installed performance will equal or surpass that of existing materials.

B. Salvaged Materials: Salvage sufficient quantities of cut or removed material to replace damaged work of existing construction, when material is not readily obtainable on current market.

1. Store salvaged items in a dry, secure place on site, or deliver to Owner as noted.
2. Items not required for use in repair of existing work shall remain the property of Owner at the Owner's option; otherwise they shall become Contractor's salvage.
3. Salvaged items to be re-used shall be cleaned, refinished, etc., as appropriate before reinstallation.
4. Do not incorporate salvaged or used material in new construction except where specifically indicated or with written permission of A/E.
5. Refer to other sections for salvage requirements that may be more stringent.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine surfaces to be cut and patched and conditions under which cutting, and patching is to be performed before cutting. If unsafe or unsatisfactory conditions are encountered, take corrective action before proceeding.

1. Before proceeding, meet at the Project Site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

B. Prior to cutting into existing concrete or masonry, the Contractor shall conduct X-ray inspections to verify location of existing internal conditions (conduit, structural steel, etc.) to ensure that they will not be damaged during cutting and demolition work.

C. After uncovering work, inspect condition affecting product installations and work performance. Advise A/E in writing if there are conditions which will change the Contract Document requirements.

3.02 PREPARATION

A. Provide adequate temporary support of work to be cut to assure structural integrity of affected work and safety for Contractor and Owner personnel.

B. Protect existing and adjoining construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.

C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Avoid cutting existing pipe, conduit, or ductwork serving the building but scheduled to be removed or relocated until provisions have been made to bypass them.

3.03 PERFORMANCE

A. Employ skilled contractor personnel to perform cutting and patching. Skilled shall mean contractor personnel trained in the installation and repair of the specific material(s) impacted.

B. Execute cutting and removals by methods preventing damage to other work. Use core drilling equipment and diamond saws for cutting required openings in concrete and masonry. Provide proper surfaces to receive installation of repairs.

C. Work shall be performed by or under the direct supervision of the General Contractor and only by specialists or workers skilled in the necessary trades for materials requiring cutting and patching. Employ qualified installer or fabricator to perform cutting and patching for sight-exposed finished surfaces. The General Contractor shall be responsible for obtaining approval from the A/E for all cutting in and around any surface that is identified in the documents as an historically significant area or specifically noted otherwise. See Section 01 35 91 for additional requirements and procedures pertaining to historic materials.

D. Execute fitting and adjustment of products to provide finished installations complying with specified products, functions, tolerances, and finishes.

E. Restore cut or removed work. Install new products as required to complete work in accordance with Contract Documents. Quality of patched or extended work shall be not less than that specified for new work.

F. Fit work air-tight to pipes, sleeves, ducts, conduit, and other surface penetrations. Maintain required clearance around pipe in accordance with National Fire Protection Association NFPA-13. Provide required firestopping in conjunction with patching.

G. Refinish entire surfaces as necessary to provide even finish matching adjacent finishes:

1. For continuous surfaces, refinish to nearest intersection.
2. For an assembly, refinish the entire unit.

3.04 CUTTING

A. Only saw cutting or core drilling of concrete and masonry are permitted; no jack hammering, hammering, or chopping unless an exception is requested by the Contractor and approved by the Owner. Limited use of roto hammers is acceptable. Use of these pieces of equipment

shall occur when the building occupancy is at its lowest in the space adjoining the work. See Specification Section 01 50 00 – 3.04H for requirements related to cutting equipment.

B. Cut existing construction using methods least likely to damage elements retained or adjoining construction.

1. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
3. Where services are required to be removed, relocated, or abandoned, by-pass utility services, such as pipe or conduit, before cutting. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining portion of pipe or conduit flush with remaining wall, floor, or ceiling to prevent entrance of moisture or other foreign matter after by-passing and cutting.
4. Monitor cutting to detect any movement of surrounding work after cutting has occurred.
5. Cutting of any surface identified as historical shall be observed by the A/E and not begun prior to A/E approval.

3.05 PATCHING

[Specifier – coordinate with mechanical and electrical spec sections]

A. Except as specified otherwise, all patching is the responsibility of the applicable trade and performed under the direction of the Contractor. All patching shall conform to the requirements set forth herein and to the standards set forth in these Contract Documents for applicable like work and materials.

B. Patch with durable seams that are as invisible as possible. Comply with specified tolerances.

1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.
2. Patching shall match existing or adjacent surfaces and shall match existing materials and assemblies so as to retain all existing fire ratings. Existing walls, floors, ceilings, beams and other building surfaces shall be neatly finished by patching, filling or otherwise as directed by the A/E.
3. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
4. Where removing walls or partitions extending from one finished area into another, patch and repair floor and wall surfaces at the removed area to obtain a uniform transition between any adjoining spaces. Provide an even surface of uniform color and appearance. If necessary to achieve uniform color and appearance, remove existing floor, wall and ceiling coverings and replace with new materials.
5. Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.
6. Fit work air-tight to pipes, sleeves, ducts, conduit, and other surface penetrations.
7. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material allowed in these specifications to full thickness of the penetrated element.
8. When finished surfaces are cut in such a way that a smooth transition with new work is not possible, terminate existing surface in a neat manner along a straight line at a natural line of division, and provide trim appropriate to finished surface as approved by A/E.

C. Refinish entire surfaces from corner to corner or to change in material as necessary to provide an even finish matching adjacent finishes.

1. For continuous surfaces, refinish to nearest intersection.
2. For an assembly, refinish the entire unit.

3.06 CLEANING

A. Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar items. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

1. Clean common areas on a daily basis that may be used by occupants.

END OF SECTION 01 73 29

GUIDE SPECIFICATIONS

The following specification is intended to be used, generally verbatim, in the contract documents. ***[Specifier notes]*** shall be deleted during the editing process. Where [ ] appear in this document, this indicates requirements which are optional depending upon the project scope and conditions. Edit as appropriate for the project. The A/E consultant shall take ownership and responsibility for the contents of this section and is expected to modify other portions as necessary to accurately reflect conditions of the project. For draft copies during the design process, use Microsoft Word, Track Changes. Set criteria so that deletions show as strikethroughs. Deletions and additions are to be in red.

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 DESCRIPTION

A. This Section includes administrative and procedural requirements for cleaning and protection during construction and final cleaning at Substantial Completion.

B. Related Requirements: Coordinate related requirements specified in other parts of the Project Manual; special cleaning requirements for specific construction elements are included in appropriate Sections of Divisions 02 through 28, as applicable.

1.03 QUALITY ASSURANCE

A. General Cleaning Requirements: Conduct cleaning and waste disposal operations in compliance with governing laws, codes, and ordinances. Comply fully with Federal and Local environmental and anti-pollution regulations.

1. Do not dispose of volatile wastes, such as mineral spirits, oil, or paint thinner, in storm or sanitary drains.
2. Burning or burying of debris, rubbish, or other waste material on premises is not permitted.

B. Conform to State safety regulations (WISHA requirements).

C. Documentation of waste management, spill response, procedures and contingency plans to be made available to Owner's Representative upon request.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Cleaning Agents (for non-historic materials and spaces)

1. Use only cleaning agents and methods recommended by Manufacturer of surface material to be cleaned.
2. Use cleaning materials only on surfaces recommended by cleaning material Manufacturer; Do not use cleaning materials damaging to surfaces.
3. Do not use cleaning materials creating hazards to health or property.

PART 3 - EXECUTION

3.01 CLEANING & PROTECTION DURING CONSTRUCTION

A. General:

1. Contractor and each subcontractor at all times shall keep the premises free from accumulation of waste materials, debris and rubbish caused by their operations.
2. During handling and installation, clean and protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
3. Execute periodic cleaning. Keep work area free from accumulation of construction waste materials and rubbish.
4. Clean and maintain completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
5. Provide on-site containers for collection of waste materials, debris, and rubbish.
6. Allow no debris, broken or open cartons, or other refuse to collect in the project or around it; allow no inflammable or hazardous materials to be stored on the site without approved fire protection precautions and procedures.

B. Waste Removal: Remove all waste materials, debris and rubbish from site periodically and dispose of at legal disposal areas away from the site, at Contractor's expense. Aggregating material and/or hauling it off site shall not occur between the hours of 10:00 PM and 7:00 AM unless it complies with Specification Section 01 50 00 – 3.04H.

C. Street and Parking Area Cleaning: Immediately clean all spilled material which results from the work of this Contract and waste hauling operations; use motorized equipment and hand labor as required. Remove from streets, driveways or parking areas in time to prevent such materials from affecting traffic or clogging street drainage system; clean any drains thusly contaminated.

D. Non-Compliance: If the Contractor fails to enforce clean-up procedures, the Owner may do the cleanup and the cost thereof shall be charged to the Contractor and/or subcontractors, as applicable, as provided in Paragraph 3.4 of the General Conditions.

E. Dust Control

1. Clean interior spaces prior to start of finish painting. Continue cleaning on an "as-needed" basis until painting is finished.
2. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly coated surfaces.
3. Control site dust as necessary to meet local jurisdiction requirements.

OR

[Specifier – use the following in lieu of 3.01 above for exterior site work projects only.]

3.01 CLEANING DURING CONSTRUCTION – GENERAL REQUIREMENTS

A. Execute periodic cleaning. Keep work, site, and adjacent properties free from accumulation of construction waste materials, rubbish, and windblown debris.

1. Protect new materials from damage by construction debris.
2. Dispose daily all flammable, hazardous, and toxic waste materials. Storage of these materials will not be permitted on the interior of the building.
    a. Disposal and storage shall be in accordance with 40 CFR; WAC 173-303; 49CFR; State and Local fire codes and regulations.

B. Provide on-site containers for collection of waste materials, debris, and rubbish.

1. Periodically remove from site.
2. Dispose of legally at disposal areas away from site.

C. Store volatile wastes in covered metal containers and remove from premises daily. Prevent accumulation of wastes which create hazardous conditions. Provide adequate ventilation during use of volatile or noxious substances.

D. Debris Control: In accordance with Section 01 74 19, Construction Waste Management and Disposal, and the following:

1. Maintain all areas free of extraneous debris.
2. Initiate and maintain a specific program to prevent accumulation of debris at construction site, storage and parking areas, and along access roads and haul routes.
    a. Provide containers for deposit of debris as specified.
    b. Prohibit overloading of trucks to prevent spillages on access and haul routes.
        1) Provide periodic inspection of traffic areas to enforce requirements.
3. Schedule periodic collection and disposal of debris as specified. Provide additional collection and disposal of debris whenever the periodic schedule is inadequate to prevent accumulation.
4. Keep storm sewers free of debris or extraneous materials.

E. Street and Off-Site Cleanup

1. Vehicles used to haul materials off-site shall be constructed or loaded so as to prevent any leaking of materials from the vehicle (RCW 46.61.655). Contractor shall be responsible for keeping sidewalks, lawns, parking areas and streets clear of all construction materials, debris, gravel, rock and dirt attributed to the Contractor or his Subcontractors. Clean-up shall be on a daily and/or “upon request” basis as determined by the A/E.
2. Contractor shall plan operations to minimize the need for cleaning street areas adjacent to the construction site, access roads, and haul routes utilized for Work under this Contract. The use of water to perform cleaning work shall be held to a minimum. Contractor shall provide self-propelled pickup sweepers for pavement cleaning and for debris removal. As a minimum:
    a. Clean streets in accordance with local street use requirements.
    b. Clean streets used for hauling excavated material from the work site to the nearest arterial or for a minimum distance of three blocks at the end of each shift of hauling excavated materials.
    c. Clean streets of debris from installation of systems or other construction activities.
    d. Prohibit overloading of trucks to prevent spillages on access road and haul streets.
    e. Water wash staging areas once per week or more frequently as needed to control dust.
    f. provide wheel wash facilities to remove dirt, clay, stones, or other deposits from the tires or between wheels before trucks and/or other equipment be allowed to travel over paved streets.
        1) Water used for washing vehicles and equipment shall not be allowed to enter storm drains unless sediment, petroleum products, fresh concrete products, or other deleterious materials are separated prior to drainage.
    g. Transportation of excavated material by vehicles driven or moved on public streets or highways shall conform to the requirements of the local jurisdictions.

3.02 FINAL CLEANING

A. Provide final cleaning operations when indicated. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit of Work to the condition expected in a normal commercial building cleaning and maintenance program, complying with manufacturer's instructions.

B. Cleaning to include all exposed surfaces and materials within the limits of construction, whether installed by the Contractor, installed by the Owner, or existing prior to the beginning of this project.

1. The extent of cleaning existing facilities (remodel and/or addition projects) shall apply only to those areas of new work, or existing areas impacted by the construction activities, even if simply due to workmen passing through the space.

C. Complete the following cleaning operations before requesting review for certification of Substantial Completion for the entire Project or a portion of the Project. Cleaning shall include adjacent existing surfaces, such as, but not limited to, walls, floors, ceilings and glazing, that have been affected by the construction activity.
[Specifier - modify as required]

1. Clean the Project Site, yard and grounds, in areas disturbed or impacted by construction activities, including landscape development areas, of rubbish, waste material, litter, and foreign substances.
2. Sweep paved areas broom clean, and wash.
3. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
4. Remove all rubber tire marks and other discoloration from all new concrete paving, and all existing concrete paving impacted by construction activities
5. Remove petrochemical spills, stains, and other foreign deposits.
6. Remove tools, construction equipment, machinery, and surplus material from the site.
7. Remove snow and ice to provide safe access to the building.
8. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
9. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
10. Broom and mop clean concrete floors and floors finished with V.C.T., sheet vinyl, and similar surfaces.
11. Vacuum clean carpet and similar soft surfaces, removing debris and excess nap. Shampoo, if required.
12. Clean transparent materials, including mirrors and glass (both sides) in doors and windows. Remove glazing compounds and other substances that are noticeable vision- obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
13. Remove labels that are not permanent labels.
14. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
    a. Do not paint over “UL” and similar labels, including mechanical and electrical nameplates.
15. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
16. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

17. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
18. Clean ducts, blowers, and coils if units were operated without filters during construction.
19. Clean food-service equipment to a sanitary condition, ready and acceptable for its intended use.
20. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs and defective and noisy starters in fluorescent and mercury vapor fixtures.
21. Leave the Project clean and ready for occupancy.

D. Rid the project of rodents, insects and other pests that may have entered as a result of the work.

E. Removal of Protection: Remove temporary protection and facilities installed for protection and administration of the work during construction. Restore landscaping and other repair as necessary or required.

F. Compliances: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner. Do not use Owner's containers for trash generated by cleaning or construction.

1. Where extra materials of value remaining after completion or associated work have become Owner's property, arrange for disposition of these materials as directed.

END OF SECTION 01 74 00

GUIDE SPECIFICATIONS

The following specification is intended to be used, generally verbatim, in the contract documents. ***[Specifier notes]*** shall be deleted during the editing process. Where [ ] appear in this document, this indicates requirements which are optional depending upon the project scope and conditions. Edit as appropriate for the project. The A/E consultant shall take ownership and responsibility for the contents of this section and is expected to modify other portions as necessary to accurately reflect conditions of the project. For draft copies during the design process, use Microsoft Word, Track Changes. Set criteria so that deletions show as strikethroughs. Deletions and additions are to be in red.

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 DESCRIPTION

A. The Owner desires that this project shall generate the least amount of waste possible and that processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors shall be employed.

B. Of the waste material that is generated, as much as economically feasible shall be reused, salvaged, or recycled. Recycle and/or salvage at least 50% of the non-hazardous construction and demolition. Recycle and/or salvage an additional 25% (75% total) of non- hazardous construction and demolition debris. This is consistent with the intent of RCW 39.04.135 and is mandated whenever practicable.

D. With these goals, the contractor shall develop a Waste Management Plan for this project.

1.03 DEFINITIONS

A. Chemical Waste: Includes petroleum products, bituminous materials, salts, acids, alkalis, herbicides, pesticides, organic chemicals and inorganic wastes.

B. Class III Landfill: A landfill that accepts non-hazardous waste such as household, commercial and industrial waste, including construction, remodeling, repair and demolition operations.

C. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.

D. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

E. Environmental Pollution and Damage: The presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to humanity; or degrade the utility of the environment for aesthetic, cultural or historical purposes.

F. Hazardous: Exhibiting the characteristics of hazardous or dangerous substances, i.e., ignitibility, corrosivity, toxicity, reactivity, environmental persistence or listed waste per WAC 173-303.

G. Inert Fill: A permitted facility that accepts inert waste such as asphalt and concrete exclusively.

1. Inert Solids / Inert Waste: Non-liquid solid waste including, but not limited to, soil and concrete, that does not contain hazardous waste or soluble pollutants at concentrations in excess of water-quality objectives established by a regional water board pursuant to local regulations and does not contain significant quantities of decomposable solid waste.

H. Nonhazardous: Exhibiting none of the characteristics of hazardous, dangerous or listed substances, i.e., ignitibility, corrosivity, toxicity, reactivity, environmental persistence or listed waste per WAC 173-303.

I. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

J. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

K. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

L. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

M. Return: To give back reusable items or unused products to vendors for credit.

N. Reuse: To reuse a construction waste material in some manner on the project site.

O. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.

P. Sanitary Wastes:

1. Garbage: Refuse and scraps resulting from preparation, cooking, distribution or consumption of food.
2. Sewage: Domestic sanitary sewage.

Q. Sediment: Soil and other debris that has been eroded and transported by storm or well production runoff water.

R. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

S. Toxic: Poisonous to humans either immediately or after a long period of exposure.

T. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

U. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.04 SUBMITTALS

A. See Section 01 33 00 for submittal procedures.

B. Landfill Alternatives Proposal – Draft Waste Management Plan: Within 14 working days after receipt of Notice to Proceed, or prior to any trash or waste removal, whichever occurs first, Contractor shall submit to the A/E and Owner for review and approval three (3) copies of the Draft Waste Management Plan projecting trash/waste that will require disposal and alternatives to landfilling, with net costs. The plan shall contain, as a minimum, the following:

1. An analysis of trash/waste to be generated and landfill options as specified for Waste Management Plan described below.
2. Describe as many alternatives to landfilling as possible.
   a. List each material proposed to be salvaged, reused, or recycled during the course of the Project.
   b. Estimate quantities for each waste stream.
   c. State the proposed recycle or disposal method for each waste stream.
   d. State on-site storage method for each waste stream.
   e. State transportation method for each waste stream.
   f. State the estimated net cost resulting from each alternative, after subtracting revenue from sale of recycled or salvaged materials and landfill tipping fees saved due to diversion of materials from the landfill.
3. Provide alternatives to landfilling for at least the following materials:
   a. Aluminum and plastic beverage containers.
   b. Corrugated cardboard.
   c. Wood pallets.
   d. Clean dimensional wood: May be used as blocking or furring.
   e. Land clearing debris.
   f. Excavated soils.
   g. Concrete: May be crushed and used as riprap, aggregate, sub-base material, or fill.
   h. Bricks.
   i. Concrete masonry units (CMUs).
   j. Precast concrete panels.
   k. Asphalt paving: May be recycled into paving for project.
   l. Metals, including packaging banding, metal studs and trim, ductwork, piping, sheet metal, structural steel, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
   m. Glass.
   n. Gypsum drywall and plaster.
   o. Carpet, carpet cushion, carpet tile, and carpet remnants, both new and removed: DuPont (http://flooring.dupont.com) and Interface (www.interfaceinc.com) conduct reclamation programs.
   p. Asphalt roofing shingles.
   q. Paint.
   r. Plastic sheeting.
   s. Rigid foam insulation.
   t. Plumbing fixtures.
   u. Mechanical and electrical equipment.
   v. Fluorescent lamps (light bulbs).
   w. Acoustical ceiling tile and panels.
4. Include the names for each subcontractor who will transport solid or hazardous waste from the site and the name of the receiving facility that will accept waste for disposal.

C. Review: The Draft Waste Management Plan will be reviewed by the A/E for comment with a copy going to the Owner.

1. The plan is checked to make sure all materials that may be economically recycled are listed.
2. The plan is also checked for the haulers, recyclers and disposal facilities, to include recycling, general waste and hazardous waste facilities.
3. Plan review comments are made by the A/E. Once no further comments are necessary, the contractor may proceed with its plan.

D. Waste Management Plan: Include the following information:

1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.
2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
   a. List each material proposed to be salvaged, reused, or recycled.
   b. List the local market for each material.
   c. State the estimated net cost, versus landfill disposal.
4. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.
5. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.
6. Transportation: Identify the destination and means of transportation of materials to be recycled, i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.
7. Recycling Incentives: Describe procedures required to obtain credits, rebates, or similar incentives.

DI. Implementation: The Contractor shall submit monthly a progress report summary of waste generated at the project. The summary shall be submitted on a form acceptable to the Owner and shall contain the following information:

1. For each material recycled, reused, or salvaged from the project, the amount (in tons or cubic yards), the date removed from the job site, the receiving party, the transportation cost, the amount of any money paid or received for the recycled or salvaged material, the net total cost or savings of salvage or recycling the material. Include manifests, weight ticket receipts or invoices.
2. The amount (in tons or cubic yards) of material landfilled from the project, the location of the receiving facility, the total amount of tip fees paid at the landfill, and the total disposal cost. Include manifests, weight tickets, receipts and invoices.

[OR] DII. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.

1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
2. Submit Report on a form acceptable to Owner; refer to sample and blank forms immediately following this Section.
3. Landfill Disposal: Include the following information:
   a. Identification of material.
   b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
   c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
   d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
4. Incinerator Disposal: Include the following information:
   a. Identification of material.
   b. Amount, in tons or cubic yards, of trash/waste material from the project delivered to incinerators.

c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.
d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.

5. Recycled and Salvaged Materials: Include the following information for each:
   a. Identification of material, including those retrieved by installer for use on other projects.
   b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
   c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
   d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
   e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
6. Material Reused on Project: Include the following information for each:
   a. Identification of material and how it was used in the project.
   b. Amount, in tons or cubic yards.
   c. Include weight tickets as evidence of quantity.
7. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

F. Recycling Incentive Programs:

1. Where revenue accrues to Contractor, submit copies of documentation required to qualify for incentive.
2. Where revenue accrues to Owner, submit any additional documentation required by Owner in addition to information provided in periodic Waste Disposal Report.

[OR]

G. Rebate Program Submittal: Provide rebate information and product documentation as required for Owner to qualify for Rebate Programs. Submit binder with final closeout submittals.

1.05 RESOURCES

A. Contractor may request specific technical assistance or referrals from the following resources:

Waste Reduction Specialist
Solid Waste Services
Program Department of
Ecology (360) 407-6352

1.06 ADDITIONAL RECYCLING REQUIREMENTS

A. Handling

1. Materials shall be free of dirt, adhesives, solvents, petroleum contamination and other substances deleterious to recycling process. Clean materials which are contaminated prior to placing in collection containers.
2. Arrange for collection by or delivery to the appropriate recycling center or transfer station that accepts construction and demolition waste for purpose of recycling.

B. Participation In Re-Use Programs

1. Industrial Materials Exchange (IMEX) program sponsored by the Local Hazardous Waste Management Program in King County.

a. IMEX is a free service designed to help businesses find markets for materials that traditionally would be discarded. The premise of the IMEX program is that material discarded by one business may be a resource for another business.
b. To obtain a current Materials Listings Catalog, call IMEX at (206) 296-4899.

2. Habitat for Humanity - South Puget Sound, a non-profit housing organization that rehabilitates and builds housing for low-income families.
   a. Sites requiring donated materials vary. Contact HFH at (360) 956-3456.

C. Rebate, Tax Credits, etc.: Rebates, tax credits and other savings obtained for recycled or re-used materials shall accrue to Contractor.

PART 2 - PRODUCTS

2.01 PRODUCT SUBSTITUTIONS

A. Notify Owner's Representative when Contractor is aware of materials, equipment or products that meet the aesthetic and programmatic intent of Contract Documents, but which are more environmentally sensitive than materials, equipment or products specified or indicated in the Contract Documents.

B. For each proposed product substitution, submit the following information in addition to requirements specified in Section 01 61 00:

1. Relative amount of waste produced, compared to specified product.
2. Cost savings on waste disposal, compared to specified product, to be deducted from the Contract Sum.
3. Proposed disposal method for waste product.
4. Markets for recycled waste product.

PART 3 - EXECUTION

3.01 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.

C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

D. Meetings: Discuss trash/waste management goals and issues at project meetings.

1. Pre-bid meeting.
2. Pre-construction meeting.
3. Regular job-site meetings.
4. Job safety meetings.

E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.

1. As a minimum, provide:
   a. Separate area for storage of materials to be reused on-site, such as wood cut-offs for blocking.

b. Separate dumpsters for each category of recyclable.
c. Recycling bins at worker lunch area.

2. Provide containers as required.
3. Provide temporary enclosures around piles of separated materials to be recycled or salvaged.
4. Provide materials for barriers and enclosures that are nonhazardous, recyclable, or reusable to the maximum extent possible, reuse project construction waste materials if possible.
5. Locate enclosures out of the way of construction traffic.
6. Provide adequate space for pick-up and delivery and convenience to subcontractors.
7. If an enclosed area is not provided, clearly lay out and label a specific area on-site.
8. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

J. Disposal Operations:

1. Promptly and legally transport and dispose of removed and demolished items and waste materials that are not identified to be recycled or reused.
2. Do not burn, bury or otherwise dispose of rubbish and waste materials on project site.
3. Aggregating material and/or hauling it off site shall not occur between the hours of 10:00 PM and 7:00 AM unless it complies with Specification Section 01 50 00 – 3.04H.

END OF SECTION 01 74 19

Demolition and Construction Waste Management Plan ***SAMPLE***

Project Name: Student Hall Contact/Phone: Joe Smith / (206) 555-2222
Expansion
Project Location: Washington Community College, Green City

Material	Estimated Quantity	Proposed Disposal Method	Proposed Handling Procedure	Hauler
Demolition				
Asphalt from parking lot	100 tons	Ground on-site, use as fill		
Wood framing	6 tons	Recycle - Wood Recycling NW	Separate into "clean wood" dumpster, nails ok.	A
Decorative wood beams	300 bd.ft.	Salvage - Green City Salvage	Remove by hand, store on site, on pallets, for pick up.	C
CMU block	60 tons	Ground on-site, use as fill		
Ceiling tile	10,000 SF	Recycle - A-1 Ceiling Tile	Remove whole, Stack on pallets and shrink wrap for pick up.	E
Metal track	4 tons	Recycle - Green City Metals	Separate into "metals" dumpster.	A
Doors	40	Salvage - Green City Salvage	Work with salvage company to remove by hand.	C
Sheet rock	30 tons	Recycle - Green's Gyp Recycle	Separate into "Gypsum Board" dumpster, no lead paint.	A
Carpet	30 CU YDS	Recycle - D-2 Carpets	Separate into "Carpet" dumpster, provided by D-2.	B
Fluorescent lamps	1,000	Recycle - Green's Hazardous Wst.	Use boxes and store in dry location on site for pick up.	A
Fluorescent ballasts	400	Recycle - Green's Hazardous Wst.	Use in drums and store in dry location on site for pick up.	A
Remaining wastes	8 tons	Garbage - City Disposal	Dispose in "trash" dumpster.	D
New Construction				
Concrete, brick & CMU	10 tons	Recycle - Green's Quarry	Break up (2' minus) and put in "concrete" dumpster.	A
Forming boards		Reuse then recycle - Wood Recy.	Reuse, then put in "clean wood" dumpster	A
Clean wood scrap	4 tons	Recycle - Wood Recycling NW	Separate into "clean wood" dumpster, nails ok.	A
Sheet rock	8 tons	Recycle - Green's Gyp Recycle	Separate into "Gypsum Board" dumpster, no lead paint.	A
Scrap metal	4 tons	Recycle - Green City Metals	Separate into "metals" dumpster.	A
Cardboard	10 CU YDS	Recycle - Green City Recycle	Separate into "cardboard" dumpster.	A
All other wastes	8 tons	Garbage - City Disposal	Dispose in "trash" dumpster.	D

Haulers: A - Acme Hauling D - City Disposal
B - EZ Carpet recycling E - A-1 Ceiling Tile
C - Green City Salvage

Demolition and Construction Waste Management Plan

Project Name:_____ **Contact/Phone:**_____

Project Location:_____

Material	Quantity	Disposal Method	Proposed Handling Procedure	Hauler
Demolition				
New Construction				

Haulers: A

_____

B

_____

C

_____

GUIDE SPECIFICATIONS

The following specification is intended to be used, generally verbatim, in the contract documents. ***[Specifier notes]*** shall be deleted during the editing process. Where [ ] appear in this document, this indicates requirements which are optional depending upon the project scope and conditions. Edit as appropriate for the project. The A/E consultant shall take ownership and responsibility for the contents of this section and is expected to modify other portions as necessary to accurately reflect conditions of the project. For draft copies during the design process, use Microsoft Word, Track Changes. Set criteria so that deletions show as strikethroughs. Deletions and additions are to be in red.

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout including, but not limited to, the following:

1. Training of Owner's personnel.
2. Maintenance Materials submission.
3. Substantial Completion.
4. Final Acceptance.

1.03 SEQUENCE OF CLOSE-OUT

A. The Contractor's superintendent shall perform a review of all installed work (general, mechanical, electrical) and note any corrections, touch-up, or otherwise restore marred, exposed surfaces, that is necessary to comply with the Contract Document requirements before requesting the A/E to review the Work. The Contractor shall develop a written correction list (pre-punch list) and track the completion of the items by initialing and dating each item, signifying that it has been reviewed and properly completed.

B. Comply with items under SUBSTANTIAL COMPLETION by submitting documentation and the Contractor's initialed correction list to the A/E with a letter requesting the A/E's review of the project.

C. Upon receipt of the information from the Contractor, the A/E will visit the site and review the Project with the Owner for compliance with the Contract Documents. The A/E will develop a punch-list of any work that still needs corrections. If the list is incidental corrective punch work to complete, the A/E will issue the notice of Substantial Completion with the corrections list attached. If the correction work is still significant, the Contractor shall complete the corrections in the same format as its pre-punch list and request additional reviews by the A/E as necessary to establish that the Project is complete to the point where the Substantial Completion notification can be issued.

D. Provide operation and maintenance instruction on installed equipment to Owner designated staff.

E. The Contractor shall correct any outstanding punch list items and submit all other close-out documentation to the A/E as indicated under FINAL ACCEPTANCE. When punch lists have been verified by the A/E as being complete and all documentation is satisfactory and accepted by the A/E, the A/E will issue its notification of Final Acceptance.

F. Upon receipt of the A/E's notification of Final Acceptance, PPD will advertise the Project as being accepted, starting the 45-day lien period.

1.04 PROJECT RECORD DOCUMENT SUBMITTAL

Refer to Section 01 78 00, Closeout Submittals.

1.05 OPERATION AND MAINTENANCE MANUALS

Refer to Section 01 78 00, Closeout Submittals.

1.06 OPERATING INSTRUCTION OF OWNER'S PERSONNEL

A. The Contractor shall provide for operating and maintenance instruction of Owner's personnel for items installed under this contract. Contractor shall provide for this instruction at a mutually agreeable time and place, which may be outside of Contractor's normal working hours.

1. Prior to any training, the Contractor is to complete all system start-up and functionality testing. The Contractor/Sub-contractor will then assist the A/E to review and confirm the systems are performing in accordance with the Contract Documents. If the documents identify that systems will be commissioned, the Owner may elect to have the commissioning agent also perform the functionality review with the Contractor. If commissioning is required, this will be completed prior to the Contractor and major subcontractors providing qualified personnel for conducting full on-site operation and maintenance training and instruction to Owner's designated user personnel and maintenance crews. Instruction shall include the proper operation, adjustment and maintenance of all general, mechanical and electrical operating systems and equipment. Contractor shall schedule this period in advance with the Owner and appropriate subcontractor or vendor's representative. This shall be scheduled two (2) weeks after submittal of the final Operating and Maintenance Manuals so that such information will be available for Owner staff familiarization prior to the time of this instructional period. Provide a minimum of (8) hours of such training and instructions on site, unless otherwise directed, conducted to Owner's satisfaction. Such instruction shall be given in time blocks not exceeding (4) hours in any, one-day and shall be exclusive of off-site factory training for such items as the energy management system.
2. At each training session, provide a sign-in sheet for signature of all Owner staff that attend. Identify the sign-in sheet with the training being provided and the date of the training. Submit the sign-in sheet(s) with FINAL ACCEPTANCE procedure.
3. Except as otherwise specified, arrange for each installer of work requiring continuing maintenance or operation to meet with Owner's personnel at project site to provide basic instructions needed for proper operation and maintenance of entire work. Include instructions by manufacturer's representatives where installers are not expert in the required procedures.
4. Use operation and maintenance manuals as the basis for instruction. Review contents of manual with personnel in full detail to explain all aspect of operations and maintenance; include as a minimum record documentation, tools, spare parts and materials, lubricants, fuels, identification system, control sequences, hazards, cleaning and renewal of finishes, and similar procedures and facilities.
5. For operational equipment, demonstrate start-up, shut-down, emergency operations, noise and vibration adjustments, safety, economy/efficiency adjustments, and similar operations. Review maintenance and operations in relation with applicable warranties, agreements to maintain bonds, and similar containing commitments.
6. All equipment operation and maintenance instructions and training shall be videotaped in a professional manner, at the expense of the Contractor, and the edited film delivered with documents for FINAL ACCEPTANCE.
7. In addition, provide (4) hours training for the energy management system.
8. Provide a minimum of (4) hours additional follow-up training sessions to be conducted four (4) months following initial training. Systems/equipment to be covered under these training sessions shall be as determined by the Owner.

9. In addition to or in conjunction with these training sessions, provide for (4) seasonal adjustment training sessions of the energy management system.

B. The Contractor shall submit a training synopsis for each system required under the Contract Documents to review operations and maintenance instruction and training. Submit training synopsis with each respective preliminary Operation and Maintenance Manual submittal. Each synopsis shall be reviewed by the A/E and approved or returned with comments if necessary. Written approval by the A/E of each synopsis is required prior to beginning such training.

C. For additional requirements for operating instructions, see respective Specification Sections.

1.07 MAINTENANCE MATERIALS

A. Provide maintenance materials (tools, spare parts, extra stock, etc.) indicated in other sections of the specifications.

1. Submit a receipt to the Owner identifying the product and quantity that is being provided.
2. Obtain Owner's signature on the receipt.
3. Send original receipt to PPD Project Manager and include a copy of the receipt in the Warranties, Bonds, Extra Stock, and Permits manual.

1.08 SUBSTANTIAL COMPLETION

A. Substantial Completion is defined in the General Conditions. Before requesting A/E's review for certification of Substantial Completion, complete the following, and provide a letter of request for Substantial Completion. List exceptions in the request.

1. Obtain and submit releases enabling the Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Advise the Owner of pending insurance changeover requirements.
3. Make final changeover of permanent locks and transmit keys, and a list identifying each key to the Owner. The list is a receipt to be signed by the Owner with a copy delivered to PPD Project Manager and a copy placed in the Operation and Maintenance Manual hardware section. Advise the Owner's personnel of changeover in security provisions.
4. Complete startup testing and commissioning of systems; submit Balancing Logs.
5. Discontinue and remove temporary facilities from the site, along with mockups, construction tools, and similar elements.
6. Complete final clean-up requirements.
7. Return all security badges and keys that were issued to the Contractor

1.09 FINAL ACCEPTANCE

A. Before requesting certification of Final Acceptance and final payment, complete the following. Submit all of the following items together – no partial submittals will be accepted.

1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include insurance certificates for products and completed operations where required.
2. Submit an affidavit that all payrolls, bills for materials and equipment, and other indebtedness connected with the work for which the Owner of property might in any way be responsible, have been paid or otherwise satisfied. (AIA Document G706).
3. Submit Contractor's Affidavit of Release of Liens (AIA Document G706A): If any liens are filed and cause the Owner to employ the services of any attorneys, the cost of the services will be deducted from the retainage.
4. Submit a letter from the Contractor's Bonding Company addressed to Owner and submitted to A/E approving release of final payment and waiving submittal of final receipts as well as a statement confirming the extension of the Bond for the one-year warranty period. Final receipts from all subcontractors and material and equipment

suppliers shall be furnished to the A/E by the Contractor if the Surety does not waive this requirement.

5. Submit a copy of the A/E's final review list ("punch list") of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, identifying the name and company of the individual who confirmed completion of each item, and date when confirmation inspection was performed.
6. Submit consent of surety to final payment on AIA Form G707.
7. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
8. Submit State Department of Labor and Industries Affidavit of Wages Paid (State Form 9843) approved by Department of Labor and Industries for all trades that have performed work on the Project.
9. Submit certified Statement indicating asbestos or lead containing material were not utilized or incorporated on the Project provided by Contractor under this contract.
10. Submit final As-Built Documents.
11. Submit final Operation and Maintenance Manuals.
12. Submit final Warranties, Bonds, and Permit Manual.
13. Submit keys and keying schedule.
14. Submit a list of all paints used, manufacturer, and formulation for each.
15. Submit evidence of completion of commissioning of designated building systems.
16. Submit evidence of completion of Owner's training for all designated systems and videotape(s).
17. Submit evidence of compliance with requirements of governing Authorities.
    a. Certificate of Occupancy, if not submitted at time of Substantial Completion. (Note: Certificate of Occupancy is required to be submitted with Substantial Completion Request unless otherwise exempted by Owner in writing.)
    b. Certificates of Inspection
        1) Mechanical Work.
        2) Plumbing Work.
        3) Fire Suppression Work.
        4) Electrical Work.
    c. Others as required by Regulatory Agencies.
18. Submit all other required close-out documents.

1.10 REVIEW FEES

A. The A/E and its consultants will complete one initial and one final project review of the Work at Substantial Completion and at Final Acceptance to establish and verify completion of punch list work. Should it be necessary for the A/E or its consultants to perform any additional reviews due to failure of Work to comply with completion status claimed by the Contractor, A/E and its consultants shall be compensated by the Contractor for each additional review required until the Work is satisfactorily completed. This compensation shall be at the A/E's and its consultants standard hourly billing rate at the time of the review, and expenses associated with the visit. Compensation by the Contractor will be through a deductive change order to the Contractor's contract.

END OF SECTION 01 77 00

GUIDE SPECIFICATIONS

The following specification is intended to be used, generally verbatim, in the contract documents. ***[Specifier notes]*** shall be deleted during the editing process. Where [ ] appear in this document, this indicates requirements which are optional depending upon the project scope and conditions. Edit as appropriate for the project. The A/E consultant shall take ownership and responsibility for the contents of this section and is expected to modify other portions as necessary to accurately reflect conditions of the project. For draft copies during the design process, use Microsoft Word, Track Changes. Set criteria so that deletions show as strikethroughs. Deletions and additions are to be in red.

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Project Record Document submittal.

B. Operation and Maintenance manuals.

C. Warranties, Bonds, Extra Stock, and Permits manuals.

1.03 SUBMITTALS

A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment. The following submittal procedure shall occur prior to Final Acceptance.

1. Submit original copy of as-builts (drawings & specifications) to A/E for review.
2. Compile and organize any drawings or schedules in the Project Manual onto sheets of the same size as the Contract Drawings and submit with other record documents.
3. Contractor will be notified within 15 workdays if the submitted documents are acceptable.
4. Should the submittal be unacceptable for any reason, the Contractor shall make requested modifications and resubmit to the A/E. Continue to resubmit as necessary until the submittal is acceptable.
5. Upon acceptance of the submittal, A/E will within 30 workdays incorporate the Contractor's as-builts into the A/E's original Contract Documents.
6. The A/E will return the specifications, the Contractor's original as-builts, and provide the Contractor with an AutoCAD or Revit disk.
7. The Contractor shall use the AutoCAD or Revit disk to obtain at its cost the following from a printer of its choice:
    a. Electrostatic reproducible made of each sheet of the Contract Drawings and compilation sheets at its original size, and any other drawings the Contractor may have provided as as-built drawings. The Contractor shall stamp each reproducible sheet as "As-Built", date, and sign each sheet.
    b. After item a. is completed, for each electrostatic reproducible, the Contractor shall have three sets of prints made on bond paper (or blue/black line prints at Contractor's option) and edge bound.
8. The Contractor shall submit to the Owner the electrostatic reproducible, 3 sets of prints, record specifications, and Contractor's original marked-up as-builts.

B. Operation and Maintenance Data:

1. Submit two (2) copies of preliminary Operating and Maintenance Manuals for operational and non-operational equipment for review by A/E. Submit for each system upon attaining

50% system completion, together with respective training synopsis; refer to Section 01 77 00. Upon review, A/E will return one copy with comments.
2. Submit 1 copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with A/E comments. Revise content of all document sets as required prior to final submission.
3. Within 10 days following receipt of the A/E approval and comments, and prior to Owner training, Contractor shall prepare and transmit to the A/E three (3) final copies of each of the above manuals.

C. Warranties, Bonds, Extra Stock, and Permits:

1. Obtain and assemble executed certificates, warranties, bonds, receipts for extra stock, permits signed by any authorities having jurisdiction, and any required service and maintenance contracts from the respective manufacturers, suppliers, and Subcontractors. These may be tabbed in the front of the General Operation and Maintenance Manual provided they do not over-fill the binder(s).
2. Verify that documents are in proper form, contain full information, and are notarized.
3. Include originals of each in operation and maintenance manuals, indexed separately on Table of Contents.
4. Co-execute submittals when required.
5. Submittal of warranties, bonds, extra stock and permit manual to match submittal requirements of Operation and Maintenance Manual.
6. Provide Table of Contents neatly typed, in complete and orderly sequence. Include complete information for each of the following:
   a. Product or work item;
   b. Firm, with name of principal, address, and telephone number;
   c. Scope;
   d. Date of beginning of warranty or service and maintenance contract;
   e. Duration of warranty or service maintenance contract;
   f. Proper procedure in case of failure;
   g. Instances which might affect validity of warranty or bond; and
   h. Contractor, name or responsible principal, address, and telephone number.
7. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within ten days after acceptance.
8. Make other submittals within ten days after Date of Substantial Completion, prior to final Application for Payment.
9. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within ten days after acceptance, listing the date of acceptance as the beginning of the warranty period.
10. Furnish two (2) executed copies, except furnish three (3) additional confirmed copies required for inclusion into Operation & Maintenance manuals.

PART 2 PRODUCTS

2.01 PROJECT RECORD DOCUMENTS

A. Project Record Documents include the following:

1. Marked-up copies of Contract Drawings.
2. Marked-up copies of Project Manuals (Specifications and Detail Book, as applicable), all volumes.
3. Addenda.
4. Reviewed and marked-up copies of shop drawings and product data.
5. Newly prepared drawings.
6. Change Orders, RFIs and other modifications to the Contract issued in printed form during construction.
7. Architect's Clarifications and Proposal Request with all supporting documentation.

8. Construction Change Directives.
9. Record Samples.
10. Field records for variable and concealed conditions.
11. Record information on Work that is recorded only schematically.
12. Manufacturer's instruction for assembly, installation, and adjusting.
13. Other miscellaneous record documents as listed below and applicable.
    a. Field records on excavations and foundations.
    b. Field records on underground construction and similar work.
    c. Survey showing locations and elevations of underground lines.
    d. Invert elevations of drainage piping.
    e. Surveys establishing building lines and levels.
    f. Authorized measurements utilizing unit prices or allowances.
    g. Records of plant treatment.
    h. Ambient and substrate condition tests.
    i. Certifications received in lieu of labels on bulk products.
    j. Batch mixing and bulk delivery records.
    k. Testing and qualification of tradesmen.
    l. Documented qualification of installation firms and/or personnel.
    m. Load and performance testing.
    n. Inspections and certifications by governing authorities.
    o. Leakage and water-penetration tests.
    p. Fire-resistance and flame-spread test results.
    q. Final inspection and correction procedures.

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. Maintenance of Documents and Samples:

1. Store and maintain in field office apart from the Contract Documents used for construction, one complete set of record documents and samples which are used to record as-built conditions.
2. Do not use Project Record Documents for construction purposes; protect from deterioration and loss in a secure fire-resistant location. Maintain record documents in good order and in a clean, dry, legible condition.
3. Make record documents and samples available at all times for review by A/E and Owner's Representatives.
4. Record actual revisions to the Work concurrent with construction progress.
5. Ensure entries are complete and accurate, enabling future reference by Owner.
    a. As specified in Section 01 31 19, following each monthly progress schedule meeting, Contractor shall meet with all major subcontractors whose work is in progress at the site, including but not limited to mechanical, plumbing, electrical, security, fire protection, civil, and as otherwise designated, to review all "as-built" revisions on the day-by-day working set of "Project Record Copy" and verify installed record information from the previous month is properly recorded on the day-by-day "Project Record Copy", with all revisions and pertinent information clearly indicated.

B. Record Drawings and Shop Drawings: A clean, undamaged set of Contract Drawings including coordination drawings and shop drawings shall be kept at the job site as as-built record documents. Record "as-built" drawings shall be comprised of all sheets contained in the Contract Drawings, as well as all special equipment or systems drawings.

1. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark whichever drawings that show conditions fully and accurately. Where shop drawings, RFI's or other communication record are used to identify a change, record a cross-reference at the corresponding location on the Contract

Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date. Items required to be marked include, but are not limited to, the following:

a. Indicate field changes of dimension and detail.
b. RFIs.
c. Depths of foundations below the first floor.
c. Horizontal and vertical measurements of underground services and utilities, referenced to the building or other permanent construction.
d. Note changes of directions and locations, by dimensions and elevations, as utilities are actually installed.
e. Duct size and routing. Indicated locations of mechanical dampers, valves, reheat boxes, cleanouts, and other items that require maintenance.
f. Show measured locations of construction-concealed internal utilities and appurtenances referenced to visible and accessible features of the structure.
g. Record accurate locations of piping, valves, traps, dampers, duct work, equipment, and the like.
h. Revisions to electrical circuitry.
i. Indicate details not on original Contract drawings.
j. “X-out” conditions not constructed and appropriately annotate "not constructed" to convey the actual "as constructed" condition.

2. Mark record sets in a clear, legible manner, using red ink (no pencils); use other colors to distinguish between variations in separate categories of the work. Use ‘whiteout’ to erase errors.
3. Mark new information that is important to Owner, but which was not shown on Contract Documents or Shop Drawings.
4. Show addenda items, change orders, RFI, or other means of communication used in the construction process.
5. Show and date revisions to drawings with a "cloud" drawn around the revision.
6. Organize record drawing sheets in manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set. Where shop drawings, RFI’s or other communication record are used as a reference, include a copy of them as part of the record drawings.

C. Shop Drawings

1. Maintain as record documents; legibly annotate to record changes made after review.
2. Include subcontractor reproducible shop drawings for all special equipment including as a minimum where applicable to the project, ductwork layout, fire sprinkler system layout, temperature control system, fire alarm system, intrusion alarm system, communications systems, data systems, detention security systems and others as deemed appropriate. Record Drawing shop drawings shall be easily reproducible, i.e., on mylar or of standard copy machine size, as appropriate and approved.

D. Project Manual(s): During the construction period, maintain one complete copy of the Project Manual(s), including Specifications, Detail Book(s), addenda, and one copy of other written construction documents, such as Change Orders and RFI's issued in printed form during construction.

1. Legibly mark these documents in red ink to show substantial variations in actual work performed in comparison with the text of the specification and modifications. Give particular attention to substitutions, selection of options and similar information on elements that are concealed or cannot otherwise be readily discerned later by direct observation. Note related record drawing information and product data. Record at each product section description of actual products installed, including the following:
   a. Manufacturer's name and product model and number.
   b. Product substitutions or alternates utilized.
   c. Changes made by Addenda and modifications.

2. Mark Detail Book schedules, details, etc., to indicate the actual installation where the installation varies from that indicated in the Detail Book and modifications issued. Complete information in accordance with Paragraph 3.01C below for all detail drawings.
3. Each prime contractor (Subcontractor) is responsible for marking up Sections that contain its own Work.
    a. General Contractor shall be responsible for collecting marked-up record Sections from each of the other prime contractors. General Contractor shall also be responsible for collating these Sections in proper numeric order with its own Sections to form a complete set of record Specifications.
    b. General Contractor shall be responsible for submitting the complete set of record Specifications as specified.

E. Record Product Data

1. Maintain one copy of each product data submittal, and mark-up variations in actual work in comparison with submitted information. Include both variations in product as delivered to site, and variations from manufacturer's instructions and recommendations for installation.
2. Give particular attention to concealed products and portions of the work which cannot otherwise be readily discerned at a later date by direct observation. Note related change orders and mark-up of record drawings and project manuals.
3. Note related Change Orders and mark-up of record Drawings, where applicable.
4. Upon completion of mark-up, submit complete set to Architect for Owner's records.
5. Where record Product Data is required as part of maintenance manuals, submit marked-up Product Data as an insert in the manual instead of submittal as record Product Data.
6. Each prime contractor (Subcontractor) shall be responsible for marking up and submitting record Product Data for its own Work.
7. Insofar as possible, insert record product data in individual sub-sections of O&M Manuals. Refer to 3.05 below.

F. Record Sample Submittal: Immediately prior to date(s) of substantial completion, Architect (and including Owner's personnel where desired) will meet with Contractor at site and will determine which (if any) of submitted samples maintained by Contractor during progress of the work are to be transmitted to Owner for record purposes. Comply with Architect's instructions for packaging, identification marking, and delivery to Owner's sample storage place.

G. Miscellaneous Record Submittals: Refer to Paragraph 2.01A.13 above for listing of miscellaneous record documents and to other Sections of these specifications for requirements of miscellaneous record-keeping and submittals in connection with actual performance of the work. Immediately prior to date of Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to Architect for Owner's records.

3.02 OPERATION AND MAINTENANCE DATA - GENERAL

A. General: For all operational equipment installed, Contractor shall submit operation and maintenance documents in manuals as specified herein. Separate sets of manuals shall be prepared for Divisions 21 through 25 and Divisions 26 through 28 equipment. For non- Division 21 through 28 equipment, the manuals shall contain both operational and non- operational items and equipment.

B. For Each Product or System: List names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

C. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

D. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

E. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. Content for Operational Equipment.

1. Product Data.
   a. Compile product data and related information for Owner's maintenance and operation..

      Contractor is to provide equipment list in Uniformat II format of all major system components. Equipment list to include component make, model, and serial number. The deliverable should be tabular (xlsx or CSV).

   b. Product data shall contain detailed information relative to the following:
      1) Description of unit or system, and component parts.
      2) Equipment functions, normal operating characteristics, and limiting conditions.
      3) Assembly, installation, alignment, adjustment and checking instructions.
      4) Operating instructions and sequences for start-up, break-in, routine and normal operation, regulation and control, shutdown, and emergency conditions. Include control diagrams and sequence of operation by controls manufacture; provide back-up disk of the sequence of operation of the DDC system.
      5) Routine procedures and guide for preventative maintenance and troubles hooting, including a schedule of recommended checks; disassembly, repair, and reassembly instructions.
      6) Detailed servicing and lubrication schedule. Include list of lubricants required.
      7) Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
      8) Complete nomenclature and model number of replaceable parts. Include with list manufacturer's current prices and recommended quantities to be maintained in storage.
      9) Safety precautions and safety features.
      10) Outline, cross-section and assembly drawings, engineering data, and color-coded wiring diagrams as installed.
      11) Test data and performance curves.
      12) Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.
      13) Provide Contractor's coordination drawings, with color coded piping diagrams as installed.
      14) Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
      15) Test and balancing reports.
   c. Include only sheet pertinent to specific product.
   d. Annotate each sheet to:
      1) Clearly identify specific product or part installed.
      2) Clearly identify data applicable to installation.
   e. Delete references to inapplicable information.
2. Drawings.
   a. Supplement product data with drawings as necessary to clearly illustrate relations of component parts of equipment and systems.
   b. Coordinate drawings with information in Project Record Documents to ensure correct

      illustration of completed installation.

c. Do not use Project Record Documents as maintenance drawings.

3. Supplement product/installation data with written text.
   a. Organize in consistent format under separate headings for different procedures.
   b. Provide logical sequence of installations for each procedure.
4. Special Mechanical Subcontractor Requirements: Comply with Divisions 21 through 25 requirements.
5. Special Electrical Subcontractor Requirements: Comply with Divisions 26 through 28 requirements.

3.04 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For all A/E non-operational products, applied materials and finish items installed, including but not limited to, floor coverings such as vinyl composition tile, acoustical ceiling panels, marker boards, etc., Contractor shall submit maintenance information as specified herein. Provide detailed information relative to the following:

1. Manufacture's data, giving full information on products.
   a. Catalog number, size, and composition.
   b. Color and texture designations.
   c. Information required for re-ordering special manufactured products.
2. Instructions for care and maintenance.
   a. Manufacturer's recommendation for types of cleaning agents and methods.
   b. Cautions against cleaning agents and methods, which are detrimental to the product.
   c. Recommended schedule for cleaning and maintenance.
   d. Instructions and recommendations for repair of finish.
3. Moisture protection and weather-exposed products.
   a. Include product data listing applicable reference standards, chemical composition, and details of installation.
   b. Provide recommendations for inspections, maintenance, and repair.

B. For additional requirements for maintenance data, see respective Specification Sections.

C. Provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

3.05 OPERATION AND MAINTENANCE MANUALS

A. Prepare instructions and data by personnel experienced in maintenance and operation of described products. Prepare data in the form of an instructional manual.

B. Format of Operation and Maintenance Manuals

1. Binders
   a. Commercial quality, stiff cover, metal-hinged 8-1/2 x 11-inch three D side ring binders with durable and cleanable plastic covers. Binders shall be Wilson Jones #344 Series or equivalent as approved by the A/E.
   b. Provide suitable ring size for content with a 1-inch minimum, up to 3-inch maximum, range.
   c. When multiple binders are used, correlate data into related consistent groupings.
2. Cover and Spine: Identify the cover and spine of each volume with typed or printed title of the project, project number, and the words OPERATION AND MAINTENANCE INSTRUCTIONS.
3. For Contractor produced pages, paper shall be 8-1/2" x 11", white, 20 pound minimum.
4. Provide tabbed dividers for each separate product and system, with typed description of product and major component parts of equipment.
5. Text: Manufacturer's printed data, or typewritten data on 24-pound paper.

6. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
7. Arrange content by systems under section numbers and sequence of Table of Contents of this Project Manual.
8. Contents: Prepare a Table of Contents for each volume, with each product or system description identified, in three parts as follows:
    a. Part 1: Directory, listing names, addresses, and telephone numbers of A/E, A/E Consultants, Contractor, Subcontractors, and major equipment suppliers.
    b. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
        1) Significant design criteria.
        2) List of equipment.
        3) Parts list for each component.
        4) Operating instructions.
        5) Maintenance instructions for equipment and systems.
        6) Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
    c. Part 3: Project documents and certificates, including the following:
        1) Shop drawings and manufacturer's printed product data.
        2) Air and water balance reports.
        3) Certificates.
        4) Photocopies of warranties and bonds.
        5) Materials Safety Data Sheets (MSDS) for each product used on the Project.
9. Provide a listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.
10. Table of Contents: Provide title of Project; names, addresses, and telephone numbers of Architect, Consultants, and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.

3.06 WARRANTIES, BONDS, AND PERMIT MANUAL

A. Project Warranty – General:

1. If, within one (1) year after the Date of Substantial Completion of the Work, or designated portion thereof, or within such longer period of time as may be prescribed by law or by the terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be defective or not in accordance with the Contract Documents, the Contractor, and where applicable, his subcontractor that portion of the work, shall correct it promptly after receipt of a written notice from the Owner or Architect to do so. This obligation shall survive Termination of the Contract. The Owner will give such notice promptly after discovery of the condition.
2. Refer to Section 01 78 36 for administrative and procedural requirements for tracking project warranty issues subsequent to date of Substantial Completion.

B. Categories Of Specific Warranties

1. Warranties on the work are in several categories, including those of General Conditions, and including (but not necessarily limited to) the following specific categories related to individual units of work specified in Sections of Divisions 02 through 28 of these specifications.
    a. Special Project Warranty (Guarantee): A warranty specifically written and signed by Contractor for a defined portion of the work; and, where required, countersigned by subcontractor, installer, manufacturer or other entity engaged by Contractor.
    b. Specified Product Warranty: A warranty, which is required by contract documents, to be provided for a manufactured product incorporated into the work; regardless of

whether manufacturer has published warranty without regard for specific incorporation of product into the work or has written and executed warranty as a direct result of contract document requirements.

c. Coincidental Product Warranty: A warranty which is not specifically required by contract documents (other than as specified in this section); but which is available on a product incorporated into the work, by virtue of the fact that manufacturer of product has published warranty in connection with purchases and uses of product without regard for specific applications except as otherwise limited by terms of warranty.

2. Refer to individual sections of Divisions 02 through 28 for the determination of units of work which are required to be specifically or individually warranted, and for the specific requirements and terms of those warranties (or guarantees).

C. Disclaimer and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

D. General Limitations

1. It is recognized that specific warranties are intended primarily to protect Owner against failure of the work to perform as required, and against deficient, defective and faulty materials and workmanship, regardless of sources.
2. Except as otherwise indicated, specific warranties do not cover failures in the work which result from: 1) Unusual and abnormal phenomena of the elements, 2) The Owner's misuse, maltreatment or improper maintenance of the work, 3) Vandalism after time of substantial completion, or 4) Insurrection or acts of aggression including war.

E. Related Damages & Losses

1. General: In connection with Contractor's correction of warranted work which has failed, remove and replace other work of project which has been damaged as a result of such failure, or must be removed and replaced to provide access for correction of warranted work.
2. Consequential Damages: Except as otherwise indicated or required by governing regulations, special project warranties and product warranties are not extended to cover damage to building contents (other than work of Contract) which occurs as a result of failure of warranted work.

F. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial completion is determined.

G. Reinstatement Of Warranty Period: Except as otherwise indicated, when work covered by a special project warranty or product warranty has failed and has been corrected by replacement or restoration, reinstate warranty by written endorsement for the time period starting on the date of acceptance of replaced or restored work and ending upon date original warranty would have expired if there had been no failure, with an equitable adjustment for depreciation.

H. Replacement Cost, Obligations: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. Contractor shall be responsible for the cost of replacing or restoring defective Work regardless of whether the Owner has benefited from use of the Work through a portion of anticipated useful service life.

I. Owner's Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, right, and remedies otherwise available

under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights, or remedies.

J. Rejection Of Warranties: Owner reserves the right, at time of final acceptance or thereafter, to reject coincidental product warranties submitted by the Contractor, which in opinion of Owner tend to detract from or confuse interpretation of requirements of Contract Documents.

K. Contractor's Procurement Obligations: Do not purchase, subcontract for, or allow others to purchase or sub-subcontract for materials or units of work for project where a special project warranty, specified product warranty, certification or similar commitment is required, until it has been determined that entities required to countersign such commitments are willing to do so.

L. Co-execute warranties when required. Provide originals of each for inclusion in each operation and maintenance manual.

M. Retain warranties and bonds until time specified for submittal.

N. SPECIFIC WARRANTY FORMS

1. Where a special project warranty (guarantee) or specified product warranty is required, prepare a written document to contain terms and appropriate identification, ready for execution by required parties.
2. Submit draft to Owner (through Architect) for approval prior to final executions.
3. Form of Warranty to state the following:

   I (We), (insert Contractor name), certify (insert name of trade or portion of work being guaranteed) installed by (insert name of appropriate subcontractor) on (insert the name of the project and project number) located in Olympia, WA, is performed in strict accordance with Contract Documents. Further, I (we) guarantee this work to be (watertight, without lead, other, etc.) caused by defects in materials and workmanship, for (fill in specific required guarantee period) years from (date of substantial completion), and will repair, or replace, without delay, any defects in materials and workmanship discovered within warranty period.

   Sincerely,

   (Name of Contractor/responsible principal/address/telephone number)
   Signed by Owner, Partner, or other person authorized to commit firm.

[***Specifier - include the "Watertightness Warranty" form immediately following this Section when instructed by the PM***]

END OF SECTION 01 78 00

Watertightness Warranty

STATE PROJECT NUMBER: _____

DATE OF SUBSTANTIAL COMPLETION: _____

OWNER: _____

BUILDING: _____

BUILDING ADDRESS: _____

_____

CONTRACTOR: _____

CONTRACTOR'S ADDRESS: _____

_____

APPLICATION CONTRACTOR: _____

APPLICATION CONTRACTOR'S ADDRESS: _____

_____

TYPE OF PRODUCT(S) AND WARRANTY PERIOD:

_____

APPLICATION CONTRACTOR: _____

APPLICATION CONTRACTOR'S ADDRESS: _____

_____

TYPE OF PRODUCT(S) AND WARRANTY PERIOD:

_____

PRODUCT MANUFACTURER: _____

PRODUCT MANUFACTURER'S ADDRESS: _____

_____

TYPE OF PRODUCT(S) AND WARRANTY PERIOD:

_____

PRODUCT MANUFACTURER: _____

PRODUCT MANUFACTURER'S ADDRESS: _____

_____

TYPE OF PRODUCT(S) AND WARRANTY PERIOD:

_____

The Contractor, Product Manufacture(s), and approved Application Contractor(s) warrant to the above-named Owner that subject to the terms, conditions, and limitations stated herein, the PRODUCT(S) listed above will remain in a watertight condition for the periods identified.

Watertightness Warranty

TERMS, CONDITIONS, AND LIMITATIONS

A. The Warranty of the Contractor, Product Manufacturer(s), and Application Contractor(s) shall include the cost of any repairs they are responsible for, including removing and reinstalling any and all overburden that may cover PRODUCT(S), and necessary to maintain the Warranty. Responsibility and assignment of costs associated with the repairs and removal and replacement of overburden are solely the responsibility of the warrantors. In no event, shall disputes among the liable parties impact the timely repair or warranty obligations.

B. The Owner shall provide the Contractor written notice, delivered within 30 days of the discovery by a representative of the Owner with the duty to report such events, of any noticed breech of watertightness. Unless apparent at that time what the cause of the breech is, the notice is only to make the Contractor aware of the breech, not its source, which may include but is not limited to flashing PRODUCT(S), sealant PRODUCT(S), roofing membrane PRODUCT(S), other Contractor installed material, or chemical damage caused by interaction of Contractor installed products. The Contractor is responsible under its Contract to investigate the breech to determine its cause. The Contractor, Application Contractor(s), Product Manufacturer(s), and a representative of the Owner, hereinafter called the investigation team, shall be convened to agree on the investigation procedures. All costs, including the initial investigation, which may include removal and replacement of any overburden, are to be borne by the party or parties responsible for the breech. If a source for the breech cannot be determined and testing specific to the identified breech area determines that the Contractor's work at the breech area is not at fault, the Owner will reimburse the Contractor for actual costs, including reasonable profit. If at any time a breech source is identified that may relate to the Contractor's tested area, the investigation team shall reconvene, and investigation procedures determined. If at any time it is found that a remote breech source caused by the Contractor's work contributes to the breech location originally tested, the Contractor shall reimburse the Owner for all payments made to the Contractor for the breech.

C. During the term of the warranty, agents or employees of the Contractor, Product Manufacturer(s), and Application Contractor(s) shall have free access to inspect the PRODUCT(S) at any time during regular business hours.

D. The Contractor, Product Manufacturer(s), and Application Contractor(s), shall:

1. Assume no liability for damage to:
    a. Interior building contents thereof.
    b. Any other property or person; and
    c. Incidental or consequential damages including loss of income, loss of time, lost sales, liability Owner has with respect to any other person or for any type or form of consequential or incidental or economic loss.
2. Assume no liability for any failure of the PRODUCT(S) resulting from:
    a. Natural or manmade disasters including but not limited to windstorms, gales, hail, floods, hurricanes, lightening, tornadoes, earthquakes, earth tremors, fires, vandalism, and mischief.
    b. Defects of surfaces that have been brought to the Owner's attention which are not Contractor installed and do not have an approved PRODUCT(S) application process.

Watertightness Warranty

c. Failures including, but not limited to, hidden work that pre-dates Contractor work, settling or shifting of the structure, or movement, cracking or deflection of the surfaces or supports which the PRODUCT(S) are not designed to accommodate.
d. The erection or construction of any additional installation in, on, or through the PRODUCT(S) after Substantial Completion, unless done in the manner prescribed and accepted by the PRODUCT(S) manufacturer.
e. Failure of the Owner to use reasonable care in maintaining the PRODUCT(S) in accordance with such instructions of the Product Manufacturer as may be in effect at the time of the installation.
f. Leaks caused by water entering from structures, components and/or systems not installed by the Contractor which are adjacent to the PRODUCT(S), or which cause deterioration in any component of the installed system to leak.
g. Excessive traffic or storage of materials related to direct Owner activities; and
h. Repairs or other applications to or on the PRODUCT(S) by the Owner after Substantial Completion, unless done in the manner prescribed and accepted by the PRODUCT(S) manufacturer.

E. Failure of any of the warrantors at any time to enforce any of the terms or conditions stated herein shall not be construed to be a waiver of such provision.

F. This Warranty shall accrue only to the Owner named herein.

CONTRACTOR

Signature: _____ Date: _____

Printed Name: _____

APPLICATION CONTRACTOR

Signature: _____ Date: _____

Printed Name: _____

APPLICATION CONTRACTOR

Signature: _____ Date: _____

Printed Name: _____

PRODUCT MANUFACTURER

Signature: _____ Date: _____

Printed Name: _____

PRODUCT MANUFACTURER

Signature: _____ Date: _____

Printed Name: _____

GUIDE SPECIFICATIONS

The following specification is intended to be used, generally verbatim, in the contract documents. ***[Specifier notes]*** shall be deleted during the editing process. Where [ ] appear in this document, this indicates requirements which are optional depending upon the project scope and conditions. Edit as appropriate for the project. The A/E consultant shall take ownership and responsibility for the contents of this section and is expected to modify other portions as necessary to accurately reflect conditions of the project. For draft copies during the design process, use Microsoft Word, Track Changes. Set criteria so that deletions show as strikethroughs. Deletions and additions are to be in red.

[Specifier: Confirm with PM what warranty process is needed. It is dependent on the complexity, size, and/or value of the project. If not "internet tracking process", convert the language to a standard notification process, keeping the SEQUENCE of events.]

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. In addition to General Conditions for Washington State Facility Construction 5.21, this section includes administrative and procedural requirements related to warranty issues:

1. Tracking issues
2. Tracking responses
3. Tracking closure

1.03 SEQUENCE

A. The Contractor shall develop an internet-based home page tracking process for access by designated construction team and Owner members prior to final acceptance of the project, or when warranty issues begin to arise, whichever occurs first. The internet tracking process is to be maintained for the general warranty period of one year. Extended warranties will be tracked through a normal paper, fax, e-mail and/or telephone process.

B. As warranty issues arise, designated Owner members will log in to the site and enter the issue. The Contractor will notify the appropriate trade (AT) that corrective work is needed. The log will show when the AT was notified and when the AT will visit the site and make corrections. The AT shall contact the Owner representative to make arrangements to visit the site. The site visit is to be no later than 48 hours after notification. The AT will advise the Owner representative when they leave the site and if the issue has been corrected.

C. The AT will enter data into the tracking process identifying when the visit occurred and a description of what corrective measures were taken (tighten loose connection, replace switch, etc.), or include the reason corrections were not made (need to order replacement switch, etc.) and when the correction is anticipated.

D. The AT will make a final entry when all corrections have been completed and the issue has been resolved.

E. If an AT fails to respond within 48 hours after a notification, or the Contractor does not proceed with corrections, the Owner may proceed with corrections and the Contractor shall reimburse the Owner for the costs.

F. If after the Contractor receives a request for warranty service, the Contractor advises the Owner, they believe it is outside of warranty requirements, resolution of the issue will be

through a meeting of the Contractor and Owner.

END OF SECTION 01 78 36

GUIDE SPECIFICATIONS

The following specification is intended to be used, generally verbatim, in the contract documents. ***[Specifier notes]*** shall be deleted during the editing process. Where [ ] appear in this document, this indicates requirements which are optional depending upon the project scope and conditions. Edit as appropriate for the project. The A/E consultant shall take ownership and responsibility for the contents of this section and is expected to modify other portions as necessary to accurately reflect conditions of the project. For draft copies during the design process, use Microsoft Word, Track Changes. Set criteria so that deletions show as strikethroughs. Deletions and additions are to be in red.

PART 1 - GENERAL

1.01 TRAINING REQUIREMENTS

A. Instruct the Owner's representatives in all aspects of the operations of all systems and equipment included in the scope of work of the project.

B. Provide training to cover operation of the building DDC system and the software procedures to allow the Owner's personnel to add, modify, or create points, DDC loops, graphics or energy management programs. The instruction shall consist of hands-on and training at the project site. Training shall include a "Question Period" at the close of each session.

C. Prior to providing instructions to Owner's representatives, provide final version of the Operating and Maintenance Manuals in three ring binders with index tabs, each containing all Subcontractor's and suppliers' names and telephone numbers, data sheets, valve charts, equipment charts if changes to equipment are made, brochures, operating, maintenance and lubricating instructions as well as number coded wiring diagrams and a complete set of reviewed Shop Drawings. Present all copies to the Owner for review in ample time for use during the instructions to Owner.

D. Supply tools, spare parts, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, troubleshooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

E. Manufacturers shall provide demonstrations and instructions on all equipment and materials.

F. Use final version of Operating and Maintenance Manual, "as-built" drawings, audio visual aids, etc. as part of instructional materials. Owner's training shall not start until these documents are completed and shall be completed just prior to the Certificate of Total Completion being granted.

G. Contractor commissioning and assistance provided to the Owner during the trial usage period shall not count as training time.

H. Commissioning and time spent with Contractor's staff by Owner's personnel shall not substitute for nor count as training. Owner's staff shall be allowed to participate in the commissioning process.

I. Obtain Owner's acceptance of instruction in writing after instructions to Owner is completed.

1.02 INSTRUCTOR QUALIFICATIONS

A. The Contractor shall provide competent technicians who shall give full instruction to the Owner's designated personnel in the adjustment, operation and maintenance, including

B. pertinent safety requirements of the equipment and systems specified, with emphasis on:

1. How to use and find information in documentation

1. System operational procedures for all modes of operation including warm-up, cool-down, emergency, seasonal change-over, occupied, unoccupied, etc.
2. Acceptable tolerances for system adjustment in all operating modes.
3. Procedures for dealing with abnormal conditions and emergency situations for which there is a specified system response.
4. Troubleshooting procedures to deal with equipment malfunction or failure

B. Arrange and pay for services of Manufacturers' representatives required for instruction on specialized portions of the installation, maintenance and/or operation.

C. A/E shall have the right to approve or reject the instructors based on their qualifications.

D. Contractor shall permit the Owner to videotape the training sessions for the Owner's internal use such as training new employees.

1.02 TRIAL USAGE AND TESTS

A. The Owner shall have the privilege of trial usage of mechanical systems or parts thereof for the purpose of testing and learning operational procedures prior to acceptance.

B. Contractor shall assist in trial usage for a period of time, as deemed reasonable by the Owner. Supply labor, material and instruments at no extra cost. Contractor shall not waive any responsibility because of trial usage. Assistance provided by the Contractor during the trial usage period shall not be counted as training time specified elsewhere in the Specification.

C. Trial usage by the Owner shall not be construed as acceptance of the Work by the A/E.

D. Provide the highest-level password for DDC system to permit Owner access for this trial usage to occur.

E. Provide and pay for all testing required on the system components where, in the opinion of the A/E, Manufacturer's ratings or specified performance are not being achieved.

1.03 TRAINING PLAN

A. Submit the training plan for approval by the A/E thirty (30) days prior to the first scheduled training session. The plan shall cover:

1. Proposed curriculum and teaching methods.
2. Required entering skills (e.g., familiarity with Windows™ controls theory). It shall be the responsibility of the Owner to ensure that the trainees have the required entering skills prior to taking the Contractor's course.

B. The duration of the training period shall not be less than 10 hours of general instruction, and not less than ten (10) hours of site-specific instruction for the Work, and not limited to a consecutive period. All training shall take place during normal working hours and shall not exceed seven hours per day. Travel time to sites or place of training shall not be counted as training time.

C. Co-ordinate all sessions with the Owner and/or his representatives. The Owner and/or the Contractor shall provide written notification at least three working days prior to cancellation or postponement of the training session.

D. Documentation specified in Section 01 78 00 shall be used as source information for the training sessions.

1. Provide a training manual for each trainee, covering in detail the data included in each training program, before training shall commence.
2. If the Contractor wishes to use visual aids such as video tape, slides, overhead, etc. as a part of the training course fulfillment, these visual aids or copies of them shall be made a part of the documentation package for future reference, refresher or retraining.
3. Provide training source material for a minimum of four of the Owner's operations personnel at least four weeks prior to start of training session.

E. Training courses shall be presented in the form of four sessions or approved by owner. Each session shall be of equal length.

F. The first session shall occur prior to the start of the system test for Substantial Completion. This course shall include but not be limited to the following:

1. System architecture
2. Equipment operation
3. Introduction to programming
4. System communication protocol
5. BACnet overview
6. System names
7. Color graphics creation and operation
8. Report generation
9. Maintenance management
10. Energy management
11. Changing set-points
12. Changing schedules
13. Alarm management

G. The second session shall start immediately after the start of Substantial Completion and shall include but not be limited to the following:

1. Preventive maintenance of all system components
2. Calibration of all sensors and controls
3. Programming of system equipment (DDC system and Front End)
4. Additional system features
5. Troubleshooting
6. Abnormal and emergency condition procedures

H. The remaining two sessions will occur at two months and four months after the second session. These sessions shall be designed to address the Owner's requirements. Co- ordinate course curriculum with Owner. Material may cover any or all of the following subjects:

1. OCL programming: editing, saving, reloading, composition and implementation
2. Color Graphic Generation: creation, file management and installation
3. Operational Skills: setpoint modification, graphic interrogation, menu manipulation, file interrogation, alarm management, and controller communications
4. Front End system: Level 0 hardware and Operator software language functions
5. Calibration and preventive maintenance of field equipment
6. Troubleshooting

I. All training shall be clearly documented on a daily basis, detailing number of hours of instruction, material covered, trainees' names and instructor(s') name. At the end of each training day, this information shall be authorized by the Owner's designated representative and by the Contractor.

J. Training for Owner's custodians/security personnel:

1. These persons shall be given an orientation to the DDC system including the location and operation of each DDC system component in their buildings, introduction to problem diagnosis, operation of the alarm printer with interpretation of its output.
2. The minimum length of this course is three hours per site. The course shall be delivered to the respective custodian(s) and other Owner's personnel in each building covered by the Work.

K. Upon completion of each session of training, the Contractor shall provide the Owner with a written statement, signed by the Owner, indicating that the training outlined by this Specification has been fulfilled to the satisfaction of the Owner.

END OF SECTION 01 79 00

GUIDE SPECIFICATIONS

The following specification is intended to be used, generally verbatim, in the contract documents. ***[Specifier notes]*** shall be deleted during the editing process. Where [ ] appear in this document, this indicates requirements which are optional depending upon the project scope and conditions. Edit as appropriate for the project. The A/E consultant shall take ownership and responsibility for the contents of this section and is expected to modify other portions as necessary to accurately reflect conditions of the project. For draft copies during the design process, Use Microsoft Word, Track Changes. Set criteria so that deletions show as strikethroughs. Deletions and additions are to be in red.

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Construction procedures to promote adequate indoor air quality after construction.

B. Building flush-out after construction and before occupancy.

C. Testing indoor air quality before commencement of construction; existing building areas only.

D. Testing indoor air quality after completion of construction.

1.03 PROJECT GOALS

A. Dust and Airborne Particulates: Prevent deposition of dust and other particulates in HVAC ducts and equipment.

1. The cleaning of ductwork is not contemplated under this Contract.
2. Contractor shall bear the cost of cleaning required due to failure to protect ducts and equipment from construction dust.
3. Establish condition of existing ducts and equipment prior to start of alterations.

B. Airborne Contaminants: Procedures and products have been specified to minimize indoor air pollutants.

1. Furnish products meeting the specifications.
2. Avoid construction practices that could result in contamination of installed products leading to indoor air pollution.

C. Ventilation: HVAC system has been designed to achieve the minimum requirements for ventilation specified in ASHRAE 62.1.

1.04 REFERENCES

A. ASHRAE Standard 62.1, or latest adopted edition

B. SMACNA (OCC) - IAQ Guideline for Occupied Buildings Under Construction, latest adopted edition.

1.05 DEFINITIONS

A. Adsorptive Materials: Gypsum board, acoustical ceiling tile and panels, carpet and carpet tile, fabrics, fibrous insulation, and other similar products.

B. Contaminants: Gases, vapors, regulated pollutants, airborne mold and mildew, and the like, as specified.

C. Particulates: Dust, dirt, and other airborne solid matter.

D. Wet Work: Concrete, plaster, coatings, and other products that emit water vapor or volatile organic compounds during installation, drying, or curing.

1.06 SUBMITTALS

A. See Section 01 33 00 for submittal procedures.

B. Indoor Air Quality Management Plan: Describe in detail measures to be taken to promote adequate indoor air quality upon completion; use SMACNA IAQ Guidelines for Occupied Buildings Under Construction as a guide.

1. Submit not less than 60 days before enclosure of building.
2. Identify potential sources of odor and dust.
3. Identify construction activities likely to produce odor or dust.
4. Identify areas of project potentially affected, especially occupied areas.
5. Evaluate potential problems by severity and describe methods of control.
6. Describe construction ventilation to be provided, including type and duration of ventilation, use of permanent HVAC systems, types of filters and schedule for replacement of filters.
7. Describe cleaning and dust control procedures.

C. Interior Finishes Installation Schedule: Identify each interior finish that either generates odors, moisture, or vapors or is susceptible to adsorption of odors and vapors, and indicate air handling zone, sequence of application, and curing times.

D. Duct and Terminal Unit Inspection Report.

E. Air Contaminant Test Plan: Identify:

1. Testing agency qualifications.
2. Locations and scheduling of air sampling.
3. Test procedures, in detail.
4. Test instruments and apparatus.
5. Sampling methods.

F. Air Contaminant Test Reports: Show:

1. Location where each sample was taken, and time.
2. Test values for each air sample; average the values of each set of 3.
3. HVAC operating conditions.
4. Certification of test equipment calibration.
5. Other conditions or discrepancies that might have influenced results.

1.07 QUALITY ASSURANCE

A. Testing and Inspection Agency Qualifications: Independent testing agency having minimum of 5 years' experience in performing the types of testing specified.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.01 CONSTRUCTION PROCEDURES - GENERAL

A. Prevent the absorption of moisture and humidity by absorptive materials by:

1. Sequencing the delivery of such materials so that they are not present in the building until wet work is completed and dry.
2. Delivery and storage of such materials in fully sealed moisture-impermeable packaging.
3. Provide sufficient ventilation for drying within reasonable time frame.

B. Begin construction ventilation when building is substantially enclosed.

C. If extremely dusty or dirty work must be conducted inside the building, shut down HVAC systems for the duration; remove dust and dirt completely before restarting systems.

D. When working in a portion of an occupied building, prevent movement of air from construction area to occupied area or into building HVAC system.

E. All tool and equipment used within a building return air space shall be equipped with a filter system to reduce the introduction of particulate and odor into the return air.

F. Fabricated products shall be pre-finished off-site wherever practical and to the greatest extent possible. The use of spray equipment for applying finishes in buildings shall be used only upon approval of Owner.

G. Provide temporary seal over all open ends of newly installed ductwork during the construction duration, until initial startup of associated HVAC system equipment.

H. HVAC equipment and supply air ductwork may be used for ventilation during construction:

1. Operate HVAC system on 100 percent outside air, with 1.5 air changes per hour, minimum.
2. Ensure that air filters are correctly installed prior to starting use; replace filters when they lose efficiency. Use MERV 8 filtration media.
3. Do not use return air ductwork for ventilation unless absolutely necessary and only then with approved filtering methods.
4. Where return air ducts must be used for ventilation, install auxiliary filters at return inlets, sealed to ducts; use filters with at least the equivalent efficiency as those required at supply air side; inspect and replace filters when they lose efficiency.

I. Do not store construction materials or waste in mechanical or electrical rooms.

J. Prior to use of return air ductwork without intake filters clean up and remove dust and debris generated by construction activities.

1. Inspect duct intakes, return air grilles, and terminal units for dust.
2. Clean plenum spaces, including top sides of lay-in ceilings, outsides of ducts, tops of pipes and conduit.
3. Clean tops of doors and frames.
4. Clean mechanical and electrical rooms, including tops of pipes, ducts, and conduit, equipment, and supports.
5. Clean return plenums of air handling units.
6. Remove intake filters last, after cleaning is complete.

K. Do not perform dusty or dirty work after starting use of return air ducts without intake filters.

L. Use other relevant recommendations of SMACNA IAQ Guideline for Occupied Buildings Under Construction for avoiding unnecessary contamination due to construction procedures.

3.02 ADDITIONAL CONSTRUCTION PROCEDURES FOR OCCUPIED BUILDINGS

A. Tenants have varying degrees of sensitivity to both airborne and settled dust which could be exacerbated during the construction process. In addition, certain areas may operate in a clean room environment and dust can create serious operational problems.

B. The Owner may perform an independent indoor air quality (IAQ) test prior to the beginning of construction which will be used as the baseline level for the building. When performed, a copy of this report will be given to the Contractor prior to the beginning of any construction activity. The Owner may perform similar air quality tests on a periodic basis throughout construction. The results of these tests will be compared to the baseline test and the results will be analyzed by the Owner to determine if acceptable indoor air quality is being maintained.

C. The Contractor shall be responsible for proposing and employing any mitigation measures required to ensure that air quality levels and dust control during construction do not exceed the baseline levels measured prior to construction. These measures may include, but not be limited to, temporary construction barriers, negative air machines, exhaust venting to the exterior, filters on mechanical ductwork, charcoal filtering systems, and the like.

D. The Contractor shall be responsible for maintaining the baseline indoor air quality (IAQ) of the environment outside of the limits of construction throughout the duration of the project. Areas within the limits of construction, where those areas are completely isolated from the adjacent environment, are not required to comply with the requirements of this section except as noted below.

E. Dust and other construction debris, which may not be quantitatively measured by the IAQ testing described above, shall be mitigated throughout the project. Dust and debris settling on building surfaces outside of the limits of construction shall be cleaned thoroughly at the end of each working shift. In addition, dust and debris on paths within the limits of construction as identified on the drawings shall be cleaned to avoid tracking dust outside of these areas.

F. IAQ and dust control measures on previous projects have been monitored closely by the Owner and have required significant attention by the Contractor. This attention involves both time and dust mitigation procedures that may be considered by the Contractor to be beyond those measures employed on other projects in which the Contractor is typically involved.

1. Contractor shall anticipate that significant attention to IAQ, dust control and daily cleaning will be required by this project and shall include all mitigation measures required to meet the requirements of this project in the base bid. No additional costs shall be approved for providing IAQ compliance, dust control mitigation or project cleaning measures.
2. Meet or exceed the minimum requirements of the SMACNA IAQ Guideline for Occupied Buildings Under Construction.

G. Contractor shall ensure that procedures, engineering controls, and other appropriate controls are utilized to maintain acceptable indoor air quality for building occupants during this Project. Before work is commenced, Contractor shall submit to the Owner a Work Plan designed to maintain indoor air quality during and after the Contractor’s work. The Work Plan shall include the following:

1. Safety Data Sheets (SDS) for all ‘off-gassing products Contractor intends to use; these include all glues, adhesives, sealers, caulking, mastics, cleaners, paints, thinners, and related products.

2. Curtailment, and/or supplemental or auxiliary workplace ventilation during the work as required to control contaminants, odors, vapors, and the like, from entering the intake system and to vent same directly outside.
3. Contractor work schedule.
4. Fume, dust, and odor suppression and/or auxiliary air filtration/cleaning.
5. Use of low hazard or low-emitting materials.
6. Plan for eliminating contaminant entry into HVAC system including outside air intakes.
7. Work practices that minimize contaminant generation.
8. Other appropriate hygiene practices.
9. Contractor contact person for IAQ problems/resolutions.

H. Contractor, as appropriate, shall notify the Owner at least 24 hours in advance, of work to be performed on the project site which may have adverse impacts on indoor air quality of workplace conditions.

I. Should complaints about indoor air quality be receive by Owner from building occupants, Contractor shall work with Owner to minimize the source of the problem.

3.03 BUILDING FLUSH-OUT

A. Contractor's Option: Either full continuous flush-out OR satisfactory air contaminant testing is required, not both.

B. Perform building flush-out before occupancy.

C. Do not start flush-out until:

1. All construction is complete.
2. HVAC systems have been tested, adjusted, and balanced for proper operation.
3. Cleaning of inside of HVAC ductwork, specified elsewhere, has been completed.
4. Inspection of inside of return air ducts and terminal units confirms that cleaning is not necessary.
5. New HVAC filtration media have been installed.

D. Building Flush-Out: Operate all ventilation systems at normal flow rates with 100 percent outside air for at least 14 consecutive days.

1. Obtain Owner's concurrence that construction is complete enough before beginning flush-out.
2. If additional construction involving materials that produce particulates or any of the specified contaminants is conducted during flush-out, start 14 day period over.

E. Install new HVAC filtration media after completion of flush-out and before occupancy or further testing.

3.04 AIR CONTAMINANT TESTING

A. Contractor's Option: Either full continuous flush-out OR satisfactory air contaminant testing is required, not both.

B. Perform air contaminant testing before starting construction, as base line for evaluation of post-construction testing.

C. Perform air contaminant testing before occupancy.

D. Do not start air contaminant testing until:

1. All construction is complete.

2. HVAC systems have been tested, adjusted, and balanced for proper operation.
3. Cleaning of inside of HVAC ductwork, specified elsewhere, has been completed.
4. New HVAC filtration media have been installed.

E. Indoor Air Samples: Collect from spaces representative of occupied areas:

1. Collect samples while operable windows and exterior doors are closed, HVAC system is running normally, and the building is unoccupied.
2. Collect samples from spaces in each air handler zone.
3. Collect samples from height from 48 inches to 84 inches above floor.
4. Collect samples from same locations on 3 consecutive days during normal business hours; average the results of each set of 3 samples.
5. Exception: Areas with normal very high outside air ventilation rates, such as laboratories, do not need to be tested.
6. When retesting the same building areas, take samples from at least the same locations as in first test.

F. Outdoor Air Samples: Collect samples at outside air intake of each air handler at the same time as indoor samples are taken.

G. Analyze air samples and submit report.

H. Air Contaminant Concentration Determination and Limits:

1. Carbon Monoxide: Measure in ppm, in relation to outdoor air; not more than outside air.
2. Carbon Dioxide: Measure in ppm, in relation to outdoor air; not more than 600 ppm higher than outdoor air. Indoor air levels should be 500 – 600 ppm.
3. Airborne Mold and Mildew: Measure in relation to outside air; not higher than outside air.
4. Formaldehyde: Measure in micrograms per cubic meter, in relation to outside air; not more than 20 micrograms per cubic meter higher than outside air.
5. Total Volatile Organic Compounds (TVOC): Measure in micrograms per cubic meter, in relation to outside air; not more than 200 micrograms per cubic meter higher than outside air.
6. 4-Phenylcyclohexene (4-PC): Measure in micrograms per cubic meter, in relation to outside air; not more than 3 micrograms per cubic meter higher than outside air.
7. Total Particulates (PM): Measure in micrograms per cubic meter, in relation to outside air; not more than 20 micrograms per cubic meter higher than outside air.
8. Regulated Pollutants: Measure in relation to outside air; not more than contained in outside air.

I. If air samples show concentrations higher than those specified, ventilate with 100 percent outside air and retest at no cost to Owner, or conduct full building flush-out specified above.

END OF SECTION 01 81 19

GUIDE SPECIFICATIONS

The following specification is intended to be used in the contract documents. It shall be project-specifically edited by the specifier and ***[specifier notes]*** shall be deleted during the editing process. Where [ ] appear in this document, this indicates requirements which are optional depending upon the project scope and conditions. Edit as appropriate for the project. The Project Commissioning Authority (CxA) shall take ownership and responsibility for the contents of this section and is expected to modify other portions as necessary to accurately reflect conditions of the project. For draft copies during the design process, use Microsoft Word, Track Changes.

This is a construction phase specification. As such is specified commission requirements for the construction team. The CxA scope of work must be clearly defined in the CxA Request for Qualifications and contract. CxA, AE, and owner responsibilities must be defined in the Commissioning Process Plan, which must be consistent with CxA and AE contracts. CxA and AE commission responsibilities appear in 01 91 13, only as they pertain to interaction with the construction team.

Section 01 91 13 specifies commission requirements that apply to all specifications divisions. Typically, the CxA will also provide project-specific, division-specific 08 00 specifications for the division-specific systems being commissioned. Common examples include Sections 20, 22, 23, and 26 08 00. A preliminary list of Functional Performance Test procedures is included in each 08 00 Section. For small projects with limited commission scopes, it might be appropriate to consolidate all commissioning requirements in to 01 91 13 and reference 01 91 13 in the Divisions related to systems to be commissioned.

The Commission Process Plan describes the commissioning process from beginning to end; often from pre or early design through post-occupancy. While the Commission Process Plan may be issued to the construction team for reference, portions of the plan not pertaining to the construction team need not be included in construction commissioning specifications. However, all construction team commissioning roles responsibilities, requirements and procedures must be defined in the Commission Process Plan prior to developing the construction specifications, and all of those construction team commissioning roles responsibilities, requirements and procedures must appear in the construction specifications (01 91 13 and the 08 00 sections). Therefore, the Commissioning Process Plan need not be referenced in the project specifications.

In general the approach described above can be applied to design-build, design-assist and integrated delivery projects with minor modification. Even for project of this type, it will typically be in the owner's best interest to hold the CxA contract; however, the CxA may be under the design-build contract if the conflict of interest is managed in accordance with Building Commissioning Association (BCA) guidelines. When the CxA is provided by the design build team, the commissioning scope and the CxA scope of work must be clearly defined in the design-build RFP, project requirements and contracts, in order to support approach described above.

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Commissioning is a designed quality-assurance process for achieving, verifying and documenting that the performance of facilities, systems, and assemblies meet the owner's documented objectives and criteria. The design team, contractor and subcontractors provide the quality control for the design, the installation and startup of the building systems. The commissioning process provides review and quantitative functional testing in order to formally observe and document that the quality control efforts of the designers and contractors are successfully completed.

B. Commissioning includes the completion of a formal commissioning process on the equipment and systems within the Commissioning Scope of Work, as specified within this Section 01 91 13. Commissioning is performed by the Commissioning Team under the leadership of the Commissioning Authority (CxA). The entire Commissioning Team is responsible for performing the

process and achieving successful commissioning results. Commissioning Team is defined in Definition of Terms portion of this section of the specifications.

C. Commissioning Standards: The commissioning process shall be in accordance with:
   1. All sections of the Contract Documents
   2. The Building Commissioning Association's (BCA) "Essential Attributes of Building Commissioning (1999)"
   3. ASHRAE Guideline 0-2005

D. Contractors' Responsibility: The Contractor is responsible for completion of the specified commissioning work. The contractors' responsibilities include:
   1. The General Contractor shall provide a Commissioning Coordinator (CC), as defined in Definition of Terms portion of this section of the specifications. The General Contractor's Commissioning Coordinator is responsible for managing the commissioning work specified for the contractors.
   2. The Contractor shall be responsible for providing material, equipment, and labor to participate in the specified commissioning process. The Contractor will assure the participation and co-operation of sub-contractors under their jurisdiction, as required to complete the commissioning process
   3. The Contractor shall support the commissioning process by integrating it into the construction process and schedule.

E. Support of Materials, Equipment and Systems Suppliers: Suppliers of major equipment and systems within the Commissioning Scope of Work (specified elsewhere in this Section 01 91 13) shall support the commissioning process. Minimum support shall consist of the following:
   1. Submit the manufacturer's installation & startup manuals as a part of the initial equipment submittal in accordance with the equipment specifications.
   2. Submit the manufacturer's operating and maintenance manuals as a part of the initial equipment submittal in accordance with the equipment specifications.
   3. Assist in developing the final functional test procedures as specified in Sections ***[019113, 230800, 260800, [xx]0800]*** and related sections.
   4. Provide authorized startup technician to perform functional performance testing as specified in Sections ***[019113, 230800, 260800, [xx]0800]*** and related sections.

1.2 RELATED SECTIONS

A. [Section 01 33 29 - Sustainable Design Reporting: Reporting requirements relating to commissioning.

B. Section 01 57 21 - Indoor Air Quality Controls: Precautions and procedures; smoking room testing; building flush-out.

C. Section 01 70 00 - Execution and Closeout Requirements: General startup requirements.

D. Section 01 78 00 - Closeout Submittals: Scope and procedures for operation and maintenance manuals and project record documents.

E. Section 01 79 00 - Demonstration and Training: Scope and procedures for Owner personnel training

F. [XX] 08 00 – [_____] SYSTEMS COMMISSIONING

G. ***[XX] 08 00 – [_____] SYSTEMS COMMISSIONING]***

H. All project specifications related to the "Systems Within The Commissioning Scope Of Work"

1.3 SYSTEMS WITHIN THE COMMISSIONING SCOPE OF WORK ***[This list is quite comprehensive and should be edited per the project requirements, including budget. Specifics of subsystems, equipment and components included should occur in the 08 00 specifications, but not here.]***

A. [Building Enclosure/Envelope

B. Plumbing

C. Heating, Ventilating and Air Conditioning (HVAC)

D. Specialty/Process Systems [in this case list]

E. Building Energy Management and Control System

F. Automated Control Systems

G. Electrical Power

H. Lighting Control

I. Electronic Safety and Security

J. Communications

K. Irrigation Systems

L. Medical Gases

M. Laboratory Gases, Vacuum and Compressed Air]

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedure.

B. Integrated commissioning/construction schedule

C. [Contractor's Systems Readiness Plans as specified in [XX] 08 0]0

D. Equipment start-up procedures. Submit in accordance with the specifications sections for systems and equipment within the commissioning scope of work. Submittal of startup procedures is required for acceptance of initial equipment submittal.

E. Equipment Operation and Maintenance manuals. Submit in accordance with the specifications sections for systems and equipment within the commissioning scope of work. Submittal of Operation and Maintenance manuals procedures is required for acceptance of initial equipment submittal.

F. Contractors' review of Initial FPTs.

G. [Record Documentation for the Systems Manual. Prior to Substantial Completion submit the following information, which is will become a part of the building Systems Manual. Submittals shall be on Compact Disk in Bookmarked Portable Document Format (.pdf).

1. Record/as-built HVAC & plumbing systems diagrams, flow diagrams, riser diagrams, schematic diagrams, and relative room pressure diagrams

2. Record/as-built plumbing systems diagrams, flow diagrams, riser diagrams, and schematic diagrams

3. Record/as-built electrical 1-lines, panel schedules and lighting plans

4. Record/as-built control system diagrams, sequences of operation, and setpoints for the central Automated Control Systems and packaged controls provided with equipment.

5. Record Control Systems wiring diagrams showing the interface with integrated control systems and controllers.

6. ***Recalibration schedule for control systems sensors, actuators and other components.***

7. A summary table listing commissioned equipment requiring servicing; along with the date placed into continuous operation, date of most recent servicing, and manufacturer's recommended service intervals]

1.5 DEFINITION OF TERMS

A. Acceptance Criteria: Acceptance of the systems is based on the contractor being able to demonstrate that the systems and their components function in accordance with the commissioning acceptance criteria.

1. Installation and static testing acceptance criteria: The acceptance criteria for installation and static testing are the materials and methods requirements specified throughout the Project Specifications.

2. Functional Performance Testing (FPT) acceptance criteria: The acceptance criteria for functional performance tests are based on the specified performance requirements and described within the FPT procedures. The functional performance test procedures include descriptions of systems and component's responses that are to be verified.

B. Commissioning Team: Commissioning is performed by the Commissioning Team, which consist of the Owner, Commissioning Authority, the Commissioning Coordinator, the Design Team, all subcontractors performing work on the equipment and systems within the commissioning scope of work, and all materials and equipment suppliers supplying equipment and systems within the commissioning scope of work. The commissioning team is led by the Commissioning Authority. The Commissioning Coordinator is the on-site manager of the commissioning process.

C. Commissioning Authority (CxA): The CxA is the owner's commissioning consultant and the leader of the commissioning Team. The CxA oversees the commissioning process and advises the owner on commissioning issues, emphasizing the long-term performance and maintainability of the systems included in the commissioning scope of work. The CxA is required to advise the owner of issues involving the design, construction, testing, adjusting and balancing, or other issues that would compromise the ability of the facility to meet the needs of the owner. The CxA is authorized to recommend to the owner the acceptance, modification, or rejection of all materials, procedures, schedules, tests, reports, or other required commissioning submittals. The CxA is not authorized to change existing contract documents, schedules, costs, or scope of work for any of the parties involved (architect or contractor).

D. General Contractor's Commissioning Coordinator (CxC): The General Contractor shall provide a Commissioning Coordinator. The CxA and the CxC comprise a commissioning management team. While the CxA leads the overall commissioning process, the CxC is responsible for managing contractors in their day-to-day performance of the specified commissioning work. The CxC is an employee of the General Contractor who is regularly and frequently on site. Qualifications for the

Commissioning Coordinator include experience and excellent abilities to schedule, coordinate, and manage mechanical and electrical subcontractors. The following tasks are some of the critical items included in the CxC's scope of work:

1. Integrating the specified commissioning activities into an overall construction schedule, updating the schedule, and providing two-week look-ahead schedules showing the upcoming commissioning related activities
2. Providing all commissioning submittals
3. Coordinating owner training, and ensuring that training is provided in accordance with the commissioning specifications
4. Ensuring that subcontractor and supplier review of the CxA provided FPT procedures and forms is completed and submitted in accordance with the specifications. This includes providing written comments regarding issues from all required FPT participants pertaining to safety, equipment protection and warranty, and appropriateness of the procedure for the systems as provided, and providing written comments, even if no exception is taken, for every FPT.
5. Coordinating development and submittal of specified flushing, cleaning and start-up procedures; and ensuring that these procedures are completed, and documentation is submitted
6. Providing test reports and progress reports in accordance with the commissioning specifications.
7. Managing the contractors' participation in the FPT process as specified in the commissioning specifications.
8. Managing the contractors' participation in resolution of issues identified during commissioning.
9. Ensuring that subcontractors perform preliminary testing to verify readiness for final FPT demonstrations; submitting documented verification that systems will pass FPTs with acceptable results as documented in the FPTs; and Coordinating the FPT demonstrations to Owner and CxA
10. Coordinating repeat FPTs that fail due to contract deficiencies until acceptable results are achieved, and managing the reimbursement of the Owners costs for repeated tests in accordance with the specifications

E. CxA Final Installation Verification Process: This process includes the on-site review of related system components for conformance to the Project Documents. The CxA will conduct this review and verify system readiness for final functional testing procedures upon receipt of the Contractor completed Contractor's System Readiness Checklists. The CxA shall document issues identified during this process and assign them to the appropriate party for resolution.

F. Prefunctional Testing or System Readiness Checklist: These checklists are provided by the CxA and include equipment installation and start-up items specified to be performed and verified by the Contractor. These checklists shall be completed by the Contractor and returned to the CxA prior to the final CxA installation verification and functional performance testing process.

G. Functional Performance Testing Process: Functional Performance Testing verifies that the systems perform in accordance with the project documents, the owner's design intent, and the A/E's basis of design. The process includes the documented testing of the systems under actual and simulated operating conditions. Functional Performance Test (FPT) procedures are detailed instructions that allow experienced system technicians to perform the FPTs with repeatable results. The repeatability of the procedures and results validate the tests. Final performance testing of systems will begin only after the Contractor certifies that systems are 100% complete and ready for functional testing, and the CxA has completed the subsequent installation verification process for the systems to be tested.

H. Commissioning Issues Log: All issues raised during commissioning shall be logged and tracked until they have been resolved. A commissioning issues log shall be maintained by the CxA. The Issues Log includes the description of all issues discovered as a result of the commissioning process. The list also includes the current issues status, assignment to the responsible party and the date of final resolution as confirmed by the CxA. Items listed may include issues where design, products, execution or performance does not appear to satisfy the Project Contract Documents and/or the design intent. The resolution of issues identified on this list may be the responsibility of the Contractor, design team, or the owner.

I. Back-Checking: Back-Checking is the process of verifying that commissioning related issues have been resolved by the responsible party. The back-checking process takes place once the Contractor has provided written notification that an issue or issues in the Commissioning Issues Log have been resolved.

J. Performance Period: The performance period is a set length of time designated to demonstrate proper facility operation prior to acceptance. The performance period commences after successful completion of other functional testing. Performance data is typically collected via EMCS trend logging or data logging. Evaluation typically includes zone temperature stability, optimum start/stop, warm-up period and other related functions. As part of this process the contractor will be required to set up and provide trends of control system parameters per the direction of the CxA. The performance period trend logs will be specified in the Functional Performance Test Procedures.

K. Seasonal or Deferred Testing: This testing is completed during conditions that do not occur during the initial functional testing period; for example, during design or seasonal transition temperatures. Seasonal or Deferred FPTs are a limited sub-set of the original tests and are designed to evaluate capacity and systems' interaction.

L. Final Commissioning Report: The Final Commissioning Report contains a summary description of the commissioning process as it occurred, and the final versions of all commissioning documentation. The Final Commissioning Report shall be prepared by the Commissioning Authority.

1.6 NONCONFORMANCE

A. The Contractor is responsible for scheduling and coordinating commissioning activities, and for providing systems and equipment that comply with the project acceptance criteria. The Contractor shall reimburse the owner for the cost of commissioning activities, including CxA labor and expenses that must be repeated because of a lack of preparation or coordination by the Contractor. Examples include.

1. Repeated system readiness verification: The CxA will back-check the Contractor's completed Prefunctional Testing/System Readiness Checklists. This documentation shall be consistent with the actual condition of the systems. Discrepancies between the information on the forms and the actual state of the systems, equipment, or components shall be noted on the Commissioning Issues log, corrected, and backchecked by the CxA. The cost of back-checking shall be subject to reimbursement.
2. Repeated witnessing of FPT demonstrations: The Contractor demonstrates the functional performance tests after they have verified that performing the FPTs will yield the documented acceptable results (as defined in the FPTs). Acceptable results must be obtained during a single demonstration. No more than two delays of less than 15 minutes each are acceptable for each test. Unacceptable results shall be noted on the Commissioning Issues log and corrected, and the FPT repeated. The cost of witnessing demonstrations that do not demonstrate specified acceptance criteria due to a lack of preparation by the contractor shall be shall be subject to reimbursement.

3. Repeated back-checking: Issues identified during the commissioning process, including site observations, systems readiness verification and functional testing, will be logged in the commissioning issues log. The Contractor shall submit a brief written statement of when and how each issue has been resolved, using issues response forms provided by the CxA. If the back-checked issues that have not been resolved as reported the associated cost of the unsuccessful back-check shall shall be subject to reimbursement.

PART 2 - PRODUCTS

2.1 PREFUNCTIONAL TESTING/SYSTEMS READINESS CHECKLISTS

A. The Contractor shall maintain and complete copies of the Prefunctional Testing/System Readiness Checklists, which will be provided by the CxA. Checklist forms and supporting documents shall be signed by the Contractor and submitted to the CxA upon completion.

B. Completion of these items shall not release the Contractor from their responsibility to complete other specified requirements of the Project Contract Documents.

2.2 STARTUP PROCEDURES AND FORMS

A. Startup procedures and checklists for equipment within the commissioning scope of work shall be submitted for review as a part of the equipment submittal. Minimum startup procedures are specified in the specifications for systems and equipment within the commissioning scope of work. Procedures shall also include all installation and start-up procedures and checklists that are provided by the equipment or system manufacturer. The accepted startup documentation shall be completed by the Contractor and submitted to the CxA for review and inclusion within the Final Commissioning Report.

2.3 TEST INSTRUMENTATION

A. The equipment required to demonstrate calibration, TAB and preparing the systems for functional testing shall be provided by the contractor and used for demonstrating functional testing to the Commissioning Authority. When field calibration of devices was required, provide the same equipment that was actually used for calibration.

B. The test equipment shall be provided in sufficient quantities to execute functional testing in an expedient fashion.

C. The test equipment shall be suitable for testing and calibration with accuracy and tolerances necessary to demonstrate that system performance is in accordance with the specified acceptance criteria.

D. Instrumentation used for functional testing system performance must have a minimum repeatability and accuracy of ± 1.0% of the acceptance criteria being measured. For example: if a supply temperature of 50F is being verified, the repeatability and accuracy of the test instrument must be at least ± 0.5F.

E. The test equipment shall have calibration certification per equipment manufacturer’s interval level or within one year if not specified.

PART 3 - EXECUTION

3.1 COMMISSIONING MEETINGS:

A. After the mobilization of the construction team, the Commissioning Authority will lead a commissioning coordination meeting with the Contractors, Owner's Representative and the Design Team. The CxA will present the commissioning process, discuss commissioning specifications, and identify specific commissioning related responsibilities.

B. Commissioning meetings provide an opportunity for direct coordination and prompt resolution of commissioning issues. The CxC coordinates the meetings; the CxA chairs and provides notes for these meetings. The CxC, the Owner, CxA, and all subcontractors listed as members of the Commissioning Team shall attend these meetings. The attendance of other commissioning team members, such as Design Team and key equipment suppliers, may be required if necessary to efficiently address the meeting's agenda. Commissioning meetings shall be held in accordance with the following requirements:

1. ***[XX] Commissioning*** meetings shall be held on ***[an as needed or specify interval such as weekly or monthly]*** basis until startup and / or functional testing of major equipment begins. The CxC, the Owner, CxA, and all subcontractors listed as members of the Commissioning Team shall attend these meetings. The attendance of other commissioning team members may be required if necessary to efficiently address the meeting's agenda.
2. While startup and functional testing are occurring, ***[weekly]*** commissioning meetings shall be held at a regularly scheduled time.

3.2 COMMISSIONING SITE OBSERVATIONS:

A. The commissioning Authority will perform periodic site observations. Reports will be submitted to the owner and the CxC. Issues identified during the site observations will be logged in the master commissioning issues log

3.3 COMMISSIONING ISSUES LOG

A. Issues identified during the commissioning process, including site observations, prefunctional testing verification and functional testing, will be logged in the commissioning issues log. The CxA will maintain the master log. For each issue, the CxA will make a recommendation regarding who they believe is in the best position to provide the resolution. It is the GC's responsibility, however, to manage issue resolution, including the determination of how the issue will be resolved and who will do the work.

B. Each issue in the list will be classified with a "status" of either "*resolved",* "*unresolved"* or "*resolved-unverified"*. *Resolved* issues are closed – having either been addressed by the contractor and verified as corrected by the CxA, or accepted by the owner. *Resolved–unverified* issues have been reported as resolved by the contractor but are not yet verified by the CxA as resolved. *Unresolved* issues have not been reported as addressed by the contractor. Updated unresolved issues lists will be distributed to team in MS Word format. =

C. Materials and methods issues discovered during commissioning but that pertain to AE construction review will be transferred to the Design Team for tracking through resolution. When the design team reports the issue resolved, the CxA will classify the issue as Resolved, without back-checking.

D. When a commissioning issue is resolved the Contractor shall submit the list with a written response describing when and how the issue is resolved. The CxA or the AE shall then back-check the issue. When a commissioning issue is resolved the Contractor shall submit the list with a written

response describing when and how the issue is resolved. The CxA or the AE shall then back-check the issue. BACK-CHARGING shall apply to issues that have not been resolved as reported.

3.4 PREFUNCTIONAL TESTING/SYSTEMS READINESS VERIFICATION

A. In preparation for the system readiness and startup, the contractor performs work in accordance with the contract bid documents, such as flushing and pressure testing piping systems, TAB, startup and contractor quality control testing. The CxC coordinates the subcontractors to verify and document that:
   1. Equipment is installed and placed into operation in accordance with the manufacturers' requirements and contract documents.
   2. The contractor has performed equipment start-up per the accepted start-up plan and start-up forms. The contractor shall correct issues as they are discovered and submit the successfully completed start-up documentation to the CxA.
   3. Equipment and components are located per the contract requirements and accessible for maintenance, operation, and testing
   4. Equipment startup and testing is performed in accordance with the contract documents, the equipment manufacture’s recommendations and good industry practices

B. Submit proposed and completed startup, testing, and adjusting plans.

C. For startup of major equipment and systems see Division-specific commission specifications sections

3.5 SYSTEM READINESS DOCUMENTATION

A. The CxA creates Prefunctional Testing/System Readiness Checklists for the Contractor, which document that the equipment has been provided in accordance with the project requirements and is ready for functional testing

B. The contractor completes, signs and submits the checklists for review. The CxC shall review and sign off on all Prefunctional Testing/System Readiness Checklists prior to submittal.

C. The CxA shall review the Prefunctional Testing/System Readiness Checklists and supporting documentation from installation and start-up activities.

3.6 FUNCTIONAL PERFORMANCE TESTS (FPTs)

A. Functional performance testing of commissioned systems shall begin after all critical issues discovered during the installation verification process have been corrected.

B. The procedure for developing and performing the FPTs shall be as follows.
   1. The Contractor shall provide the equipment and commissioning submittals as specified in the project documents.
   2. The Commissioning Authority shall draft the FPT procedures based on the contractors’ submittals and the contract documents. The draft procedures shall be submitted to the Commissioning Team for review.
   3. Each contractor and equipment supplier that is specified as an FPT participant in the Division-specific 08 00 Commissioning Sections shall participate in the development of the FPTs by providing written comments on their associated FPTs regarding each of the following issues:

a. Verify that the procedures can be performed without compromising the safety of the participants.
b. Verify that the procedures can be performed without compromising the warranties of equipment, components, and systems.
c. Verify that the procedure is appropriate for the equipment, components, and systems as provided
d. At the contractor's option, make recommendations to improve tests.

4. The CxA shall complete the working drafts of the FPTs
5. Subcontractors and suppliers shall provide the personnel, expertise and test equipment to operate and maintain the systems during testing.
6. As a part of their in-house quality assurance and control testing process, the Contractor shall test all systems within the commissioning scope of work, using the FPTs until the acceptable results specified in the FPT procedure are verified and documented. If necessary to obtain acceptable results, the Contractor may consult with the CxA to acquire clarification and resolve issues. The CxA shall be available for on-site assistance of this nature.
7. The Contractor shall submit documentation that verifies that the acceptable results specified in the FPT procedures have been verified and that they are ready to demonstrate the FPTs with acceptable results. Acceptable documentation consists of completed FPT record forms which document acceptable FPT results, or indication on the Systems Readiness Checklists that the Contractor's pre-functional testing has verified that functional performance testing of the equipment and associated system demonstrates the acceptable results specified in the FPT procedures.
8. After the CxA has accepted the Contractor's documentation of acceptable results, the FPTs shall be demonstrated to the CA. If acceptable results are not demonstrated for an FPT, the Contractor shall resolve the issue(s) and the demonstration shall be repeated.

[Delete this paragraph if sampling is not included in the project contract]

9. [The contractors shall verify and document acceptable FPTs results for all equipment components and systems. The FPTs may be demonstrated to the CxA for a sample of the systems that comply with all of the following criteria. This process is referred to in this document as "demonstration sampling."

a. There shall be many of the systems with similar components that have identical sequences of operation which are implemented using identical control software programming.
b. The components and systems to be included in the Demonstration Samples shall be chosen by the CxA at the time of demonstration.
c. The sample size shall be in accordance with the Division-specific 08 00 Commissioning Sections.
d. Acceptable results must be demonstrated for the entire sample. Whenever the demonstrated results are not acceptable, the contractors shall make corrections, the FPT shall be demonstrated again, and the FPT shall be demonstrated for all of the systems and components of that type.]

3.7 SCHEDULING OF COMMISSIONING ACTIVITIES ***[This section may not be appropriate for every project. It requires the contractor to schedule time for FPTs but it also puts the burden for estimating this CxA.]***

A. The following commissioning activities shall be integrated into the construction schedule to show task links, durations, and start and completion dates. The durations for CxA reviews and demonstration of FPTs to the CxA are preliminary estimates based on a single successful review or demonstration for each activity and procedure, with no delays. These estimates do not include the

contractors pretesting and pre-demonstration preparation a to verify that the demonstration or review will successfully confirm the acceptance criteria

1. Submittal of Integrated commissioning/construction schedule for CxA review; submit no more than ***[xx]*** working days after Notice to Proceed
2. CxA provided Systems Readiness Forms to the Contractor; distributed no more than ***[xx]*** working days after approval of all construction submittals
3. Completed Systems Readiness documentation submitted for CxA review; submit no fewer than ***[xx]*** working days prior to CxA back-check of Systems Readiness documentation.
4. CxA back-check of Systems Readiness documentation; duration of field review ***[xx]*** working days; schedule for completion no fewer than ***[xx]*** working days prior to demonstration of FPTs to CxA
5. Initial FPTs to Contractor for review; distributed no more than ***[xx]*** working days after approval of all submittals, including controls submittals
6. Submittal of Contractor review of FPTs; submitted no more than ***[xx]*** working days after distribution of Initial FPTs
7. Working FPTs from CxA to Contractor; distributed no more than ***[xx]*** working days after CxA receives contractor review comments. Must be completed prior to Contractors' FPT preparation period.
8. Contractors' FPT preparation period; schedule to be determined by Contractor
9. Submittal of Contractors' documentation that FPTs are ready to demonstrate to CxA; submit no fewer than ***[xx]*** working days prior to demonstrate to CxA.
10. Demonstration of FPTs to CxA; durations estimated below; schedule for completion no fewer than ***[xx]*** working days prior to award of Substantial Completion
    a. Division ***[xx]*** systems FPT demonstration period: ***[xx]*** working days
    b. Division ***[xx]*** systems FPT demonstration period: ***[xx]*** working days
    c. Division ***[xx]*** systems FPT demonstration period: ***[xx]*** working days

3.8 SYSTEMS ACCEPTANCE

A. Completion of functional performance testing is a required prior to Acceptance of equipment and systems.

3.9 PROJECT CLOSEOUT

A. Training on related systems and equipment operation and maintenance shall only be scheduled to commence after functional testing is satisfactorily completed and O&M manuals have been delivered and approved. Each Contractor is responsible to provide a topical outline of all subjects to be covered in the training session(s), the expected length of time for the training sessions, and a brief resume listing the qualifications of the proposed training presenters. The CxC is responsible for developing the training plan with input from the contractor. The CxC is responsible for coordinating training with the Owner and CxA and to verify execution of the training plan.

B. The Contractor shall submit test reports, balancing reports, record drawings and O&M manuals relevant to the systems commissioned.

C. Upon completion of all commissioning activities the CxA will prepare and submit to the owner the Final Commissioning Report detailing the commissioning plan and all commissioning activities and recommending acceptance to the Owner. The CxC will support this effort by coordinating the contractor provided documentation.

END OF SECTION 01 91 13

Basis of Design

This standard contains certain design criteria and procedures which apply to all remodeled/ rehabilitation projects. This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff in performing associated maintenance and repair work.

1.1 Design Criteria

A. All demolition/removal work performed on historical buildings shall be performed in compliance with the guidelines set forth by the Secretary of the Interior's Standards and Guidelines for the Treatment of Historic Structures. http://www.nps.gov/history/tps/standards/four-treatments/treatment-guidelines.pdf Further guidance should be obtained from the Owner's Historic Preservation Representative.

B. Refer to Paragraph G.1 of the General Design Requirements regarding good faith inspection report pertaining to asbestos containing materials in DES owned facilities.

C. The Owner may select and employ a Historic Preservation Representative (HP Representative) having expertise in historic preservation to conduct on-site observations and inspections as specified in Section 01 45 23, Historic Preservation Inspection Services, to ensure on the Owner's behalf that the Work is carried out in conformance with the Contract Documents. Projects involving repair and/or restoration work to historical structures shall include Section 01 45 23 in their Contract Documents.

D. If the building is occupied, identify that the Owner will remove certain equipment, furnishings and inventory items as necessary for Contractor's progress of the Work.

E. Condition of the building prior to selective demolition: The Contractor is to accept premises on an "as-is" condition. Owner assumes no responsibility for building condition now, at time of bidding, nor thereafter. Damage or loss resulting from any cause to buildings, persons and/or property shall not relieve Contractor from his obligation to complete all work under the Contract.

F. A/E is to review with Owner any items that are to be removed and if not being reused, which might be selected by the Owner to be retained.

G. Removal and storage of historic building components, fixtures and fittings shall be performed prior to any selective demolition work.

1.2 Submittals

A. The Specifications and/or Drawings are to include, as a minimum, the Contractor providing a demolition plan addressing the following, as applicable:
   1. Location of dust and water barriers for work in each construction area, including details.
   2. Proposed method of preventing dust/dirt/debris from entering into Owner occupied areas (control plan).
   3. Occupant egress.
   4. Demolition disposal route to dumpsters, including debris chute if used, and cleanup plan.
   5. Proposed dust/dirt/debris control at dumpster and debris chute.
   6. Schedule of activities that could disturb the Owner-occupied areas (noise, smells, vibration, etc.).
   7. Description of method(s) for protecting existing and installed work.

8. Schedule of required utility and building system shutdowns.
9. Schedule of demolition work in Owner occupied areas.
10. Daily cleanup plan for Owner occupied areas.
11. Identify demolition work (saw cutting, drilling, removal) that will involve or affect any structural element or part of the building structure.
12. Submit a proposed flooring and adhesive removal process, if needed, of floor covering for review and approval.

1.3 Installation, Fabrication and Construction

A. The Specifications and/or Drawings are to address the following protection issues:
   1. Before beginning selective demolition activities, erect barriers, fences, overhead protection, walkways, covered passageways, guard rails, chutes, shoring, and the like, to protect personnel, construction and vegetation.
   2. Construct temporary enclosures as required to limit dust and noise as described in Section 01 50 00.
   3. The Contractor is to provide total protection from the construction process and weather elements to keep those portions of existing conditions surrounding the Project free of damage.
   4. When using wheeled equipment or buggies directly over floors in areas to remain, without solid floor protection, such equipment or buggies shall have pneumatic (air filled) rubber tires. Do not use equipment or buggies having hard rubber or steel wheels or casters over existing floors without use of solid protection board laid over flooring traffic paths. Such protection board shall be a minimum 1/2-inch-thick plywood, laid over plastic sheeting.
   5. Any damage caused by the construction process shall be immediately corrected by the Contractor as directed by the A/E and Owner, at Contractor's expense.
   6. Cooperate with Owner for maintaining their continuous operations in all remaining portions of the existing facilities during the work of this Project.
   7. Remove temporary protection and cover when no longer needed
   8. Keep all drains open for free drainage at all times. The Contractor is to take care not to cause damage to any existing utilities; if damaged, repair at no cost to the Owner in manner approved by the applicable agency owning the utility.
   9. Provide for tree and plant protection.

B. The Specifications and/or Drawings are to cross reference the following issues, as applicable:
   1. Protection, Salvage and Treatment Procedures for Historic Building Materials: Refer to Section 01 35 91.
   2. Historic Preservation Inspection Services: Refer to Section 01 45 23.
   3. Maintain security of existing buildings at all times and mechanical/electrical systems to remain. Refer to Section 01 50 00, paragraph 1.09F, for additional security requirements.
   4. Service Outages: Refer to Section 01 50 00, paragraph 1.09J.
   5. Traffic Maintenance and Control: Refer to Section 01 50 00, paragraph 3.03L.
   6. Dust Control: Refer to Section 01 50 00, paragraph 3.04F.
   7. Construction Waste Management & Disposal: Refer to Section 01 74 19.
   8. Indoor Air Quality: Refer to Section 01 81 19, Indoor Air Quality.

C. General

1. Prior to starting demolition, the Contractor, A/E and Owner are to make a complete inspection of the existing conditions surrounding the Project, including visible defects. An inspection report is to be completed by the A/E and signed by all parties to the survey.
2. At the completion of demolition, the Contractor, A/E and Owner are to make an examination for possible damage to existing conditions surrounding the Project caused by demolition work. An examination report is to be completed by the A/E and signed by all parties to the examination.
3. If the Contractor exposes material that trades working in an area may consider hazardous, they are to report it to the Contractor who is to immediately stop work in the area and notify the Owner.
4. The Contractor is to thoroughly clean the entire Project area of demolition debris and dust prior to installation of any new work.

END OF BUILDING REMODEL SELECTIVE DEMOLITION STANDARD

Basis of Design

This standard contains procedures which apply to dangerous waste removal work.

1.1 Definitions

A. "Generator" means any person, by site, whose act or process produces dangerous waste or whose act first causes a dangerous waste to become subject to regulation. For all DES owned facilities, DES is the generator.

B. "Person" means an individual, trust, firm, joint stock company, federal agency, corporation (including a government corporation), partnership, association, state, municipality, commission, political subdivision of a state, or any interstate body.

C. "Dangerous wastes" (DW) means those solid wastes designated in WAC 173-303-070 through 173-303-100 as dangerous.

D. "Hazardous wastes" (HW) means those solid wastes designated by 40 C.F.R. Part 261, and regulated as hazardous and/or mixed waste by the United States EPA.

E. "Extremely hazardous waste" (EHW) means those dangerous and mixed wastes designated in WAC 173-303-100 as extremely hazardous.

F. "Hazardous debris" means debris that contains a hazardous waste listed in WAC 173-303-9903 or 173-303-9904, or that exhibits a characteristic of hazardous waste identified in WAC 173-303-090.

G. "Special waste" means any state-only dangerous waste that is solid only (non-liquid, non- aqueous, nongaseous), that is: Corrosive waste (WAC 173-303-090 (6)(b)(ii)), toxic waste that has Category D toxicity (WAC 173-303-100(5)), PCB waste (WAC 173-303-9904 under State Sources), or persistent waste that is not EHW (WAC 173-303-100(6)). Any solid waste that is regulated by the United States EPA as hazardous waste cannot be a special waste.

H. "State-only dangerous waste" means a waste designated only by this chapter, chapter 173-303 WAC, and is not regulated as a hazardous waste under 40 C.F.R. Part 261.

I. "EPA/state identification number" or "EPA/state ID#" means the number assigned by EPA or by the department of ecology to each generator, transporter, and TSD facility.

J. “Manifest" means the shipping document EPA Form 8700-22 (including, if necessary, EPA Form 8700-22A, originated and signed by the generator or offered in accordance with the requirements of WAC 173-303-180 (Manifest), and the applicable requirements of WAC 173-303-170 through 173-303-692.

1.2 Design Criteria

A. Insert the following statement into the Contract Documents involving dangerous waste removal work including asbestos abatement work: “Contractor shall provide minimum 24 hour notification to the Maintenance Operations customer service office (360/725-0000) prior to any planned dangerous waste removal including asbestos abatement work.

B. Washington law uses the term *dangerous waste*. Federal law uses the term *hazardous waste*. Washington’s definition of dangerous waste includes some wastes that are not included in the federal definition (state-only dangerous waste).

C. For projects containing dangerous waste, DES will notify the Department of Ecology and obtain an EPA/state identification number as required by WAC 173-303-060.

Products, Materials and Equipment

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A. Dangerous waste may be accumulated on site and stored in accumulation containers. Each accumulation container must be clearly labeled or marked with the words “Dangerous Waste” or “Hazardous Waste” and the date waste was first put into the container. In addition, each container must have a label or sign on it that identifies the major risk(s) associated with the waste. The dangerous waste regulations (WAC 173-303-190(2)) require that a container to be transported must be labeled according to the U.S. DOT labeling requirements (see also 49 CFR Part 172). Risk labels that could be confused with or conflict with U.S. DOT labeling standards must be removed prior to transporting containers.

Installation, Fabrication and Construction

A. The demolition/hazardous waste contractor contracted by DES shall be responsible for preparing dangerous waste for shipping and preparation of the manifest, including designation and listing of the waste.

B. The manifest must be EPA Form 8700-22 and, if necessary, EPA Form 8700-22A. The manifest must be prepared in accordance with the instructions for these forms, as described in the uniform manifest Appendix of 40 C.F.R. Part 262.

   1. The DES Project Manager must designate on the manifest one facility that is permitted to handle the waste described on the manifest.

   2. The manifest must consist of enough copies to provide DES, the demolition/abatement contractor, each transporter, and the designated facility owner/operator with a copy for their records, and another copy signed by all parties returned to DES.

      a. Prior to transporting dangerous waste, the DES Project Manager shall:

         1) Sign and date the manifest;

         2) Obtain the handwritten signature of the initial transporter and date of acceptance on the manifest; and

         3) Retain one copy in accordance with WAC 173-303-210, Generator recordkeeping.

      b. The DES Project Manager must give the remaining manifest copies to the transporter.

C. “As-Built” Abatement Information: Require abatement contractor to provide a floor plan and other necessary information indicating the locations of the abated material. Such ‘as-built” information shall indicate type and quantity of dangerous material abated for each location.

END OF FACILITY REMEDIATION STANDARD

Basis of Design

This standard contains certain design criteria and procedures for the design and installation of cast-in-place concrete structures, building elements, and site elements. This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the PPD Project Manager. Exceptions to this standard will be made only upon specific written approval using the "Facilities Design Guidelines and Construction Standards Exception Request" form included in these Design Guidelines and Construction Standards.

1.1 Design Criteria

A. Require sample slabs with color additive in the concrete mix in varying amounts to produce and verify color match with existing in-place paving.

Products, Materials and Equipment

1.1 Concrete

A. Portland Cement: Conform to the requirements of ASTM C150.

B. Sand and Coarse Aggregate: Conform to the requirements of ASTM C33.

C. Fly Ash: Conform to the requirements of ASTM C618, Class F, with maximum 1% loss on ignition (LOI).

D. Air Entraining Agent: Conform to the requirements of ASTM C260.

E. Water-Reducing Admixture: Conform to the requirements of ASTM C494, Type A, except Type F or G for concrete to be pumped.

F. Reinforcing Steel: Conform to the requirements of ASTM A615, Grade 60.

G. Welded Wire Fabric: Conform to the requirements of ASTM A185, Fy=65 ksi.

1.2 Color Admixture for Exterior Paving

A. Refer to "Bases, Ballasts & Paving" Standard 32 10 00.

Installation, Fabrication and Construction

3.1 General

A. Refer to "Bases, Ballasts & Paving" Standard 32 10 00 for exterior paving requirements.

B. Begin curing immediately after placement, protect concrete from premature drying, excessively hot and cold temperatures, and mechanical injury.

1. Curing compound for Integrally Colored Concrete shall comply with ASTM C309 and be of same manufacturer as colored admixture, manufactured for use with integrally colored concrete.

C. Maintain curing procedures for seven (7) days at minimum temperature of 50 degrees F; keep moist and protect from vehicle and pedestrian traffic.

D. Cleaning of concrete mixers will not be allowed on campus grounds. Contractor shall submit methods of cleaning concrete equipment including delivery equipment.

E. Where appropriate, temporary storm drain catch basin filters shall be installed to prevent construction materials from entering into the system.

END OF CONCRETE STANDARD

Basis of Design

This standard contains certain design criteria and procedures for the design and installation of interior decorative concrete finishes and follows the guidelines set forth by the American Concrete Institute ACI 310R-13 Guide to Decorative Concrete.

This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the PPD Project Manager. Exceptions to this standard will be made only upon specific written approval using the "Facilities Design Guidelines and Construction Standards Exception Request" form included in these Design Guidelines and Construction Standards.

1.1 Design Criteria

A. Require the crew leader of concrete slab work to receive a decorative concrete to be certified as an ACI Decorative Concrete Flatwork Finisher. In addition, require the use of ACI-certified flatwork finishers and/or decorative flatwork finishers to ensure that the quality is consistently high.

1. Installer/Applicator shall be certified by concrete finish equipment and chemical manufacturer and shall provide adequate number of skilled workmen who are thoroughly trained and experienced in the necessary craft.
2. Manufacturer's Certification: Provide a letter of certification from both the equipment and chemical manufacturer stating that the installer is a certified applicator and is familiar with proper procedures and installation requirements recommended by the manufacturer.

B. Floor flatness ($F_{F)}$ is an important characteristic for concrete intended to be polished. For the best results, an F_F number equal to or greater than that recommended for the class of grinding specified is recommended.

C. Polished concrete is achieved by sequential mechanical abrasion. The process is divided into two phases – the 'grinding' phase and the 'polishing' phase. All polished concrete exhibits significantly enhanced durability and wear resistance when properly and thoroughly densified. Recommended practice is to specify both the class of grind and level of gloss. A complete description of design intent is phrased as Class X, Level Y; for example, Class B, Level 2. Classes of grind range from 0 for burnished and A to D describing increasing levels of exposure of the concrete matrix. Gloss levels range from 0 to 4; Level 0 has no to low gloss, Level 4 has very high gloss.

1. The purpose of grinding is to flatten the surface of the slab to permit fine polishing of the surface, to intentionally expose aggregates within the concrete, or both. The intended amount of aggregate exposure is described as "class of grind".
2. Class of Grind: The class of grind describes the amount of visible aggregate exposure resulting from initial grinding and is a result of the amount of surface material removed. Multiple passes with grinding equipment may be necessary to achieve a particular class of grind.
    a. Class 0 – Burnished; no significant removal of surface material. Burnishing is applicable to smooth surfaces only, as no significant surface material will be removed.
    b. Class A – Cream; minimal exposure of the fine aggregate. This requires concrete placement at or above F_F -70. The high F_F requirement of the initial concrete placement is critical to maintain a uniform appearance while minimizing exposure of aggregates.

c. Class B – Salt and Pepper; exposure of the small aggregates. This yields a worn, industrial look. Concrete placement at or above F_F -45 is needed to maintain a uniform appearance while minimizing exposure of larger aggregates.
d. Class C – Medium Aggregate; exposure of mid-range aggregates. All surface paste is removed with grinding. Concrete placement at or above F_F -35 is recommended.
e. Class D – Large Aggregate; exposure of the coarse aggregates similar in appearance to terrazzo. All surface paste is removed with grinding. Concrete placement at or above F_F -25 is recommended.

3. Level of Gloss: The purpose of polishing is to completely remove the abrasive marks of grinding and achieve the specified level of gloss. The level indicates the gloss of the uncoated polished surface. Using a specific grit does not guarantee achieving the desired level of gloss; grit is only a descriptor of the tooling commonly used to attain that gloss.
   a. Level 0 – No to low gloss, flat appearance, and a spectral gloss below 15. This is usually attained using tools of less than 200 grit.
   b. Level 1 – Low gloss, satin, or matte appearance and a spectral gloss within the range 15 to 29. This is usually attained using 400-grit tools.
   c. Level 2 – Medium gloss, satin, or matte appearance, diffused reflection of and a spectral gloss within the range 30 to 49. This is usually attained using 800-grit tools.
   d. Level 3 – High gloss, clearly reflects objects and a spectral gloss within the range 50 to 60. This is usually attained using 1500-grit and finer tools.
   e. Level 4 – Very high gloss, sharp mirror-like reflection of objects and a spectral gloss above 60. This is usually attained using 3000-grit and finer tools.
4. The level indicates the gloss of the uncoated polished surface. Using a specific grit does not guarantee achieving the desired level of gloss; grit is only a descriptor of the tooling commonly used to attain that gloss. The same gloss meter and technique used to measure the spectral gloss of the mockup panel should be used to assess the gloss of the final floor. Random, dispersed sample gloss measurements are necessary to establish a statistically accurate assessment of gloss on a floor

1.2 Mockup

A. Mockup: Before performing decorative concrete work, an on-site mock-up representative of specified process, surface, finish, colors and joint design/treatments shall be installed for review and approval. Mockups shall be installed using the same installer personnel who will perform actual work.
   1. Construct mock-up area under conditions similar to those that will exist during actual placement, minimum 5 x 5 foot in size, with coatings, stain/dye, and finishing processes applied, as applicable.
   2. Notify Architect and Owner Representative seven (7) days in advance of dates and times when mock-up processes will occur.
   3. Use a gloss meter to accurately assess the spectral gloss of the mockup panel at end of polishing process to determine gloss meets specified project spectral gloss level. Provide additional polishing necessary to meet specified gloss level.
   4. Obtain Architect's approval of mock-ups before starting actual work. If the Architect determines that mock-ups do not meet requirements, provide new mock-up at location as directed by Architect.
   5. Maintain mock-ups during construction in an undisturbed condition as a standard for judging the completed work.
   6. Approved mock-ups shall remain in place and visible for comparison to the final installation.

Products, Materials and Equipment

2.1 Concrete Mix

A. Concrete mixtures that achieve 3500 psi (24 MPa) 28-day compressive strength are generally considered normal for decorative concrete installation. However, concrete mixtures that achieve 4000 psi (28 MPa) or greater 28-day compressive strength should be used for concrete to receive a polished finish.

B. Water-cementitious materials ratio range of 0.38 to 0.45 are workable. Lower *w/cm* values result in less water of convenience and generally produce more stable concrete color and increased concrete durability.

C. SCMs (supplementary cementitious materials) such as fly ash, slag cement, silica fume, etc. react with calcium hydroxide ($Ca(OH)_2$) to form calcium-silicate hydrate (C-S-H). This reaction can negatively affect the effectiveness of decorative concrete materials such as densifiers or reactive stains.

D. Calcium chloride and admixtures that contain chloride are not recommended for use in decorative concrete.

Installation, Fabrication and Construction

3.1 General

A. Maintenance of Color Hardened & Densified Concrete: No wax is required or recommended, but a neutral to medium high (9.5 to 10) pH cleaner containing a small amount of replenishment densifier formulated into the product should be used to prevent loss of gloss and premature wear.

B. Maintenance Plan & Closeout Documentation: The installer should consult with the product manufacturers when creating the maintenance plan for the final work. The Plan should include recommended procedures, products, technical data sheets, and MSDS sheets for products recommended. The maintenance instructions should be delivered with the document packet to the owner as part of closeout documents.

END OF DECORATIVE CONCRETE FINISHING STANDARD

Basis of Design

This standard contains certain design criteria and procedures for products and procedures applicable to masonry restoration and cleaning of historic buildings. This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the PPD Project Manager. Exceptions to this standard will be made only upon specific written approval using the "Facilities Design Guidelines and Construction Standards Exception Request" form included in these Design Guidelines and Construction Standards.

1.1 Design Criteria

A. Masonry repair and restoration shall be executed in accordance with the Department of the Interior/National Park Service Cultural Resources Preservation Brief Number 2: "Repointing Mortar Joints in Historic Masonry Buildings." http://www.nps.gov/history/tps/how-to- preserve/briefs/2-repoint-mortar-joints.htm.

B. All work shall be performed in compliance with the guidelines set forth by the Secretary of the Interior's Standards and Guidelines for the Treatment of Historic Structures. http://www.nps.gov/history/tps/standards/four-treatments/treatment-guidelines.pdf Further guidance should be obtained from the Owner's Historic Preservation Representative and The Northwest Masonry Guide, available from the Masonry Institute of Washington, (425) 828-0433.

C. The Owner may select and employ a Historic Preservation Representative (HP Representative) having expertise in historic preservation to conduct on-site observations and inspections as specified in Section 01 45 23, Historic Preservation Inspection Services, to ensure on the Owner's behalf that the Work is carried out in conformance with the Contract Documents. Projects performing masonry repair and/or restoration work shall include Section 01 45 23 in their Contract Documents.

D. Repair and replacement materials shall match remaining historic construction in all physical and visual aspects including material, form, color, texture and workmanship.

E. The compressive strength of the repointing mortar shall be equal or less than the compressive strength of the surrounding masonry.

F. Perform work using the gentlest methods available. Prevent damage to materials and finishes to remain.

G. As much of the historic material as possible shall be saved.

H. Mortar joints shall be duplicated in joint width and profile.

I. Only qualified personnel shall point historic buildings.

J. Only pressure washer operator experienced in cleaning work of types they will be performing and on the equipment that will be used shall perform pressure wash cleaning on historic buildings.

K. Pressure washers for sandstone cleaning shall not exceed 180 psi water pressure. Water temperature for cleaning sandstone shall not exceed 200 degrees F.

L. No biocides or waterproofing shall be applied to sandstone elements.

M. No liquid waterproofing, water-repellent treatment or sealer shall be applied to the above-grade stone masonry cladding of historic buildings.

1.2 Submittals

A. Prior to beginning work, Contractor shall submit a written work plan for review and approval by the Owner's Historic Preservation Representative. The work plan shall describe in detail how the scope of work will be executed. As required for the project, the work plan shall include as necessary, but not be limited to, the following methods for:

1. Providing a safe work environment.
2. Removal of damaged mortar joints.
3. Cleaning masonry.
4. Precautions against theft and/or vandalism of stored materials.
5. Access to work areas and protection of adjacent areas.
6. Sequence and dimensions of raking and lifts.
7. Mixing and storing materials.
8. Removal of excess mortar from masonry surfaces, including cavity and weep protection.
9. Final pointing/tooling.
10. Waterproofing open joint areas.

Products, Materials and Equipment

2.1 Masonry - General

A. Repair of sky-facing joints in exterior masonry of historic buildings shall consist of lead weather caps (canes) set in full bed of urethane sealant.

2.2 Brick

A. Existing brick shall be salvaged, preserved and reused to the greatest extent possible. Whenever possible, sound brick with exterior surface damage shall be turned to show undamaged face. Replacement brick shall match color, texture, compressive strength and size of existing brick. Installation shall match coursing and bonding.

B. Approval of completed work will be based on a viewing distance of five feet from the work surface.

Installation, Fabrication and Construction

- Refer to requirements specified in respective restoration and/or cleaning sections.

END OF MAINTENANCE OF MASONRY STANDARD

Basis of Design

This standard contains certain design criteria and procedures for products applicable to restoration and cleaning of historic metal elements. This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff in performing associated maintenance and repair work.

1.1 Design Criteria

A. Contact owner's Historic Preservation Representative for recommended processes for cleaning and treatment of bronze sculptures.

END OF MAINTENANCE OF METAL STANDARD

Basis of Design

This standard contains certain design criteria and procedures for the design and installation of metal fabrications. This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the PPD Project Manager. Exceptions to this standard will be made only upon specific written approval using the "Facilities Design Guidelines and Construction Standards Exception Request" form included in these Design Guidelines and Construction Standards.

1.1 Design Criteria

Provide access to roofs. Preferred is a permanent stairway and railings with a door. If space can only provide a sloped or vertical ladder, provide with railing and/or cage as required by code, as well as a telescoping safety post attached to top of ladder. Access door or hatch to roof shall be keyed to campus maintenance master standard.

END OF METAL FABRICATIONS STANDARD

Basis of Design

This standard contains certain design criteria and procedures applicable to architectural woodwork including historic restoration work. This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the PPD Project Manager. Exceptions to this standard will be made only upon specific written approval using the "Facilities Design Guidelines and Construction Standards Exception Request" form included in these Design Guidelines and Construction Standards.

1.1 Design Criteria

A. In general, casework for new construction and remodel construction not involving historic architectural woodwork shall comply with Architectural Woodwork Standards, Section 10, Casework, custom grade.

B. Historic restoration work including new work required to match existing historic architectural woodwork shall conform to Architectural Woodwork Standards (AWS), Section 12, Historic Restoration Work. Where Section 12 references other AWS sections, they shall meet requirements set forth for "Premium" grade construction and materials.

1. Cabinet box construction at exposed exterior and interior cabinet surfaces as well as semi-exposed surfaces, including drawer boxes and shelving, shall be fabricated from 7-ply hardwood plywood meeting ANSI/HPVA HP-1. Hardwood face veneers shall match existing historic casework.

2. Cabinet box construction at concealed construction shall conform to PS 1, Group I Douglas Fir Grade "B" on both face veneers; minimum 5-ply for 3/4-inch thickness.

END OF MAINTENANCE OF ARCHITECTURAL WOODWORK STANDARD

Basis of Design

This standard contains certain design criteria and procedures that applies to the design and installation of fluid-applied waterproofing systems applied to roofs located over occupied and service spaces which are below grade and covered with earth or walking surfaces, and above grade roofs which are developed as plazas for landscaping, planters, and pedestrian circulation.

This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the PPD Project Manager. Exceptions to this standard will be made only upon specific written approval using the "Facilities Design Guidelines and Construction Standards Exception Request" form included in these Design Guidelines and Construction Standards.

1.1 Design Criteria

A. Codes, Regulations, and Standards

All products, materials, equipment, and installation shall conform to the following codes, regulations, and standards of latest issue:

1. American Society for Testing and Materials.
2. Factory Mutual Standards.
3. National Roofing Contractors Association Roofing and Waterproofing Manual.
4. National Fire Protection Standards.
5. Underwriters Laboratories Standards.
6. International Mechanical Code.
7. Uniform Plumbing Code.
8. Washington State Energy Code.
9. ADAAG, WAC 51-50, ASME 117.1 and IBC

B. General Requirements

1. Provide minimum 20-year waterproof warranty period. Refer to Section 01 78 00 and the "Watertightness Warranty" form immediately following that Section for determining applicability of said project specific warranty form.
2. Soils reports and the drawings shall graphically identify water tables.
3. Joints in concrete slabs-on-grade and foundation joints shall have water stops.
4. A sub-grade perimeter drainage system is required, and in some cases, under slab drainage.
5. All seismic joints, expansion joints, perimeter joints, joints at shaft walls, that cannot be successfully provided with water stops, shall have vertical curbs that extend one foot minimum above the waterproof membrane; and appropriate flashings.
6. The structure shall slope one-quarter of an inch per foot minimum (valley) away from all joints and carry water to drains at the sloped structural deck or over the edge of the foundation wall. The design of the structure shall enhance the slope as building creep relaxes.
7. No upset beams or appendages shall impede the flow of water.
8. Conduits, piping, etc., shall be surface mounted above or below the structural slab. Cast-in conduits or piping are not allowed.

9. Conduit and piping shall not penetrate the horizontal waterproof membrane.
10. Area drains shall be designed to accept the complete rate of flow from a 100-year storm (3.3 inches/hour) as contributed from the deck, adjacent walls, and other run-off without requiring water storage on the deck surface. Use Uniform Plumbing Code (UPC) Table 11- 2 to properly size piping.
11. Roofing projects shall call for testing the roof drainage system for proper flow prior to and after the roofing installation and provide a flood test of the installed roofing to ensure no leaks. Require minimum 48-hour flood test over occupied spaces together with continuous observation during such flood test. Require minimum 24-hour flood test over non-occupied spaces.
12. Horizontal joints shall be designed with armor plate guard, gasket, and interior gutter drain system. Vehicular traffic areas shall be fully supported; designed for H-20 load. The joint shall be the high point, or a curb at the adjacent building, with positive slope away from the joint. Stainless steel flashing at side walls and over up-set curbs shall be tent-like and adequately cover the vertical surfaces.
13. Grates and joints shall have spaces no greater than 1/2 in wide in one direction If gratings have elongated openings, then they shall be placed so that the long dimension is perpendicular to the dominant direction of travel.
14. Include manufacturer's Standards Drawings (SD drawings) for specific installation details.

Products, Materials and Equipment

2.1 Waterproofing Membrane – Hot, Fluid Applied

A. The waterproof membrane shall be a monolithic, one component, hot-applied, seamless rubberized self-healing thermoplastic membrane, made from bitumen, natural rubbers, and a blend of polymers. System shall be comprised of two layers of hot-applied membrane at 180 mils total thickness with an embedded layer of reinforcing mesh between layers and topped with manufacturer's standard protection sheet. Manufacturers and their proposed system/products will need to go through an evaluation process by the A/E and recommendation to DES for final determination before being permitted to bid the Project.

2.2 Waterproofing Membrane – Cold, Fluid Applied

A. The waterproof membrane shall be manufactured for submerged installation. System shall be a a two component, synthetic rubber, cold vulcanized, fluid applied waterproofing membrane and comprised of two layers of membrane at 120 mil total thickness with an embedded layer of reinforcing mesh between layers and topped with manufacturer's standard protection sheet. Manufacturers and their proposed system/products will need to go through an evaluation process by the A/E and recommendation to DES for final determination before being permitted to bid the Project.

Installation, Fabrication and Construction

3.1 Waterproofing Membrane – Below Grade & Plaza Roofs

A. The A/E shall review all the manufacturer's details and provide additional details as developed with the manufacturer for all special situations to ensure a watertight installation.

END OF FLUID-APPLIED WATERPROOFING STANDARD

Basis of Design

This standard contains certain design criteria and procedures for low sloped membrane roofing systems. The design standard shall be a roofing assembly with a life expectancy of 20 years, with placement of drains and installation of crickets to avoid any standing water over the roof surface.

This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the PPD Project Manager. Exceptions to this standard will be made only upon specific written approval using the "Facilities Design Guidelines and Construction Standards Exception Request" form included in these Design Guidelines and Construction Standards.

1.1 Design Criteria

A. The preferred roof system for low sloped roof decks (2:12 roof or less) is a single-ply membrane generally classified as TPO (*thermoplastic olefin*) or PVC (*polyvinyl chloride/thermoplastic*) installed directly over concrete roof decks or a high-density cover board. A fiber-reinforced membrane may be specified.

B. The roof assembly should meet Energy Star requirements, including reflectivity of not less than .65 (65%) of initial solar reflectance, and greater than or equal to .50 as measured three years following installation. The membrane color shall be white or light gray unless another color is required for consistency with historic preservation.

C. Typically, roofing is mechanically fastened where installed over metal decks, and fully adhered where installed over a rigid wood deck, recover board or over concrete. Optionally, the membrane may be mechanically fastened if the roof assembly includes rigid foam board (or recover board) insulation as defined below. Method of attachment specified by architect will reflect wind lift, parapet details and building height. Ballasted roof systems are not acceptable. The roof assembly should generally meet or exceed standards for 80 mph wind shear as required by building code.

D. Rigid insulation used in roof assemblies will consist of polyisocyanurate or extruded styrene foam board insulation, in R-value range consistent with energy codes. Typical installations have insulation installed above the roof deck (rather than beneath), tapered and with crickets as needed for drainage.

E. Roofing system shall be minimally warranted with a 15-year total system "no-prorate" warranty for commercial buildings, issued from date of substantial completion, provided by the manufacturer. The roof assembly warranty shall include decking, insulation, membrane material, flashing and installation. The warranty shall be issued by the manufacturer, with design approved by the manufacturer and installed through a local roofing company certified by the manufacturer for their products. In addition to roofing manufacturer warranty, require roofing installer to provide a 2-year workmanship warranty for both labor and materials covering removal and replacement of any work related to roofing, flashings, or metal work found to be defective or otherwise not in accordance with the Contract Documents, signed and countersigned by Installer (Roofer) and Contractor. Refer to Section 01 78 00 and the "Watertightness Warranty" form immediately following that Section.

F. Non-skid walking pads from roof access point to and around all roof-top equipment will be included as part of the roofing system, including areas where maintenance is expected to root-top HVAC units or other similar equipment. Walk pads will be compatible with roof membrane products and adhesives and shall be included in the roofing warranty.

G. Roofing projects shall include installation of fall protection devices if such does not currently exist. Refer to Standard 07 72 00 for additional fall protection requirements.

H. Roofing project require testing the roof drainage system (including scuppers, rainwater leaders, overflow, downspouts and downstream piping) for proper flow. Typically, the drainage system is proofed prior to construction, and again after roofing installation. A flood test of the installed roofing is required to ensure the integrity of the roof and rainwater leaders.

I. Spare roofing materials and supplies will be specified by the Project Manager and Building Manager.

J. Require Contractor provide as part of closeout submittals a placard identifying roofing type and manufacturer, roofing installer's name and phone number, name and phone number of roofing manufacturer's representative, date of installation (substantial completion date), and type and length of specified warranties, Placard to be furnished to Building & Grounds ready to mount to wall or other substrate close to area of roof access.

Products, Materials and Equipment

2.1 Membrane Roofing

A. Single ply membrane manufactured by **Sika Sarnafil**, **GAF, Versico, Firestone, Carlisle SynTec**, or as approved by owner.

B. Membrane shall have a minimum thickness of 60 mils (.060") for field application, and a greater thickness if used for gutters or in conjunction with flashing.

C. All fasteners, anchors, nails, straps and bars used in any roofing assembly shall be post-galvanized steel, aluminum or stainless steel, used in such a manner to avoid galvanic corrosion. Fasteners and anchors shall have a 1" minimum embedment.

Installation, Fabrication and Construction

3.1 Membrane Roofing

A. Perform work in accordance with NRCA Roofing and Waterproofing Manual and manufacturer's instructions.

END OF MEMBRANE ROOFING STANDARD

Basis of Design

This standard contains certain design criteria and procedures for the design and installation of roof accessories. This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff and Capitol Security & Visitor Services in performing associated maintenance and repair work. Alternate solutions may be discussed with the FPS Project Manager. Exceptions to this standard will be made only upon specific written approval using the "Facilities Design Guidelines and Construction Standards Exception Request" form included in these Design Guidelines and Construction Standards.

1.1 Design Criteria

A. Roofing projects shall include installation of fall protection system complying with WAC 296-155 (after Oct 2020 WAC 296-880) if such does not currently exist. Fall protection systems that engineer out the fall hazard are preferred. (i.e. - code compliant guardrails and parapets). If the fall hazard cannot be engineered out, next preferable is a combination warning line and horizontal lifeline. *Fall restraint* systems are third in preference. Horizontal lifelines are preferred over individual anchor points. A *fall arrest* system shall only be used upon approval of DES's Safety Manager.

B. Access to roof areas shall be provided through a doorway, hatch or stairway and railings. Roof access hardware should be keyed to building's standard KeyMark keyway. Hatches shall meet IBC 1015 and Washington State specific building code requirements such as WAC 51-52-0306. Roof access shall be a construction core with a control key provided to DES Capitol Security & Visitor Services. Doors shall have cores on each side of the doorway leading to/from roof.

C. Walk pads should be installed from the roof access point to any new roof-top HVAC, electronic or other equipment to reduce the damage to all roof systems. Walk pads should also be installed around such rooftop equipment where tools, parts, or assembly/disassembly may occur that may puncture, scrape or damage the membrane surface.

D. Where feasible, freeze-proof hose bibs shall be installed near roof access doors and hatches to provide water for roof cleaning. All valves and shut offs should be located inside the structure to prevent freezing.

E. All door hardware noted below will be Owner Provided Equipment (OPE).

Equipment Type	Equipment Sub Type	Required Manufacturer/Model	Notes
Door Hardware	Cassette	Corbin Russwin ML 2000 mortise	
	Core/Housing	Corbin Russwin large format I/C housing (OPE)	Provide construction cores. Construction core control key shall be provided to CSVS. CSVS will coordinate with building tenants on final key issues and deployment of KeyMark cores.

END OF ROOF ACCESSORIES STANDARD

Basis of Design

This standard contains certain design criteria and procedures for the design and installation of joint sealants. This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the PPD Project Manager. Exceptions to this standard will be made only upon specific written approval using the "Facilities Design Guidelines and Construction Standards Exception Request" form included in these Design Guidelines and Construction Standards.

1.1 Design Criteria

A 2-Part sealant shall only be installed on horizontal traffic surfaces exposed to weather.

B. Bond breaker tape shall be used on all mortar joints behind caulking

C. All sealants applied to masonry (sandstone, granite, marble, brick, terrazzo, etc) shall be custom color matched to the material, or clear, to allow removal as needed in the future with minimal impact on the appearance. Past experiences have left dark colored sealants that stain the material and leave a highly visible blemish.

D. Provide backer rod where appropriate.

E. Repair of sky-facing joints in exterior masonry of historic buildings shall consist of lead weather caps (canes) set in full bed of single-component urethane sealant.

Products, Materials and Equipment

- No specific requirements.

Installation, Fabrication and Construction

- No specific requirements.

END OF JOINT SEALANT STANDARD

Basis of Design

This standard contains certain design criteria and procedures for the design and installation of building entrances and to exterior and interior doors and frames. This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff and Capitol Security & Visitor Services teams in performing associated maintenance and repair work. Alternate solutions may be discussed with the PPD Project Manager. Exceptions to this standard will be made only upon specific written approval using the "Facilities Design Guidelines and Construction Standards Exception Request" form included in these Design Guidelines and Construction Standards.

1.1 Design Criteria

A. Doors shall not contain asbestos.

B. Doors shall be standard 84" height. Minimum widths are to comply with ADA.

C. Within an accessible route, at exterior doors where environmental conditions required a closing pressure greater than 8.5 pounds, power operated doors shall be used within the accessible route of travel; interior doors that require an opening pressure of greater than 5 lbs. shall have power operated doors.

D. Where work is occurring in an historic space, verify with PM if matching existing type and finish is needed.

E. Door frames for new construction are to be a welded assembly; knock-down type frames, may be used where installed in existing wall structures or in new construction upon specific approval by Asset Manager (AM) or PM.

F. Provide weather shield over door frame heads that are exposed to weather.

G. Coordinate any view windows with ADA and hardware templates to prevent overlaps and possibly other conflicts, in particular doors with panic exit devices.

H. New wood doors and their frames in historic buildings shall match existing style and/or construction.

Products, Materials and Equipment

All equipment noted below are Owner Provided Equipment (OPE). Product, Material, and Equipment requirements for exterior door components are below. Limit amount of facility entry points to least amount possible.

Equipment Type	Equipment Sub Type	Required Manufacturer/Model	Notes
Exterior Door Hardware	Cassette	Corbin Russwin ML 2000 mortise lock (OPE)	
	Core/Housing	Corbin Russwin large format I/C housing (OPE)	Provide construction cores. Construction core control key shall be provided to CSVS. CSVS will coordinate with building tenants on final key issuance and deployment of KeyMark
	Crashbars	Von Duprin low voltage quiet electric latch crashbars (OPE)	cRoeorqeusi.res coordination with CSVS.

	Removable secured mullion	Must include Corbin Russwin large format I/C housing (OPE)	Required for locations with double doors. Requires HES 9600 electric strikes on both sides and concealed door position switches on both leafs.
	Hinges		Require high security non-removable hinges.
Exterior Door Operator	Door operator	Nabco (OPE)	Requires coordination with CSVS to determine model based on application area and door.
	Push pads		Wired push pads.
Exterior Emergency Exits	Door hardware		Use appropriate automatic closure and exit hardware.
	Concealed door position switch	Schlage door position switch 679 (OPE)	
	Camera on interior of door	Axix 4K Megapixel mini dome (OPE)	
Exterior Intercom System	Intercom	2N IP Verso (OPE), Alphone IX Series, Zenitel Stentofon	Coordination required with CSVS for configuration and specifications related to location.
	Tablet	2N Indoor Touch 2.0 (OPE), Iphone IX Series, Zenitel Stentofon	

Product, Material, and Equipment requirements for reception/public interaction areas (required physical separation/secured entries are below.

Equipment Type	**Equipment Sub Type**	**Required Manufacturer/Model**	**Notes**
Reception Area Door Hardware	Cassette	Corbin Russwin ML 2000 mortise lock (OPE)	
	Core/Housing	Corbin Russwin large format I/C housing (OPE)	Provide construction cores. Construction core control key shall be provided to CSVS. CSVS will coordinate with building tenants on final key issuance and deployment of KeyMark cores.
	Double doors	Must include Corbin Russwin large format I/C housing (OPE)	If using double doors for entry to secured area, CSVS requires use of removable secured mullion with HES 9600 strikes and concealed door position switch in each leaf.
	Crashbars	Von Duprin low voltage quiet electric latch crashbars (OPE)	Requires coordination with CSVS.
Reception Area Door Operator	Door operator	Nabco (OPE)	Requires coordination with CSVS to determine model based on application area and door.
	Push pads		Wired push pads.
Intercom System	Intercom	2N IP Verso (OPE) Aiphone IX Series (OPE), Zenitel Stentofon	Coordination required with CSVS for configuration and specifications related to location.
Intercom System	Tablet	2N Indoor Touch 2.0 (OPE) Aiphone IX Series (OPE), Zenitel Stentofon	

Product, Material, and Equipment requirements for mechanical rooms/MDF/IDF/ electrical rooms/generator rooms/fire control rooms are below.

Equipment Type	Equipment Sub Type	Required Manufacturer/Model	Notes
Door Hardware	Cassette	Corbin Russwin ML 2000 mortise lock (OPE)	Coordination required with CSVS on hardware function.
	Core/Housing	Corbin Russwin large format I/C housing (OPE)	Provide construction cores. Construction core control key shall be provided to CSVS. CSVS will coordinate with building tenants on final key issuance and deployment of KeyMark cores.
	Crashbars	Von Duprin low voltage quiet electric latch crashbars (OPE)	Requires coordination with CSVS.
Door Operator	Door operator	Nabco (OPE)	Requires coordination with CSVS to determine model based on application area
	Push pads		Wireless push pads. and/or

Product, Material, and Equipment requirements for interior office doors (all office doors).

Equipment Type	Equipment Sub Type	Required Manufacturer/Model	Notes
Door Hardware	Cassette	Corbin Russwin ML 2000 mortise lock (OPE)	Coordination required with CSVS on hardware function.
	Core/Housing	Corbin Russwin large format I/C housing (OPE)	Provide construction cores. Construction core control key shall be provided to CSVS. CSVS will coordinate with building tenants on final key issuance and deployment of KeyMark cores.
	Crashbars	Von Duprin low voltage quiet electric latch crashbars (OPE)	Requires coordination with CSVS.

Door Operator	Door operator	Nabco (OPE)	Requires coordination with CSVS to determine model based on application area
	Push pads		Wireless push pads. and/or

Product, Material, and Equipment requirements **common conference rooms with audio visual equipment/breakout spaces/ break rooms** are below.

Equipment Type	**Equipment Sub Type**	**Required Manufacturer/Model**	**Notes**
Door Hardware	Cassette	Corbin Russwin ML 2000 mortise lock (OPE)	
	Core/Housing	Corbin Russwin large format I/C housing (OPE)	Provide construction cores. Construction core control key shall be provided to CSVS. CSVS will coordinate with building tenants on final key issuance and deployment of KeyMark cores.
	Crashbars	Von Duprin low voltage quiet electric latch crashbars (OPE)	Requires coordination with CSVS.
Door Operator	Door operator	Nabco (OPE)	Requires coordination with CSVS to determine model based on application area
	Push pads		Wireless push pads. and/or

Product, Material, and Equipment requirements for **restrooms** are below.

Equipment Type	**Equipment Sub Type**	**Required Manufacturer/Model**	**Notes**
Door Operator	Door operator	Nabco (OPE)	Requires coordination with CSVS to determine model based on application area
	Push pads		Wireless push pads. and/or

Product, Material, and Equipment requirements for **concealment/safe rooms** are below.

Equipment Type	**Equipment Sub Type**	**Required Manufacturer/Model**	**Notes**

Dead bolts		(OPE)	Shall be integrated with Corbin Russwin ML 2000 cassette. Shall include Corbin Russwin large format I/C core. Thumb turn on inside, key lock on outside. Dead bolts shall comply with fire code, AHJ and IBC. This is for use in areas such as restrooms and other locations with gatherings of less than 50 individuals.

Installation, Fabrication and Construction

- No specific requirements.

END OF DOORS & FRAMES STANDARD

Basis of Design

This standard contains certain design criteria and procedures for the design and installation of glazed storefronts, windows, and curtain walls, and their coordination with other exterior cladding systems. This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the PPD Project Manager. Exceptions to this standard will be made only upon specific written approval using the "Facilities Design Guidelines and Construction Standards Exception Request" form included in these Design Guidelines and Construction Standards.

1.1 Design Criteria

A. Windows shall match existing style and/or construction and meet the requirements of the Washington State Energy Code. However, where projects involve work related to historic windows, an evaluation shall be made comparing historic preservation or matching the historic materials to providing new windows meeting the energy code requirements.

B. Windows typically shall be non-operable to allow HVAC system to control building temperature and pressure. Where operable windows are provided, they should require no more than 5 lbf to open or close and must be able to be opened with a closed fist or electronically.

C. Provide weather shield over window heads that are exposed to the weather.

Products, Materials and Equipment

- No specific requirements.

Installation, Fabrication and Construction

3.1 Cleaning of Historic Metal Windows

A. Loose Debris: Vacuum channels to remove loose debris.

1. Use a small wood or soft plastic scraper or stick to loosen debris packed into corners.
2. Use a small round wood or soft plastic stick to loosen debris from weep holes.
3. Use a narrow plastic vacuum attachment.
4. Use a soft synthetic fiber vacuum attachment brush for outer face of windows and frame.

B. Efflorescence and Light Soiling: Use a wet, clean, lint free, cotton waste cloth to wipe off and soften efflorescence and accumulated dirt.

1. Use only de-ionized water.
2. Wash from top working down.
3. Do not allow water to run onto exterior stone sill or interior marble sill. Water runoff would redeposit salts on stone.
4. Rinse thoroughly with second wet, clean, lint free, cotton waste cloth.
5. Follow-up with a dry, clean, lint free, cotton waste cloth wipe-down to eliminate water stains and pick up additional residual salts.

C. Greasy Residue/Scabs: Soften stubborn greasy residue with de-ionized water.

1. General:

   a. Use non-ionic detergent as required. Rinse thoroughly following detergent use with de-ionized water.

2. Lightly scrub with soft, natural bristle brush to loosen debris.
3. Do not allow water to run onto exterior stone sill or interior marble sill. Water runoff would redeposit salts on stone.
4. Brush block to be plastic or wood.
5. Brush should not have any metal.
6. Scrub with grain of metal.

   a. Report any signs of bright shinny metal Indicating patina removal and stop work immediately to re-evaluate cleaning methods.

7. Rinse thoroughly with a wet, clean lint free, cotton waste cloth.
8. Do not allow water to run onto exterior stone sill or interior marble sill. Water runoff would redeposit salts on stone.
9. Follow-up with a dry, clean, lint free, cotton waste cloth wipe-down to eliminate water stains and pick up additional residual salts.

D. Soap for Window Washing: "Dawn" liquid dishwashing soap or a mild detergent with a pH of approximately 8.0. Only a few drops per 5-gallon bucket is needed. Do not use detergents containing pyrophosphates such as tide or ammonia solutions, acids, or alkaline soaps as they will damage the bronze.

E. Monitor windows following cleaning to determine rate and occurrence of efflorescence reformation and air borne material deposits.

F. Contact Artifacts Consulting, Inc. at 253-572-4599 for questions regarding cleaning of historical windows or other aspects of historical preservation.

END OF WINDOWS STANDARD

Basis of Design

This standard contains certain design criteria and procedures for the selection and installation of finish hardware for exterior and interior doors. This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff and Capitol Security & Visitor Services in performing associated maintenance and repair work. Alternate solutions may be discussed with the PPD Project Manager. Exceptions to this standard will be made only upon specific written approval using the "Facilities Design Guidelines and Construction Standards Exception Request" form included in these Design Guidelines and Construction Standards.

1.1 Design Criteria

A. General

1. All hardware is to comply with IBC and ADA requirements.
2. Hardware schedule submittals are to be provided for DES review.
3. A final hardware schedule is to be provided with the Operation and Maintenance manuals.
4. Each kind of hardware is to be provided by only one manufacturer.
5. Specify sex bolt and mating screw type fasteners for closers and panic exit devices where wood doors have mineral cores, or where doors have hollow interiors.
6. Require the manufacturer to visit the site and check doors for final proper operation. Require that a warranty period adjustment occur, typically six months after final completion.

B. Lock Sets and Latch Sets

1. All equipment noted below are Owner Provided Equipment (OPE).
2. All doors and handles, with the exception noted below, shall be heavy-duty mortise type with non-handed lever handles and trim.
   a. Mortise locks shall be Corbin Russwin ML 2000 Series accepting 6 pin interchangeable cores, non-handed lever trim; finishes matching existing where applicable (OPE).
   b. Where cylindrical locks are required to match existing lock type, they shall be Corbin Russwin CL 3300 Series accepting 6 pin interchangeable cores, complete with lever trim and finish to match existing (OPE).
   c. All housings shall be Corbin Russwin that accepts large format IC cores (OPE).
3. Selection of Lock sets and key function shall be coordinated with Owner during the design phase. Perimeter doors shall be reviewed for electronic control and be ADA compliant.
4. Where a Project is within an existing building, all hardware and lock core finish shall match existing hardware (OPE). Confirm with the Project Manager that there is no project planned in the near future that would change out the existing hardware.
5. All lock hardware shall be approved by the DES Capitol Security Assistant Director or designee before installation.

C. Panic Hardware:

1. Provide panic exit hardware as required by code, or if more restrictive, as required by the AHJ. Do not use pairs of doors with vertical rod exit devices. Provide single doors with fixed or removable mullions and heavy-duty rim type devices.

D. Keys and Keying

1. Require a meeting with the hardware supplier and DES Capitol Security staff for developing a keying schedule.
2. Provide figure eight removable cores in all locks, or as required by Owner. Temporary construction cores shall be provided by the Contractor. Permanent cores shall be received and installed by the Owner.
3. Mechanical and electrical rooms shall be keyed alike to the current maintenance key. Keying shall be performed by the Owner.

E. Door Closers

1. Provide all required fire rated doors with self-closing devices and latching hardware. Verify with DES the manufacturer, type, and model number to be used.
2. Janitor rooms generally require doors with 20-minute rating. To facilitate their closure, but discourage the propping open of doors, all should have 180 degrees hold open and connected to the fire alarm system.
3. Overhead closers are preferred. All closers shall have adjustments for latch and closing speeds, and back-check control.
4. Door closers are not required on access doors and panels, unless required by code, which are only opened under maintenance supervision. This shall include access panels in public corridors, doors in shafts or pipe chases, and electrical/telephone closets (3 feet deep or less).

F. Power Operated Doors

1. All equipment noted below are Owner Provided Equipment (OPE).
2. Entry doors and high use doors. Confirm DES required type and model of opener. Consultant shall coordinate any security access card readers and ADA access pads so that pushing the ADA pad does not activate door operator when door is in secure mode.
   a. Door operator shall be appropriately sized Nabco operator with compatible wired push pads (OPE).
   b. Door operators shall be coordinated with and approved by owner.
3. Entry doors and high use doors that exceed the capacity of a normal closer may require a heavy duty closer or floor closer. Confirm with Owner required type and model.
4. Operator units shall be installed on doors where opening pressure is greater than 8.5 lbf for exterior doors and greater than 5 lbf for interior doors.
5. Push pad actuator units shall be installed on same side and in close proximity to card key readers.
6. Toilet Rooms
   a. Toilet rooms require ADA access pads. If there are internal double-acting doors, review with Owner specific requirements.
   b. Note: At Community Colleges, getting stuck in restrooms occurs more often than having difficulty getting into the building, consider power doors on restrooms.

G. Pushes and Pulls: Shall be operable with a closed fist. Push and pull plates shall be cut for cylinders or fitted with thumb knobs as required to fit deadlocks or night latches.

H. Kick plates, Mop Plates and Armor Plates:

1. Exterior and interior plates shall be stainless steel, 0.05" minimum thickness.
2. Kick plates shall be a minimum of 8" high and 2" less than door width; mop plates 6” high.

3. Kick Plates shall be applied to the Push Side of the Door, Mop Plate applied to the Pull Side.
4. All plates shall have beveled four edges (B4E) and countersunk for screws.

Note: Some people with disabilities must push against a door with their chair or walker to open it. Applied kick plates on doors with closers can reduce required maintenance by withstanding abuse from wheelchairs and canes. To be effective, kick plates should be equal to width of door, less 2 inches, 16 inches in height, set centered across the width of the door and its bottom edge 1 inch from bottom edge of door.

I. Thresholds:
1. Furnish all Thresholds with ¼”-20 x 2” Zinc Plated Flat Head Sleeve Anchors.
2. The maximum height of thresholds at doorways shall be 1/2 inch (19.1 mm). Such thresholds shall have beveled edges on each side.

II. Butts
1. All butts are to be ball bearing.

III. Electric Strikes:
1. All equipment noted below are Owner Provided Equipment (OPE)
2. Electric strikes shall comply with BHMA A156.31 and UL listed as a Burglary-Resistant Electric Door Strike; style to suit locks.
3. Electric strikes shall be 24-volt DC and individually fused from power supply and shall operate in fail safe mode upon activation of fire alarm.
   a. Electric strikes shall be of the following model family:
      - HES 4500 (OPE)
      - HES 9600 (OPE)
      - HES 1006 (OPE)
      - Exceptions shall be approved by the DES Capitol Security Assistant Director or designee.
4. Card readers, power supply, cabling and other related components to be provided per Standard 28 13 00, Access Control.

IV. Crash bars
1. All equipment noted below are Owner Provided Equipment (OPE).
2. Crash bars shall be Von Duprin low voltage quiet electric latch (OPE).
3. No internal vertical rods are allowed. External vertical rods crash bars shall have compliant ADA kick plate at the bottom of the door.

Products, Materials and Equipment

- No specific requirements.

Installation, Fabrication and Construction

- No specific requirements.

END OF HARDWARE STANDARD

Basis of Design

This standard contains certain design criteria and procedures for interior and exterior plaster and gypsum board assemblies including plaster repair and restoration of historic buildings.

This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the PPD Project Manager. Exceptions to this standard will be made only upon specific written approval using the "Facilities Design Guidelines and Construction Standards Exception Request" form included in these Design Guidelines and Construction Standards.

1.1 Design Criteria

A. General

1. Resource materials pertaining to plaster and gypsum board assemblies and associated products, standards and guidelines are available from the Northwest Wall and Ceiling Bureau. They can be contacted by phone at (206) 524-4243 or by email at info@nwcb.org.

B. Plaster Repair

1. Plaster repair for historic buildings may require specific needs under historical preservation requirements. Confirm with PM how this work is to be addressed.
2. Interior plaster repair and restoration shall be executed in accordance with the Department of the Interior/National Park Service Cultural Resources Preservation Brief Number 21: "Repairing Historic Flat Plaster – Walls and Ceilings" http://www.nps.gov/history/tps/how-to-preserve/briefs/21-flat-plaster.htm and Preservation Brief Number 23: "Preserving Historic Ornamental Plaster" http://www.nps.gov/history/tps/how-to-preserve/briefs/23-ornamental-plaster.htm, as applicable to the repair/restoration work.
3. The Owner may select and employ a Historic Preservation Representative (HP Representative) having expertise in historic preservation to conduct on-site observations and inspections as specified in Section 01 45 23, Historic Preservation Inspection Services, to ensure on the Owner's behalf that the Work is carried out in conformance with the Contract Documents. Projects performing plaster repair and/or restoration work shall include Section 01 45 23 in their Contract Documents.

C. Gypsum Board

1. Due to possible asbestos containing cores of gypsum board panels manufactured outside of the USA, gypsum board panels for DES projects shall be manufactured in the USA. Each panel shall contain the wording "Made in the USA" or "USA Gypsum" or similar wording certifying manufacture in the USA.
2. It is preferred that 'gypsum board' panels contain recycled content material, either in its paper facings and/or its gypsum core; such recycled content shall be certified by the manufacturer.

1.2 Quality Assurance for Historical Properties Plaster Repair/Restoration

A. A Minimum of five (5) years' experience in the installation and repair of 3-coat plaster systems and decorative gypsum plaster elements in historic buildings.

B. Project superintendent/foreman shall have a minimum of eight (8) years' experience and shall have worked on a minimum of three (3) projects of similar size and scope.

C. Superintendent / Foreman shall be present at all times during repairs and shall personally direct the work.

D. First class workmen experienced in the best and accepted methods of the trade shall do all work.

1.3 Quality Assurance Plan for Historical Properties Plaster Repair/Restoration

A. Indicate methods for protecting furniture, finishes and miscellaneous items to remain.

B. Indicate method for managing dust control and debris removal.

C. Indicate methods for removal of damaged plaster.

D. Indicate methods for forming and installing new decorative elements.

E. Indicate methods for final clean up, including complete removal of all dust and debris throughout job site.

1.4 Quality Control for Historical Properties

The Owner's Site Representative and the Architect shall review work on a regular basis for conformance with the approved Quality Assurance Plan.

1.5 Phasing / Sequencing / Scheduling

If building is to remain occupied, the work will be phased to allow the occupants to relocate with the building to accommodate the construction process.

A. Provide a detailed week-by-week schedule of the work and a three-week "looks ahead" schedule to allow occupants to plan around construction.

B. Provide all protection necessary to ensure that dust does not penetrate from areas of work to areas where work is not in progress.

C. Ensure that all furniture, fixtures and contents are protected from dust, damage, or theft throughout the course of the work.

D. Ensure that dust from plaster removal and clean-up does not penetrate HVAC system. HVAC system shall be shut down, if possible, while work is being performed.

E. At the completion of work, all furniture, equipment, carpets, floors and all other surfaces and contents shall be left completely free of dust and debris from the work performed on this project.

Products, Materials and Equipment

- Specified products need to meet the intended use in moist areas.
- Repair and replacement materials shall match to the greatest extent possible remaining historic construction in all physical and visual aspects including material, form, color, texture and workmanship.

Installation, Fabrication and Construction

- No specific requirements

END OF PLASTER & GYPSUM BOARD STANDARD

Basis of Design

This standard contains certain design criteria and procedures for ceramic, glass and stone tiling. This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the PPD Project Manager. Exceptions to this standard will be made only upon specific written approval using the "Facilities Design Guidelines and Construction Standards Exception Request" form included in these Design Guidelines and Construction Standards.

1.1 Design Criteria

A. The latest edition of the "TCNA Handbook for Ceramic, Glass, and Stone Tile Installation" as published by the Tile Council of North America shall be used to determine appropriate tiling materials and installation methods. The TCNA Handbook is available for purchase at TCNA's website at www.TCNAtile.com.

END OF TILING STANDARD

Basis of Design

This standard contains certain design criteria and procedures for interior ceiling finishes not indicated in other sections. This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the PPD Project Manager. Exceptions to this standard will be made only upon specific written approval using the "Facilities Design Guidelines and Construction Standards Exception Request" form included in these Design Guidelines and Construction Standards.

1.1 Design Criteria

A. Suspended ceilings shall be heavy duty grid with standard 2'x2' or 2'X4' ceiling panels; match existing in remodel or building addition work. Concealed spline ceiling systems shall not be used.

B. Do not install suspended acoustical ceilings in restrooms.

C. Provide two (2) extra cartons of each type ceiling panels used on the project.

D. Require a sample kit of each suspended ceiling T-bar grid system to be used in the project to be submitted with suspension system shop drawings. Require sample kit to be identified by building name/number and turned over to Building & Grounds for their records.

Products, Materials and Equipment

2.1 Acoustical Ceiling Panels

A. Approved Manufacturers:

1. Armstrong World Ind.
2. U.S. Gypsum.
3. BPB USA / Celotex.

2.2 Suspension Grid System

A. Approved Manufacturers:

1. Donn Products Inc.
2. Chicago Metallic Corp.
3. Armstrong World Ind.
4. U.S. Gypsum

Installation, Fabrication and Construction

- Refer to Northwest Wall and Ceiling Bureau's Technical Document 401, Suspension Systems for Acoustical Lay-in Ceilings Seismic Design Categories D, E & F. This document has been revised based on current Building Code Standards (2012) and can be obtained on their website at https://www.nwcb.org.

END OF CEILINGS STANDARD

Basis of Design

This standard contains certain design criteria and procedures for various flooring materials. This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the PPD Project Manager. Exceptions to this standard will be made only upon specific written approval using the "Facilities Design Guidelines and Construction Standards Exception Request" form included in these Design Guidelines and Construction Standards.

1.1 Elevators:

Finished floor material shall be resilient flooring or terrazzo.

1.2 Entry Mats:

Capturing dirt at entrance ways is one of the most effective labor-saving devises in a quality custodial operation. Walk off mats are also essential to reduce slip and fall accidents during Washington's rainy weather. Therefore, wherever possible, entryways will be totally matted, and recessed matting installed in areas where applicable.

A. Matting shall generally be a dark color. Samples should be submitted for approval and review of colors

B. Total length of interior walk-off matting should be no less than 12 ft. from outside entry doors to the end of mating area.

C. Recessed (Inlaid) matting in exterior areas or vestibules is preferred. This will allow water to flow through the backing.

D. Inlaid matting areas may require a floor drain under mats.

E. Inlaid matting frames shall be of aluminum, bronze or other material complementary to the building design

F. Inlaid panels must be such that they can be easily removed for cleaning.

G. Metal foot grille type mats will be allowed only if specified.

1.3 Carpet and Carpet Tile

A. **Carpet**:

1. All carpeting shall be compatible with traditional carpet cleaning procedures including water extraction and roto scrubbing.
2. No products that require 'dry product cleaning' or specific chemical treatment will be accepted.
3. Carpet shall be either type 6 or type 6,6 nylon fiber and shall have an impervious backing.
4. All carpet installations shall be free from ripples, ravels, frays, puckers and raw exposed edges.
5. Carpet shall have a permanent stain guard protection which is not removable by commercial cleanings or abrasive wear.

6. Carpet shall maintain static generation of less than 3.0 KV at 7- degrees F and 20% relative humidity.
7. Carpeting and cushioning pad and adhesives must have been tested and passed Indoor Air Quality Carpet "Green Label" Testing Program of the Carpet and Rug Institute (CRI).
8. Only one dye lot will be allowed for each carpet type in continuous areas. Dye lots shall not be mixed.
9. Carpet installations shall extend under open-bottomed obstructions and under removable flanges and furnishings, and into alcoves and closets of rooms indicated to be carpeted
10. Carpet edge guards shall be installed where edge of carpet is exposed.
11. Only carpeting whose manufacturer will guarantee that carpet base color and pattern over print colors meet the following criteria shall be allowed:

    a. Will resist fading
    b. Will not bleed in cold water
    c. Will not experience crocking (the transfer of colorant from the surface of a carpet to another surface by rubbing.
    d. Contain static resistant properties
    e. Contain stain resistant properties that are permanent and not removable by commercial cleanings or abrasive wear.

B. **Carpet Tiles**:

1. Minimum 18 inch by 18 inch size carpet tiles; maximum 24 inch by 24 inch size.
2. Tiles shall be installed using full spread pressure sensitive (re-sealable) type of adhesive.
3. Adhesives must be waterproof, non-staining, nonflammable, "Green Label" pressure sensitive (releasable) as recommended by carpet manufacturer for compatibility with carpet backing.
4. All loop pile tiles will demonstrate some fuzzing. It is the contractor's responsibility to trim all edges of tile to eliminate fuzzing at tile edges.
5. Colors and patterns shall be submitted for approval.

Products, Materials and Equipment

- Adhesive products shall have a volatile organic compound (VOC) content not exceeding 50g/L.

Installation, Fabrication and Construction

3.1 Examination & Preparation

A. Prepare sub-floor surfaces as recommended by flooring and adhesive manufacturers. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Verify that concrete sub-floor surfaces are dry enough and ready for flooring installation by testing for moisture emission rate and alkalinity in accordance with ASTM F 710; obtain instructions if test results are not within limits recommended by respective flooring manufacturer and adhesive materials manufacturer.

3.2 Resilient Floors

A. Sheet Goods Installation

1. Install resilient sheet flooring in longest practical lengths
2. Ensure a minimum number of seams and place them in inconspicuous and low traffic areas
3. Match edges of floor coverings for color shading and pattern at seams following manufacturer's directions
4. Scribe, cut and fit sheet floor coverings to butt tightly to vertical surfaces, permanent fixtures and built-in furniture including cabinets, pipes, outlets, and thresholds as possible.

3.3 Cleaning

Immediately after installation of resilient floor products, the following cleaning should be performed.

A. Remove any adhesive and other surface blemishes using cleaner recommended by the product manufacturer.

B. Sweep or vacuum floors thoroughly.

C. Observe manufacturer's recommended waiting period before washing floors.

D. Damp-mop floors to remove marks and soil.

E. Apply sealers/floor finish. Sealer coefficient of friction shall comply with ADA requirements.

F. Protect flooring against mars, marks, indentations, and other damage from construction operations, and placement of equipment and fixtures during remainder of construction period. Use protection methods indicated or recommended in writing by flooring manufacturer.

G. Upon completion of carpet installation, carpet shall be vacuumed using a two motor, top loading, upright commercial machine with brush element, utilizing a high filtration dust bag.

H. Upon cleaning, carpet shall be protected from soiling and damage until final acceptance. Building paper, laid with a 6-inch overlap and secured with non-Transfer of colorant from the surface of a carpet to another surface by rubbing. tape, is recommended for protecting carpets

I. Spots shall be removed using products compatible with those used on the campus.

3.4 Campus Floor Care Standards:

A. Terrazzo - 2 coats shall be applied as soon as possible to provide protection of floors during construction process. After construction and prior to building opening floors will be stripped and/or refinished as needed and a total of 4 - 6 coats of a product such as "80" manufactured by Coast Wide Laboratories will be applied. Floor to have a High-Speed burnishing process completed before occupancy.

B. Concrete – Penetrating sealer to be applied as soon as concrete is ready to provide protective coating.

C. Carpet – Carpet purchased with a stain protector (Stainguard) and /or to be applied as soon as the carpet is installed.

D. Granite - Penetrating Sealer to be applied as soon as installation is completed, and the floor is ready.

E. VCT – 2 coats of water-based sealer/finish will be applied 48 hours after installation or as soon as possible to provide protection of floors during construction process. After construction and prior to building opening floors will be stripped and/or refinished as needed and a total of 4-6 coats will be applied.

F. Floor to have a High-Speed burnishing process completed before furniture installation and/or occupancy occurs.

G. Rubber flooring shall be cleaned according to manufacturer's instructions. Applying a finish to rubber flooring should be avoided.

H. All computer rooms shall be finished with an anti-static product such as "Discharge" by Butchers.

I. Ceramic tile group shall be sealed with a deep penetrating sealer such as by 3M

3.5 Floor Finish and/or Sealer specifications:

A. All Finish and/or Sealer specification sheets and MSDS sheets will be provided to custodial department for approval prior to use.

B. Only water-based finishes/ sealers will be used

C. Finishes and sealers must be removable with water-based strippers

D. Must be non-yellowing

E. Must have slip resistant properties

F. Must not require special room ventilating – general ventilation will suffice

G. Must be compatible with campus floor products (approval upon submittal)

H. Product specifications will be submitted for approval of compatibility with campus maintenance products

END OF FLOORING STANDARD

Basis of Design

This standard contains certain design criteria and procedures for paint products and systems and applies to Interior and Exterior painting. This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the PPD Project Manager. Exceptions to this standard will be made only upon specific written approval using the "Facilities Design Guidelines and Construction Standards Exception Request" form included in these Design Guidelines and Construction Standards.

There are a variety of paints that meet or exceed the current EPA and Washington State regulations on VOC's in paint. The Department of Enterprise Services requires that paints used on DES properties be of paints with VOC levels of 0–100 gm/l. Best results, especially for chemically sensitive individuals, is for non- VOC paints, levels with less than 1 gm/l (the grams per liter include colorants). A DES Representative must approve any products not within the EPA and Washington State regulations for VOC's.

"Paint", as herein defined, means all coating systems materials. Work includes preparation and finishing of all interior and exterior surfaces that are a part of this project. Work shall include adjacent existing surfaces that are disturbed as a result of this work. Work excluded shall be that which is normally excluded such as operating parts and code-required labels.

1.1 Quality Assurance

A. Provide solvent-free, low-VOC paint products. The Capitol Campus standard for paint colors are based on Kelly-Moore products. Provide paint colors that match those referenced in the Kelly-Moore pallet. This shall include common trim and accent colors. .

B. Interior walls and ceilings surfaces shall be painted in accordance with the following criteria over an appropriate prime/base coat, unless otherwise stated.

1. Areas not otherwise listed below to be washable acrylic latex with eggshell finish.
2. Corridors, stairwells, entry vestibules, lobbies, laundry facilities / rooms, public wash / shower / bathrooms with be washable acrylic latex with semi-gloss finish.
3. Public change / wash / shower rooms and institutional facility bathing, and shower rooms will be washable waterborne epoxy with a semi-gloss finish.
4. Public and institutional facility "clean" or "sanitary" areas such as food preparation and laboratory areas will be waterborne epoxy in a semi-gloss finish.

C. Painting is to be of "premium grade", one coat of primer and two coats of finish.

D. Qualified journeyman, as defined by local jurisdiction, shall be engaged in painting and decorating work.

E. A minimum of five (5) years of experience as a journey level painter shall be required of all painting supervisors on the job.

F. A journeyman must accompany apprentices at all times while on the job. A minimum of one apprentice shall be present for every three journeymen.

G. Inspect substrates prior to starting work, submit a written report of any unsatisfactory conditions. Beginning work shall imply acceptance of substrate.

H. All work subject to inspection by Owner's Site Representative, or other quality assurance association.

1.2 Regulatory Requirements

A. Conform to the latest edition of Industrial Health and Safety Regulations issued by applicable authorities having jurisdiction in regard to site safety (ladders, scaffolding, venting, etc.).

B. Conform to requirements of local authorities having jurisdiction in regard to the storage, mixing, application and disposal of all paint and related wasted materials.

1.3 Product Delivery, Storage and Handling

A. Deliver all painting materials in sealed, original labeled containers bearing manufacturer's name, brand name, type of paint or coating and color designation, standard compliance, materials, content as well as mixing and/or reducing and application requirements.

B. Store all paint materials in original labeled containers in a secure (lockable), dry, heated and well ventilated single designated area meeting the minimum requirements of both paint manufacturer and authorities having jurisdiction and at a minimum ambient temperature of 45 degrees F. Only materials used on specific projects are to be stored on job site.

C. Where toxic and/or volatile / explosive / flammable materials are being used, provide adequate fireproof storage lockers and take all necessary precautions and post adequate warnings (e.g., no smoking) as required.

D. Take all necessary precautionary and safety measures to prevent fire hazards and spontaneous combustion and to protect the environment from hazard spills. Materials that constitute a fire hazard (paints, solvents, drop clothes, etc.) shall be stored in suitable closed and rated containers and removed from the site on a daily basis.

E. Comply with requirements of authorities having jurisdiction, in regard to the use, handling, storage and disposal of hazardous materials.

F. Storage of Materials in occupied areas is not acceptable, check with Building Manager for availability of storage area, if non-available, remove of materials daily is required.

1.4 Scheduling

A. Schedule painting operations to prevent disruption of and by other trades.

B. Schedule painting operations in occupied facilities to prevent disruption of occupants in and about the building. Painting shall be carried out [after facility working hours] [during silent hours] [on weekends] in accordance with Owner's operation requirements. Schedule work such that painted surfaces will have dried before occupants are affected.

1.5 Project / Site Requirements

A. Perform no painting or decorating work when the ambient air and substrate temperatures are below 50 degrees for both interior and exterior work.

B. Perform no exterior painting work unless environmental conditions are within the paint manufacturer's requirements or until adequate weather protection is provided. Where required, suitable weatherproof covering and sufficient heating facilities shall be in place to maintain minimum ambient air and substrate temperatures for 24 hours before, during and after paint application.

C. Perform no interior painting or decorating work unless adequate continuous ventilation and sufficient heating facilities are in place to maintain ambient air and substrate temperatures above minimum requirements for 24 hours before, during and after paint application. Provide

supplemental ventilating and heating equipment if ventilation and heating from exiting system is inadequate to meet minimum requirements.

D. Perform no painting or decorating work when the relative humidity is above 85% or when the dew point is less than 5 degrees variance between the air / surface temperature.

E. Perform no painting or decorating work when the moisture content of the substrate exceeds paint manufacturer's recommended maximum moisture content.

F. Conduct all moisture tests using a properly calibrated electronic Moisture Meter, except test concrete floors for moisture using a simple cover patch test.

G. Test concrete, masonry and plaster surfaces for alkalinity as required.

Note: Concrete and masonry surfaces must be installed at least 28 days prior to painting and decorating work and must be visually dry on both sides.

H. Apply Paint only to dry, clean, properly cured and adequately prepared surfaces in areas where dust is no longer generated by construction activities such that airborne particles will not affect the quality of finished surfaces.

Products, Materials and Equipment

2.1 General

All materials shall comply with EPA and State of Washington regulations regarding Volatile Organic Compounds (VOC). All oil-based paints are not to exceed 250 gm/l VOC.

2.2 Mixing and Tinting

A. Unless otherwise specified, all paint shall be ready-mixed and pre-tinted. Re-mix all paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and color and gloss uniformity.

B. Paste, powder or catalyzed paint mixes shall be mixed in strict accordance with manufacturer's written instructions.

C. Where thinner is used, addition shall not exceed paint manufacturer's recommendations. Do not use kerosene or any such organic solvents to thin water-based paints.

D. If required, thin paint for spraying according in strict accordance with paint manufacturer's instructions. If directions are not on container, obtain instructions in writing from manufacturer and provide copy of instructions to General Administration Representative.

Installation, Fabrication and Construction

3.1 Surface Preparation

A. Remove and securely store all miscellaneous hardware and surface fittings / fastenings (e.g. electrical plates, mechanical louvers, door and window hardware (e.g. hinges, knobs, locks, trim, frame stops), removable rating / hazard / instruction labels, washroom accessories, light fixture trim, etc. From wall and ceiling surfaces, doors and frames, prior to painting. Carefully clean and replace all such items upon completion of painting work in each area. Do not use solvent or reactive cleaning agents on items that will mar or remove finishes (e.g. lacquer finishes). Doors shall be removed before painting to paint bottom and top edges and then re- hung.

B. Protect all adjacent interior surfaces and areas, including rating and instruction label on doors, frames, equipment, piping, etc., from painting operations and damage by drop clothes, shields, masking, templates, or other suitable protective means and make good any damage caused by failure to provide such protection.

C. Substrate defects shall be made good and sanded by others ready for painting particularly after the first coat of paint. Start of finish painting of defective surfaces (e.g. gypsum board) shall indicate acceptance of substrate and any costs of making good defects shall be borne by the painter including re-painting of entire defective surface (no touch-up painting).

3.2 Application

A. Do not paint unless substrates are acceptable and/or until all environmental conditions (heating, ventilation, lighting and completion of other subtrade work) are acceptable for applications of products.

B. Apply paint or stain in accordance with manufacturer's written instructions.

C. Apply paint and decorating material in a workmanlike manner using skilled and trade qualified applicators as noted under quality assurance.

D. Apply paint and coatings within an appropriate time frame after cleaning when environmental conditions encourage flash-rusting, rusting, contamination or the manufacturer's paint specifications require earlier application.

E. Painting coats specified are intended to cover surfaces satisfactorily when applied at proper consistency and in accordance with manufacturer's recommendations.

F. Tint each coat of paint progressively light to enable confirmation of number of coats.

G. Sand and dust between each coat to provide an anchor for next coat and to remove defects.

H. Do not apply finishes on surfaces that are not sufficiently dry. Unless manufacturer's directions state otherwise, each coat shall be sufficiently dry and hard before a following coat is applied.

I. Prime coat of stain or varnish finishes may be reduced in accordance with manufacturer's directions.

1. **Ferrous Metals**

   a. All ferrous metal surfaces shall be primed, all sides, and painted, unless shop finished.

   b. Clean ferrous surfaces of oil, grease, dirt, loose mill scale, and other foreign substances by solvent or mechanical cleaning. Touch up shop-applied prime coats wherever damaged or bare. Back prime backs, edges and ends of exterior ferrous metal work.

   c. Two (2) coats of finish to be applied after primer has dried according to Manufacturer's suggestions

2. **Concrete**

   a. Remove dirt, scale, powder, laitance, parting compounds, oil and grease, by light sandblasting or by approved alternate method. For cast-in-place work, allow at least 14 days before starting work, unless otherwise approved.

   b. Fill pock marks and air holes, if applicable. Fill with an approved latex base primer and filler material. Thoroughly brush or roll over surface. Let dry for not less than 24 hours before painting.

c. Remove contamination, dirt, dust and foreign matter from concrete floors. Apply surface treatment keep all traffic off surfaces until painted.

d. Two (2) coats of finish to be applied after primer has dried according to Manufacturer's suggestions

3. **Concrete Masonry Units**

a. Remove dirt, loose mortar, scale and efflorescence or powder.

b. Holes and other surface imperfections must be filled with appropriate block filler. CMU installer must sack areas too large for block filler.

c. Two (2) coats of finish to be applied after block filler has dried according to Manufacturer's suggestions.

4. **Metal Doors, Windows and Their Frames**

a. Prepare surfaces including tops, bottoms and surfaces normally concealed from view.

b. Two (2) coats of finish to be applied after primer has dried according to Manufacturer's suggestions

5. **Miscellaneous Metals** – Put metals in proper condition to receive paint. Grease, rust, scale, dirt and dust are required to be removed. Use only one-component, moisture-cured, micaceous iron oxide and zinc filled (miozinc) polyurethane primer for steel items to have field paint finish. As an option, exterior metal items to have a painted finish may be finished with a factory-applied 2-coat powder coat finish consisting of one (2.5 mils DFT) prime coat of zinc-rich epoxy powder coat primer together with one (2.5 -3.5 mils DFT) weather resistant semi-gloss polyester powder coat finish.

a. **Galvanized –** Only galvanize metal items that are not to be painted.
b. **Iron and Steel**
   1) Shop primed surfaces – prime surfaces at welded or abraded spots. Clean previously primed surfaces free of any oil and grease.
   2) Surfaces not previously primed – Remove rust and scale by wire brushing, sandblasting or other method. Remove rust, dirt, oil and scale and clean surface. Prime entire surface with one-component, moisture-cured, micaceous iron oxide and zinc filled (miozinc) polyurethane primer.
   3) Two (2) coats of finish to be applied after primer has dried according to Manufacturer's suggestions

6. **Wood Products to Receive Stain**

a. Remove dust and grit, this would include removing dirt, footprints, oil or other contaminations caused by other trades. Apply one coat of stain to cut ends and edges (tops, bottoms, behind hinges and latches) prior to installation.

b. Apply stain to surface, wiping dry with clean dry cloth, making sure no lint or strings are left behind.

c. Apply one (1) coat of sanding sealer, let dry (according to manufacturer's suggestions), then apply two (2) coats of Satin sheen Varnish.

7. **Wood Products to Receive Paint**

    a. Surfaces are to be cleaned of dirt and contamination. Wipe off dust and minor grit prior to prime and subsequent coats. Spot coat knots, pitch streaks and sappy sections with sealer. Backprime prior to installation. Fill all nail holes and fine cracks after primer has dried, sand smooth, ready for finish.

    b. Two (2) coats of finish to be applied after primer has dried according to Manufacturer's suggestions

8. **Cement Board, Siding, Piping, Shingles**

    a. Remove dirt, powdery residue and foreign matter, ready for paint on exposed surfaces.

    b. Two (2) coats of finish to be applied after primer has dried according to Manufacturer's suggestions

9. **Cement Plaster and Stucco** – Allow 14 days to cure before starting work in this section, unless otherwise approved.

    a. Remove dirt, loose material, scale, powder and other foreign material.

    b. Remove oil and grease with TSP, or similar cleaning solution, rinse and let dry.

    c. Fill minor isolated hairline cracks with patching plaster and smooth off to match adjacent surfaces.

    d. Two (2) coats of finish to be applied after primer has dried according to Manufacturer's suggestions

10. **Gypsum Plaster** – Allow 14 days to cure before starting work in this section, unless otherwise approved.

    a. Remove dust, dirt, loose materials and other foreign matter.

    b. Fill minor isolated hairline cracks with patching plaster and smooth off to match adjacent surfaces.

    c. Prime new Gypsum with Manufacturer's suggested primer.

    d. Two (2) coats of finish to be applied after primer has dried according to Manufacturer's suggestions.

11. **Gypsum Wallboard**

    a. Surfaces are to be flat, smooth and free from any imperfections, textured where required and left clean by other trades. If texture is applied, it must match adjacent substrates exactly.

    b. Remove any contamination, dust and dirt.

    c. If repairs are done after priming, reprime repaired areas.

    d. Two (2) coats of finish to be applied after primer has dried according to Manufacturer's suggestions

3.3 Do not paint:

A. Non-Ferrous metals, such as brass, bronze, chrome, aluminum, or stainless steel.

B. Finished plated hardware and plated hardware and plumbing fittings.

C. Interior metal registers and grilles, unless factory finish is damaged or unless otherwise noted.

D. Existing transparent finished woodwork, unless otherwise noted.

E. Stone, marble or brick.

F. Plastic Laminate.

G. Glass, unless otherwise specified.

H. Ceramic tile.

I. Galvanized metal.

3.4 Mechanical and Electrical Equipment

Refer to appropriate mechanical and electrical sections for schedule of color-coding and identification banding of equipment, ductwork, piping and conduit.

A. Paint all shop primed equipment

B. Remove louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

C. Prime and paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports except where items are pre-finished.

D. Do not paint identification markings.

E. Paint interior surfaces of air ducts that are visible through grilles and louvers with one coat of flat black paint to limit of sight line.

F. Paint exposed conduit and electrical equipment occurring in finished areas.

G. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.

H. Color code equipment, piping, conduit, and exposed ductwork in accordance with color schedule.

END OF PAINTING & COATING STANDARD

Basis of Design

Provide all interior and exterior building signage for Capitol Campus projects in accordance with the separate Washington State Capitol Campus Sign Standards for State Buildings and Grounds. Exceptions to this standard will be made only upon specific written approval using the "Facilities Design Guidelines and Construction Standards Exception Request" form included in these Design Guidelines and Construction Standards.

For other off campus DES facilities, the A/E and PM will review any existing standards that may be in use and incorporate those into the design.

Products, Materials and Equipment

2.1 Site Signage

A. All site signage shall conform to the Washington State Capitol Campus Sign Standards for State Buildings and Grounds, under the direction of the Enterprise Services Sign Shop.

B. For post mounted signage, the post type, size and footing detail shall be consistent with existing adjacent signage, where applicable, and approved by the DES Project Manager.

Installation, Fabrication and Construction

- No specific requirements.

END OF SIGNAGE STANDARD

Basis of Design

This standard contains certain design criteria and procedures for toilet compartments. This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the PPD Project Manager. Exceptions to this standard will be made only upon specific written approval using the "Facilities Design Guidelines and Construction Standards Exception Request" form included in these Design Guidelines and Construction Standards.

1.1 Design Criteria

A. Toilet compartments shall be ceiling hung type, wall braced, with vandal-resistant institutional hardware.

B. Approved material types include solid black phenolic core with decorative laminate face both sides and high-density polyethylene (HDPE) with smooth texture.

C. Non-approved material types include stainless steel, powder coated steel, and plastic laminate/ particleboard core types.

END OF TOILET COMPARTMENTS STANDARD

Basis of Design

This standard contains certain design criteria and procedures for the selection and installation of toilet and bath accessories. This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the PPD Project Manager. Exceptions to this standard will be made only upon specific written approval using the "Facilities Design Guidelines and Construction Standards Exception Request" form included in these Design Guidelines and Construction Standards.

1.1 Design Criteria

A. Paper towel dispensers shall be touchless roll type or multi-fold type; do not specify C-fold. Specify large capacity dispensers. It is desirable to have two dispensers in restrooms with more than one lav.

B. Do not specify combination paper towel dispenser / waste receptacle as these have been problematic in the past.

C. All operable controls for toilet room accessories shall be placed within one or more of the reach ranges specified in Section 308 of ANSI A117.1. The clear floor space adjacent to the control switch shall be located beyond the arc of the door swing and centered on the control switch.

D. Toilet room accessories for ADA accessible sinks and water closets shall be located within one of the reach ranges specified in Section 308 of ANSI A117.1. Shelves shall be installed so the top of the shelf is 40 inches minimum and 42 inches maximum above the floor.

E. At least one coat hook provided within accessible toilet compartments shall be located within one of the reach ranges.

F. Mirrors at accessible vanities shall be mounted with the bottom edge of the reflecting surface no higher than 40 in above the finish floor

G. Operable parts on drying equipment, towel or cleansing product dispensers, and disposal fixtures shall have a maximum reach height of 40 inches for reach depths less than 6 inches.

H. Flush controls shall be hand operated or automatic. Hand operated flush controls shall comply with Section 309 of ANSI A117.1, except the maximum height above the floor shall be 44 inches. Flush controls in accessible compartments shall be located on the open side of the water closet.

Products, Materials and Equipment

2.1 Toilet & Bath Accessories

A. Finishes, General: unless noted otherwise, finishes to be satin finish stainless steel.

B. Jumbo Tissue Dispensers:
   1. Manufacturers: Georgia Pacific, James River
   2. Details: High-capacity 12" jumbo bath tissue dispenser shall hold one roll up to 12" in diameter plus one 7" diameter stub roll; the equivalent of 14.7 rolls of standard two-ply tissue.

C. Double-Roll 'Hands-Free' Paper Towel Dispenser:
   1. Product: Georgia Pacific enMotion® or Kimberly-Clark "In-Sight" #09380 wall-mount 'Hands-Free' automated paper towel dispenser, or approved, with one 8" dia. and one 3- 1/2" dia. rolls.

2. Details:
    a. Dispenser shall hold and dispense a hard wound towel.
    b. There shall be a stub roll feature that allows a new roll to be placed in the dispenser but uses the remainder of the current roll before starting the new roll.
    c. There shall be controls to allow the paper length, delay between dispenses and sensor range to be adjusted.
        1) The length shall be adjustable to 8-, 12-, or 16-inch paper settings.
        2) The delay between dispenses shall be adjustable from 1, 2, or 3 second delay between dispenses.
        3. The sensor range shall be adjustable so that the dispenser is activated when a hand is waved within 1, 2, or 3 inches from the sensor.
    d. The dispenser shall run on 4 D cell alkaline batteries.

G. Electric Hand Dryer: Excel Dryer “Xlerator” Model XL-C, or Dyson “Airblade” Model AB02, energy efficient touch-free hand dryer. ADA compliant.
    1. Finish/Color: chrome or gloss metallic silver lacquer.
    2. Mounting: surface
    3. Operation: automatic (touch-less), 120V with dedicated circuit.

H. Toilet Seat Cover Dispenser:
    1. FOIC (Furnished by Owner, Installed by Contractor).

I. Grab Bar (straight): Installation and sizes as indicated on Drawings.
    1. Product: Bobrick; B-6206
    2. Material: Stainless steel, 0.05 inch thick.
    3. Mounting: Exposed.
    4. Gripping Surfaces: Smooth, satin finish.
    5. Outside Diameter: 1-1/2 inches for heavy-duty applications.

J. Grab Bar (corner): Installation and sizes as indicated on Drawings.
    1. Product: Bobrick; B-6237
    2. Material: Stainless steel, 0.05 inch thick.
    3. Mounting: Exposed.
    4. Gripping Surfaces: Smooth, satin finish.
    5. Outside Diameter: 1-1/2 inches for heavy-duty applications.

K. Paper Towel Waste Receptacle: FOIC (Furnished by Owner, Installed by Contractor).

L. Feminine Napkin/Tampon Waste Receptacle: FOIC (Furnished by Owner, Installed by Contractor).

M. Feminine Napkin/Tampon Dispenser: FOIC (Furnished by Owner, Installed by Contractor).

N. Liquid-Soap Dispenser: wall mounted “storage container” type soap dispensers:
    1. Product: Bobrick B-4112 Contura Series.

O. Mirror Unit: Sizes as indicated on Drawings.
    1. Product: Bobrick; B-290
    2. Frame: Stainless-steel angle.

2.2 Janitor Accessories

A. Janitorial Mop and Broom Holder: Not used. Do not provide.

2.3 Underlavatory Guard

A. Product: Truebro “Lav-Guard”

B. Insulating Piping Coverings: White, antimicrobial, molded-vinyl covering for supply and drain piping assemblies intended for use at accessible lavatories to prevent direct contact with and burns from piping. Provide components as required for applications indicated with flip tops at valves that allow service access without removing coverings.

Installation, Fabrication and Construction

1.1 Toilet & Bath Accessories

A. Install accessories using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

1. Install grab bars to withstand a downward load of at least 250 lbf, when tested according to method in ASTM F 446.

B. Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items. Remove temporary labels and protective coatings.

END OF TOILET ACCESSORIES STANDARD

Basis of Design

This standard contains certain design criteria and procedures for fire extinguishers and extinguisher cabinets and brackets. This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the PPD Project Manager. Exceptions to this standard will be made only upon specific written approval using the "Facilities Design Guidelines and Construction Standards Exception Request" form included in these Design Guidelines and Construction Standards.

1.1 Design Criteria

A. Extinguishers located in walks, halls, corridors, passageways or aisles shall be placed in semi-recessed or recessed cabinets, complying with the ADA Accessibility Guidelines (ADAAG).

B. It is preferred that extinguishers located in open office spaces be located wherever possible in areas not otherwise designated as a walk, hall, corridor, passageway or aisle and be mounted to wall with an extinguisher bracket, no cabinet.

C. Extinguisher handle and lever assembly shall be metal; no plastic handles or levers allowed.

END OF FIRE PROTECTION SPECIALTIES STANDARD

Basis of Design

This standard contains certain design criteria and procedures for the design and installation of window treatment. This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the PPD Project Manager. Exceptions to this standard will be made only upon specific written approval using the "Facilities Design Guidelines and Construction Standards Exception Request" form included in these Design Guidelines and Construction Standards.

1.1 Design Criteria

Blinds shall be commercial grade. Provide spare parts and repair kits.

Products, Materials and Equipment

2.1 Horizontal Louver Blinds

A. Blinds: Horizontal slat louvers hung from full-width headrail with full-width bottom rail; manual control of raising and lowering by cord with full range locking; blade angle adjustable by control wand; complying with Window Covering Manufacturers Association WCMA A100.1, Safety of Corded Window Covering Products.

1. Metal Slats: Spring tempered pre-finished aluminum; radiused slat corners, with manufacturing burrs removed.
2. Slat Support: Woven polypropylene cord, ladder configuration.
3. Head Rail: Pre-finished, formed aluminum box, with end caps; internally fitted with hardware, pulleys, and bearings for operation; same depth as width of slats.
4. Bottom Rail: Pre-finished, formed steel with top side shaped to match slat curvature; with end caps. Color: Same as headrail.

Installation, Fabrication and Construction

- No specific requirements.

END OF WINDOW TREATMENT STANDARD

Basis of Design

This standard contains certain design criteria and procedures for site furnishings and fixtures. This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the PPD Project Manager. Exceptions to this standard will be made only upon specific written approval using the "Facilities Design Guidelines and Construction Standards Exception Request" form included in these Design Guidelines and Construction Standards.

Products, Materials and Equipment

1.2 Exterior Furnishings and Fixtures

All exterior furnishings and fixtures located on the Capitol campus shall conform to the Washington State Capitol Campus Exterior Furnishings and Fixtures Design Guidelines as published by Enterprise Services. Such items include lighting fixtures, waste receptacles, benches and tables, drinking fountains, bicycle racks and lockers, and certain miscellaneous items.

Installation, Fabrication and Construction

- No specific requirements.

END OF SITE FURNISHINGS STANDARD

Basis of Design

This standard contains certain design criteria and procedures applicable to exterior fountains. This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the PPD Project Manager. Exceptions to this standard will be made only upon specific written approval using the "Facilities Design Guidelines and Construction Standards Exception Request" form included in these Design Guidelines and Construction Standards.

1.1 Design Criteria

A. Repair or rehabilitation of existing historic fountains may require specific needs under historical preservation requirements. Confirm with DES Project Manager how this work is to be addressed.

B. All new or replacement piping shall either be stainless steel or PVC; no copper. All exposed piping shall be stainless steel.

C. All collection ponds shall have waterproof liner.

D. Allow for fountain plumbing including all associated piping subject to freezing to be drained for winterizing.

E. Provide filtration system with easy access for cleaning.

F. Any integral lighting shall be LED type.

G. Water Treatment for Open Loop Type Fountains: (e.g., Tivoli, Pritchard, Governor's Mansion)

1. Acceptable Water Conditions: Biocide treatment only (e.g., Legionella Disease)

2. Chemical Treatment / Procedures: Bromo-Chlor Tablets at 1.0 – 2.0 ppm.

END OF FOUNTAIN STANDARD

Basis of Design

This standard contains certain design criteria and procedures for passenger and freight elevators. This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the PPD Project Manager. Exceptions to this standard will be made only upon specific written approval using the "Facilities Design Guidelines and Construction Standards Exception Request" form included in these Design Guidelines and Construction Standards.

1.1 Design Criteria

A. General Requirements

1. Comply with most stringent applicable provisions of following codes, laws, and/or authorities, including revisions and changes in effect:
   a. Safety Code for Elevators and Escalators, ASME A17.1.
   b. Guide for Inspection of Elevators, Escalators, and Moving Walks, ASME A17.2.
   c. Elevator and Escalator Electrical Equipment, ASME A17.5.
   d. National Electrical Code, NFPA 70.
   e. Americans with Disabilities Act, ADA.
   f. Life Safety Code, NFPA101.
   g. Washington Administrative Code, WAC Chapter 296-96 Safety Regulations and Fees for all Elevators, Dumbwaiters, Escalators and other Conveyances.
2. Restrict hydraulic elevators to a shaft length of 50 feet maximum. Restrict holeless hydraulic application to a single or two-stage dual holeless hydraulic application with a travel distance of 23'-0" and three stops maximum. In addition, restrict the use of holeless hydraulic elevators to applications where low to moderate use of the elevator is assumed throughout the day.
3. Do not use hydraulic type where the water table is high enough to be in contact with piston cylinder assembly.
4. Use biodegradable oil for any hydraulic application.
5. Provide traction elevators in buildings with more than five stops and in buildings with high traffic.
6. Dual-purpose service/passenger elevators can be substituted for dedicated service elevators in special situations or as a practical alternative as programming requirements indicate. A dedicated true service elevator should be designed when the application requires vertical transportation for the sole purpose of transporting large or heavy material on a continuous basis throughout the day.
7. Where building projects allow machine-room-less (MRL) type elevator to be installed, a dedicated control room shall be provided, designed in accordance with the requirements for a machine room per code. A control space or closet is prohibited.
8. Size shaft/hoistway to accommodate all manufacturers for the type of elevator specified. Do not provide a shaft/hoistway that accommodates only one manufacturer's size of elevator.
9. Design elevator shafts to be ventilated or pressurized as required by Washington Administrative Code (WAC).
10. All elevators are to be provided with emergency electrical power.
11. Elevators are to have voice activation for identifying each floor level.

12. Elevators shall comply with ADA requirements. In addition, elevator compartment shall be sized large enough to accommodate a gurney for use in case of medical emergency.
13. Provide seismic design to comply with code requirements, including seismic guide rail brackets, retainer plates, dual counterweight derailment sensing wires, and a dual axis seismic switch.
14. Pit shall have clearances under car for safety of workers in the pit. Access shall be by ladder, or a pit access door in accordance with Section 2.2.4 of ASME A17.1.
15. Call buttons in elevator lobbies and halls shall be centered at 42 in (1065 mm) above the floor. Such call buttons shall have visual signals to indicate when each call is registered and when each call is answered. Call buttons shall be a minimum of 3/4 in (19 mm) in the smallest dimension. The button designating the up direction shall be on top
16. Interior elevator buttons shall be located as close to opening of door as possible. Provide floor buttons at a maximum height of 54" off the floor for a side approach, and 48" off the floor for a front approach. Locate emergency controls at 35" off the floor. Floor buttons shall be a minimum of 3/4" in the smallest dimension.
17. All elevator car lighting shall be compact fluorescent or LED lighting and be switched off when not in use.
15. Existing elevators that are being modernized or upgraded shall meet current elevator and building code requirements, as well as the operational requirements of the building. This includes related components in the machine room, shafts, pits, and lobbies, including electrical components, mechanical components, life safety components, and miscellaneous steel components. Any elevator or related building components where it is determined that the necessary work to meet current code requirements is not feasible must be reviewed and confirmed as an acceptable variance by the elevator division of Labor and Industries, who is the applicable Code Authority prior to completing design.

B. Proprietary Equipment and Accessories Installed

All elevator equipment on the State Capitol Campus shall be equipment that has a minimum of three years of proven safe and reliable operation in the State of Washington and can be maintained by any qualified elevator service company. The following conditions shall also be met:

1. The equipment shall be available to DES within 24 hours.
2. The contractor shall identify all the proprietary equipment by name and determine availability.
3. If a proprietary equipment is upgraded within twelve (12) months, vendor shall upgrade existing state campus equipment at no cost to the state. All proprietary equipment and accessories will be disclosed in writing. A list of these items shall be made available together with a guarantee of availability. This guarantee shall specify that these parts will be available for the life of the equipment and within a twenty-hour period of failure.
4. Diagnostic equipment shall include a manual complete with access codes, adjusters' manuals and set-up manuals for adjustment, diagnosis, and troubleshooting of elevator system, and performance of routine safety tests.

C. Elevator Type

1. Complete a vertical transportation analysis to determine the appropriate quantity, type, size, speed, and grouping of the elevators for each new project. Minimum performance standards are as follows, which should be evaluated based on one-way and two-way peak demand during a five-minute time period as part of the analysis:

    a. Handling Capacity = At least 12-13% of the anticipated building population.

b. Average Interval = Less than 30 seconds during peak one-way demand and less than 35 seconds during peak two-way demand.

2. Capital Campus elevators are subject to heavy-duty service, are prone to vandalism, and are required to provide accessible access to most building areas. It is imperative that they be designed accordingly. Elevators shall be designed for combination passenger and freight (class A) services, as many delivery services on the campus utilize the convenience of the elevator. Generally, elevators should have a minimum of 150 FPM travel speed, however the actual speed should be verified with the Owner for each installation.
3. The minimum desired car capacity is 3,500 pounds with minimum clear inside dimensions of 6'-8" wide by 5'-5" front to back. A larger sized elevator is preferred. The Owner may choose to waive this requirement in favor of the minimum accessibility requirement. This should be verified with the Owner.
4. The basic control system is to be selective-collective. Elevators shall be designed to land at basement, attic and all intermediate floors. It is preferred that a landing stop be provided at rooftop level for buildings with flat/low sloped roof decks. Locate the machine room overhead where possible for traction elevators and adjacent to the hoistway at the lowest landing for hydraulic elevators. For traction type elevators with rooftop landing, it is preferred to locate machine room at rooftop level adjacent to hoistway. However, locating the machine room directly over the hoistway should be considered, accessed by a stairway from the rooftop level. The type of elevator installed should take into consideration initial installation cost, maintenance cost, and the need for higher horsepower requirements in some situations.

D. Elevator Pit

An 18" x 18" x 18" sump pit is required in each elevator pit with a flush metal cover in accordance with WAC 296-96-02560. Applicable codes, while allowing the use of a sump pump in the pit, do not allow a direct connection to a storm or sanitary drain. Therefore, it is imperative that elevator pits be thoroughly sealed to prevent water penetration. The pit shall be sealed against ground water and around the hydraulic shaft. Guarded pit lighting to provide an illumination of 10 ftc at all areas of the pit floor and any pit platforms with approved light switches is required in accordance with ASME A17.1 Rule 2.2.5. A pit ladder shall be provided in compliance with the minimum standards for elevators according to the most recent elevator codes of the State.

E. Alarms and Emergency Communication

1. The alarm button shall sound local alarm in the elevator car. The elevator subcontractor shall provide a set of dry alarm contacts with a pair of wires to the elevator controller to provide the means for the Owner or subcontractor to monitor the local alarm. A system trouble alarm shall be provided by the elevator contractor. A pair of dry contacts shall be provided with wiring to a terminal strip in the elevator controller. The contacts shall close if the car does not respond to any call button within five minutes. Wiring from the controller to the Owner's computerized control system panel shall be provided by the electrical subcontractor. The control system subcontractor shall make the termination in the field control panel and include these points on points list.
2. The contractor shall provide ADA and ASME A17.1 compliant two-way communication system between the elevators and a location agreed upon by the Owner and the contractor. Coordinate precise equipment with Owner prior to specifying. Provide a dedicated voice grade telephone line to each elevator controller for emergency communications to the Capitol Campus auto-dial network. The telephone device shall be full duplex, hands free, vandal-resistant equipment programmed for autodial to the DES

control station. Recorded messages shall not be sent. The device shall meet all current ADA requirements. An intercom between the elevator and main elevator lobby or building fire control center should also be provided.

3. All elevators shall be linked to the Capitol Campus auto-dial telephone system. The contractor shall provide all equipment and service to connect the elevator telephone to the campus network. Specific information on the telephone connection shall be obtained from the DES Telecommunications Coordinator.
4. If provided, audible emergency alarms shall produce a sound that exceeds the prevailing equivalent sound level in the room or space by at least 15 dbA or exceeds any maximum sound level with a duration of 60 seconds by 5 dbA, whichever is louder. Sound levels for alarm signals shall not exceed 120 dbA.
5. The emergency intercommunication system shall not require voice communication.

F. Elevator Fire Service

The elevators shall be installed with phase I and phase II fire service features as required by ASME A17.1. This includes alternate floor selection and the necessary signal fixtures in the car and hall. The electrical contractor shall install the necessary smoke detectors as required by the State elevator code and make wiring in the building fire alarm system according to specifications provided by the local authority having jurisdiction, (the City of Olympia Fire Marshall). Contractor to contact METASYS personnel to interface new fire alarm system to Johnson Controls METASYS system.

G. Key Cylinder

1. Keyed independent service shall be provided for the convenience of building maintenance personnel. Provide fire service keys in accordance with WAC 296-96- 02471. The key switches required by ASME A17.1 rules 2.27.2 through 2.27.5 for all new and altered elevators in a building shall be operable by the FEO-K1 key. The keys shall be Group 3 Security (see ASME A17.1-8.1). A separate key shall be provided for each switch. This key shall be of a tubular 7-pin style 137 construction and shall have a biting code of 6143521 starting at the tab sequences clockwise as viewed from the barrel end of the key. The key shall be coded 'FEO-K1.' The possession of the 'FEO-K1" key shall be limited to elevator personnel, emergency personnel, elevator equipment manufacturers, and authorized personnel during checking of firefighters' emergency operation.
2. The Owner will provide key specification upon request to the contractor. Contractor to contact PPD lock smith supervisor to verify key cylinder requirements. In response to lobby smoke detectors, the elevator(s) shall return to the designated level and doors shall remain open until fire department resets. Key switch operation (phase II) shall be installed in accordance with ASME A17.1.

H. Automatic Disconnecting for Fire Sprinklers

For all buildings with fire sprinkler systems the sprinkler heads in the elevator machine room and the hoistways shall comply with ASME A17.1, rule 2.8.2.3.2. The power supply disconnecting means shall be in accordance with WAC 296-96-02480.

I. Vandalism and Reckless Damage Resistance

1. Elevator installations in many buildings on the Capital Campus are subject to a considerable amount use vandalism and reckless damage. Because of wanton disregard of state property by some individuals or groups, the consultant is encouraged to specify

vandal resistant equipment such as signal fixtures. Installation of standard pre- engineered elevators are not rejected by this standard. But the following design standards shall be provided if the Owner desires in certain installations.

a. When required by the Owner, vandal resistant fixtures shall be Survivor/Plus by Adams Elevator Equipment Co. or an approved equal. Each button shall be flush mounted with minimal clearance between moving components to prevent jamming. Exposed services shall be of stainless steel, except where necessary to transmit light. All indicators shall be flush mount type with only small holes less than 3/8" and/or hairline joints to transmit light. All exposed fasteners shall be the tamper resistant type.

b. Vandal-resistant push buttons shall be provided as follows: Diameter to be 1.25 inches, made of solid stainless steel. The surface shall be rounded with minimal clearance between the button and the halo to prevent jamming. The button travel shall be stopped by a metal shoulder to prevent the transfer of pressure to the electrical switch contract and mounting studs. The metal halo shall be recessed into the face of the plate to prevent prying. The jewel shall be made of Lexan or equal material. The electrical switch component shall be protected with a Lexan body and contain contacts silver to silver with self-cleaning wipe and be U.L. approved. All buttons shall be of the illuminated type per ASME A117.1.

c. When required by the owner, car lighting shall be of the vandal proof type. Architects and designers should avoid using suspended ceilings with incandescent lamps in elevator cars. These lights are expensive and easily removed. Indirect lighting within the car should be given strong consideration.

d. Car interiors and doors shall be as graffiti resistant as possible. This is generally mandatory in elevators installed in parking structures and libraries. Verify actual requirements with the Owner.

e. Permanent Braille symbols are required. The stick-on type are consistently peeled off or otherwise removed. Any exception must be approved by the owner.

2. Provide provisions for wiring necessary for a CCTV system in the elevator traveling cable, even if there is no current plan to install cameras in elevators as a means to deter vandalism.

J. Escutcheon Hole

Provide an escutcheon hole on all hoistway doors.

1.2 Project Specific Requirements

A. Interlocks

Each hoist way entrance shall be equipped with an approved type interlock tested as required by code. The interlock shall be designed to prevent operation of the car away from the landing until the doors are locked in the closed position as defined by code and shall prevent opening the doors at nay landing from the corridor side unless the car is at rest at that landing or is in the leveling zone and stopping at that landing. Interlocks shall bear Underwriters' Laboratories "B" label of approval.

B. Hoistway Door Unlocking Device

Hoistway-door unlocking devices as specified by the ANSI/ASME A17.1 code shall be provided to permit authorized persons to gain access to hoistway when elevator car is away from the landing. Drill and mount each hoistway door for emergency access to interlock via broken-arm emergency door key. Use appropriate ferrule inserts to finish access holes.

C. Door Operation

1. A direct current motor driven heavy duty operator shall be furnished and installed, designed to operate the car and hoistway doors simultaneously. Door movements shall be electrically cushioned at both limits of travel.
2. The elevators shall be equipped to comply with ADA/ASME A17.1 accessible codes. Install door jamb symbols per ASME code at all landings. Locate all signals in this project at accessible levels.
3. Supply a car-top inspection/operating station complete with light fixture and on/off switch and emergency stop switch. Locate this station at proper operating elevation.
4. The minimum acceptable time from notification that a car is answering a call until the doors of that car start to close shall be calculated from the following equation:

   T = D/(1.5 ft/s) or T = D/(445 mm/s)

   where T total time in seconds and D distance (in feet or millimeters) from a point in the lobby or corridor 60 in (1525 mm) directly in front of the farthest call button controlling that car to the centerline of its hoistway door.

D Signal Fixtures - Vandal Resistant

1. Provide vandal resistant car station with built in Braille Arabic identification conforming to and mounted at ADA/ASME levels. Phase I and phase II shall be included as a control function. The car station shall include:
   a. Alarm Button.
   b. Keyed Emergency Stop.
   c. Capacity Plate (inlaid).
   d. Door Open Button.
   e. Door Close Button.
   f. Keyed Light Switch.
   g. Keyed Fan Switch.
   h. Keyed Independent Service Switch.
   i. Emergency Lighting mounted in car station.
   j. All signal fixture finished shall be No. 4 stainless steel.

E. Car Position Indicator and Car Riding Lantern and Gong Assembly

1. A vandal-resistant car lantern and gong assembly shall be provided that consists of engraved chevron arrows highlighted at the three apex points by a round Lexan illuminated lens.
2. An electronic chime shall be provided which meets ASME accessible code by sounding once in the “up” direction and twice in the “down” direction. An acceptable alternative is a voice announcer system which meets ADA together with a car-riding lantern and gong assembly with a floor passing audible signal.

F. Controller and System Operation

1. The elevator system shall be microprocessor based and software driven. The software shall be generic. The system shall operate in real time, continuously analyzing changing position, condition, and workload. The microprocessor should be capable of calculating estimated time of arrival (ETA) for calls registered.
2. The microprocessor shall provide flexibility to meet defined patterns of traffic such as up peak, down peak, and heavy interfloor demands and still adjust for the many indeterminate variations in these patterns which occur in buildings.
3. The position selector shall be part of the microprocessor system. The microprocessor control system shall store the floor position and slowdown points in memory.

4. The drive control system shall be a dual-loop feedback system based primarily on car position. The velocity profile shall be calculated by the microprocessor control system producing extremely smooth and accurate stops. The velocity transducer shall permit continuous comparison of machine speed to velocity profile and to actual car speed. This accurate position/velocity feedback shall permit a fast and accurate control of acceleration and retardation.
5. The controller shall include reverse phase protection, bypass, nudging, anti-nuisance, door time-saver, limited door reversal, independent service, and include all ADA requirements.
6. Other features which should be included in supervisory operation include:

    a. Selective Collective Assignment
    b. Delayed Car Protection
    c. Emergency Dispatching
    d. Parking Operation
    e. Anti-Nuisance Call Control
    f. Load Weighing Device

G. Machine Room and Remote Monitoring Requirements

1. Remote monitoring of elevator operation is now an option available on microprocessor controllers. Whenever possible the elevator system installer shall provide as part of the installation a computer-based system with keyboard that allows remote monitoring by service technicians.
2. The installation must include a modem and appropriate serial port on the computer to allow the Owner to monitor the elevator operation on a similar computer in the Operations Center. The modem must be able to send and receive data over the Owner's campus wide network.
3. Provide two telephone outlets, fully wired, in each machine room. The jacks must be RJ-11 or compatible technology and connected to the Owner's network. One line shall include a wall hung handset for troubleshooting use by service technicians. The second line, capable of local service only, will serve as the means of connecting the modem to the network for remote monitoring.
4. The design for the machine room shall provide the Owner with capability of maintaining a temperature of 50 to 90 degrees Fahrenheit. A Computerized Temperature Control System alarmable point shall be provided by the control system contractor.
5. The HVAC system for the machine room must provide a dust free environment to the greatest extent possible. Dust and other airborne particles are extremely detrimental to microprocessor equipment and repairs are very costly.
6. The machine room shall be keyed to the Owner's machine room master key for the convenience of service personnel and security purposes. The Owner shall provide the contractor with the lock manufacturer and keyway at the time of construction.

H. Protective Pads

Protective pads for the elevator car complete with the hanging hooks are to be included in the elevator specification. The pads are to be the maximum length allowed by code and cover all walls. Pads shall be delivered to Owner at start of the warranty period.

1.3 Acceptance Tests

- All tests shall be performed in the presence of the Washington State Elevator Inspector and the Owner's representative. The installation contractor shall obtain State Elevator Certification, and

shall pay the installation fee. Installation fee shall include the plan check fee, acceptance inspection, and the initial unrestricted operating permit.

1.4 Submittals

A. Operation and Maintenance Data

1. Upon final acceptance of the elevator by the Owner the installation contractor shall provide the Owner with two copies of the Operation and Maintenance Manual for the elevator. The two copies are to be given to the Owner's elevator maintenance contract administrator. One copy will be provided to the elevator maintenance contractor on a loan basis. The other will be filed with other maintenance information in the Owner's as- built files. The General Contractor is under no obligation to include the same information in any other maintenance manuals.
2. The manual shall be neatly organized and logically indexed and bound in a long-lasting wear resistant cover. The manual shall include complete, directly reproducible as-built drawings, diagrams including wiring type, wiring control schematics, drawings showing physical location of relays and electrical components. Include complete preventative maintenance instructions detailing services to be performed, frequencies of service, and repair and overhaul instructions on all components of the elevator system. Provide a complete description of the elevator operation including the functions of signals, door devices, and other pertinent features. Complete troubleshooting information shall be provided as well as a complete parts list for the installed elevator system.
3. The elevator contractor shall provide all drawings and control schematics on a CD in AUTOCAD readable format verified by the Owner.
4. The Owner is cognizant of the fact that modern control systems have components, which require special tools, and designated maintenance and troubleshooting information which the manufacturer considers proprietary. The installation contractor shall agree in writing prior to award of the contract for installation to disclose all requirements for proper maintenance, troubleshooting, and repair of the control (microprocessor based) system. The manufacturer's conditions for the Owner's acquisition of special manuals, tools, and/or components which are considered proprietary shall be clearly defined, including costs included in the installation bid price and copies of any documents required by the manufacturer for execution by the Owner. The contractor's failure to disclose information satisfactory to the Owner shall necessitate rejection of the bid. The Owner shall agree, in, that no reproduction or dissemination of the materials shall be made without the specific written permission of the company and that the materials shall not be used in any manner detrimental to installation contractor.

B. Shop Drawings, Product Data and Samples

1. Include capacities, sizes, performances, operations, safety features, finishes, and similar information. Include product data for car enclosures, hoistway entrances, and operation, control, and signal systems. Include product data for signal fixtures, lights, graphics, Braille plates, and details of mounting provisions.
2. Include plans, elevations, sections, and large-scale details indicating openings at each landing, machine room layout, coordination with building structure, relationships with other construction, and locations of equipment.
3. Include fixture, cab, and entrance shop drawings.
4. Indicate maximum dynamic and static loads imposed on building structure at points of support and maximum and average power demands.

5. Power Confirmation Information: Include motor horsepower, code letter, starting current, full-load running current, and demand factor.
6. Samples for Initial Selection: For finishes involving surface treatment, paint or color selection.

1.5 Maintenance

The contractor shall provide new installation service concurrent with the warranty period. The warranty period shall be for twelve (12) months commencing from the date the Owner accepts the elevator(s) for substantial completion. The service shall include all necessary preventive maintenance and repairs to keep the elevator in operation condition and list all warranted items by name. Updated software versions shall be provided and installed by the vendor during the warranty period. The contractor will be reimbursed by the Owner for any repairs or service which are found to result from vandalism or caused by an interruption in the Owner's utility services.

Products, Materials and Equipment

1.1 Acceptable Manufacturers

A. ThyssenKrupp Elevator (formerly Dover)

B. Otis Elevator Company

C. KONE, Inc. (formerly Montgomery)

D. Schindler Elevator Corporation

Installation, Fabrication and Construction

- Comply with manufacturer's instructions and the Elevator Safety Code for work required during installation.

END OF ELEVATOR STANDARD

Basis of Design

This standard contains certain design criteria and procedures for fire suppression sprinkler systems and applies to all work of Division 21. This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the PPD Project Manager. Exceptions to this standard will be made only upon specific written approval using the "Facilities Design Guidelines and Construction Standards Exception Request" form included in these Design Guidelines and Construction Standards.

1.1 Design Criteria

A. General Requirements

1. Automatic sprinkler systems shall comply with the minimum requirements for design, installation and maintenance of sprinkler systems as set forth in WAC 296-24-60705, General Requirements, and WAC 296-24-60799, Appendix A – Automatic Sprinkler Systems, together with NFPA Standard No. 13.

2. Design and installation Contractor shall have a minimum of five (5) years' experience in the design, installation, and testing of wet and dry pipe automatic fire protection sprinkler systems and be licensed and certified to Level 3 in accordance with WAC 212-80-018.

3. Contractor shall provide a service log at the fire pump controller in a format approved by the DES Project Manager. The log shall record the date and time of all service, examinations and trouble calls, condition of the system, and name of the technician. The log shall fully describe each trouble call including the nature of the trouble, necessary correction performed, and parts replaced.

B. Maintenance & Testing

Maintenance and testing shall be performed on a quarterly basis. A computerized preventive maintenance schedule shall be provided and shall describe the protocol for preventive maintenance of equipment. The schedule shall include a systematic examination, adjustment, and cleaning of all equipment.

Service call contractors and in-house maintenance personnel shall maintain the service log for all services, examinations, and trouble calls provided. Each trouble call shall be fully described in the log the nature of the trouble, necessary correction performed, and parts replaced.

C. Tools & Replacement Parts

1. Sprinkler Parts Cabinet:

   a. Spare sprinkler parts shall be kept in a cabinet where ambient temperatures do not exceed 100 deg. F.

   b. Install cabinet in location as directed by PM.

2. Sprinkler Heads: Provide a minimum five percent (5%) spare sprinklers with escutcheons with a minimum of 2 of each type/or as required by NFPA 13, whichever is more demanding.

3. Sprinkler Wrenches: Provide a minimum of 2 of each type sprinkler wrenches used.

4. Sprinkler System Water Flow Switch: Provide one (1) of each size installed.

5. Sprinkler System Valve Tamper Switch: Provide one (1) of each type installed.

6. Sprinkler System Pressure Switch: Provide one (1) of each type installed.
7. Provide two (2) sprinkler plugs attached to multi-section extension poles of 8 ft. minimum length.

D. List of Sprinklers

1. The fire protection sprinkler system contractor shall provide a typed list of all sprinkler heads installed in the project per the requirements of NFPA 13.
2. The typed list shall be placed within the spare sprinkler cabinet and shall identify each sprinkler-by-sprinkler identification number, manufacturer, model, orifice, deflector type, thermal sensitivity, and pressure rating.
3. The typed list shall also provide a general description, the quantity of each type of sprinkler provided within the spare head cabinet, and the date the list was generated.

Products, Materials and Equipment

2.1 General

All devices and equipment shall be Underwriter Laboratories Inc. listed for their intended purpose. All sprinklers shall be Factory Mutual approved.

2.2 Piping & Fittings

A. Pipe and fittings from inside face of building 12 inches above finished floor to a distance of approximately 5 feet outside building: Ductile iron, flanged fittings and 316 stainless steel bolting.

B. Fire protection water supply within the building up to sprinkler system isolation valves shall be per NFPA 13.

C. Sprinkler piping downstream of the isolation valve on wet-pipe systems shall be per NFPA 13 and conforming to the following:

1. Schedule 10 pipe may be used for piping in concealed applications.
2. Where piping is exposed, use Schedule 40 pipe only.

D. Sprinkler piping of a dry pipe system shall be Schedule 40 galvanized pipe for all piping including pre-action systems.

E. Threaded or flanged fittings shall be ANSI B1 6.3 cast iron, class 125 minimum. Threaded fittings shall not be permitted on pipe with a wall thickness less than Schedule 40.

F. All fittings on galvanized piping shall be galvanized in accordance with ASTM A53.

G. Plain end pipe, fittings with locking lugs or shear bolts are not permitted. Slip type or clamp-on type rubber gasketed fittings shall not be permitted, except on drains downstream of drain valve.

H. Pipe Identification: All pipe, including specially listed pipe allowed by NFPA 13, shall be marked continuously along its length by the manufacturer in such a way as to properly identify the type of pipe. Pipe identification shall include the manufacturer’s name, model designation, or schedule.

2.3 Valves

A. Listed Indicating Valves:

1. Gate: OS&Y, 2400 kPa (350 psi) water working pressure (WWP).

2. Butterfly: Gear operated, indicating type, 2400 kPa (350 psi) WWP. Butterfly valves are to be installed in a manner that does not interfere with the operation of any system component.

3. Ball (inspectors test and drain only): Brass and/or bronze body, stainless steel trim, for 2050 kPa (300 psi) service, indicating type.

4. Ball and butterfly valves shall not be used on incoming water service, and on the suction side of either the fire pump or jockey pump.

B. Check Valves: Swing type, rubber faced, or wafer type spring loaded butterfly check valve, 2400 kPa (350 lb) WWP.

C. Alarm Check: Iron body, bronze mounted, variable pressure type with retarding chamber. Provide basic trimmings for alarm test bypass, gages, drain connections, mounting supports for retarding chamber, and drip funnel. Provide pressure sensitive alarm switch to actuate the fire alarm system.

D. Drain Valves: Threaded bronze angle, globe, ball or butterfly, 4100 kPa (600 psi). Water or gas (WOG) equipped with reducer and hose connection with cap or connected to a drain line.

E. Self-Contained Test and Drain Valve:

1. Ductile iron body with bronze “Drain” and “Test” bonnets. Acrylic sight glass for viewing test flow. Various sized orifice inserts to simulate flow through 17/32-inch, 1/2 inch, 7/16 inch, and 3/8 inch diameter sprinklers. 1-1/4-inch diameter female threaded outlets.

2. Bronze body, with chrome plated bronze ball, brass stem, steel handle, Teflon seat, and sight glasses. Provide valve with three position indicator plate (off, test, and drain), 1/4 inch tapping for pressure gage and various other orifice inserts to simulate flow through 3/8-inch, 7/16 inch, 1/2 inch, and 17/32 inch diameter sprinklers.

F. Dry Pipe Valve: Flanged, iron body. Provide basic trimmings for alarm test bypass, water flow alarm, high- and low-pressure switches, gages, drain connections, drip funnel, accelerator and necessary pipe, fittings and accessories required to provide a complete installation.

G. Standpipe Hose Valve: 2-1/2 inch screwed, brass hose angle valve, 2400 kPa (350 psi) WWP, male hose threads same as local fire department service, 2-1/2-inch x 1-1/2 inch reducer, and with permanently attached polished brass cap and chain.

H. Standpipe Hose Valve Cabinets: Cabinets shall be white glossy polyester coated 20-gauge steel with continuous steel hinge with brass pin, recessed type; 24 inch x 24 inch x 10 inch size.

I. Double Check Backflow Prevention Assembly: Unit shall be functional in either vertical or horizontal position, rated for 1200 kPa (175 psi) working pressure. Double check backflow prevention assembly shall be FM approved, ASSE approved, State approved, and UL listed.

2.4 Automatic Ball Drips

Cast brass 3/4 inch in line automatic ball drip with both ends threaded with 3/4-inch NPT threads.

2.5 Fire Department Siamese Connection

Brass, flush wall type or pad mounted, exterior fire department connection with brass escutcheon plate, without sill cock, and a minimum of two (2) 2-1/2-inch connections threaded to match those on the local fire protection service, complete with polished brass caps and chains. Provide escutcheon with integral raised letters “Automatic Sprinkler” or “Standpipe and Automatic Sprinkler”. Provide connection with a swing check valve. Install an automatic ball drip between fire department connection and check valve to discharge over an indirect drain connection or to the outside. When

additional alarm valve is installed, additional check valve is not required. Check valves shall be installed in accordance with their vertical or horizontal listing.

2.6 Sprinklers

A. Quick response sprinklers shall be standard type except as noted below.

B. The maximum distance from the deflector to finished ceiling shall be 2 inches for pendent sprinklers. Pendent sprinklers in finished areas shall be provided with semi-recessed adjustable escutcheons and installed within the center one-third of their adjustment. The sprinkler shall be installed in the flush position with the element exposed below the ceiling line.

C. At the specified locations, provide the following type of FM approved sprinklers:

LOCATION	TYPE
Mechanical Equipment Rooms, Electrical & Electrical Switch Gear Rooms, Telephone Closets Transformer Vaults	Quick Response, Upright or Pendent Brass (200 deg F)
Elevator Shafts, Dumbwaiter Shafts, Elevator Machine Rooms, Elevator Pits	Standard Upright or Sidewall Brass (200 deg F)
Warehouse (Storage under 12 ft.)	Quick Response, Upright or Pendent Brass (150-165 deg F)
Warehouse (Storage over 12 ft.)	See NFPA 13
Cold Rooms, Freezers, Controlled Temperature Rooms and Unheated Areas	Standard Pendent, Dry Type (150-165 deg F)
Kitchen Hoods, Exhaust Ducts & Duct Collars	Standard Pendent or Upright (Extra High Temperature (325-375 deg g F)
Generator Rooms	Standard Pendent or Upright (286 deg F)
Skylights	Standard Pendent or Upright (286 deg F)
Elevator Lobbies & Corridors	Quick Response, Recessed Pendent, Chrome Plated (150-165 deg F)
All Areas Not Listed Above	Quick Response, Recessed Pendent, Sidewall, Chrome Plated (150-165 deg F)

2.7 Air Compressor

A. Provide air compressor specifically approved for a dry sprinkler system with U.L. Listed, FM approved dry valves.

B. A listed relief valve shall be provided between the compressor and controlling valve and shall be set to relieve at a pressure 10 psi in excess of the operating air pressure of the system.

C. Automatic air supply to more than one dry pipe system shall be connected to enable individual maintenance of air pressure in each system.

2.8 Fire Pump

A. Provide a horizontal base mounted, split case, bronze fitted, single stage, double suction, centrifugal fire pump.

B. Provide fire pump controller, approved for fire pump service, completely assembled, wired and tested at the factory. Mark controller “Fire Pump Controller”. Enclose equipment in approved NEMA 3R enclosure. The combined manual and automatic type controller shall include the following as a minimum:

1. Disconnect switch, externally operable, quick break type.
2. Circuit breaker, time delay type with trips in all phases for 300 percent of the motor full load current.
3. Running period timer set to keep motor in operation for a period not to exceed ten (10) minutes when started automatically.
4. Pilot lamp to indicate circuit breaker closed and power available.
5. Alarm relay to energize an audible or visible alarm through an independent source of power to indicate circuit breaker open or power failure.
6. Provide means on the controller to operate an alarm contact continuously while the pump is running.
7. Provide all necessary wiring and interface circuitry to enable fire alarm system to monitor controller and pump condition, pump power failure, pump running supervisory power failure alarm signals and phase reversal on line side of motor starter.

C. Hydrostatically test the pump at 150 percent of the working pressure, but in no case to less than 1700 kPa (250 psi). Provide a complete factory performance test and furnish characteristic curves prepared from the test results.

D. Include the following accessories with the fire pump unit:

1. Eccentric tapered suction reducer.
2. Concentric tapered discharged increaser.
3. Hose valves.
4. Caps and chains.
5. Pressure gages.
6. Circulation relief valve.
7. Automatic air release valve.
8. Ball drip valve.
9. Coupling guard.
10. Water measuring device.
11. Test header.
12. Test loop.

E. Provide the services of a factory-trained representative to align coupling and be available to assist in final acceptance test.

F. Water Measuring Device: Capable of water flow of not less than 175 percent of pump rated capacity, to test the pump. Provide discharge drain line from the device to a suitable drain.

G. Pump Settings:

1. Jockey Pump Stop Point: Pump churn pressure plus the minimum static supply pressure.
2. Jockey Pump Start Point: Jockey pump stop point less 70 kPa (10 psi).
3. Fire Pump Start Point: Jockey pump start point less 35 kPa (5 psi).
4. Where minimum run timer is provided, fire pump shall continue to operate after attaining these pressures. Final pressures shall not exceed pressure rating of the system.
5. When the operating differential of pressure switches does not permit these settings, settings shall be as close as equipment will permit. Establish settings through observation of pressures on test gages.
6. When minimum run timer is provided, the fire pump shall continue to operate at churn pressure beyond the stop setting. Final pressure shall not exceed the pressure rating of the system components.

2.09 Jockey Pump

A. Pump shall be close coupled turbine type, cast iron frame and case, bronze impeller, bronze fitted, stainless steel shaft, tungsten carbide mechanical seal.

B. Motor shall be open drip proof type.

C. Jockey Pump Controller: UL Listed, with magnetic starter, fusible disconnect switch, hand-off automatic selector switch, control circuit transformer, running period timer, adjustable Mercury tube pressure switch, and NEMA 2, drip tight.

D. Jockey pumps shall be sized to make up the allowable leakage rate within 10 minutes or 1 GPM, whichever is larger, and shall have rated capacities of not less than accepted leakage rate. They shall have discharge pressure sufficient to maintain the desired fire protection system pressure.

2.10 Test Header

No specific requirements. Just provide with appropriate piping, valve, identification plate, etc.

2.11 Waterflow Switches

A. Integral, mechanical, non-coded, non-accumulative retard type, with two sets of SPDT auxiliary contacts and adjustable from 0 to 90 seconds. Set flow switches at an initial setting between 30 and 45 seconds.

B. All conduit and wiring connected thereto shall be provided in Fire Detection and Alarm work of Division 28.

C. Preferred Switches: Potter Electric Signal Co. Model VSR Series vane type waterflow switch for use on wet sprinkler systems; Model PS10 Series pressure activated switch for use on dry pipe systems.

2.12 Valve Supervisory Switches

A. Provide each indicating sprinkler, standpipe and fire pump control valve with adequate means for mounting a valve supervisory switch.

B. The mechanism shall be contained in a weatherproof die cast aluminum housing, which shall provide a 3/4 inch tapped conduit entrance and incorporate the necessary facilities for attachment to the valves.

C. Switch housing to be finished in red baked enamel paint.

D. Supervisory switches for ball and butterfly valves may be integral with the valve.

E. All conduit and wiring connected thereto shall be provided in Fire Detection and Alarm work of Division 28.

F. Preferred Switches: Potter Electric Signal Co. Model PCVS-2 control valve supervisory switch or Model OSYSU-2 outside screw and yoke valve supervisory switch.

2.13 Pressure Switches

A. Provide with 1/2-inch NFT male pressure connection.

B. Alarm switch shall be activated by any flow of water equal to or in excess of the discharge from one sprinkler.

C. Supervisory switch shall be activated by either high or low air pressure condition.

D. Furnish switch in a red baked enamel finished, weatherproof, oil resistant housing with tamper resistant screws.

E. Preferred Switches: Potter Electric Signal Co. Model PS10 Series pressure activated water flow switch or Model PS40 Series high/low pressure sensitive switch.

2.14 Water Motor Gong

Provide water powered mechanical device providing an audible signal when there is a flow of water in the automatic sprinkler system.

2.15 Wall, Floor & Ceiling Plates

A. Exposed piping passing through walls, floors or ceilings shall be provided with escutcheon plates.

B. Comply with NFPA 101 Fire Barrier Penetration codes.

2.16 Pressure Gauge

Provide a 1280 kPa (200 psi) water pressure gauge at each flow alarm switch location, at the top of each sprinkler or standpipe riser, at each main drain connection, and on the suction and discharge of the fire pump. Provide an 80-psi air pressure gauge at dry pipe valve.

2.17 Hangers

Provide per requirements of NFPA 13.

2.18 Signage

A. Identification Signs: Provide a permanently marked metal or engraved rigid plastic identification sign with proper lettering and secured with corrosion resistant wire, chain, or other approved methods for all control valves, drains, inspector’s test valves, and fire department connection zones in accordance with NFPA 13.

B. Hydraulic Signs (Placards):

1. Each sprinkler system riser shall have the NFPA 13 required hydraulic sign placed near the control valve that is permanently marked and made either of weatherproof metal, rigid plastic, or weatherproof Tyvek.

2. The hydraulic sign shall be permanently secured with corrosion resistant wire, chain, or adhesive backing.

3. The hydraulic sign shall identify the location of the design area, discharge density, design area size, system demands at the base of riser, hose stream allowances, current water flow information, auxiliary design parameters (densities and areas) associated with the system installed, and the name of the installing contractor.

C. General Information Signs (Placards).

1. Each sprinkler system riser shall have the NFPA 13 required general information sign placed near the control valve that is permanently marked and made either of weatherproof metal, rigid plastic, or weatherproof Tyvek.

2. The general information sign shall be permanently secured with corrosion resistant wire, chain, or adhesive backing.

3. The general information sign shall identify the name and location of the facility protected, the presence of high piled and/or rack storage, maximum height of storage planned, aisle width planned, commodity classification, encapsulation of pallet loads, presence of solid shelving, flow test data, presence of flammable/combustible liquids, presence of hazardous materials, presence of other special storage, location of all auxiliary drains and low pint drains, original results of main drain flow test, name of installing contractor or designer, and the indication of presence or location of anti-freeze or other auxiliary systems.

D. Full Forward Flow Test Signs (Placards):

1. The fire protection sprinkler system contractor shall provide a sign that is to be attached to the backflow preventer that is permanently marked and made either of weatherproof metal, rigid plastic or weatherproof Tyvek.

2. The full forward flow test sign shall be permanently secured with corrosion resistant wire, chain, or adhesive backing.

3. The full forward flow test sign shall indicate the following information:

a. Pressure on the supply side of the backflow preventer assembly prior to testing.
b. Pressure on the discharge side of the backflow preventer assembly prior to testing.
c. Pressure on the supply side of the backflow preventer assembly during testing.
d. Pressure on the discharge side of the backflow preventer assembly during testing.
e. Total pressure drop across the backflow preventer assembly during testing.
f. System test flow rate based upon hydraulic system demands.
g. Manufacturer’s documented pressure drop data from the pressure drop flow curve.

Installation, Fabrication and Construction

3.1 General

A. The State of Washington "Washington Administrative Code" (WAC) Section 212.80.043(9) requires a State of Washington Level III Certificate of Competency holder to prepare the layout drawings for the fire protection work.

B. Only a designer that is certified as a Level IV technician by National Institute for Certification in Engineering Technologies (NICET) in the automatic sprinkler system layout sub field of fire

protection engineering technology (in accordance with NICET 1014-7) shall be allowed to perform the fire protection work on this project.

C. The installing Contractor shall have a minimum of five (5) years' experience in the design, installation, and testing of wet pipe automatic fire protection sprinkler systems, or similar fire protection systems. A list of installations of a similar nature and scope shall be provided on request.

D. Installation, workmanship, fabrication, assembly, erection, examination, inspection, and testing shall be in accordance with NFPA 13.

B. All piping in finished areas shall be installed concealed above the ceiling space unless specifically noted otherwise.

C. Sprinkler heads located in acoustical ceiling tiles shall be installed in a consistent pattern, centered both directions within the ceiling tiles (12" from a ceiling grid), and placed to avoid all lights, air diffuser grilles, and obstructions.

D. Sprinkler heads located in rooms that contain entire gypsum wallboard ceilings shall be installed in a consistent pattern within the gypsum wallboard ceiling and placed to avoid all surface mounted lights, air diffuser grilles, and obstructions.

E. Sprinkler heads located in soffits shall be installed in a consistent pattern and placed to avoid all lights (surface mounted and/or recessed), air diffuser grilles, and obstructions.

F. Sprinkler heads in exposed areas shall be installed in a consistent pattern while avoiding all lights, ductwork, and structural members.

3.2 Piping - General

A. Conceal all piping, except in pipe basements, stairwells and rooms without finished ceilings.

B. All piping and fittings installed prior to the backflow preventer are considered part of the potable water system and shall be required to be of a type that maintains a clean and rust-free potable system. The use of black and galvanized pipe and fittings on the potable waterside of the backflow preventer will not be allowed.

C. Install piping and sprinklers aligned with natural building lines and other sprinkler lines.

D. Locate piping in stairways as near ceiling as possible to prevent tampering by unauthorized personnel. Provide minimum headroom of 7 foot 6 inches for all piping.

E. Piping arrangement shall avoid contact with other piping and equipment and allow clear access to other equipment or devices requiring access or maintenance.

F. Use CPVC piping only when allowed by the local AHJ. When allowed, install CPVC piping only above gypsum board or acoustical ceiling panels classified for surface burning characteristics (See U.L. product category BIYR in the Building Materials Director), or behind a Listed Sprinkler Cover Support System. In unfinished areas with flat ceiling construction and sprinkler deflectors installed within 8 inches of the ceiling, piping may be exposed when listed quick response sprinklers are used.

G. Grooved couplings and fittings shall be installed in accordance with the manufacturer's recommendations. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from the pipe end to the groove. Grooved coupling gaskets shall be molded and produced by the coupling manufacturer.

H. Prevent use of sprinklers heads that have been dropped, damaged, show signs of corrosion, show signs of foreign matter buildup, show signs of a cracked glass bulb, or show a visible loss of fluid.

I. The glass bulb protector shall remain in place until the sprinkler head is completely installed. The fire protection sprinkler system contractor shall remove the glass bulb protector by hand after installation and prior to the sprinkler system being placed in service.

J. All sprinkler heads installed to protect the area under ductwork or similar obstructions shall be restrained from lateral movement.

K. Ends of new piping and existing piping affected by Contractor's operations shall be thoroughly cleaned of water, cutting oil, and foreign matter. Keep piping systems clean during installation by means of plugs or other approved methods and securely close open ends of piping when work is not in progress to prevent entry of foreign matter. Inspect all piping before placing into position for foreign matter and remove as necessary.

L. Access doors shall be provided in ceilings of rooms where above ceiling access is required for sprinkler system maintenance.

3.3 Drains, Test Pipes & Accessories

A. Install a drain at base of risers, drain connection on valved sections, and drains at other locations as required for a complete drainage of the system. Install ball valve in drain lines and connect to the central drain riser. Discharge riser outside over splash block, indirectly over standpipe drain connected to storm sewer, or as otherwise approved by DES Project Manager. The main drain shall be capable of full discharge test without allowing water to flow onto building floor.

B. Install test pipes in accordance with NFPA 13. Test pipes shall be valved and piped to discharge through proper orifice.

3.4 Switches

A. Install a water flow switch for each sprinkler zone and standpipe riser; elsewhere as necessitated by NFPA 13.

B. Install a supervisory switch connected to the fire alarm system for each sprinkler system riser, sprinkler zone, standpipe system riser, main service entrance, fire pump supply and discharge, jockey pump supply, PIV (post indicator valve), and control valve. Do not install supervisory switches at standpipe hose valves or test and drain valves.

C. Mount switch so as not to interfere with normal operation of the valve and adjust to operate within two revolutions toward the closed position of the valve control, or when the stem is moved no more than one fifth (1/5) of the distance from its normal position.

3.5 Pressure Gage

Install a 1280 kPa (200 psi) pressure gage at each flow alarm switch location, at the top of each sprinkler or standpipe riser, at each main drain connection, and on the suction and discharge of the fire pump, except on DPV systems.

3.6 Tests For Newly Installed Systems

A. Flush newly installed systems prior to performing tests in order to remove any debris which may have been left as well as ensuring piping is unobstructed.

B. Automatic Sprinkler System: NFPA 13 and 25.

C. Standpipe and Hose System: NFPA 25.

D. Centrifugal Fire Pumps: NFPA 20.

3.7 Instructions For Newly Installed Systems

Furnish the services of a competent instructor for not less than two (2) four-hour periods for instructing personnel in the operation and maintenance of the fire pump and sprinkler system.

END OF FIRE SUPPRESSION SPRINKLER SYSTEMS STANDARD

Basis of Design

This standard contains certain design criteria and procedures for plumbing systems and applies to the general plumbing requirements for all work of Division 22. This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the PPD Project Manager. Exceptions to this standard will be made only upon specific written approval using the "Facilities Design Guidelines and Construction Standards Exception Request" form included in these Design Guidelines and Construction Standards.

1.1 Mechanical (Plumbing) Systems

A. Separate sanitary and storm sewer lines.

B. Provide access for maintenance on back flow preventers.

C. Zone plumbing systems and provide individual isolation valves for each zone. Valves shall be properly identified with signage and indicated on as-built drawings.

D. On remodel projects, remove all abandoned piping back to live connection.

E. Provide hose bib centered along wall under all restroom vanities for custodial use. Provide hose bib also at each janitor sink.

F. At public restrooms where more than one lavatory is to be provided, provide one deep utility sink with high gooseneck faucet at one end location in lieu of standard lav unit.

G. It is desired that whenever possible, capital campus projects should incorporate a reclaimed water system connected to the local LOTT reclaim water system. Design, materials and workmanship for the construction, operation and maintenance of reclaimed water systems on the capital campus shall be in accordance with the current edition of the City of Olympia Engineering Design and Development Standards (City "EDDS") as set forth in the Olympia Municipal Code, Chapter 13.24 – Reclaimed Water, except where these DES standards provide otherwise. The City of Olympia's reclaimed water standards have been developed with the Washington State Department of Transportation (WSDOT) Standard Specifications for Road, Bridge, and Municipal Construction as their basis, providing exceptions, clarifications, and enhancements as necessary.

1.2 Entry To Permit-Required Confined Space

A. Entry into confined spaces such as steam tunnels, storm sewers, and as otherwise defined in Section 296-809-20002 of Chapter 296-809 WAC, Confined Spaces, shall be performed in conformance with permit entry procedures set forth in Section 296-809-500.

B. Employee training for employees entering a confined space shall conform to WAC Section 296-809-400.

C. It is recommend that when entry into a confined space is anticipated, a sub-consultant such as Pipe Experts LLC (360-943-5840) be contacted.

1.3 Backflow Prevention Assemblies

A. Backflow shall be "Y" type, single check, non-cartridge style only.

B. Backflow shall be Wilkins or Febco for 4 inches and smaller, Febco for 4 inches and above.

1.4 Markings

Pipe Marking: Color code pipe markings shall conform to ANSI/ASME A13.1, with markings occurring at maximum 10 foot intervals in each space where piping is exposed; provide markings also

at all concealed lines in chases and above ceilings. Provide identifying labels with legend and arrows indicating direction of flow.

1.5 Closeout Submittals

A. All sub-consultants to the prime consultant are not to include their own requirements regarding closeout submittals. Division 22 specification sections regarding closeout submittals including project record documents, operation and maintenance manuals, warranties, bonds, etc., are only to reference seeing Section 01 78 00. Extra stock is to be identified in respective Division 22 sections. If the consultant has specific criteria, they need beyond Section 01 78 00, they can specifically identify it at the same time as being in addition to requirements of Section 01 78 00.

B. Special Tools: At completion of project this Contractor shall furnish to the Owner one complete set of any and all special tools such as odd size wrenches, keys, etc. (allen wrenches are considered odd), which are necessary to gain access to, service, or adjust any piece of equipment installed under this contract. Each tool shall be marked or tagged to identify its use.

Products, Materials and Equipment

2.1 Piping/Plumbing

A. Building sanitary and storm lines shall be ductile or cast iron, no-hub.

B. Potable water lines shall be copper Type L above ground, wrapped Type K below ground.

2.2 Fixtures

A. Water closets and urinals shall be wall hung low flow type with carriers; Zurn 1/2-pint flow urinals are preferred. Use single action sensor activated flushometers with delayed flush, manual mechanical override, and eight (8) second “walk-by” delay. Flushometers for new construction shall be Sloan or Zurn low voltage, hard-wired assemblies; replacement battery operated automatic flush valves shall be Technical Concepts.

B. Lavfaucets with hard-wired “surround” or “proximity” type sensor activation is preferred. Low flow type with dry cam gear operation; no solenoid valves.

C. Drains shall be Zurn, Josham or Smith.

D. Drinking fountains shall be refrigerated type; Halsey, Taylor, Haws or Elkay.

E. Water shutoff / piping valves shall be Hibco, Kennedy, Apollo or Stockman ball valve type, no gate valves.

F. Trap primers shall be J.R. Smith, Prime-EZE.

2.3 Backflow Prevention Assemblies

A. Backflow shall be “Y” type, single check, non-cartridge style only.

B. Backflow shall be Wilkins or Febco for 4 inches and smaller, Febco for 4 inches and above.

2.4 Markings

A. Pipe Marking: Piping shall be marked as follows:

1. Type: Self-sticking colored markers, lettered to identify the pipe contents, and banded at each end with arrow tape indicating the direction of flow. Markers shall be similar and

equal to Brady "System 1" and Seton "Opti-Code" markers. Spray painted stencil labeling is not acceptable. Some markers may be special order.

2. Marker Colors and Wording:

Piping System & Wording	Background	Letters/Arrow
Domestic Cold Water	Green	White
Domestic Hot Water	Yellow	Black
Domestic Hot Water Circ.	Yellow	Black
Chilled Water Return	Green	White
Chilled Water Supply	Green	White
Heating Return	Yellow	Black
Heating Supply	Yellow	Black
Condensation	Yellow	Black
Steam	Yellow	Black
Condenser Water Supply	Green	White
Condenser Water Return	Green	White
Sanitary Sewer	Green	White
Storm Water	Green	White
Reclaimed Water	Green	White
Vent	Green	White
Steam Blow Off	Yellow	Black
Sprinkler-Fire	Red	White

3. Marker Lettering: Lettering shall identify the material conveyed in each pipe. Systems which have supply and return piping shall have piping labeled as such (i.e. chilled water return, chilled water supply etc.). Size of letters and color field shall comply with ANSI A13.1., repeated here for convenience:

Outside Diameter of Pipe or Covering	Length of Color Field	Size of Letters
3/4 to 1-1/4 Inches	8 Inches	½ Inch
1-1/2 to 2 Inches	8 Inches	3/4 Inch
2-1/2 to 6 Inches	12 Inches	1-1/4 Inches
8 to 10 Inches	24 Inches	2-1/2 Inches
Over 10 Inches	32 Inches	3-1/2 Inches

B. Valve Marking: Valves shall be marked as follows:

1. Identification tags made of aluminum, engraved with valve size, name of system served (cold water, hot water, etc.) and purpose of valve. Tags shall be installed on all valves except stops at plumbing fixtures. Tags shall not be less than 3" x 1" in size; lettering shall be minimum 1/4-inch high. Tags on domestic hot water systems shall be red with white lettering; on hydronic systems white with black lettering; on fuel piping yellow with black lettering; and green with white lettering for other systems. Tags shall be wired to each valve with No. 6 polished nickel-steel jack chain.
2. Valve charts shall be provided for each mechanical room providing valve data for emergency, main building, and main area shut-off valves. Valve charts shall be neatly typed on 8-1/2" x 11" paper and framed under plastic with an aluminum or wood frame and posted in the appropriate room at a visible location acceptable to the Architect/ Engineer. Sample chart organization:

"PROJECT NAME"

MAIN VALVE CHART

Valve Size	Service	Location	Purpose
3 Inch	CW Main	Mechanical Room 101 NW Corner	Main Water Shut-off
2 Inch	CW North Wing	Above Ceiling NE Corner, Room 151	North Wing CW Shut-off

Installation, Fabrication and Construction

3.1 Markings

A. Pipe Marking Locations: Markers shall be installed on all exposed piping adjacent to each shut-off valve, at branches to indicate changes of direction, where pipes pass through walls and floors, on 10-foot centers or at least one in each room on each pipe. Markers shall be installed on all concealed accessible piping (i.e., piping above suspended ceilings, behind access doors, in accessible chases, etc.) near the point of access. For piping above suspended ceilings, markers shall be installed the same as if the piping was exposed (i.e., same as if the suspended ceiling was not in place). Markers shall be installed so as to easily read by a person standing on the floor. Provide additional direction of flow arrows at each pipe connections at all control valves.

B. Valve Identification: Provide valve tag on every valve, cock, and control devices in each piping system; exclude check valves, valves within factory-fabricated equipment units, plumbing fixture faucets, convenience and lawn watering hose bibbs, and shut-off valves at plumbing fixtures, and similar rough-in connections of end-use fixtures and units. List each tagged valve in Valve Schedule for each piping system.

END OF GENERAL PLUMBING REQUIREMENTS STANDARD

Basis of Design

This standard contains certain design criteria and procedures for the insulation of piping and associated mechanical equipment, and liquid storage vessels. This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the PPD Project Manager. Exceptions to this standard will be made only upon specific written approval using the "Facilities Design Guidelines and Construction Standards Exception Request" form included in these Design Guidelines and Construction Standards.

1.1 Design Criteria

A. **Codes, Regulations, and Standards**

All work shall conform to the following codes, regulations, and standards of latest issue including Washington State amendments where applicable:

1. Factory Mutual Standards.
2. Washington State Energy Code.
3. International Fire Code.
4. International Mechanical Code.
5. Uniform Plumbing Code.
6. Underwriters Laboratories Standards.

B. **General Requirements**

All surfaces shall be insulated to reduce energy loss or gain, avoid undesired condensation, and reduce corrosion.

C. **Specific Requirements**

1. A vapor barrier jacket is required for chilled water piping, equipment, refrigerant suction piping, domestic cold-water piping, rain leader piping, air handling ducts and equipment with air temperatures of 55 degrees F. or less.
2. Pipe insulation in utility tunnels, up to the building service header main valve, shall have a uniformly ribbed, 0.01-inch minimum thickness metallic casing with a vapor barrier lining.
3. Fittings, valves, and flanges shall have an insulation thickness no less than the adjacent piping but must be removable without damage for easy re-application.
4. Removal of hazardous materials including insulation containing asbestos is the responsibility of the Owner.
5. Pipe insulation in maintenance areas (mechanical rooms, accessible shafts, etc.) is subject to mechanical damage (crushing, abrasion and laceration) resulting from maintenance activities. Rigid insulation materials protected with a canvas wrap are required in these spaces.
6. Oversize Pipe Rings, Inserts, and Shields: Install the pipe insulation and jacket extending through the pipe hanger ring. Provide an extra high-density insulation insert and metal shield within each hanger, except where pipe covering protection saddles are welded to the pipe.

a. Insulating Inserts: Extra high density insulating inserts shall be the same thickness as pipe insulation and shall be Pittsburgh-Corning "Foamglas" cover not less than the lower 40 percent of the circumference of the insulation; sizes of section, 6 inches minimum length up to 6 inch outside diameter, 8 inches minimum length for larger sizes. "Foamglas" shall not be used for high pressure steam. Install the insulating insert section to replace a cutout section of insulating material within the insulation jacket, with tightly fitted butt type joints. For pipe on trapeze channel hangers, provide Pipe Shield Model A3000 insulated pipe support which covers 100 percent of the circumference of the pipe.

b. Metal Shields: Except where pipe covering protection saddles are specified, provide outside of the jacket and inside of each hanger, a metal shield of 18 gage sheet metal, minimum, covering lower 40 percent of the circumference of the insulation, length not less than that specified for cut-in section of high-density insulating insert. On 6 inch and larger pipe, shields shall be 14 gage minimum, two pipe diameters in length.

Products, Materials and Equipment

2.1 General

All insulation, facings, coatings, adhesives and other accessories shall have a fire hazard rating not to exceed 25 for Flame Spread and 50 for Fuel Contributed and Smoke Developed; ratings determined by UL Standard No. 723, NFPA Standard No. 255, test results from the approved testing laboratory shall be available to indicate that fire hazard ratings for materials do not exceed the above amounts.

2.2 Fiberglass Pipe Insulation

Shall conform to FS HH-I-558, Form D, Type III, Class 12.

2.3 Fiberglass Pipe Fitting Insulation

Shall conform to FS HH-I-558, Form E, Class 16.

2.4 Flexible Unicellular Polyolefin Pipe Insulation

Shall conform to UBC 42-1 Class 1, UL 94HBF.

Installation, Fabrication and Construction

3.1 General

Protect insulating products from moisture and contaminants during storage and installation Replace damaged insulation shall have a durable finish suitable for painting for color coding, or other identification marking.

3.2 Pipe Insulation

A. Install pipe insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its intended purpose.

B. Install insulation on mechanical systems subsequent to testing and acceptance of tests.

C. Clean and dry mechanical surfaces prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.

D. Maintain integrity of vapor-barrier jackets on mechanical insulation and protect to prevent puncture or other damage.

E. Cover valves, fittings and similar items in each piping system with equivalent thickness and composition or efficiency of insulation as applied to adjoining pipe run. Install factory molded, precut or job fabricated units (at Installer's option) except where specific form or type is indicated.

F. Extend mechanical insulation without interruption through walls, floors and similar piping penetrations, except where otherwise indicated.

G. Install protective metal shields and insulated saddles wherever needed to prevent compression of insulation.

H. On remodel/renovation projects, repair damaged sections of existing mechanical insulation, damaged during construction period. Use insulation of same thickness as existing insulation, install new jacket lapping and sealed over existing.

END OF PIPING AND PLUMBING INSULATION STANDARD

Basis of Design

This standard contains certain design criteria and procedures applicable to the general mechanical HVAC systems and applies to all sections of Division 23. This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the PPD Project Manager.

1.1 General Requirements

A. Mechanical systems must comply with the current Washington State Energy Code, be designed for long life spans before major repairs or replacement is required and take into account the total life cycle cost including the initial cost, the cost of the energy consumed, and the costs of the operation and maintenance of the equipment over its economic life. Quality, proven systems are desired; however, alternative systems may be considered. Design must take into consideration required clearances and access to eventually replace all components and enclosures.

B. ASHRAE Compliance: Unless otherwise specified, comply with the minimum requirements as stated in the latest adopted ASHRAE Standard; “Energy Standard for Buildings Except Low-Rise Residential Buildings

C. All equipment should be located in building mechanical rooms or penthouse. Unitary roof top equipment is not desired. Mechanical rooms must be sized for repair, maintenance, and eventual replacement of equipment.

   1. Flood protection shall be provided in the mechanical rooms and penthouses. Four-inch concrete housekeeping pads shall be provided for equipment.

   2. Floor drains and/or sump pumps shall be provided.

D. All HVAC terminal units shall use Electronically Commutated motors (ECM) and be controlled by the Building Control System (BCS).

E. HVAC air intakes shall be adequately separated from exhaust piping and placed upwind from such piping, based on prevailing winds.

F. HVAC system design shall meet requirements in the International Mechanical Code with Washington State Amendments and/or ASHRAE Standard 62.1. Provide demand control ventilation if it is required by code. If it is not required by code evaluate the system to determine if it is lifecycle cost effective to use a method of demand control ventilation. Demand control methods for multi-space systems could include supply air CO2 control or space by space CO2 control. Demand control methods for single zone spaces could include space or return air CO2 control.

G. HVAC system shall run on maximum outside air efficiency and be capable of running on 100% outside air for building flush-out purposes.

H. New building spaces shall have minimum 1.5 air exchanges per hour utilizing 100% outside air for a minimum 2-week period prior to building space occupancy. Do not use return air ductwork for ventilation unless absolutely necessary and only then with approved filtering methods.

I. All HVAC system dampers and control valves shall be electronically operated and shall be spring return (except for dampers at VAV boxes).

J. Additions or modifications of a building’s HVAC system, connected to a Campus heating and/or cooling system, shall allow the campus system to take advantage of heat recovery opportunities.

K. Fan coil units shall have a temperature rating consistent with requirements for a hot water system where the heating water is supplied by a heat pump (based on 130-degree supply temperature).

L. All HVAC equipment having a factory installed poly phase electric motor equal to or larger than 3 hp shall be specified to be a NEMA Premium efficiency rated motor.

M. HVAC air intakes for new facilities shall be located at least 20 feet above any adjoining accessible feature as a security measure. For other projects, review with PM possible security requirements.

1.2 HVAC System Filters

A. All ventilation air supplied to occupied space shall be filtered through minimum MERV-8 extended surface filters (pleated filters) per ASHRAE Standard 52 – Atmospheric Dust Spot Test Method. Filters shall be set in factory-built frames with hinged door, properly sized for specific unit. Fan design shall take into account deferential pressure across the filter bank.

B. This filter requirement applies to main HVAC supply equipment and for VAV boxes.

C. Pre-construction: Prior to any construction activities, the HVAC system shall be secured to prevent the introduction of particulates into the air distribution system. This may include isolating air intakes, air exhaust and providing pre-filter medium to prevent the loading of particulates on the HVAC systems filters. If adverse loading is observed on the building's HVAC filters, they shall be required to be changed at the projects expense.

1.3 Steam and Heating Systems

A. Steam lines shall be installed in utilidors with sufficient workspace for maintenance. Lighting shall be provided for 1 foot candle average on the floor. 120-volt GFCI convenience outlets shall be provided at 200 foot intervals. Floor drains shall be provided at 100-foot intervals piped to pump stations located every 500 feet.

B. Isolation valves shall be provided in each building located before and after each maintainable or replaceable component in any and all fluid transferring systems. Valves shall be properly identified with signage and indicated on as-built drawings.

C. Heating water converters shall have connections for treating hot water loop.

D. All heating loops and condensate loops shall have sampling devices installed at appropriate intervals. Hydronic loops, condenser loops, and tower sump loops shall have sampling ports and a means for adding chemical treatment. Provide pot feeders on closed loops, located near pump unit.

E. Condensate from hot water converters shall return to condensate system and back to central heating plant. Condensate shall be directed to a condensate return tank for flashing, before entering the relatively cold main condensate return line. High pressure drip steam traps shall be discharged into flash tank to avoid flash steam in condensate mains.

F. Flash tanks shall be ASME approved.

G. Provide strainers at all Pressure Regulating Valves, steam traps, and control valves.

H. All heating and cooling loops shall have metering devices installed at appropriate intervals with at least one of each type per building. Meters and associated communications equipment must be consistent with campus standards.

1.4 Refrigerant Condensers

A. Liquid cooled refrigerant condensers such as "plate and frame" or "tube within tube", other than cleanable shell and tube type, must be only used on closed hydronic condenser loops. Only shell and tube condensers, with provisions for disassembly for cleaning, shall be allowed on open loops.

1.5 Water Heating System Treatment

A. See Standard 23 25 00 for treatment of open and closed loop systems.

1.6 Air Conditioning

A. See Standard 23 81 00.

B. Provide independent cooling systems for telecom, IDF, MDF, and elevator equipment rooms.

C. All equipment installation is to follow factory specifications.

D. If equipment is installed over a raised floor, all electrical wiring shall use overhead wiring racks to keep space below raised floor clear for air movement.

E. Compliant with WAC 173-443 and RCW 70A.60

1.7 Packaged Water Chillers

A. All chiller system digital communications shall be of BACnet protocol, including inter-unit communications, and communications to Campus DDC network.

B. Any chiller systems using variable primary chilled water pumping shall have primary pumps and automated valves controlled by the chiller plant controller, not relying on network values or network communications for operation.

C. Shell and tube chiller condensers shall be of two pass configurations to allow a blonk end for removal for the purpose of cleaning condenser tubes.

D. New chiller installations shall use R134a refrigerant.

1.8 Cooling Towers

A. Evaporative cooling towers, closed and open loop types, shall use fresh water only. Use of reclaimed municipal water not permitted.

B. Evaporative cooling towers shall be treated with stabilized bromine biocides, for hygiene and control of biological activity.

C. Evaporative cooling towers shall use phosphonate polymer-based corrosion and scale inhibitors.

D. Electronic or “pulsed magnetic field” water treatment devices shall not be allowed to be used on any evaporative cooling towers or loops.

1.9 Mechanical Equipment Required to have BACnet interface

A. Following equipment, when provided, is required to have BACnet or approved alternate interface (See Section 25 50 00 for specific requirements):

1. Rooftop Units.
2. Humidifiers.
3. Computer Room Air Conditioning Units.
4. Chillers.
5. Boilers.
6. Utility meters for electricity, steam, chilled water, natural gas.

Products, Materials and Equipment

2.1 Steam and Heating Systems

A. System valves and flanges shall be 250 PSI class. Steam system piping shall be schedule 80 steel.

B. Shutdown valves shall be motor operated globe valves, 250-pound class with 208/240 volt actuator. Control shall be 4-20 MA or 0-10 VDC proportional control.

C. Provide cartridge type high pressure steam traps with integral strainer and blow down valve (Yarway Unibody Mode 721 class 600 3/4).

D. Provide steam turbine flow meter for each building; install or replace with appropriately sized Onicon meter.Steam reducing stations shall be Spence.
E. All high-pressure steam flange gaskets shall be Flexitalic steel.
F. All flanges are to be through bolted.

2.2 Controls System

A. Refer to Guide Specifications Section 23 09 23, Direct-Digital Control System for HVAC.
B. Refer to Guide Specifications Section 23 05 93, Testing, Adjusting and Balancing for HVAC.

Installation, Fabrication and Construction

Refer to requirements specified in the individual Mechanical Sections.

END OF GENERAL HVAC REQUIREMENTS STANDARD

GUIDE SPECIFICATIONS

The following specification is intended to be used, generally verbatim, in the contract documents. ***[Specifier notes]*** shall be deleted during the editing process. Where [ ] appear in this document, this indicates requirements which are optional depending upon the project scope and conditions. Edit as appropriate for the project. The A/E consultant shall take ownership and responsibility for the contents of this section and is expected to modify other portions as necessary to accurately reflect conditions of the project. For draft copies during the design process, use Microsoft Word, Track Changes. Set criteria so that deletions show as strikethroughs. Deletions and additions are to be in red.

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes testing, adjusting, and balancing HVAC systems to produce design objectives, including the following:

1. Balancing airflow and water flow within distribution systems, including submains, branches, and terminals, to indicated quantities according to specified tolerances.
2. Adjusting total HVAC systems to provide indicated quantities.
3. Measuring electrical performance of HVAC equipment.
4. Setting quantitative performance of HVAC equipment.
6. Measuring sound and vibration.
7. Duct air leakage test.
8. Reporting results of the activities and procedures specified in this Section.

1.2 DEFINITIONS

A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.

B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to design quantities.

C. DALT: Duct Air Leakage Test.

D. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.

E. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.

F. Report Forms: Test data sheets for recording test data in logical order.

G. Static Head: The pressure due to the weight of the fluid above the point of measurement. In a closed system, static head is equal on both sides of the pump.

H. Suction Head: The height of fluid surface above the centerline of the pump on the suction side.

I. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

J. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.

K. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.

L. Test: A procedure to determine quantitative performance of a system or equipment.

M. Testing, Adjusting, and Balancing Agent: The entity responsible for performing and reporting the testing, adjusting, and balancing procedures.

N. AABC: Associated Air Balance Council.

O. AMCA: Air Movement and Control Association.

P. NEBB: National Environmental Balancing Bureau.

Q. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

1.3 SUBMITTALS

A. Quality-Assurance Submittals: Within 30 days from the Contractor's Notice to Proceed, submit 2 copies of evidence that the testing, adjusting, and balancing Agent and this Project's testing, adjusting, and balancing team members meet the qualifications specified in the "Quality Assurance" Article below.

B. Contract Documents Examination Report: Within 45 days from the Contractor's Notice to Proceed, submit 2 copies of the Contract Documents review report as specified in Part 3 of this Section.

C. Strategies and Procedures Plan: Within 60 days from the Contractor's Notice to Proceed, submit 2 copies of the testing, adjusting, and balancing sample documentation for the project team to review.

D. Certified Testing, Adjusting, and Balancing Reports: Submit 2 copies of reports prepared, as specified in this Section, on approved forms certified by the testing, adjusting, and balancing Agent.

E. Sample Report Forms: Submit 2 sets of sample testing, adjusting, and balancing report forms.

1.4 PRE-FIELD DALT PRELIMINARY NOTIFICATION

A. Notification: On completion of the duct installation for each system, the Contractor shall notify the Architect/Engineer in writing within 7 days after completion.

B. Duct Testing: The Architect/Engineer and Owner shall randomly select sections of the completed duct system for testing by the Contractor. The testing shall follow the requirements of the Washington State Energy Code. From time of receipt of the Contractor’s notification of system completion, the Contracting officer shall provide the contractor within 7 working days selected locations of duct sections which are to be tested.

C. DALT testing: All DALT testing shall be in accordance with SMACNA HVACADLTM.

D. System Performance: Duct systems as defined in Specification Section **[*Specifier insert section number]*** metal Ductwork shall be leak-tested in accordance with the SMACNA HVAC air duct leakage test manual with the rate of air leakage less than or equal to L max. as determined in accordance with the following Equation:

$$L_{max} = C_L P^{0.65}$$

Where: L_{max} = the maximum permitted leakage in cfm per 100 ft^2 duct surface.
C_L = 6 for square/rectangular sheet metal or fibrous ducts, 3 for round/oval sheet metal, fibrous or flexible ducts.
P = test pressure which shall be equal to the design duct pressure class rating in inches w.g.

1.5 CERTIFIED DALT REPORT

A. Report Form: Submit report data on Air Duct Leakage Test Summary Report Forms as shown on Page 6-2 of SMACNA HVACADLTM. In addition, submit in the report, a marked duct shop drawing which identifies each section of duct tested with assigned node numbers for each section. Node numbers shall be included in the completed report forms to identify each duct section. The report shall be reviewed and certified by the TAB supervisor.

B. The TAB supervisor shall include a copy of all calculations prepared in determining the duct surface area of each duct test section. In addition, the Certified DALT report shall contain copy(s) of the calibration curve for each of the DALT test orifices used for testing.

C. Instruments: List the types of instruments actually used to measure the data. Include in the listing each instrument's unique identification number, calibration date, and calibration expiration date. Instruments shall have been calibrated within one year of the date of use in the field. Instrument calibration shall be traceable to the measuring standards of the National Institute of Standards and Technology.

D. Certification: Include the typed name of the TAB supervisor and the dated signature of the TAB supervisor.

1.6 QUALITY ASSURANCE

A. Comply with the latest adopted International Mechanical Code with State-Wide Amendments, AHJ Fire Department Ordinance Standards, the Washington State Energy Code, and Municipal Codes.

B. Agent Qualifications: Engage a testing, adjusting, and balancing agent certified by either AABC or NEBB.

C. Testing, Adjusting, and Balancing Conference: Meet with the Owner's and A/E representatives on approval of the testing, adjusting, and balancing strategies and procedures plan to develop a mutual understanding of the details. Ensure the participation of testing, adjusting, and balancing team members, equipment manufacturers' authorized service representatives, HVAC controls Installer, and other support personnel. Provide at least 10 working days' advance notice of scheduled meeting time and location.

1. Agenda Items: Include at least the following:
   a. Submittal distribution requirements.
   b. Contract Documents examination report.
   c. Testing, adjusting, and balancing plan.
   d. Work schedule and Project site access requirements.
   e. Coordination and cooperation of trades and subcontractors.
   f. Coordination of documentation and communication flow.

D. Certification of Testing, Adjusting, and Balancing Reports: Certify the testing, adjusting, and balancing field data reports. This certification includes the following:

1. Review field data reports to validate accuracy of data and to prepare certified testing,

adjusting, and balancing reports.

2. Certify that the testing, adjusting, and balancing team complied with the approved testing, adjusting, and balancing plan and the procedures specified and referenced in this Specification.

E. Testing, Adjusting, and Balancing Reports: Use standard forms from AABC's "National Standards for Testing, Adjusting, and Balancing", or standard forms from NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems, or approved equivalent forms."

F. Instrumentation Type, Quantity, and Accuracy: As described in AABC national standards or as described in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification."

G. Instrumentation Calibration: Calibrate instruments at least every 12 months or more frequently if required by the instrument manufacturer.

. Responsibilities:

1. Advance Notice: Furnish to the Architect/Engineer with advance written notice for each event, the commencement of the DALT field work and for the commencement of the TAB field work.
2. Insulation Work: If DALT work is required, ensure that no insulation is installed on ducts to be DALT'd until DALT work on the subject ducts are complete. Later, ensure that openings for TAB test ports in insulation covering HVAC ducts and machinery are closed and sealed.

1.7 PROJECT CONDITIONS

A. Partial Owner Occupancy: The Owner may occupy completed areas of the building before Substantial Completion. Cooperate with the Owner during testing, adjusting, and balancing operations to minimize conflicts with the Owner's operations.

1.8 COORDINATION

A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist testing, adjusting, and balancing activities.

B. Notice: Provide 7 days' advance notice for each test. Include scheduled test dates and times.

C. Perform testing, adjusting, and balancing after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

1.9 ONE YEAR WARRANTY

A. Warranty Option 1. National Project Performance Guarantee: Provide a guarantee on AABC'S "National Standards" forms stating that AABC will assist in completing the requirements of the Contract Documents if the testing, adjusting, and balancing Agent fails to comply with the Contract Documents. Guarantee includes the following provisions:

B. Warranty Option 2. Special Guarantee: Provide a guarantee on NEBB forms stating that NEBB will assist in completing the requirements of the Contract Documents if the testing, adjusting, and balancing Agent fails to comply with the Contract Documents. Guarantee includes the following provisions:

1. The certified Agent has tested and balanced systems according to the Contract Documents.

2. Systems are balanced to optimum performance capabilities within design and installation limits.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Contract Documents to become familiar with project requirements and to discover conditions in systems' designs that may preclude proper testing, adjusting, and balancing of systems and equipment.

1. Contract Documents are defined in the General and Supplementary Conditions of the Contract.
2. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.

B. Examine approved submittal data of HVAC systems and equipment.

C. Examine equipment performance data, including fan and pump curves. Relate performance data to project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce the performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.

D. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Specification Sections have been performed.

E. Examine system and equipment test reports.

F. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

G. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

H. Examine air-handling equipment to ensure clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

I. Examine terminal units, such as variable-air-volume boxes and mixing boxes, to verify that they are accessible, and their controls are connected and functioning.

J. Examine plenum ceilings, utilized for supply air, to verify that they are airtight. Verify that pipe penetrations and other holes are sealed.

K. Examine strainers for clean screens and proper perforations.

L. Examine 3-way valves for proper installation for their intended function of diverting or mixing fluid flows.

M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

N. Examine open-piping-system pumps to ensure absence of entrained air in the suction piping.

O. Examine equipment for installation and for properly operating safety interlocks and controls.

P.

P. Report deficiencies discovered before and during performance of testing, adjusting, and balancing procedures.

3.2 PREPARATION

A. Prepare a testing, adjusting, and balancing plan that includes strategies and step-by-step process outline for complex or unique systems.

B. Complete system readiness checks and prepare system readiness reports. Verify the following:

1. Permanent electrical power wiring is complete.
2. Hydronic systems are filled, clean, and free of air.
3. Automatic temperature-control systems are operational.
4. Equipment and duct access doors are securely closed.
5. Balance, smoke, and fire dampers are open.
6. Isolating and balancing valves are open and control valves are operational.
7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
8. Windows and doors can be closed so design conditions for system operations can be met.

3.3 GENERAL TESTING AND BALANCING PROCEDURES

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC national standards and this Section or according to the procedures contained in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes, and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to the insulation Specifications for this Project.

C. Mark equipment settings with paint or other suitable, permanent identification material, including damper-control positions, valve indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

3.4 FUNDAMENTAL AIR SYSTEMS' BALANCING PROCEDURES

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. For variable-air-volume systems, develop a plan to simulate diversity.

C. Determine the best locations in main and branch ducts for accurate duct airflow measurements.

D. Check the airflow patterns from the outside-air louvers and dampers and the return- and exhaust-air dampers, through the supply-fan discharge and mixing dampers.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check dampers for proper position to achieve desired airflow path.

H. Check for airflow blockages.

I. Check condensate drains for proper connections and functioning.

J. Check for proper sealing of air-handling unit components.

3.5 FUNDAMENTAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports with pertinent design data and number in sequence starting at pump to end of system. Check the sum of branch-circuit flows against approved pump flow rate. Correct variations that exceed plus or minus 5 percent.

B. Prepare hydronic systems for testing and balancing according to the following, in addition to the general preparation procedures specified above:

1. Open all manual valves for maximum flow.
2. Check expansion tank liquid level and air bladder pressure.
3. Check makeup-water-station pressure gage for adequate pressure for highest vent.
4. Check flow-control valves for specified sequence of operation and set at design flow.
5. Set differential-pressure control valves at the specified differential pressure. Do not set at fully closed position when pump is positive-displacement type, unless several terminal valves are kept open.
6. Set system controls so automatic valves are wide open to heat exchangers.
7. Check pump-motor load. If motor is overloaded, throttle main flow-balancing device so motor nameplate rating is not exceeded.
8. Check air vents for a forceful liquid flow exiting from vents when manually operated.

3.6 TEMPERATURE TESTING

A. During testing, adjusting, and balancing, report need for adjustment in temperature regulation within the automatic temperature-control system.

B. Measure outside-air, wet- and dry-bulb temperatures.

3.7 TEMPERATURE-CONTROL VERIFICATION

A. Verify that controllers are calibrated and commissioned.

B. Check transmitter and controller locations and note conditions that would adversely affect control functions.

C. Record controller settings and note variances between set points and actual measurements.

D. Verify operation of limiting controllers (i.e., high- and low-temperature controllers).

E. Verify free travel and proper operation of control devices such as damper and valve operators.

F. Verify sequence of operation of control devices. Note air pressures and device positions and correlate with airflow and water-flow measurements. Note the speed of response to input changes.

G. Confirm interaction of electrically operated switch transducers.

H. Confirm interaction of interlock and lockout systems.

I. Verify main control supply-air pressure and observe compressor and dryer operations.

J. Record voltages of power supply and controller output. Determine if the system operates on a grounded or non-grounded power supply.

K. Note operation of electric actuators using spring return for proper fail-safe operations.

3.8 TEMPERATURE CONTROL SUPPORT

A. Provide Testing and Balancing for all work items within Division 25.

B. Follow equipment start-up procedures as recommended by Manufacturer unless otherwise specified.

C. Special start-up procedures may be specified elsewhere. Test and Balance Contractor shall advise Controls Subcontractor, Contractor, and A/E of any adjustments, changes, or additions required to systems.

D. HVAC system Support for the Control System:
   1. Set minimum damper positions of all AHUs. The A/E will provide outdoor air flow requirements for each AHU.
   2. Set flow requirements and static pressure settings of all AHUs and exhaust systems. The A/E will provide flow and static pressure setpoints.
   3. Set minimum and maximum flows on all VAV boxes. The A/E will provide the flow requirements.

3.9 TOLERANCES

A. Set HVAC system airflow and water flow rates within the following tolerances:
   1. Supply, Return, and Exhaust Fans: Plus, or minus 10 percent.
   2. Air Outlets and Inlets: 0 to minus 10 percent.
   3. Heating-Water Flow Rate: 0 to minus 10 percent.
   4. Cooling-Water Flow Rate: 0 to minus 10 percent.

3.10 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article above, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: As Work progresses, prepare reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.11 FINAL REPORT

A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in 3-ring binder, tabulated and divided into sections by tested and balanced systems. Electronic PDF document organized in the same manner is acceptable.

B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.

1. Include a list of the instruments used for procedures, along with proof of calibration.

C. Final Report Contents: In addition to the certified field report data, include the following:

1. Pump curves.
2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance, but do not include approved Shop Drawings and Product Data.

D. General Report Data: In addition to the form titles and entries, include the following data in the final report, as applicable:

1. Title page.
2. Name and address of testing, adjusting, and balancing Agent.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of testing, adjusting, and balancing Agent who certifies the report.
10. Summary of contents, including the following:
    a. Design versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.
11. Nomenclature sheets for each item of equipment.
12. Data for terminal units, including manufacturer, type size,
13. Notes to explain why certain final data in the body of reports vary from design values.
14. Test conditions for fans and pump performance forms, including the following:
    a. Settings for outside-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Face and bypass damper settings at coils.
    e. Fan drive settings, including settings and percentage of maximum pitch diameter.
    f. Inlet vane settings for variable-air-volume systems.
    g. Settings for supply-air, static-pressure controller.
    h. Other system operating conditions that affect performance.

E. Instrument Calibration Reports: For instrument calibration, include the following:

1. Report Data: Include the following:
   a. Instrument type and make.
   b. Serial number.
   c. Application.
   d. Dates of use.
   e. Dates of calibration.

3.12 DALT PROCEDURES

A. DALT Field Work: Leak test the HVAC air ducts and sections of each system as selected by the A/E and Owner. Accomplish leak tests in accordance with SMACNA HVACADLTM, except as modified by this section. Use the duct class, seal class, leakage class and the leak test pressure data indicated on the drawings, to comply with the procedures specified in SMACNA HVACADLTM. Test all ductwork indicated on the drawings to be DALT tested, including ductwork of pressure class 3 inches WG, or less, if indicated to be DALT'd. Testing shall be in accordance with the procedures specified in SMACNA HVACADLTM, except as supplemented and modified by this section. DALT field work shall be monitored by the QC representative. If any of the duct sections selected by the A/E team for testing exceed the leakage class during testing, an additional duct section shall be tested at no cost to the Owner for each test section that fails initial testing.

B. Data from DALT Field Work: After completion of the DALT work, prepare a pre-final DALT report using the reporting forms specified. Data required by those data report forms shall be furnished by the TAB team. Prepare the report neatly and legibly; the pre-final DALT report shall be the final DALT report minus the TAB supervisor's review and certification. Verbally notify the Architect/Engineer TAB representative that the field check of the pre-final DALT report data can commence; give this verbal notice 48 hours in advance of when the field checking shall commence.

C. Quality Assurance for DALT Field Work:

   1. Field Check:
      a. Pre-final DALT report data: Field check for accuracy, in the presence of the Architect/Engineers TAB representative, the pre-final DALT report data for each system. Pre-final report field checks may be conducted separately for each system to allow phased testing.
      b. Additional system field check: If any data on the DALT report form for a given duct section is out-of-tolerance, then data for one more duct section will be checked. The additional duct section to be checked shall be in addition to the original 50 percent of duct sections to be checked.
      c. Out-of-Tolerance: If any of the duct sections checked for a given system are determined to be out-of-tolerance, testing shall be terminated and the pre-final DALT report data for the given system shall be disapproved.
   2. Additional Field Checks: If during the random field checks of the pre-final DALT report data is determined to be out-of-tolerance, the contractor shall make the necessary corrections and prepare a revised pre-final DALTS report. A field check of the revised report data shall then be rescheduled with the Architect/Engineers TAB representative.
   3. Final Certified DALT Report: On successful completion of all field checks of the pre-final DALT report data for all systems, the TABS Supervisor shall assemble, review, certify and submit the final certified DALT Report.

3.13 ADDITIONAL TESTS

A. Within 90 days of completing testing, adjusting, and balancing, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial testing, adjusting, and balancing procedures were not performed during near-peak summer and winter conditions, perform additional inspections, testing, and adjusting during near-peak summer and winter conditions.

END OF SECTION 23 05 93

Basis of Design

This standard applies to the insulation of ductwork and associated mechanical equipment.

1.1 Design Criteria

A. **Codes, Regulations, and Standards**

All work shall conform to the following codes, regulations, and standards of latest issue:

1. Factory Mutual Standards.
2. Washington State Energy Code.
3. International Fire Code.
4. International Mechanical Code.
5. Underwriters Laboratories Standards.

B. **General Requirements**

All surfaces shall be insulated to reduce energy loss or gain, avoid undesired condensation, and reduce corrosion.

C. **Specific Requirements**

1. A vapor barrier jacket is required for chilled water piping, equipment, refrigerant suction piping, air handling ducts and equipment with air temperatures of 55 degrees F. or less.
2. Fittings, valves, and flanges shall have an insulation thickness no less than the adjacent piping but must be removable without damage for easy re-application.
3. Demolition (removal) of carcinogenic insulation containing asbestos shall be performed by the Owner.

D. **Duct Liner**

The use of internal duct lining insulation is strictly prohibited.

E. **Fiberglass (External) Duct Wrap Insulation**

Duct wrap insulation thicknesses and R-values shall meet the Washington State Energy Code.

F. **Foam Board Duct Wrap Insulation**

Duct wrap insulation thicknesses and R-values shall meet the Washington State Energy Code.

Products, Materials and Equipment

2.1 General

All insulation, facings, coatings, adhesives and other accessories shall have a fire hazard rating not to exceed 25 for Flame Spread and 50 for Fuel Contributed and Smoke Developed; ratings determined by UL Standard No. 723, NFPA Standard No. 255, test results from the approved testing laboratory shall be available to indicate that fire hazard ratings for materials do not exceed the above amounts.

2.2 Fiberglass (External) Duct Wrap Insulation

Shall be flexible fiberglass duct wrap insulation conforming to FS HH-I-558, Form B, Type I, Class 6, with factory applied foil-scrim-kraft facing (vapor barrier) consisting of aluminum foil reinforced with

fiberglass scrim laminated to UL rated kraft; Johns Mansville “Microlite” flexible glass fiber blanket or approved substitute.

2.3 Foam Board Duct Wrap Insulation

Extruded Polystyrene Board Insulation: ASTM C 578, Type IV; Extruded polystyrene board with natural skin surfaces; with the following characteristics:

1. Flame Spread Index: 75 or less, when tested in accordance with ASTM E 84.
2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E 84.
3. Board Edges: Square.
4. Compressive Resistance: 30 psi.
5. Water Absorption, maximum: Per ASTM 2842, 0.7 percent by volume.
6. Manufacturer: Dow Chemical Co. "Styrofoam SM", or approved

Installation, Fabrication and Construction

3.1 General

Protect insulating products from moisture and contaminants during storage and installation Replace damaged insulation shall have a durable finish suitable for painting for color coding, or other identification marking.

3.2 Duct Wrap Insulation

All duct systems shall meet or exceed the insulation requirements of the WSEC (Washington State Energy Code). Where insulation thickness specified is larger than those listed in the WSEC, the larger values shall be used. Insulate the following duct systems as follows:

1. Supply Duct: All supply air ducts shall have (1) layer of duct wrap.
2. Return Duct: All return air duct shall have (1) layer of duct wrap.
3. Mixed Duct: All mixed air duct shall have (1) layer of duct wrap.
4. Outside Air Duct: All outside air duct shall have (1) layer of duct wrap.
5. Transfer Duct: All transfer air ducts shall have (1) layer of duct wrap.
6. Exhaust Duct: Provide (1) layer of duct wrap from exterior louver, roof cap, etc., to a point 10’-0” into building or to backdraft damper, whichever distance is less. All other exhaust duct to be uninsulated.
7. Relief Duct: Provide (1) layer of duct wrap from exterior louver, roof cap, etc., to a point 10-0” into building or to backdraft damper, whichever distance is less. All other relief duct shall be uninsulated.
8. At Fire Dampers and Fire Smoke Dampers: No duct wrap shall be used at Fire / Fire Smoke Damper installations, so as to prevent any hindrance of Fire / Fire Smoke Damper operation.
9. All ducts shall be sealed at all seams, joints, fastener penetrations and connections with elastomeric tape which shall consist of a pressure sensitive layer of modified butyl rubber duct sealer laminated to a backing material which will conform to surface variations and irregular areas and will not harden, crack, or peel. The sealant shall provide an instant, positive bond which shall seal on contact, be waterproof, and shall conform with N.F.P.A. Class 1 requirements. Standard of Quality: Hard cast FG-1402.

END OF HVAC INSULATION STANDARD

Basis of Design

This standard contains certain design criteria and procedures applicable to any new or modified DES owned mechanical system that contains either open or closed loop type hot or cold-water systems on the capitol campus, and to include boiler condensate treatment. This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the PPD Project Manager.

1.1 Design Criteria

A. Open Loop System: An open loop system is defined as water piping or appurtances in a mechanical system that is subject to being exposed to atmospheric conditions; e.g., cooling tower sump.

1. Acceptable Water Conditions:
   a. PH Level: 7 – 9 PH.
   b. Scale Inhibitor Level: 4 – 8 ppm.
   c. Chloride Level: 15 – 35 ppm.
   d. Conductivity Level: 400 – 600 ppm.
2. Chemical Treatment / Procedures: Apply the following only with open loop systems, having a “bleed & feed” type applicator:
   a. ACCI-6250: Scale + Corrosion Inhibitor.
   b. Posca: Scale Inhibitor.
   c. Unibrom Plus: Biocide / Algae Control.
   d. Disperse-It: Biodispersant.

B. Closed Loop System: A closed loop system is defined as water piping or appurtances in a mechanical system that is <u>not</u> subject to being exposed to atmospheric conditions, e.g., chilled water loop.

1. Acceptable Water Conditions:
   a. PH Level: 8 – 10.5 PH.
   b. Iron Level: 0 – 5 ppm.
   c. Nitrite Level: 1200 – 2400 ppm.
   d. Conductivity Level: 2000 – 4000 ppm.
2. Chemical Treatment / Procedures: Apply the following only with closed loop systems:
   a. 6439: Scale + Corrosion Inhibitor.
3. Freeze Protection: Water system must contain Propelene Glycol Solution @ equal or greater than 25%, having a freeze point of 15 deg. F or less.

C. Boiler Condensate: High-efficiency boiler condensate (Note: City of Olympia will accept no less than 5.0 PH).

1. Acceptable Water Conditions:
   a. Condensate PH Level: 7 – 10 PH.
2. Condensate Treatment: “Calcium Carbonite” or Magnesium Oxide PH Neutralizer.

D. All treated systems shall require a meter on any make-up water lines to ensure minimal chemical and water usage.

Products, Materials and Equipment

2.1 Chemical Monitoring & Injection

A. Closed Loop Systems: Not applicable. (Monitor manually)

B. Open Loop Systems Having a "Feed & Bleed" Method:

1. Chemical Injection Dosing Pumps: LMI Manufacturing Model #P121, containing both "adjustable stroke" and "adjustable speed". Must have safety interlock using a "No-Flow" switch.

2. Chemical Injection Controllers: WALCHEM Manufacturing Model #WCT410-1N1.

2.2 Filtration Method

A. Side Stream Pot Feeder for Clean or Lightly Fouled Systems.

1. 2 Gallon type for small systems; 100 gallons or less.

2. 5 Gallon type for larger systems; systems greater than 100 gallons.

B. For Fouled Systems or New Construction/Remodel: Filter type to be interchangeable with either 2- or 5-gallon pot feeders, and capable of filtering down to the 5-micron level. Side stream filter system with stainless steel housing and accepting disposable 10, 20, or 30" filter cartridges, as applicable.

C. Filtration apparatus used on heating water systems shall be rated for 250 deg. F. minimum.

Installation, Fabrication and Construction

3.1 General

A. All piping systems requiring chemical treatment shall initially be cleaned with a recognized cleaner for removal of all iron, oils, and construction debris.

B. All water sampling is to be documented for verification, including findings, date, and water usage.

C. Cleaning procedures to be as follows:

1. The cleaning chemical shall be a caustic-based polymer product; Boil Out Liquid or equivalent.

2. Chemicals added by a pot feeder for desired level of 350 – 500 ppm (parts per million) of p-alkalinity.

3. The cleaning agent needs to be circulated for a minimum of 12 hours with all valves in the open position.

4. Bleeding the system needs to be monitored until the pH scale level is at or below 8.0 and the iron levels are below 1.5 ppm.

D. Preservatives shall only be introduced into systems with 2.0 ppm of iron and pH at 8.0 or less. A bleed is to continue until the system is within the indicated range.

E. The appropriate amounts of a nitrite-based corrosion and yellow metal inhibitor shall be added by a pot feeder until the system nitrite level is within 1,200 – 2,400 ppm. After complete circulation of the inhibitor through the system, the nitrite level shall remain within the 1,200 – 2,400 ppm industry standard range. If it does not, the system shall have additional treatment added and/or re-perform the indicated sequence.

F. Any new or repaired system is to be monitored by the Contractor on a weekly basis through water treatment testing to confirm the proper levels are maintained for a minimum of one month.

G. While not limiting the vendors who may provide chemical treatment, past chemical treatment suppliers include: CH20, Water Treatment Specialists. For remodel projects, designer should list previous suppliers to ensure chemical compatibility.

END OF HVAC WATER TREATMENT STANDARD

Basis of Design

This standard contains certain design criteria and procedures applicable to any new or modified DES or Tenant Agency owned mechanical system that are a “stand alone” heating and/or cooling system. To also include any DES-TIS remodels or modifications. This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the PPD Project Manager.

1.1 Design Criteria

A. Preventative Maintenance: A quarterly preventative maintenance schedule must be incorporated with DES HVAC preventative maintenance program.

B. Closeout Documents:

1. Two (2) sets of maintenance and operations manuals shall be provided containing the following as a minimum:

   a. All factory documentation.

   b. Installing contractor modification documentation.

   c. Wiring diagrams and as-built wiring diagrams.

   d. BIM coordination documentation if applicable.

2. One set of approved closeout documents shall be delivered onsite for customer use. The second set shall be delivered to the DES HVAC preventative maintenance supervisor.

Products, Materials and Equipment

2.1 Equipment

A. Data Room Applications:

1. Design shall meet the requirements of ASHRAE TC 9.9 2011.

2. Equipment must contain provisions for the following:

   a. Air Conditioning, De-Humidification, Humidification, and Re-Heat, if necessary to meet above requirements.

   b. Hot Aisle / Cold Aisle for server locations.

   c. Hot or Cold Aisle containment is required for new data room applications. For work in existing data rooms, hot or cold aisle containment should be installed if life cycle cost effective.

   d. Ducted Return – Air Plenum.

   e. Common location and/or shared set points for multiple units in a common zone.

2. Preferred Manufacturers: Liebert,

B. IDF / Communication Equipment Room Applications:

1. Equipment must contain provisions for the following: Heating and Air Conditioning.

2. Preferred Manufacturers: Liebert, Goodman, Mitsubishi, Daiken.

2.2 Equipment Control

A. Factory Controller If Equipped: Obtain with as many options so as to be flexible and meet "System Safeguards" specified below.

B. Factory Controller If Not Equipped: Use a 7-day programmable thermostat such as the Honeywell Vision Pro Touch Screen Thermostat which shall include as a minimum the following features:

1. Multi-functional unit capabilities.
2. Fan recirculation mode (30% random daily indoor fan starts).

2.3 System Safeguards

A. Internal Refrigerant Monitoring Capabilities:

1. Lo-Pressure: Equipped with manual reset or lock out relay.
2. Hi-Pressure: Equipped with manual reset or lock out relay.
3. Low – Ambient Controller: Johnson Controls P-66 Fan cycling controller.

B. Anti-Short Cycling Device:

1. Delay-On-Make Timer: Adjustable 0 – 5 minutes.

Installation, Fabrication and Construction

- No specific requirements.

END OF DECENTRALIZED UNITARY HVAC EQUIPMENT STANDARD

Basis of Design

This standard contains certain design criteria and procedures applicable to the general operating DDC system requirements and applies to all sections of Division 25. This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the PPD Project Manager.

1.1 General Scope

A. These standards and procedures contain the design criteria for operating DDC system, complete with all Level 0 devices listed, and applies to all Sections of Division 25. This information is intended to help the mechanical/controls system engineer during the design process.

1. The Work shall include all DDC panels, Level 0 hardware, Level 0 software, e-mail to cell phone alarming, electrical, integration of BACnet based DDC equipment, electronic and computerized control hardware and software to provide a fully functional DDC system to the A/E's satisfaction.
2. Specify a Level 1 panel(s), or a Level 1A panel(s), to connect to all the points within each major equipment and mechanical room.
    a. Specify a network of terminal controllers using MS/TP. The MS/TP panel network can be connected to the Level 1 panel in the Mechanical Room.
    b. Specify separate Level 1 or Level 2 panels for major equipment outside the Mechanical Room that are not terminal devices. Do not use spare points on terminal device controllers for this purpose. These points may also be home run back to the main Level 1 panels.
3. Specify all related auxiliary items including: Wiring, Conduit, Input/Output Hardware Object Lists, Control Sequence Descriptions, Operating and Maintenance Manuals, Thermowells, Metering Devices, etc.
4. Systems requiring DDC shall include, but not be limited to, the following:
    a. Air handling units
    b. VAV box controllers
    c. Packaged Room Air Conditioning Systems
    d. Chillers and cooling loops
    e. Boilers and heating loops
    f. Domestic hot water system
    g. Convertor and heating loop
    h. Miscellaneous exhaust and ventilation systems
    i. Emergency Generator and Fuel Storage tanks
    j. Miscellaneous status and alarm systems
    k. Miscellaneous connections to mechanical equipment
    l. Other Project-specific equipment listed in the Control Sequences Sections.

B. Existing Conditions: The Capitol Campus is currently operated with a "Centrally Monitored" and controlled EMS system for all 23+ DES owned buildings. The owner has an existing Johnson Controls "METASYS" graphical web based front end in place, including but not limited to PC's, a dedicated server (JCI ADX), printers, and all related hardware and software. The Owner will be responsible (with support from the Control Contractor on a project-by-project basis.) to integrate a building's Non-Metasys DDC system into the Owner's existing GUI. Work with owner's representative to map all points referenced in Standard 25 50 00 as BACnet points in the Front End and verify a system graphic with all control, status and monitoring points displayed. The final points list shall be based on the equipment supplied.

1.2 Design Criteria

A. General:

1. Provide all remote sensing points and instruments as indicated and/or required for fully functional DDC system that meets the Specification requirements.
2. DDC panels shall use Imperial or Metric (SI) units in calculations, displays, etc. Selection of units on a point-by-point basis shall be at the Operator's discretion.
3. Provide readouts in both Imperial and SI units for water and gas consumption.
4. Provide all units required in SI.

B. Level 0 Hardware & Software Requirements: Provided by Owner.

C. Motorized Dampers and Valves

1. New dampers and actuators are required for new projects. All actuators shall be electric/electronic.
2. New valves and actuators are required for new projects. All actuators shall be electric/electronic.

D. The demarcation of work and responsibilities between Division 25 and other Divisions shall be as outlined in the following Responsibility Matrix.

Responsibility Matrix				
Work	**Furnish**	**Install**	**Low Volt Wiring**	**Line Power**
DDC low voltage and communication wiring	Div. 25	Div. 25	Div. 25	N/A
VAV box controllers	Div. 25	Div. 23	Div. 25	Div. 26
Controls conduits and raceway	Div. 25	Div. 25	Div. 25	Div. 25
Automatic dampers	Div. 25	Div. 23	N/A	N/A
Manual valves	Div. 23	Div. 23	N/A	N/A
Automatic valves	Div. 25	Div. 23	Div. 25	N/A
VAV boxes	Div. 23	Div. 23	N/A	N/A
Pipe insertion devices and taps including thermowells, flow and pressure stations.	Div. 25	Div. 23	Div. 25	Div. 25
Controls - Current Switches.	Div. 25	Div. 25	Div. 25	N/A
Controls - Control Relays	Div. 25	Div. 25	Div. 25	N/A
Power distribution system monitoring interfaces	Div. 26	Div. 26	Div. 25	Div. 26
Controls air compressors	Div. 25	Div. 25	N/A	Div. 26
Vibration isolation and seismic bracing	Div. 23	Div. 23	N/A	N/A
DDC interface with Chiller controls	Div. 25	Div. 25	Div. 25	Div. 25
Chiller controls interface with DDC	Div. 23	Div. 23	Div. 25	Div. 26
DDC interface with Classroom unit controls	Div. 25	Div. 25	Div. 25	Div. 26
Classroom unit controls interface with DDC	Div. 23	Div. 23	Div. 25	Div. 26
All DDC controllers, equipment, housings and enclosures.	Div. 25	Div. 25	Div. 25	Div. 25
Smoke Detectors	Div. 26	Div. 26	Div. 26	Div. 26
Fire/Smoke Dampers	Div. 23	Div. 23	Div. 25	Div. 26
Fire Dampers	Div. 23	Div. 23	N/A	N/A
Chiller Flow Switches	Div. 23	Div. 23	Div. 25	N/A
Boiler wiring	Div. 23	Div. 23	Div. 23	Div. 26
Water treatment system	Div. 23	Div. 23	Div. 23	Div. 26
VSDs	Div. 23	Div. 26	Div. 25	Div. 26
Refrigerant monitors	Div. 23	Div. 25	Div. 25	Div. 26

Computer Room A/C Unit field-mounted controls	Div. 23	Div. 23	Div. 25	Div. 26
Fire Alarm shutdown relay interlock wiring	Div. 26	Div. 26	Div. 26	Div. 26
Fire Alarm smoke control relay interlock wiring	Div. 26	Div. 26	Div. 25	Div. 26
Fireman's Smoke Control Override Panel	Div. 26	Div. 26	Div. 26	Div. 26
Fan Coil Unit controls	Div. 25	Div. 25	Div. 25	Div. 26
Unit Heater controls	Div. 25	Div. 25	Div. 25	Div. 26
Packaged RTU space mounted controls	Div. 23	Div. 25	Div. 25	Div. 26
Packaged RTU factory-mounted controls	Div. 23	Div. 23	Div. 25	Div. 26
Packaged RTU field-mounted controls	Div. 25	Div. 25	Div. 25	Div. 26
Cooling Tower Vibration Switches	Div. 23	Div. 23	Div. 26	Div. 26
Cooling Tower Level Control Devices	Div. 23	Div. 23	Div. 26	Div. 26
Cooling Tower makeup water control devices	Div. 23	Div. 23	Div. 26	Div. 26
Pool Dehumidification Unit Controls	Div. 23	Div. 23	Div. 25	Div. 26
Starters, HOA switches	Div. 26	Div. 26	N/A	Div. 26
Control damper actuators	Div. 25	Div. 25	Div. 25	Div. 26

1.3 Closeout Submittals

All sub-consultants to the prime consultant are not to include their own requirements regarding close-out submittals. Division 26 specification sections regarding closeout submittals including project record documents, operation and maintenance manuals, warranties, bonds, etc., are only to reference seeing Section 01 78 00. Extra stock is to be identified in respective Division 26 sections. If the consultant has specific criteria, they need beyond Section 01 78 00, they can specifically identify it at the same time as being in addition to requirements of Section 01 78 00.

1.4 Abbreviations And Acronyms

A. AI – Analog Input

B. AHU – Air Handling Unit

C. AO – Analog Output

D. ASHRAE – American Society of Heating, Refrigerating, and Air Conditioning Engineers

E. ASME – American Society of Mechanical Engineers

F. BACnet – Building Automation and Control network

G. BBMD – BACnet Broadcast Management Device

H. BDT - Broadcast Distribution Table

I. BI – Binary Input

J. BIBB - BACnet Interoperability Building Blocks

K. BIL – basic impulse insulation level

L. BO – Binary Output

M. CD – Compact Disc

N. DDC – Direct Digital Control

O. DVD – Digital Versatile Disc or Digital Video Disc

P. FCC – Federal Communications Commission

Q. HVAC – Heating, Ventilation and Air Conditioning

R. I/O – Input/Output

S. ID – Identifier or Identity

T. IEC - International Electrotechnical Commission

U. IEEE – Institute of Electrical and Electronic Engineers

V. IP - Internet Protocol

W. ISA - Instrument Society Of America

X. LAN – Local Area Network

Y. MS/TP - Master-Slave/Token Passing.

Z. MAC - Media Access Control

AA. MUA – Make-Up Air handler

BB. NEC - National Electrical Code

CC. NEIS - National Electrical Installation Standards

DD. NEMA - National Electrical Manufacturers Association

EE. NIST - National Institute of Standards and Technology

FF. NFPA - National Fire Protection Association

GG. NSTA - National Safe Transit Association

HH. OSI - Open Systems Interconnection

II. OWS – Operator Workstation

JJ. PICS – Protocol Implementation Conformance

KK. POT – Portable Operator's Terminal

LL. PTP – Point-To-Point (or Peer-To-Peer)

MM. RTU – Roof Top Unit

NN. SAE - Society of Automotive Engineers

OO. TAB – Testing And Balancing

PP. TCP - Transmission Control Protocol

QQ. UBD - Uniform Building Code

RR. UDP – User Datagram Protocol

SS. UL – Underwriters Laboratories

TT. VPN – Virtual Private Network

UU. WAN – Wide Area Network

1.5 General Definitions

A. The definitions shall apply to all parts of the Contract Documents.

B. Accessible open areas - include boiler rooms, mechanical rooms, crawl spaces used for storage and full height, walkable crawl spaces, hallways, offices, areas used by the public or occupants, workshops, etc. Such spaces are also referred to as exposed spaces.

C. Accessible concealed areas - include crawl spaces not covered by the “accessible open” definition and T-bar ceiling spaces.

D. BETA equipment - any component that has not been released by the Manufacturer for general distribution prior to the Owner issuing the Bid.

E. Ethernet – A carrier sensing, multiple access with collision detection, network technology defined by ISO/IEC 8802-3.

F. Inaccessible concealed areas - include walls, shafts, or ceiling pipe chases, block walls, drywall ceilings and other areas that do not permit entry by the Owner.

G. Internet Protocol – a protocol that handles the breaking up of data messages into packets (also called datagrams), the routing of the packets from their origin to the destination network and node, and the reassembling of the packets into the data message at the destination. IP operates at the internetwork layer of the TCP/IP model, which is equivalent to the network layer of the ISO/OSI reference model.

H. Testing And Balancing (TAB) - means to test, adjust and balance all systems, equipment and devices to perform in accordance with Contract Documents.

I. Transmission Control Protocol (TCP) – a protocol that enables two hosts to establish a connection and exchange streams of data. TCP handles delivery and order of data streams.

J. Operator - These terms refer to the person or persons who will own and operate the DDC system.

K. Year 2036 compliant - correctly present the date and time, the day of the week, leap years, date calculations, to the year 2036. The date and time to the year 2036 shall be correct after a power failure. This date and time shall be presented without Operator intervention. All hardware and software provided in the Work shall be Year 2036 compliant.

L. BACnet, as used in this specification, shall refer implicitly to ANSI/ASHRAE 135-2004 unless otherwise noted.

1.6 DDC Definitions

A. Client - In networked systems, an application or device acting as a requestor or consumer of data. A client requests a server device for data resident in the server.

B. Color graphics - These are pictorial representations of all mechanical systems, DDC system panels and the building floor plans stored on the server, POT or a DDC panel hard drive.

C. Downloading - This means transferring programming and/or configuration data from a Level 0 device to a lower level control device. BACnet refers to this operation as writing to a BACnet device using Atomic File Write.

D. Extended logging - This is the process of collecting and archiving trend data in excess of 200 samples on an input, output or software variable, setpoint, etc. to the Front End archive. The extended logs may be stored in the existing Campus Front End software native format or automatically saved in an EXCEL™ (or approved equal) spreadsheet for retrieval by the Operator. Extended logging may also be done by a hard drive connected directly to the DDC panel.

E. Front End - This is the graphical interface software to the DDC system panel network. The Front End requirements are outlined in Standard 25 10 00.

F. Intelligent thermostats - An intelligent thermostat is a device that, in addition to showing local temperatures and providing localized control, can provide information on inputs, outputs and variables and access to the network. They may provide equipment status, override control and setpoint changes. Display and control features are programmable.

G. Internetwork - a set of two or more networks inter-connected by routers. In a BACnet Internetwork, there shall be no more than one message path between any two nodes.

H. Local connection - This shall mean connecting a computer or service tool via a cable, directly into a communications port on the device to which communications is being attempted.

I. Operator Workstation – a desktop computer used to provide direct or remote communications to the DDC system.

J. Peer-to-Peer - A network in which messages are passed between nodes that are considered equal peers on the network.

K. Portable Operators Terminal (POT) – a laptop or tablet computer used to provide direct and remote communications to the DDC system.

L. Server – In networked systems, a computer, application or device acting as a server of data and/or services

M. Service Tool - a proprietary tool used to provide direct communications to the DDC system panel network. The Service Tool may be used in combination with the POT to provide direct communications to the DDC system panel network.

N. Set, command, override or modify - These terms are used interchangeably and refer to the process of taking a hardware or software point out of programmed control and placing it into manual control or a fixed state or value by the operator.

O. Software point/variable - These terms are used interchangeably and refer to the software setpoints, limits, virtual points, subroutine arguments, etc. that are used to pass data from panel to panel or in and out of subroutines. Software points/variables are considered objects in this Specification.

P. Terminal mode - This means accessing the DDC system panel network via local or remote connection using a computer in VT100 emulation or Windows HyperTerminal (ASCII text) mode.

Q. Transmit/Transmission - This means sending data to servers, OWS, POT, DDC panel, printer, pager, etc. via a data communications link (e.g., serial connection, telephone, Ethernet network).

R. Trending - This is the process of collecting historical data at the panel level on an input, output or software variable or setpoint. The terms “history” and “trend log” are used interchangeably in this Specification. There are two types of trends. Logged trends are the accumulation of historical data. Dynamic trends are the real time graphical display of data.

S. Uploading - This means transferring programming and/or configuration data from the DDC panels to a Level 0 device. BACnet refers to this operation as reading from a BACnet device using Atomic File Read.

T. All other definitions shall be based on the following references: Direct Digital Controls for HVAC Systems by T. Hartman (McGraw-Hill, 1993); Direct Digital Control of Building Systems: Theory and Practice by M. Newman (Wiley, 1994) and DDC for HVAC Monitoring and Control course by ASHRAE (ASHRAE, 1995). The Engineer shall be the final arbiter of all definitions or terms.

1.7 BACnet Definitions

A. BACnet/IP – an open (non-proprietary) data communication protocol for building automation and control networks developed by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) that allows building automation controllers of different manufacturers to communicate with each other. The protocol is fully described in Annex J of the BACnet specification.

B. BACnet gateways - These are Level 0 or 1 devices that translate proprietary points (objects), services and communications protocols to BACnet objects and services. Gateways shall be bi-directional.

C. BACnet Identifier - BACnet defines three important IDs used to identify BACnet 1) devices, 2) objects, and 3) properties. An Object ID identifies an object’s type and instance number. A Vendor ID defines who manufactured a device. A Property ID identifies a property by a code.

D. BACnet Interoperability Building Blocks (BIBBs) - These are BACnet objects and services grouped together by ANSI/ASHRAE 135-2004 to define interoperable features. These are prescribed in terms of an “A” and a “B” device. Both of these devices are nodes on a BACnet Internetwork. In most cases the “A” device will act as the user of data (client) and the “B” device will be the provider of this data (server). In addition, certain BIBBs may also be predicated on the support of certain, otherwise optional BACnet objects or properties and may place constraints on the allowable values of specific properties or service parameters. The current version of the BIBBs circulated on the bacnet.org ftp site at the time of Bid Close will form part of the Specification Documents.

E. BACnet PICS – A Protocol Implementation Conformance Statement document that details the particular BACnet objects, services and capabilities supported by a type of BACnet device (fully

described in Annex J of the BACnet specification). Every BACnet-compliant device has an associated PICS published by the Manufacturer.

F. BACnet Testing Laboratories™(BTL) – A lab operated by the BACnet International to test building automation products and certify them as BACnet compliant. Listings of tested products are available at www.bacnetinternational.org.

G. BBMD – BACnet Broadcast Management Devices are used to distribute Broadcast-messages across multiple IP subnets. Only one BBMD should be active per IP Broadcast Domain as otherwise a "telegram flood" may occur due to broadcast messages repeating themselves. All BBMDs of a BACnet/IP network must have the same BDT (Broadcast Distribution Table) configuration. BBMDs are fully described in Annex J of the BACnet specification.

H. Bridge - A device that connects two LANs or segments of the same LAN at the MAC, or Datalink layers. The LANs can be alike or different. A bridge can connect an Ethernet and token-ring network, for example. Unlike routers that operate at the OSI Network and higher layers, bridges forward messages without analyzing or rerouting them.

I. Datalink – a layer defined in the OSI (Open Systems Interconnection) model to add basic packet organization to groupings of octets transmitted using physical layer signaling

J. Device Profile – A collection of BIBBs that describes the minimum BACnet capabilities of a particular device in order to achieve reliable exchange of information

K. Half-Router - a device that can participate as one partner in a point-to-point (PTP) connection. Two half-routers form an active PTP connection and act as a single router.

L. Instance - a number that uniquely identifies an object within a device or a device on a BACnet internetwork.

M. Interoperability – the ability of devices to provide objects and services to support BIBBs and other BACnet features in a network visible manner.

N. Local matter - A feature provided in a proprietary matter which does not need to meet the test of interoperability or network visibility.

O. Media Access Control (MAC) - The combination of physical and datalink layers that together control access to a given medium. In BACnet, each device has a unique MAC Address/Network Number combination that identifies it on the BACnet internetwork. In BACnet ANSI/ASHRAE Standard135-2004, the MAC LAN types are: BACnet ARCnet, BACnet Ethernet 8802-3, BACnet/IP, BACnet MS/TP (master-slave/token passing), BACnet over LonTalk Foreign Frames and BACnet PTP (point-to-point).

P. MS/TP - A type of LAN implementation defined in BACnet that uses the EIA-485 signaling standard. To initiate communications on the network, a node will have an electronic "token", which is passed from one node to another around the network. Master devices are allowed to have the token, whereas slave devices are allowed only to respond to requests from master devices.

Q. Native BACnet DDC panels - These are Level 1/1A DDC panels that use BACnet objects, services and communication protocols (e.g., MS/TP) directly without use of translation devices or drivers. Only the programming language of the device may be done as a local matter.

R. Native BACnet server - This is a Level 0 device that uses BACnet objects, services and communication protocols without the use of translation devices or drivers. Graphics,

programming and configuration services and tools may be done as a local matter. Servers that do not meet these requirements shall be considered a BACnet gateway.

S. Network visible - BACnet objects whose properties can be read using BACnet Read Property and Read Property Multiple services from another Manufacturer's BACnet client.

T. Object - a collection of information in a BACnet system described by a group of properties. An Object might represent information about a physical input or output, or it may represent a logical grouping of points that perform some function, such as a setpoint. Every Object has an identifier that allows the BACnet system to identify it. An Object is similar to a data point, although it contains additional information other than present value. It is only through its properties that an Object is monitored and controlled. The terms input, output, variable, and points are considered Objects in this Specification. References to the Points List are to the I/O Hardware Object List. Fully defined in ANSI/ASHRAE 135-2004.

U. Property (of an Object) - the means by which objects are monitored and controlled. BACnet defines over 300 properties of Objects. Three properties (Object-identifier, Object-name, and Object-type) must be present in every object. BACnet also requires that certain Objects support specific additional properties. The type of Object and the type of device in which that Object resides determine which properties are present. Some properties are writeable, and others can only be read. The attribute of a point is considered to mean a property of an Object. Fully defined in ANSI/ASHRAE 135-2004.

V. Router - A device that connects two or more LANs. Routers are similar to bridges, but provide additional functions, such as message filtering and forwarding based on various criteria.

W. Services – the method by which one BACnet device gets information from another BACnet device, commands a BACnet device to perform certain actions (through its objects and properties, of course), or lets other BACnet devices know that something has happened. The only mandatory service required by all BACnet devices is the read property service. There are a total of 39 standard services.

X. UDP – One of the IP family of protocols. UDP is used to convey BACnet/IP messages and is characterized by a "port number" for each protocol. The UDP-Port may take a value between 47808 (BAC0 hex) and 47817 (BAC9 hex).

Y. Other definitions as outlined in the ANSI/ASHRAE 135-2004 standard and subsequent Addenda up to Bid Close shall form part of the Specification Documents.

1.8 Reference Standards

A. 518 IEEE Guide for the Installation of Electrical Equipment to Minimize Noise Inputs to Controllers from External Sources

B. ANSI/ASHRAE Standard 135-2004: *BACnet – A Data Communications Protocol for Building Automation and Control Networks*, as amended from time to time. Simply referred to as "BACnet" in this document.

C. ISO/IEC 8802-3 (2000), Information Processing Systems – Local Area Networks – Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications.

D. Underwriters Laboratories: Products shall be UL-916-PAZX listed.

E. Federal Communications Commission - Part J.

F. UL 508 for Isolation Voltages

G. IEC 60068-2.1, 2.2, 2.3, 2.6 and 2.27

H. IEC 61000-4.2, 4.3, 4.4, 4.5 and 4.6

I. NSTA Project 1A

J. National Electrical Manufacturers Association (NEMA)

K. 250, Enclosures for Electrical Equipment (1000 Volts Maximum)

L. EI 21.1 Instrument Transformers for Revenue Metering (110 kV BIL and less)

M. EI 21.2 Instrument Transformers for Revenue Metering (125 kV BIL through 350 kV BIL)

N. ICS 2-230

O. ICS 3-304-42

P. Institute of Electrical and Electronic Engineers (IEEE)

Q. C12.11 Instrument Transformers for Revenue Metering, 10 kV BIL through 350 kV BIL (0.6 kV NSV through 69 kV NSV)

R. IEEE Std. 472-1974/ANSI C37.90/90A-1974

S. National Fire Protection Association (NFPA) 70

T. National Electrical Code (NEC)

U. National Electrical Contractors Association

V. National Electrical Installation Standards (NEIS)

W. SAE HS-1738, Electrical Standard for Industrial Machinery

Products, Materials and Equipment

2.1 Standard Of Material - General

A. Require control devices of each category to be of same type and manufacturer.

B. External trim materials to be corrosion resistant. Internal parts to be assembled in watertight, shockproof, vibration proof, and heat resistant assembly, as required to suite the application.

C. Devices installed in Occupant space shall not exceed Noise Criteria of NC-35. Noise generated by any device shall not be detectable above space ambient conditions.

2.2 Conduit For Pathways

A. As per requirements of Electrical Division 26.

B. Conduit Boxes, Fittings

1. Bushings and connectors: with nylon insulated throats.
2. With push pennies to prevent entry of foreign materials.

C. Fittings For Rigid Conduit

1. Couplings and fittings: threaded type steel.
2. Double locknuts and insulated bushings: use on sheet metal boxes.
3. Use factory “ells” where 90-degree bends required for 1 inch (25 mm) and larger conduits.

D. Fittings For Thin Wall Conduit: Connectors and couplings: steel compression type only.

2.3 Supports For Conduit, Fastenings, Equipment

A. Solid Masonry, Tile and Plastic Surfaces: Lead anchors or nylon shields.

1. Hollow masonry walls: suspended drywall ceilings: toggle bolts.

B. Exposed Conduits or Cables

1. 2 Inch (50 mm) diameter and smaller: one hole steel straps.
2. Larger than 2-inch (50 mm) diameter: two hole steel straps.

C. Suspended support systems:

1. Individual cable or conduit runs: support with 6 mm diameter threaded rods and support clips.
2. Two or more suspended cables or conduits: support channels supported by 6 mm diameter threaded rod hangers.

2.4 Electrical Boxes

A. Junction and Pull Boxes: Welded steel.

B. Surface Mounting Cast FS: Screw on flat covers.

C. Flush Mounting: Covers with 25 mm minimum extension all round.

D. Outlet Boxes: 4 Inch (100 mm) minimum, square.

E. Wiring Devices, Cover Plates

2.5 Device & Equipment Identification

A. Labels: Labels shall be embossed plastic with 1/4 inch (6 mm) high letters unless specified otherwise. Allow for an average of twenty-five (25) letters per label.

B. Nameplates

1. Nameplates shall be engraved lamacoid, either screwed or riveted in place in accordance with the Contract Documents.
2. Lamacoid shall consist of a 1/8 inch (3.0 mm) thick plastic engraving sheet with a white face and a black core.

NAMEPLATE SIZES	DIMENSIONS	LINES	LETTER HEIGHT
Size 1	3/8” x 2” (10 x 50 mm)	1	1/8 inch (3 mm)
Size 2	1/2" x 2-3/4” (12 x 70 mm)	1	3/16 inch (5 mm)
Size 3	1/2" x 2-3/4” (12 x 70 mm)	2	1/8 inch (3 mm)
Size 4	3/4" x 3-5/8” (20 x 90 mm)	1	5/16 inch (8 mm)
Size 5	3/4" x 3-5/8” (20 x 90 mm)	2	3/16 inch (5 mm)
Size 6	2” x 4” (25 x 100 mm)	1	1/2 inch (12 mm)
Size 7	2” x 4” (25 x 100 mm)	2 lines	1/4 inch (6 mm)

Installation, Fabrication and Construction

3.1 General Installation Requirements

A. Outdoor installations shall use weatherproof construction in EEMAC 12 enclosures.

B. Specify all DDC panels, transducers and relays installed in IEC approved enclosures.

C. All isolation valves, check valves, sensors and other equipment, fixtures and devices requiring normal maintenance and/or cleaning shall be mounted such that they are fully serviceable.

D. Specify extended lubricators where necessary.

E. Specify insulation standoffs for controls and sensors when DDC or pneumatic/electric/electronic controls are included.

F. Specify a spring return at each outdoor air damper and 3-way valve operator that upon AHU fan shutdown shall close the damper, thus ensuring that it is in the fail-safe mode even if the device is commanded to a particular position (e.g., a fully open damper in cold weather) on the DDC system.

G. Specify an air flow switch wired in series to the humidifier starting circuit that upon AHU fan shutdown shall prevent the humidification system from starting.

H. Specify low limit switches on each AHU

I. Require coordination of the configuration and control parameters for all VSDs with the VSD manufacturer to determine optimal acceleration settings, deceleration settings, minimum speeds, etc. to achieve stable control of all systems.

J. For all sump pit level monitoring and alarm indication, tie into existing sump pump float alarm. Provide a new sump pump float alarm if the existing alarm is not functioning or does not exist.

K. Specify terminations to use standard conduit box with slot screwdriver compression connector block unless otherwise specified.

L. Where openings in roof are required for outgoing conduits, specify a removable gasketed plate with conduits installed using waterproof fittings or conduit installed in a pitch pocket, whichever is most compatible with respective roofing assembly.

3.2 Integration Of BACnet Interfaces

A. Require controls and control devices for equipment provided under work of other Divisions that are to be part of or interfaced to the control system to be integrated into the system and co-coordinated by the Controls Contractor.

B. Require Controls Contractor to map all points referenced in Standard 25 50 00 as BACnet points in the existing Campus Front End and provide a system graphic with all control, status and monitoring points displayed. The final list shall be based on the equipment supplied.

C. Require Controls Contractor to assume that the equipment interface does not support BACnet Alarms and Events. The Controls Contractor to be responsible for generating the required Event Enrollment and Notification Class objects for the equipment per the DDC Specification requirements. Controls shall supply at least two graphics to represent the data for this equipment interface.

3.3 Installation Of Sensors

A. Gauges, thermostats and DDC system sensors shall be installed to permit easy observance and to insure proper sensing of all conditions. Shield elements from direct radiation and avoid placing them behind obstructions.

B. Do not use strap-on sensors if sensor is used to control or monitor a device. Strap-on sensors are only permissible where written permission is given by the A/E or where existing boiler and chiller controls are being retained.

C. Room temperature sensors shall be installed on concealed junction boxes properly supported by the wall framing. Sensors shall not be located on an exterior wall unless approved. If approved, sensors shall be insulated if located on an exterior wall.

D. All wires attached to sensors shall be air sealed in their raceways or in the wall to stop air transmitted from other areas affecting sensor readings.

E. Sensors used in mixing plenums, and hot and cold decks shall be of the averaging type. Averaging sensors shall be installed in a serpentine manner vertically across duct. Each bend shall be supported with a capillary clip.

F. Low limit sensors used in mixing plenums shall be installed upstream of the coil in a serpentine manner horizontally across duct. Each bend shall be supported with a capillary clip. Provide 10 ft of sensing element for each 10 ft² [3 m of sensing element for each 1 m²] of coil area.

G. All pipe-mounted temperature sensors shall be installed in wells. Install all liquid temperature sensors with heat-conducting fluid in thermal wells.

H. Wells for temperature sensing devices shall be installed in the piping at a location that promotes proper liquid flow across the entire surface of the well. Well shall not restrict flow area to less than 70% of normal line size flow area.

I. Sensors shall be readily accessible and adaptable to each type of application in such a manner as to allow for quick, easy replacement and servicing without special tools or skills.

J. Install outdoor air temperature sensors on north wall at designated location. Outdoor installation shall be weatherproof construction in NEMA 12 enclosures. These installations shall be protected from solar radiation and wind effects by stainless steel shields.

K. Differential air static pressure:

1. Supply Duct Static Pressure: Pipe the high-pressure tap to the duct using a Pitot tube. Pipe the low-pressure port to a tee in the high-pressure tap tubing of the corresponding building static pressure sensor (if applicable), or to the location of the duct high-pressure tap and leave open to the plenum.
2. Return Duct Static Pressure: Pipe the high-pressure tap to the duct using a Pitot tube. Pipe the low-pressure port to a tee in the low-pressure tap tubing of the corresponding building static pressure sensor as described in the Control Sequences Sections.
3. Building Static Pressure: Pipe the low-pressure port of the pressure sensor to the static pressure port located on the outside of the building through a high-volume accumulator. Pipe the high-pressure port to a location behind a thermostat cover or in an appropriate ceiling mounted location as described in the Control Sequences Sections.
4. The poly piping to the pressure ports on all pressure transducers shall contain a capped test port located adjacent to the transducer.
5. All pressure transducers, other than those controlling VAV boxes, shall be located in field device panels, not on the equipment monitored or on ductwork. Mount transducers in a location accessible for service without use of ladders or special equipment.
6. All air and water differential pressure sensors shall have gauge tees mounted adjacent to the taps. Water gauges shall also have shut-off valves installed before the tee.

3.4 Sprinkler Proof Equipment

A. Protect DDC panels or other equipment from sprinkler damage or from damage when equipment needs to be drained for servicing.

B. All electrical equipment installed in areas where sprinklers are also installed shall be constructed so that exposure to water from the sprinkler heads shall not impair the effectiveness of the DDC system equipment.

C. Provide a separate and complete cover or roof on all DDC systems if systems are subject to potential water damage. An overhang at the front, rear and sides shall effectively prevent the entrance of water at the top and through projecting faceplates, etc.

D. Louvers shall be of the outdoor type where falling water or water running down the sides of the enclosure shall not enter the enclosure.

E. Sprinkler proof or relocate all DDC panels that are within 10 ft. [3 m] of a backflow preventer, sprinkler head or water relief valve.

3.5 DDC Systems Input And Output Point Installation

A. Require a complete database for all systems detailed in the Input/Output Hardware Object Lists, including point names, point descriptors, alarm messages, menu penetration, operator access, color graphics (as detailed by the Contractor in the Graphics List), custom system reports as defined elsewhere in these Standards and operating schedule (1 per system or independent control zone).

B. Require all inputs and outputs to the DDC system as filled out by the Contractor in the Input/Output Hardware Object List and as required by the Control Sequences.

C. All DDC panels shall be configured so that all primary input, output and control logic for each major piece of equipment described in the Points List shall be resident within a single DDC panel to provide network independent, standalone closed loop control.

D. In no instance shall control programs or I/O points for primary systems be distributed over two or more DDC panels without the expressed written permission of the A/E.

E. Require coordination of all telephone conduit runs with local telephone utility before installation begins. Permission shall be obtained from utility before any equipment is mounted on their plywood equipment mounting panels.

3.6 Non-DDC Equipment Installation

A. Install per Manufacturer's recommendations and Control Sequences.

B. Submit written control sequences for items listed in Control Sequences for approval by A/E prior to commencement of Work. Programming and documentation shall be approved by A/E following the Shop Drawing provisions Section 01 33 00.

C. Install Work according to Control Sequences. Include all additional hardware required to meet the Control Sequences.

D. Contractor shall follow Manufacturer's instructions and shall be responsible for the reconnection of all safety devices such as boiler safeties.

E. The Controls Contractor shall modify/relocate or arrange for the modification/relocation of existing devices/controls on the AHUs to suit exterior or interior duct insulation. Include insulation standoffs where required.

F. Commission system to operate to the satisfaction of the A/E following the provisions of Section 25 08 00.
G. Provide 8 hours of training to Owner on site on the non-DDC equipment, including videotaped training session, in addition to the training specified elsewhere in this Specification.
H. Provide "as-built" control drawings for insertion into the Operating and Maintenance Manual.
I. Provide CD of AutoCAD .DWG files of all Drawings to A/E.
J. Provide copy of final approved version of Control Sequences on CD in Word™ to A/E.

3.7 Installation of conductors & cables

A. Electrical material and installation shall be in accordance with the appropriate requirements of all applicable sections of the current edition of the National Electrical Code and the local Electrical Authority.

B. Confirm all ratings, voltages, etc., of equipment prior to ordering.

C. Power wiring for the control's equipment shall be coordinated by the Controls Contractor, or qualified personnel working for the Controls Contractor.

D. Existing wiring may be re-used where in acceptable condition. Confirm with A/E prior to re-using. Any wiring reused as part of the Work shall be covered by project warranty.

E. Use coded conductors throughout with different colored conductors for each phase and white wire for neutral.

F. All safety controls (e.g., LLSs) shall be wired in series with both "HAND" and "AUTO" starter positions to ensure that systems are properly protected.

G. All electrical wiring, terminal blocks and other high voltage contacts shall be fully enclosed or properly guarded and marked to prevent accidental injury to personnel.

H. Power electric/electronic valves and dampers from the AHU/MUA/RTU power so they will fail to the fail-safe position when the AHU/MUA/RTU is not running.

I. Provide all Control panels with power line conditioning (surge suppression) devices.

J. All temperature sensor wiring, and communications cables must be run separate from any line voltage and shielded to prevent interference from 60 cycle noise. Any wiring conditions that produce intermittent reading variations or system "glitches" shall be remedied at the Contractor's expense.

K. Provide all wiring Work using the following methods:

1. All wire shall be copper.
2. Panel board feeders shall be in conduit.
3. All 120 V interlock wiring and power supplies for panels shall be installed in conduit.
4. 120 V circuits shall be, at a minimum, of #12 AWG RW-90 copper. For runs over 150 ft. [50 m] in length, use #10 AWG RW-90 copper
5. Provide 24 in. [600 mm] of flexible conduit (Type FMC) connection to all input and output devices. FMC may not be used in any locations listed below:
    a. In wet locations unless the conductors are approved for the specific conditions and the installation is such that liquid is not likely to enter raceways or enclosures to which the conduit is connected
    b. In hoist ways
    c. In storage battery rooms
    d. In any hazardous (classified) location
    e. Where exposed to materials having a deteriorating effect on the installed conductors, such as oil or gasoline
    f. Underground or embedded in poured concrete or aggregate
    g. Where subject to physical damage
6. Provide 24 in. [600 mm] of liquid tight flexible conduit (Type LFMC) connection to all input and output devices in any locations listed below:
    a. Where conditions of installation, operation, or maintenance require flexibility or protection from liquids, vapors, or solids
    b. As permitted by code in other hazardous (classified) locations
    c. For direct burial where listed and marked for the purpose
    d. These permitted uses are not all-inclusive, but only provide guidance on where LFMC may be used. LFMC may not be used where any combination of ambient and conductor temperature produces an operating temperature in excess of that for which the material is approved or where it may be subject to physical damage.
7. All wiring between Control panels and field devices shall be communication wiring and installed in conduit where considered exposed in accessible open areas (e.g., boiler rooms, mechanical rooms, and service rooms), susceptible to damage, or located in inaccessible spaces, electrical and plumbing chases, shafts and ceiling spaces. Provide 24 in. [600 mm], AC-90 connection to input and output devices.
8. Use cable approved by the Authority Having Jurisdiction in ceiling plenum. Approved cable can be run exposed in all suspended and accessible ceiling spaces. All ceiling spaces on this project are considered to be return air plenums. All cabling shall be securely attached to the underside of the deck or to sprinkler line support rods. Cable runs in ceiling space shall maintain a minimum of 24 in. [600 mm] above the ceiling tiles.

No cable supplied in the Work shall be tied to or bundled with other network cable in the building.

9. All temperature control wiring 50 volts or more shall be a minimum of #14-gauge wire. All temperature control wiring less than 50 volts shall be minimum #18-gauge wire.

L. Provide 120 V power supplies to all main DDC panels, separately circuited from all other loads.

1. Provide one 15-amp 120/1/60 fused power circuit to each DDC panel location.
2. Identify breaker in panel and add lock on breaker to prevent accidental disruption of power to panels.
3. Select breakers that are not tied to contactors. Selection of breakers shall be approved via the Shop Drawing process in Section 01 33 00.
4. Use emergency power supply to power DDC panels wherever it is available.

M. All low-voltage wiring shall meet Class 2 requirements. (Low-voltage power circuits shall be sub-fused when required to meet Class 2 current-limit.)

1. All wiring within the DDC panels themselves shall be Class II.
2. Where Class 2 (current-limited) wires are in concealed and accessible locations including ceiling return air plenums, approved cables not in raceway may be used, provided that cables are UL Listed for the intended application. For example, cables used in ceiling plenums shall be UL Listed specifically for that purpose.
3. All wiring in mechanical, electrical, or service rooms, or where subject to mechanical damage, shall be installed in raceway at levels below 10 ft. [3 m].
4. Do not install Class 2 wiring in raceway containing Class 1 wiring. Boxes and panels containing high-voltage wiring and equipment may not be used for low-voltage wiring except for the purpose of interfacing the two (e.g., relays and transformers).
5. Do not install wiring in raceway containing tubing.
6. Where Class 2 wiring is run exposed, wiring is to be run parallel along a surface or perpendicular to it, and neatly tied at 10 ft. [3 m] intervals.
7. Where plenum cables are used without raceway, they shall be supported from or anchored to structural members. Cables shall not be supported by or anchored to ductwork, electrical raceways, piping, or ceiling suspension systems.
8. All wire-to-device connections shall be made at a terminal block or terminal strip. All wire-to-wire connections shall be at a terminal block.
9. All wiring within enclosures shall be neatly bundled and anchored to permit access and prevent restriction to devices and terminals.
10. Maximum allowable voltage for control wiring shall be 120 V. If only higher voltages are available, the Contractor shall provide step-down transformers.
11. All wiring shall be installed as continuous lengths, with no splices permitted between termination points.
12. Use coded conductors throughout with different colored conductors.
13. The Contractor shall terminate all control and/or interlock wiring and shall maintain updated (as-built) wiring diagrams with terminations identified at the project site.

N. Communication Wiring:

1. All cabling shall be installed in a neat and workmanlike manner. Follow Manufacturer's installation recommendations for all communication cabling.
2. Do not install communication wiring in raceway and enclosures containing Class 1 or other Class 2 wiring.
3. Maximum pulling, tension, and bend radius for cable installation as specified by the cable Manufacturer shall not be exceeded during installation.
4. Verify the integrity of the entire network following the cable installation. Use appropriate test measures for each particular cable.

5. When a cable enters or exits a building, a lightning arrester must be installed between the lines and ground. The lighting arrester shall be installed according to the Manufacturer's instructions.
6. All runs of communication wiring shall be unspliced length when that length is commercially available.
7. All communication wiring shall be labeled to indicate origination and destination data.
8. Grounding of coaxial cable shall be in accordance with code requirements.

O. All cables and wires shall be color coded at 16 ft. [5 m] intervals for specific service identification. All cables and wires within junction boxes and entry points at walls, floors, and ceilings shall be labeled to identify its panel termination points. Color coding conventions for cables and wires shall be co-coordinated with and approved by the A/E.

P. Arrange for and coordinate rough-in and final inspections with the Authorities Having Jurisdiction and A/E.

Q. See Electrical Division for wiring requirements in Hazardous Environmental Rating Class 1.

R. All network cabling shall be yellow.

3.8 Grounding & Bonding for Integrated Automation

A. The entire installation shall be grounded and bonded in accordance with the National Electrical Code.

B. To remove the detrimental effects of ground looping or lightning strikes, all Control panels must be connected to a single point, true earth ground.

1. Panel grounding to structural steel or cold-water piping is not acceptable.
2. Verify that existing building ground is operational. Owner shall repair ground as required.
3. The entire installation shall be grounded in accordance with the National Electrical Code.

C. Grounding Conductors: Bare stranded copper, tinned, soft annealed and sized as indicated.

D. Insulated Grounding Conductors: Green

E. Non-corroding accessories necessary for grounding system shall include, but not necessarily limited to:

1. Grounding and bonding bushings
2. Protective type clamps
3. Bolted type conductor connectors
4. Bonding jumpers, straps
5. Pressure wire connectors

F. Installation General Requirements:

1. Installation shall be a complete permanent, continuous grounding system including electrodes, conductors, connectors, and accessories. Where EMT is used, run ground wire in conduit.
2. Use mechanical connectors for grounding connections to equipment provided with lugs.
3. Soldered joints are not permitted.
4. Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.
5. Make grounding connections in radial configuration only.

6. Install system and circuit grounding connections to neutral of primary electrical grid.

G. Install grounding connections to typical equipment included in, but not necessarily limited to following list:

1. Service equipment
2. Transformers
3. Switchgear
4. Duct systems
5. Frames of motors
6. Motor control centers
7. Starters
8. Control panels
9. Building steel work
10. Generators
11. Elevators and escalators
12. Distribution panels
13. Outdoor lighting

H. Installation to include grounding connections for data communications link, sound, fire alarm, and intercommunication systems.

I. Bond non-current carrying metal parts together with size 12 AWG copper equipotential conductor. Run conductor from separate lug or service neutral bar to, but not necessarily limited to, following indoor systems and equipment:

1. Hot water heating system
2. Main water pipe
3. Main building drain
4. Oil line
5. Data communications links, radio/TV, emergency and fire alarm lead-in or service conduits, near panels
6. Make connections to pipes on building side of main valves and tanks. Connect jumpers across boilers to supply and return hot water heating pipes

J. Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of the A/E and Authority Having Jurisdiction over installation.

1. Perform tests in accordance with Electrical General Requirements.
2. Perform tests before energizing electrical system.
3. Disconnect all ground fault indicators before testing.

3.9 Electrical Installation - Pathways

A. Electrical material and installation shall be in accordance with the appropriate requirements of all applicable sections of the current edition of the National Electrical Code and the local Electrical Authority. Refer to Electrical Division for requirements for conduit installation.

B. Conduit system shall not be filled to more than 75% capacity to provide room for future point expansion in the Work. Size conduit to meet this requirement.

C. Existing pathways may be re-used where in acceptable condition. Confirm with A/E prior to re-using. Any equipment reused as part of the Work shall be covered by the warranty provisions of Section 01 78 00.

D. Where conduit is used for input and output points, provide conduit sized to meet the requirements of 3.9B above.

E. Include all pathway Work using the following methods:

1. Conduits shall be fastened to main building structure and shall run parallel or perpendicular to main building structure.
2. All devices mounted in accessible open or exposed areas shall be in FS-type boxes without knockouts. Run all wiring in conduit. Paint all conduit or wire mould in all accessible open areas available to the public. Paint to match existing color. Conduit in other accessible, open areas such as boiler rooms, mechanical rooms need not be painted.
3. Devices in accessible concealed areas or inaccessible concealed areas can be in junction boxes with knockouts.
4. Outlet boxes shall be electro-galvanized pressed steel type.
5. All devices located outside of mechanical, or equipment rooms shall be flush wall mounted unless otherwise indicated.
6. Caddy™ Clips shall not be used as fasteners anywhere in the Work.

F. All low-voltage wiring shall meet Class 2 requirements. (Low-voltage power circuits shall be sub-fused when required to meet Class 2 current-limit.)

1. Provide sleeves for plenum wiring where it passes through walls and floors. Maintain fire rating at all penetrations.
2. Size of raceway and size and type of wire shall be the responsibility of the Contractor, in keeping with the manufacturer's recommendation and Code requirements, except as noted elsewhere in this Specification.
3. Include one pull string in each raceway 1" [2.5 cm] or larger.
4. Control and status relays are to be located in designated enclosures only. These enclosures include packaged equipment control panel enclosures unless they also contain Class 1 starters.
5. Conceal all raceways, except within mechanical, electrical, or service rooms. Install raceway to maintain a minimum clearance of 6" [15 cm] from high-temperature equipment (e.g., steam pipes or flues).
6. Secure raceways with raceway clamps fastened to the structure and spaced according to code requirements. Raceways and pull boxes may not be hung on flexible duct strap or tie rods. Raceways may not be run on or attached to ductwork.
7. Adhere to Electrical Division requirements where raceway crosses building expansion joints.
8. Install insulated bushings on all raceway ends and openings to enclosures. Seal top end of all vertical raceways.
9. Flexible metal raceways and liquid-tight, flexible metal raceways shall not exceed 3 ft. [1 m] in length and shall be supported at each end. Flexible metal raceway less than 2" electrical trade size shall not be used. Liquid-tight, flexible metal raceways shall be used in areas exposed to moisture, including chiller and boiler rooms.
10. Raceway must be rigidly installed, adequately supported, properly reamed at both ends, and left clean and free of obstructions. Raceway sections shall be joined with couplings (per code). Terminations must be made with fittings at boxes and ends not terminating in boxes shall have bushings installed.

G. All conduits shall be color coded at 16 ft. [5 m] intervals for specific service identification. Color coding conventions for conduit and junction boxes shall be co-coordinated with and approved by the A/E.

3.10 Identification General Requirements

A. All devices and equipment, whether new or existing, that are used for monitoring or control by the DDC system, shall be clearly identified by a permanently attached label, tag or nameplate. Locate identification in a conspicuous location.

B. Each inscription shall be in the Working Language, identifying the device type, point number and corresponding zone it controls. All labeling shall be consistent with the naming convention and approved by the A/E via the Shop Drawing process.

C. Naming Conventions: Use identification that is consistent with the A/E's established naming conventions. Coordinate identification of equipment and systems supplied by other Divisions to ensure that identical naming conventions are used.

D. Identification Conventions

1. Coordinate with equipment identification systems defined in other Divisions of the Work.
2. Provide apparatus (including electric motors) with proper nameplates affixed thereto, showing the size, name of equipment, serial number and all information usually provided, which also includes voltage, cycle, phase and horsepower of motors and the name of the Manufacturer and his address.
3. Identify all new and reused devices, sensors etc. Use lamacoid plastic plates of an approved size complete with beveled edges having engraved white 1/8" [3 mm] letters on black background giving the name of the equipment or equipment service and its number, e.g., "Main Circulating Pump P-1", "Radiation Valve V-1". Fix to equipment using pop rivets or sheet metal screws. Stick-on nameplates of any type are not acceptable under any circumstances.
4. Provide brass or lamacoid numbered tags, 1-5/16" [32 mm] diameter with stamped numbers secured by chains on all valves that are controlled by the DDC system. Tags may also be rectangular, waterproof, luggage tag style. Prepare an approved list detailing the valve location, tag numbers and purpose it serves. Mount one (1) copy of this list in a glazed frame where advised by the A/E and provide additional copies for the Operating and Maintenance Manuals.
5. Identify all conduits, cable junction boxes and pull boxes per 3.9G above.
6. Identify locations of all control devices installed in the ceiling space on the T-bar or access door directly below it, with a dot or star in the Contractor's corporate colors.

E. Panel Identification

1. Each control panel cabinet shall be identified using a Size 6 lamacoid label.
2. Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics
3. Identify equipment with Size 3 labels engraved "ASSET INVENTORY No. [_____]". Number as directed by the A/E.
4. Disconnects, starters and contactors: indicate equipment being controlled and voltage
5. Terminal cabinets and pull boxes: indicate system and voltage
6. Transformers: indicate capacity, primary and secondary voltages
7. Provide apparatus (including electric motors) with proper nameplates affixed thereto, showing the size, name of equipment, serial number and all information usually provided, which also includes voltage, cycle, phase and horsepower of motors and the name of the Manufacturer and his address.
8. Identify all new and reused devices, sensors etc. Use lamacoid plastic plates of an approved size complete with beveled edges having engraved white 1/8" [3mm] letters on black background giving the name of the equipment or equipment service and its number, i.e., *"Main Circulating Pump PU-1", "Radiation Valve V-1", "Air Handling Unit*

AHU-1", "Motor M-1", etc. Fix to equipment using pop rivets or sheet metal screws. Stick-on nameplates of any type are not acceptable under any circumstances.

9. Provide all valves that are new or re-used with brass numbered tags, 5/8" [16 mm] diameter with stamped numbers secure be chains to the valve. Prepare an approved list detailing the valve location, tag numbers and purpose it serves. Mount one (1) copy of this list in a glazed frame where advised by the A/E and provide additional copies for the Operating and Maintenance Manuals.
10. Stencil on identification approved by A/E complete with flow arrows for all piping installed during the Work.

F. Panel Wiring Diagrams

1. Each DDC panel shall have a permanent, non-fading, "as-built" interconnection wiring diagram of the complete field installed system, with properly identified device model and catalogue number of each system component and device and list of the meaning of the alarm and other lights.
2. Clearly identify all I/O address numbers and associated DDC point name on each input and output.
3. The diagram shall be sealed by plastic laminate and affixed to the inside of the field panel.
4. All panel and junction box terminal strips shall be fully labeled to identify wiring connections.

G. Ceiling Markers

1. Ceiling markers shall be installed for identifying above ceiling equipment locations for easy operations and maintenance staff access.

Maintenance

4.1 DDC System Maintenance

Provide for the maintenance of the DDC system during the 18 month warranty period that starts with Final Completion of the Project as follows:

A. Maintenance shall cover all aspects of the control system, including: Front End software, other equipment supplied by Contractor, data transmission equipment and links, electronic controls, all DDC panels, end devices, transducers, software, etc. supplied under the Work.

B. Maintenance shall include all regular labor, material, emergency service as defined herein, travel costs to the building site, escalations and other costs to warrant and maintain all Work (hardware and software) supplied or modified by the Contractor under work of this Contract. All costs for travel, accommodation, food, etc. shall be the responsibility of the Contractor. The Owner shall not be held responsible for any lost productivity due to inclement weather conditions delaying or extending the time required to complete the Work. Maintenance shall include the following:

1. A minimum of two site visits/year prior to the start of the heating and cooling seasons to check, calibrate and repair/replace all hardware and software supplied as part of the Work.

   a. At the end of each site visit, Contractor shall make a backup copy of all software. They shall give one copy to the Owner and shall retain one copy for themself. They shall provide free access to this backup copy should the Owner's copy be destroyed or damaged.

2. Contractor shall make any changes to existing programming necessary to correct any problems encountered. While maintenance does include correction of software errors discovered, it shall not include changes to software to correct mechanical equipment

faults, undersized equipment, or mechanical system or control sequence enhancements made or desired by the Owner.

3. Telephone Support: Telephone support is defined as up to 780 minutes total per warranty period year for the project as a whole, with carryover of all unused telephone support time to the next year. Assistance shall be chargeable at preferred Customer Discount rates if the problem is not related to a Contractor supplied software or a hardware problem.
4. Equipment shall be repaired or replaced at no charge by the Contractor if lightning strikes the building, and other electric/electronic equipment in the building is not damaged, and the Contractor's DDC equipment is damaged.
5. Reload of DDC panel software due to extended power failures (defined as power failures beyond 24 hours duration) once per year per site.
6. Extended labor and materials warranty on the Work.

C. Maintenance responsibilities of the Contractor shall not include:

1. Consumable items such as printer ribbons, ink cartridges and paper.
2. Electric controls that were not installed as part of the Work.
3. Damage to equipment or loss of software due to the Owner's negligence, misuse, abuse or loss of password.
4. Loss of equipment due to fire, theft, vandalism or other insurable losses.

D. Include in the DDC system maintenance, the cost to install one factory authorized firmware upgrade on all DDC panels on an annual basis. Also include any firmware or software upgrades to meet upgrades to new BACnet features. Contractor is responsible for correcting or changing any programming necessitated by the upgrade.

1. The Owner is responsible for providing the new Operating System software, any upgrades to third party software needed and any computer hardware upgrades.
2. Upgrade provisions does not include introduction of new product hardware where a full board replacement is required or where there is no backward compatibility to the DDC product supplied for the Work.

E. Concurrent with the warranty period, the Contractor shall also warrant existing controls and instrumentation that were modified to become integral with the new DDC control system (applicable where the Work includes modification of control systems in the Work).

1. Maintenance shall entail all labor and material required to perform seasonal start-up, recalibration, adjustment, lubrication and testing.

F. Maintenance work shall be performed as detailed in the Specification and as outlined in the Contractor's Operating and Maintenance Manuals. The Owner's representative shall be allowed to accompany the Contractor's service technician(s) to become familiar with all maintenance procedures.

G. A detailed service report shall be filed with the Owner after each maintenance visit, detailing the Work performed, time spent, devices replaced or repaired, and the personnel involved.

H. Thirty (30) days prior to the warranty expiry date, the following maintenance procedures shall be performed by the Contractor. A comprehensive report shall be submitted to the Owner, detailing findings and actions taken.

1. Clean all DDC panels as required.
2. Inspect all wiring terminations and connections.
3. Inspect all electronic terminations and connections.
4. Inspect all actuator couplings to the building equipment.
5. Inspect input and output field mountings.

6. Verify power supply AC mains.
7. Verify panel and building grounds.
8. Verify DC power supply voltages.
9. Verify standby batteries and supplies.
10. Set system to battery backup mode to ensure long life.
11. Exercise all software command functions.
12. Verify displays and printouts.
13. Verify analog inputs, outputs and totalizer points.
14. Test output commands and analog output points.
15. Test start/stop and alarm programs.
16. Modify (manual) status and check overrides.
17. Trip remote alarm and verify alarm display.
18. Check programmed start/stops.
19. Check all sensors and calibrate where applicable or replace sensor.
20. Check all analog output transducers and calibrate where applicable.
21. Check all Level 0 Devices, peripherals and ancillary equipment
22. Check Read/Write functions to memory.
23. Check and set real time clock and clock reset function
24. Run all-point trend log.
25. Run all reports.
26. Run alarm log.
27. Service printers in accordance with the Manufacturer's recommendations.

4.2 REQUIREMENTS FOR EMERGENCY SERVICE

A. The Contractor shall provide emergency service on a 24-hours-a-day basis, including weekends and public holidays on the demand of the Owner. This service support will include all necessary labor and materials to repair or replace any worn and/or malfunctioning equipment as covered under the terms of this Specification. For the purpose of this section, emergencies shall be defined as any mechanical or control failures for which no temporary solution exists, that threatens comfort, health, life, mechanical system integrity, or safe operation of equipment.

B. Emergency calls during the warranty period shall be addressed by the Contractor within four (4) hours of notification. Note: This 4 hour response time does not include travel to the site, but normally includes remote computer connection to the site. Service shall be available 24 hours per day, seven days a week. Provide the Owner with an emergency phone number for contacting service personnel.

END OF GENERAL INTEGRATED AUTOMATION REQUIREMENTS STANDARD

GUIDE SPECIFICATIONS

The following specification is intended to be used in the contract documents. It shall be project- specifically edited by the specifier. ***[specifier notes]*** shall be deleted during the editing process. Where [ ] appear in this document, this indicates requirements that typically need to be edited or might be optional depending upon the project scope and conditions. Edit as appropriate for the project. The Project Commissioning Authority (CxA) shall take ownership and responsibility for the contents of this section and is expected to modify other portions as necessary to accurately reflect conditions of the project. For draft copies during the design process, use Microsoft Word, Track Changes.

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Methods and procedures for start-up and verification of control system components and systems in support of and prior to Owner's Commissioning Authority (CxA) testing. This includes:
   a. Start-up testing and verification of systems.
   b. Check out demonstration or proper operation of components.
   c. On-site operational tests.
   d. Point to point testing of all components.
2. Comply with Section 01 91 13 General Commissioning Requirements.
3. Related Sections
   a. Section 01 33 00 Submittal Procedures
   b. Section 01 78 00 Closeout Submittals
   c. Section 01 79 00 - Demonstration and Training

1.02 DESIGN REQUIREMENTS

A. Confirm with A/E that Design Criteria and Design Intents are still applicable.

B. Commissioning personnel to be fully aware of and qualified to interpret Design Criteria and Design Intents.

1.03 SUBMITTALS

A. Submittals, General: Submittals in accordance with Section 01 33 00 - Submittal Procedures.

B. Submit the following for inclusion in the Final Commissioning Documentation. Submit report format for review within ***{x}*** days of notice to proceed.

1. Include measurements, final settings and certified test results.
2. Recommend additional changes and/or modifications deemed advisable in order to improve performance, environmental conditions or energy consumption.

PART 2 - PRODUCTS

NOT USED (Refer to Section 01 91 13)

PART 3 - EXECUTION

3.01 COMMISSIONING PROCEDURES AND REQUIREMENTS

A. The Contractor is responsible for recommissioning all existing points.

1. [List points, components, and sequences of operation to be recommissioned.]

B. Changes, adjustments and modifications to the automated control systems suggested during commissioning shall be approved and documented in the construction documents by the A/E, prior to being implemented. Revise "Record documentation to reflect final setting and programming.

C. Through the commissioning process, the Contractor shall verify the installation, operation and functional performance of automated control systems hardware and software under the appropriate seasonal conditions, for compliance with design intent and the Contract Documents.

D. A complete static and dynamic commissioning test shall be performed for all hardware and software points and all sequences of operation at each site, all control panels and for all Level 0 devices by the Contractor.

1. Static tests: Commissioning tests shall consist of a full range of static tests carried out to verify that all hardware points, software, panels, transducers, all Level 0 devices and other components, function in accordance with the Specifications.
2. Dynamic tests: System performance shall be checked under dynamic conditions which simulate varying load and operating modes, including pre-conditioning, start-up, normal operating, emergency and fail-safe modes, shut-down interlocks and lock-outs defined in the Control Sequences.

3.02 FUNCTIONAL PERFORMANCE TESTING

A. Functional Performance Test procedures (FPTs) are developed and performed in accordance Section 01 91 13.

B. Functional testing shall consist of the following four phases:

1. Component Testing:
   a. Component testing applies to all control input and output devices, including those provided the EMCS, equipment suppliers and other low voltage automated control systems. Examples include but are not limited to: sensor assemblies, detectors, relays and switches, valves, dampers, and actuators.
   b. Component testing applies to electronic and analog thermometers and gauges, as well as electronic input and output (I/O) devices.
   c. Component testing consists of demonstrating field I/O calibration and operation including but not limited to:
      1) Accuracy of sensors is within design temperature range as specified.
      2) Sensors are located such that they are accessible for maintenance, and will provide accurate representative measurements of the medium being measured (away from potential causes of erratic operation).
      3) Alarmed points report correctly to operator interface station.
      4) Accuracy and settings of binary switches and alarms is as specified, within design temperature range.
      5) Actuators operate smoothly in a linear relationship with the signal they receive over the full range of operation.
      6) Actuators are located such that they are accessible for maintenance.
      7) Fail safe operation of components and controllers is as specified for loss of control signal, electric power, and network communications.
      8) All components, values and alarms are correctly mapped to operator interface station.
2. Operational Systems Testing: After functional testing of the system components has been successfully completed sequences of operation and control system functions shall be functionally tested. Each control loop shall be tested to verify stable control with the

specified and appropriate responses.

3. Integrated Systems Testing: After operational testing has successfully demonstrated that each system functions in accordance with the project documents, functional testing shall occur to verify that the interaction between the systems is as required. Each interactive function shall be functionally tested for automated control systems provided throughout the project specifications.
4. Real Time Dynamic Stability Testing (trend logging):
   a. After operational testing has been successfully completed real time performance testing shall be performed. Data shall be logged for the intervals and periods specified in the FPT procedures. Unless otherwise specified in the FPTs, test periods shall include occupied, unoccupied, weekend, and holiday schedules.
   b. The CxA will provide the Control System Contractor with a list of required trend log definitions and associated acceptance criteria to be implemented as a basis for reviewing performance during this period.
   c. The Contractor will review the performance period test plan and set up the trend log definitions from the CxA. The trending shall be provided by the contractor in both a text and graphic format with related system parameters grouped together for easy comparison. If DDC system resident memory is limited or there are other issues with the trending requirements, the Contractor will notify the CxA and request the CxA redefine the test plan.
   d. Analysis of the data shall demonstrate that that the systems operate in accordance with the acceptance criteria specified in the FPT procedures. Verify that data demonstrates acceptable results before submitting for CxA review. If acceptable results are not demonstrated, perform testing and trouble shooting and corrective action to provide resolution.

3.03 FUCTIONAL PERFOAMNCE TEST SAMPLING

A. When an FPT applies to many similar components or systems that are not a part of a life- safety system, the contractor may demonstrate the functional performance tests (FPTs) to the Commissioning Authority (CxA) as specified in Section 019113. Demonstration Sampling will apply only in accordance with 019113, and only for the components and systems listed in the accompanying Functional Performance Test (FPT) Demonstration Sampling Table.

FPT PROCEDURE	SAMPLE SIZE

3.01 SEASONAL TESTING

A. Perform seasonal testing in accordance with the specification for Real Time Dynamic Stability Testing, which is specified elsewhere in this section.

B. The following table indicates which FPTs include Seasonal Testing.

FPT PROCEDURE	SEASON(S)

305 COMMISSIONG DOCUMENTATION

[*Examples of commission documentation appear below. Edit or replace these samples to be project-specifically appropriate, or provide the documentation that will actually be used for the project. Include the following verbiage as appropriate:*]

"The following sample documentation is intended to exemplify the level of testing and documentation required to be used for this project. Actual documentation will be provided after submittals have been accepted."

OR

"The following documentation is preliminary, based on the project basis of design and specified performance and acceptance criteria. Revisions may be made based on the accepted submittals."

A. Prefunctional Testing/Systems Readiness Checklists.

B. Functional Performance Test Procedures

PROJECT NAME Error! Reference source not found. **COMMISSIONING DATE (YY/MM/DD)** ____/____/____ **COMMISSIONING COMPLETED BY** _____ **(PRINT NAME)** _____ **POINT TYPE - BI**	
Point Name _____ Description _____ Address _____.	
COMMISSIONING ITEM	**REV'D**
Labels: Panel labels match software point name ____(Y). Panel label attached to termination wire ____(Y).	
Verify alarm condition: Check one for the BI point: _____ **Current Switch BI**: *Check current switch to verify the amperage value is appropriate for the BI trip point and that the BI status trips when the motor starts.* _____ **Safety BI:** *Check safety if applicable (e.g., LLS).* _____ **Alarm BI:** *Trip alarm to check that alarm registers (e.g., sump pump, CO, flood, filter, pressure UPS).* _____ **Status BI:** *Verify that proof follows binary output command (e.g., fan status).* _____ **Other BI**: *Describe* _____. Units defined correctly in programming _____(Y) Point hardware conforms to Device # _____ (provide cutsheet) or follows the text below: List Units of Measurement for point (amps, ppm) _____. Device operating range from _____ to _____ *(e.g., differential pressure from .1 – 4" w. c.).* Cut-in value set to _____ *(e. g., PIL switch cuts in at 2' from top of pit)*. Cut-out value set to _____ *(e. g., PIL switch cuts out at 3' from top of pit)*.	
Alarm debounce time limit set in software: _____(e. g., 120 seconds delay between input transitions).	
Alarm programming: Soft copy of the status alarm complete with message text and point status is included in the programming submittal _____(Y). *Software simulation for alarm creation is* **not** *acceptable.*	
Runtime: Runtime set up _____(Y). Runtime alarm trips at _____Hours. Runtime Log Maintenance Alarm complete with message text and runtime total is included in the programming submittal _____(Y).	
Other Hardware Input or Output proof interlock points: (e.g., Boiler alarm disabled when OAT > 5 °C) Describe Hardware interlock _____. Describe Hardware interlock _____.	
POINT PROGRAMMING, GRAPHICS, TRENDING AND DOCUMENTATION	**REV'D**
Programming: Point programming completed per Control Sequences _____(Y).	
Graphics: Point on Front End: floor plan graphic ____(Y) equipment graphic ___(Y) panel graphic ____(Y)	
Trends: Point trend data in panel and Front End ____(Y). 144 30 minute samples set up in panel ____(Y). List trend data point name, if different than original point name to provide average _____.	
Documentation: Point on Shop Drawings: equipment plan _____(Y) floor plan _____(Y) panel layout _____(Y) Point in Control Sequences ___(Y) OR point programming properly documented ___(Y) Confirm point cutsheet in O&M manual _____(Y). Confirm Bill of Materials description _____(Y)	
Training: Point function and operation covered during the training courses ____(Y). Client initials _____.	

REVIEWING A/E'S SIGNATURE _____ **DATE** _____
AUTHORISED CONTRACTOR'S SIGNATURE _____ **DATE** _____
AUTHORISED A/E'S SIGNATURE _____ **DATE** _____

PROJECT NAME Error! Reference source not found. **COMMISSIONING DATE (YY/MM/DD)** ____/____/____
COMMISSIONING COMPLETED BY _____**(PRINT NAME)** _____**POINT TYPE - AI**

Point Name _____ Description _____ Address _____.

COMMISSIONING ITEM	REV'D
Labels: Panel labels match software point name _____(Y). Panel label attached to termination wire _____(Y). Units defined correctly in programming _____(Y)	
Point hardware conforms to Device # _____(provide cutsheet) or follows the text below: List Units of Measurement for point (amps, ppm) _____. Device operating range from _____ to _____*(e.g., differential pressure from .1 – 4" w. c.).* **Verify alarm condition:** High Alarm limit set to _____(e. g., alarm may be fixed, reset by season or differential from setpoint). Low Alarm limit set to _____(e. g., alarm may be fixed, reset by season or differential from setpoint).	
Alarm debounce time limit set in software: _____(e. g., 120 seconds in alarm condition).	
Alarm programming: Soft copy of the status alarm complete with message text and point status is included in the programming submittal _____(Y). Software simulation for alarm creation is not acceptable.	
Runtime: Runtime set up _____(Y). Runtime alarm trips at _____Hours. Runtime Log Maintenance Alarm complete with message text and runtime total is included in the programming submittal _____(Y).	
Other Hardware Input or Output proof interlock points: (e.g., Boiler SWT alarm disabled when OAT > 5 °C) Describe Hardware interlock _____. Describe Hardware interlock _____.	

ANALOG INPUT TESTING													**REV'D**
Measured value													
Sensor reading													
Test sensor over entire expected operating range in equal increments. Test hysteresis at extremes and midpoint. Provide at least one day's worth of data for each relative humidity and CO_2 sensor using a data logger and a trend log for the same period. Use testing equipment with accuracy of at least twice that specified for sensor.													

POINT PROGRAMMING, GRAPHICS, TRENDING AND DOCUMENTATION	**REV'D**
Programming: Point programming completed per Control Sequences _____(Y).	
Graphics: Point on Front End: floor plan graphic ___(Y) equipment graphic ____(Y) panel graphic ____(Y)	
Trends: Point trend data in panel and Front End ____(Y). 144 30 minute samples set up in panel _____(Y). List trend data point name, if different than original point name to provide average _____ OR ___(N/A).	
Documentation: Point on Shop Drawings: equipment plan _____(Y) floor plan _____(Y) panel layout _____(Y) Point in Control Sequences ___(Y) OR point programming properly documented ___(Y) Confirm point cutsheet in O&M manual _____(Y). Confirm Bill of Materials description _____(Y)	
Training: Point function and operation covered during the training courses _____(Y). Client initials _____	

REVIEWING A/E'S SIGNATURE _____ **DATE** _____
AUTHORISED CONTRACTOR'S SIGNATURE _____ **DATE** _____
AUTHORISED A/E'S SIGNATURE _____ **DATE** _____

PROJECT NAME Error! Reference source not found. **COMMISSIONING DATE (YY/MM/DD)** ____/____/____ **COMMISSIONING COMPLETED BY** _____**(PRINT NAME)** _____ **POINT TYPE - BO**	
Point Name _____ Description _____ Address _____.	
COMMISSIONING ITEM	**REV'D**
Labels: Panel labels match software point name _____(Y). Panel label attached to termination wire _____(Y). Units defined correctly in programming _____(Y).	
Verify operating conditions: Fail Safe position _____(e.g., position to which device will fail under loss of control and power). Normal position _____(e.g., position at which device is set under normal conditions). **Point output action:** direct acting _____. reverse acting _____. Field relay installed _____(Y/N) Able to command point ON and OFF when HOA in Auto position _(Y). Not able to command point ON or OFF when HOA in Hand position _____(Y). Not able to command point ON and OFF when HOA in OFF position _____(Y). Able to control output via HOA during power loss in panel _____(Y). Hard wired interlocks prevent control by HOA and point commands _____(Y) (*e.g., A/C will not start unless fan status is ON*).	
Runtime: Runtime set up _____(Y). Runtime alarm trips at _____Hours. Runtime Log Maintenance Alarm complete with message text and runtime total is included in the programming submittal _____(Y).	
Other Hardware Input or Output proof interlock points: (e.g*., Fan alarm disabled when fan not commanded ON*) Describe Hardware interlock _____. Describe Hardware interlock _____. Describe Hardware interlock _____.	
POINT PROGRAMMING, FRONT END AND DOCUMENTATION	**REV'D**
Programming: Point programming completed per Control Sequences _____(Y).	
Graphics: Point on Front End: floor plan graphic ___(Y) equipment graphic ___(Y) panel graphic _____(Y)	
Trends: Point trend data in panel and Front End ____(Y). 144 30 minute samples set up in panel _(Y). List trend data point name, if different than original point name to provide average _____OR ____(N/A).	
Documentation: Point on Shop Drawings: equipment plan _____(Y) floor plan _____(Y) panel layout _____(Y) Point in Control Sequences _____(Y) OR point programming properly documented _____(Y) Optimum Start/Stop and Schedules in Control Sequences ____(Y) Confirm point cutsheet in O&M manual _____(Y). Confirm Bill of Materials description _____(Y)	
Training: Point function and operation covered during the training courses _____(Y). Client initials _____.	

REVIEWING A/E'S SIGNATURE _____ **DATE** _____
AUTHORISED CONTRACTOR'S SIGNATURE _____ **DATE** _____
AUTHORISED A/E'S SIGNATURE _____ **DATE** _____

PROJECT NAME Error! Reference source not found. **COMMISSIONING DATE (YY/MM/DD)** ____/____/____ **COMMISSIONING COMPLETED BY** _____ **(PRINT NAME)** _____ **POINT TYPE - AO**	
Point Name _____ Description _____ Address _____	
COMMISSIONING ITEM	**REV'D**
Labels: Panel labels match software point name _____(Y). Panel label attached to termination wire _____(Y). Units defined correctly in programming _____(Y)	
Verify operating conditions: Fail Safe position _____(i.e., position to which device will fail under loss of control and power). Normal position _____(i.e., position at which device is set under normal conditions). Point output action: direct acting _____. reverse acting _____. Field transducer installed _____(Y/N) Field device has a manual controller installed _____(Y/N) *(Ignore if manual control provided)* Able to command point when Potentiometer in Auto position _____(Y/N). Control point from Potentiometer in Auto position with panel powered _____(Y/N). Control point from Potentiometer in Auto position with panel not powered _____(Y/N). Not able to command point when Potentiometer in Manual position _____(Y/N). **Point hardware conforms to Device # _____(provide cutsheet) or follows the text below:** List Units of Measurement for point (psi, volts, mA) _____. Output point operating range from _____ to _____*(e.g., 0.0 - 10.0 volts).* Transducer operating range from _____ to _____*(e.g., pressure output from 0.0 - 20.0 psi).* End Device operating range from _____ to _____*(e.g., pressure output from 0.0 - 20.0 psi).* **End Device Modulation:** *(Ignore reference to transducer if device is directly driven from DDC panel)*. Point output at which modulation starts _____ Point output at which modulation stops _____. Transducer output at which modulation starts _____ Transducer output at which modulation stops _____.	
Other Hardware Input or Output proof interlock points: (e.g.*, Mixed air dampers interlocked to relay).* Describe Hardware interlock _____. Describe Hardware interlock _____. Describe Hardware interlock _____.	
POINT PROGRAMMING, FRONT END AND DOCUMENTATION	**REV'D**
Programming: Point programming completed per Control Sequences _____(Y).	
Graphics: Point on Front End: floor plan graphic ___(Y) equipment graphic ____(Y) panel graphic ____(Y)	
Trends: Point trend data in panel and Front End _____(Y). 144 30 minute samples set up in panel ___(Y). List trend data point name, if different than original point name to provide average _____.	
Documentation: Point on Shop Drawings: equipment plan _____(Y) floor plan _____(Y) panel layout _____(Y) Point in Control Sequences _____(Y) OR point programming properly documented _____(Y) Reset Schedule in Control Sequences ____(Y) Confirm point cutsheet in O&M manual _____(Y). Confirm Bill of Materials description _____(Y)	
Training: Point function and operation covered during the training courses _____(Y). Client initials _____.	

REVIEWING A/E'S SIGNATURE _____ **DATE** _____
AUTHORISED CONTRACTOR'S SIGNATURE _____ **DATE** _____
AUTHORISED A/E'S SIGNATURE _____ **DATE** _____

PROJECT NAME Error! Reference source not found. **COMMISSIONING DATE (YY/MM/DD)** ____/____/____
COMMISSIONING COMPLETED BY _____ (PRINT NAME)_____ **POINT TYPE - AO**

Point Name _____ Description _____ Address _____
.

INCREMENTAL POINT OUTPUT TESTING: (Note: testing includes measuring hysteresis effects)														
Set Point to these values	0%	10%	0%	20%	30%	40%	50%	60%	50%	70%	80%	90%	100%	90%
Trans Input (V_{DC} , mA, pulses)														
Trans Output (psi, Ω, pulses)														
End Device Position (measured % on shaft - use felt marker)														

Test point output and potentiometer control by incrementing output to values shown in the top row of each table. Accurately record all data in cells as laid out. Ignore transducer input line if analog signal outputted directly from panel. Note units used in each case.

POTENTIOMETER OVERRIDE TESTING: (Note: testing includes measuring hysteresis effects)									
Set Pot to these approx values	0%	10%	0%	25%	50%	75%	50%	100%	75%
Trans Output (psi, Ω, pulses)									
End Device Position (% on shaft)									
End Device Position (% on shaft)									

Write *DOES NOT WORK WITH POWER OFF* through the last two lines of the table if potentiometer does not work with the power off.

REVIEWING A/E'S SIGNATURE _____ **DATE** _____
AUTHORISED CONTRACTOR'S SIGNATURE _____ **DATE** _____
AUTHORISED A/E'S SIGNATURE _____ **DATE** _____

END OF COMMISSIONING OF INTEGRATED AUTOMATION REQUIREMENTS STANDARD

Basis of Design

This standard contains certain design criteria and procedures applicable to integrated automation instrumentation and termination devices for HVAC and electrical systems. This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the PPD Project Manager.

Products, Materials and Equipment

2.1 General

A. Provide all new equipment of proven design and quality.

B. All equipment and material to be IEC and UL certified, manufactured to minimum standard specified including additional specified requirements. Equipment that is not IEC certified shall be submitted to the local Electrical Authority for special inspection and approval before delivery of equipment to site. All such equipment shall bear a Special Acceptance sticker (or approved equal) from the local Approving Authority to indicate approval.

C. Each major component of equipment shall have the model and serial number on a nameplate securely attached in a conspicuous place.

D. All devices of a particular category shall be of the same type and Manufacturer.

E. Devices that require recalibration more than once per year are not acceptable under any circumstances.

F. All damper and valve operators shall be direct drive. Floating point actuators are not allowed.

G. For ease of installation in local control panels, all transducers, relays, etc. shall be mounted in standard Snap-Track™ or DIN rail and be equipped with quick disconnect standard screw terminals, or be modular, pluggable type.

2.2 Cabinets

A. Provide rigid panel board for each DDC panel and groupings of transducers, transformers and other devices.

B. Mount panel boards in 12 ga. [2.7 mm] thick steel cabinet with baked enamel finish c/w adequate ventilation to prevent damage to the components inside. Cabinets to be NEMA 1 rated. The Contractor may reuse existing cabinets where possible, however, all cabinets, whether new or existing, shall be same color and shall comply with the terms and conditions for expansion capacity specified elsewhere.

C. Mount all relays, transducers, auxiliary devices, pressure gauges and DDC panels in cabinets. Provide ON/OFF power switch with over-current protection for control power sources to each local panel.

D. Cabinet shall have hinged key-lock access door. All cabinets shall be lockable with same key. Provide two keys per panel.

E. A common terminal strip shall be affixed within each cabinet. All wiring and tubing within cabinets shall be located in trays and clearly identified. Neatly bundle wiring and tubing in Panduit™ wire duct.

F. Mount panels adjacent to associated equipment on vibration free wall or free standing frame.

G. Mount panel wiring diagrams laminated in clear plastic inside cabinet or in rigid clear plastic enclosure on adjacent wall.

H. Cabinets shall be modular. Use multiple cabinets if required for capacity in any one location. All cabinets shall be assembled to IEC standards and include a IEC assembly approval sticker or bear a special acceptance sticker from the Authority Having Jurisdiction.

I. All panel reference indication shall be by 1" [25 mm] lamacoid labels.

J. Provide a switchable LED light and 120 VAC duplex outlet in each main cabinet. Do not deadhead one side of duplex outlet.

K. Provide cabinets that are sized for the spare point capacity specified.

2.3 Control Transformers

A. Control transformers shall be UL Listed for Class 2 current-limited service, or shall be provided with over-current protection on both primary and secondary circuits for Class 2 current-limited service. Connected loads shall not exceed 80% of the transformer's rated capacity.

B. DC power supply output shall match output current and voltage requirements. Unit shall be full-wave rectifier type with output ripple of 5.0 mV maximum peak-to-peak. Regulation shall be 1.0% line and load combined, with 100 µsec. response time for 50% load changes. Unit shall have built-in over-voltage and over-current protection, and shall be able to withstand a 150% current overload for at least 3 seconds without trip-out or failure.

C. Unit shall operate between 32 °F - 120 °F [0 °C - 50 °C]. EM/RF shall comply with FCC Class B and VDE 0871 for Class B, and MIL-STD 810C for shock and vibration.

D. Use of 100 VA or greater, 24 VAC transformers for providing power to a number of controllers and actuators is not acceptable unless secondary circuits are divided and sub-fused to limit available short-circuit current to NEC Class 2 specifications.

E. Transformers shall be suitable for ambient temperatures of 40 °F - 130 °F [4 °C - 55 °C] and shall provide ±0.5% accuracy at 24 VAC and a 5 VA load.

F. Current transformers
   1. AC current transformers shall be UL/IEC Recognized and completely encased (except for terminals) in approved plastic material.
   2. Transformers shall be available in various current ratios and shall be selected for ±1% accuracy at 5 A full scale output.

G. Transformers shall be fixed-core or split-core type for installation on new or existing wiring, respectively.

H. Voltage transformers
   1. AC voltage transformers shall be UL/IEC Recognized, 600 VAC rated, complete with built-in fuse protection.

2. Transformers shall be suitable for ambient temperatures of 40 °F - 130 °F [4 °C - 55 °C] and shall provide ±0.5% accuracy at 24 VAC with a 5 VA load.
3. Windings (except for terminals) shall be completely enclosed with metal or plastic material.

2.4 DC Power Supplies

A. Separate DC power supplies shall be selected to match the voltage and current requirements of the connected loads.

B. Supplies shall be full-wave rectifier type with output ripple of 5.0 mV maximum peak-to-peak.

C. Regulation shall be 1.0% line and load combined, with 100 µsec. response time for 50% load changes.

D. Unit shall have built-in over-voltage and over-current protection, and shall be able to withstand a 150% current overload for at least 3 seconds without trip-out or failure.

E. Units shall be selected to limit connected loads to 75% of rated output capacity to allow for extended life and/or future expansion.

F. Unit shall operate between 0 32 °F - 120 °F [0 °C - 50 °C]. EM/RF shall comply with FCC Class B and VDE 0871 for Class B, and MIL-STD 810C for shock and vibration.

G. When AC input voltage is 24 VAC Class 2 current-limited, UL or IEC listing is not necessary. When AC input is Class 1 (120 VAC or greater), UL recognition and/or IEC listing is required.

H. Power the transducers and HOAs from a circuit that is separate from the circuit powering the DDC panels.

2.5 Power Line Filtering

A. Provide transient voltage and surge suppression for all server(s) and DDC panels either internally or as an external component. Surge protection shall have the following at a minimum:

1. Dielectric strength of 1,000 volts minimum
2. Response time of 10 ηsec or less
3. Transverse mode noise attenuation of 65 dB or greater
4. Common mode noise attenuation of 150 dB or better at 40 Hz to 100 Hz

2.6 Electric Relays

A. Control relays shall be UL Listed plug-in type with dust cover and LED “energized” indicator.

B. DPDT relay with coils rated for 120 VAC or 24 VAC as required.

C. Contacts rated at 10 A @ 120 VAC. Use horsepower rated relays where required. Size to required current and voltage.

D. Time delay relays shall be UL Listed solid-state plug-in type with adjustable time delay. Delay shall be adjustable ±200% (minimum) from set point shown on plans. Contact rating, configuration, and coil voltage suitable for application. Provide NEMA 1 enclosure when not installed in local control panel.

E. Relays are to be plug-in type with termination base and/or self contained,(Relay in a box) RIB or Equal.

2.7 Override Timers

A. Override timers shall be spring-wound line voltage, UL Listed, contact rating and configuration as required by application.

B. Provide 0-to-6-hour calibrated dial unless otherwise specified; suitable for flush mounting on control panel face, located on local control panels or where shown.

C. For systems controlled via DDC, a momentary contact pushbutton with override time set in software is an acceptable alternate.

2.8 Electric Thermostats

A. Supply Honeywell (or approved equal) line voltage electric thermostat suitable for the motor load to be controlled, to start and stop the unit heater fan motor, for wiring by Electrical Division. See Mechanical Drawings for locations. Wire to work in heating mode. Thermostats shall come complete with a display showing the temperature. Setpoint shall be adjustable without removing the cover.

2.9 Return Line Aquastats

A. Supply return line aquastat (Honeywell L4006B or approved equal) that shall cycle unit heater fan operation, for wiring by Electrical Division.

2.10 Differential Pressure Gauges

2.11 Air Pressure Gauges

A. Diameter: 38 mm minimum.

B. Range: zero to two times operating pressure of measured pressure media to nearest standard range.

2.12 Damper Operators - Modulating Electronic

A. Provide direct drive damper operators where indicated or replacement is required by the A/E.

B. Spring return for “fail-safe” in Normally Open or Normally Closed position.

C. All non-spring-return actuators shall have an external manual gear release to allow manual positioning of the damper when the actuator is not powered. Spring-return actuators with more than 133 lbf-in [15 N·m] torque capacity shall have a manual crank for this purpose.

D. Provide an adjustable external stop for open and close position. Adjustable spring and stroke, external stops to limit strokes with 10% allowance in either direction.

E. The actuator shall have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the rotation of the actuator.

F. All rotary spring-return actuators shall be capable of both clockwise and counter-clockwise spring-return operation. Linear actuators shall spring-return to the retracted position.

G. Size operators to fully close dampers against maximum pressure or dynamic closing pressure, whichever is greater.

H. Provide one damper operator for each 25 ft² [2.5 m²] of damper area or portion thereof, or for maximum dynamic and static damper closing pressure, whichever is greater.

I. Damper operator linkage shall be double yoke with double set screws for fastening to damper shaft.

J. Multiple section dampers over 48" [1200 mm] in width shall be driven from both ends.

K. Damper operators shall be provided with adjustable metal mounting brackets. Damper operator shall be rigidly attached so as not to deflect when operating damper from 0 to 100% position.

L. Actuators shall be designed for a minimum of 60,000 full-stroke cycles at the actuator's rated torque.

M. Actuators shall have an operating temperature range from -40 °F to 150 °F [-40 °C to 65 °C]. When used outdoors, the electronic actuator shall be sealed from the environment to prevent the introduction of moisture into the internal workings of the actuator or utilize heaters in the actuator housing to maintain a constant temperature.

N. Actuators shall be provided with a raceway fitting and a minimum 3 ft. [1 m] electrical cable and shall be pre-wired to eliminate the necessity of opening the actuator housing to make electrical connections.

O. Actuators shall be UL Standard 873 Listed as meeting applicable safety requirements and recognized industry standards.

P. All 24 VAC/VDC actuators shall operate on Class 2 wiring and shall not require more than 10 VA for AC or more than 8 W for DC applications. Actuators operating on 120 VAC or 230 VAC shall not require more than 11 VA.

Q. Proportional actuators shall accept a 0 - 10 VDC or 0 - 20 mA control signal and provide a 2 - 10 VDC or 4 - 20 mA operating range.

R. All damper actuators shall come complete with 0 - 10 VDC or 0 - 20 mA position feedback signal.

S. Standard of acceptance: Belimo

2.13 Valve Actuators

A. Valve actuators shall be manufactured by the valve manufacturer.

B. Each actuator shall have current limiting circuitry incorporated in its design to prevent damage to the actuator.

C. Modulating and two-position actuators shall be provided as required by the Control Sequences. Actuators shall provide the minimum torque required for proper valve close-off against the system pressure for the required application. The valve actuator shall be sized based on valve manufacturer's recommendations for flow and pressure differential. All actuators shall fail in the last position unless specified with mechanical spring return in the Control Sequences. The spring return feature shall permit normally open (NO) or normally closed (NC) positions of the valves, as required. All direct shaft mount rotational actuators shall have external adjustable stops to limit the travel in either direction.

D. Modulating actuators shall accept 24 VAC or VDC and 120 VAC power supply and be UL listed. The control signal shall be 2 - 10 VDC or 4 - 20 mA and the actuator shall provide a clamp position feedback signal of 2 - 10 VDC. The feedback signal shall be independent of the input signal, and may be used to parallel other actuators and provide true position indication. The feedback signal of each valve actuator (except terminal valves) shall be wired back to a terminal strip in the control panel for trouble-shooting purposes.

E. Two-position or open/closed actuators shall accept 24 or 120 VAC power supply and be UL listed. Butterfly isolation and other valves, as specified in the Control Sequences, shall be furnished with adjustable end switches to indicate open/closed position or be hard wired to start/stop the associated pump or chiller.

F. Acceptable manufacturers: Johnson, Belimo or approved equal.

2.14 Sensors & Transmitters - General

A. All DDC analog input and output points shall have an end-to-end accuracy equal to or better than those listed in Table 1.

Table 1 : Reporting Accuracy

Measured Variable	Required reporting Accuracy
Space Temperature	±0.5 °F [±0.25 °C]
Space Temperature	±1 °F [±0.5 °C]
Ducted Air	±1 °F [±0.5 °C]
Outside Air	±2 °F [±1.0 °C]
Dew Point	±3 °F [±1.5 °C]
Water Temperature	±1 °F [±0.5 °C]
Delta-T	±0.25 °F [±0.15 °C]
Relative Humidity	±2% RH
Water Flow	±5% of full scale
Airflow (terminal)	±10% of full scale (see Note 1)
Airflow (measuring stations)	±5% of full scale
Airflow (pressurized spaces)	±3% of full scale
Air Pressure (ducts)	±0.1” w.g. [±25 Pa]
Air Pressure (space)	±0.01” w.g. [±3 Pa]
Other Pressures	±1.0% (full scale)
Water Pressure	±2% of full scale (see Note 2)
Electrical	5% of reading (see Note 3), (A, V, W, Power factor)
Carbon Monoxide (CO)	±5% of reading
Carbon Dioxide (CO2)	±50 ppm
All others	±1.0% (full scale)
All meters	±2.5% (absolute)

Note 1: over range of 10%-100% of scale
Note 2: For both absolute and differential pressure
Note 3: Not including utility-supplied meters

B. All adjustable binary sensing devices (e.g. air flow switches, low limit thermostats, etc.) shall have an accuracy of ±5.0% (full scale).

C. All new operating status indication (fans, pumps, etc.) shall be obtained by using current sensing transducers or current switches.

D. Devices and sensing elements that require recalibration more than once per year are not acceptable under any circumstances.

E. For ease of installation in local control panels, all transducers, relays, etc. shall be mounted in standard Snap-Track™ or DIN rail and be equipped with quick disconnect standard screw terminals, or be modular, pluggable type.

2.15 Sensors - General

A. All sensors (temperature, relative humidity, etc.) shall be corrosively resistant with all internal parts assembled in a watertight, shockproof, vibration-proof, and heat resistant assembly.

B. All sensors shall be installed in strict accordance to the Manufacturer's recommendations.

C. All sensors located in hallways, lobbies and areas open to the public shall be fitted with tamper-proof guards. Provide Shop Drawing of guard.

D. All space temperature sensors shall be installed in such a manner to prevent incorrect readings due to air movement within walls. They shall not be installed near sources of heating or cooling, supply air diffusers, outside walls and doorways without prior written approval from the A/E.

2.16 Temperature Sensors

A. Temperature sensors shall be precision elements with sensing to read out accurately of ±0.50 °F [±0.25 °C] over entire range of element. RTDs and thermistors are considered as equals, providing the Manufacturer's equipment is designed to provide the accuracy and stability specified.

B. Temperature sensing range shall be selected to match anticipated range of particular temperature being sensed, including:

1.	Space Temperatures	50 °F - 104 °F [10 °C - 40 °C]
2.	Outdoor Temperature	-40 °F - 104 °F [-40 °C - 40 °C]
3.	Duct Temperature	14 °F - 104 °F [-10 °C - 40 °C]
4.	Thermowells	32 °F - 250 °F [0 °C - 120 °C]

C. Outside air sensors shall be complete with weatherproof enclosure and sun shield to a design acceptable to the A/E.

1. Provide Shop Drawing of sun shield.
2. Outdoor air temperature sensor shall not be mounted in fresh air duct or within 25 ft. [8 m] of any exhaust or vent outlets.

D. Duct mounted sensors shall be point type for use in return air ducts and shall be averaging type for all other duct locations.

E. Point type sensors are acceptable in discharge air duct locations that have a cross-sectional area of 10 ft² [1 m²] or less, and where the sensing element is between a and b of the distance across the duct interior from any duct wall.

F. All averaged sensors shall be of sufficient length to accurately determine correct average temperature (minimum of two (2) complete passes horizontally).

1. Sensor shall bendable at field installation time to a minimum radius of 4" [100 mm] at any point along the sensor length without degradation in performance.

2. Sensors shall be thermally isolated from brackets and supports to respond to air temperature only.
3. Sensors shall be supported separately and not connected to coils or filter racks.

G. The electronic thermostat/sensor shall permit control over the terminal devices such as the reheat coil valves and room radiation valves. All room thermostat/sensors shall be wall mounted with vented cover, back box and tamper-proof screws. There shall be a keypad to permit the Operator to adjust the temperature within a specified range ([65 °F - 75 °F [18 °C - 24 °C]) without removing the cover. The current space temperature shall be displayed on an LCD screen attached to the sensor. The device shall permit the occupant to send a signal to override the occupancy schedule defined in the DDC panel. The device shall also be connected to the DDC system panel network and shall be addressable and accessible at the Front End and in terminal mode. Contractor shall provide five thermostats complete with a communications port for use by POT or service tool (locations to be determined).

2.17 Enthalpy Sensors

A. Shall be duct-mounted, precision elements with microprocessor, capacitive RH sensor and RTD temperature sensor. Shall read out accurately of ±2.0 btu/lb over 0-50 btu/lb range.

2.18 Temperature Sensor Wells

A. When thermo wells are required, the sensor and well shall be supplied as a complete assembly, including wellhead and Greenfield fitting or Handibox.

B. Thermo wells shall be pressure rated and constructed in accordance with the system working pressure.

C. Thermo wells and sensors shall be mounted in a threadolet or 0.5 in [12.5 mm] NFT saddle and allow easy access to the sensor for repair or replacement.

D. Immersion sensors shall be provided with a separable stainless steel well of size to suit sensing element. Pressure rating of well is to be consistent with the system pressure in which it is to be installed. Void between well and sensing element shall be filled with heat transfer medium.

E. Unless specified otherwise, all fluid temperature sensing used for control loop input and/or for alarm condition detection on primary systems shall utilize immersion wells if the existing controls are not being retained. Contractor is responsible for providing wells. This may include isolating and draining selected parts of the system and then refilling the system. Addition of chemical treatment and mechanical equipment start-up is the responsibility of the Owner.

F. Where pipe diameter is less than the insertion length of the well, the well shall be installed at an elbow location to affect proper flow across entire well area.

F. Wells shall not restrict flow in piping by more than 30% (i.e., well shall not represent more than 30% of pipe as measured on a cross section by area).

H. The well must withstand the flow velocities in the pipe.

I. Acceptable Manufacturers: Johnson Controls or equal.

J. Coordinate with Mechanical Contractor to have pete’s plug adaptors installed next to any in pipe control sensor for testing and troubleshooting.

2.19 Relative Humidity (RH) Sensors

A. Relative humidity elements shall utilize polymer film technology with an accuracy of ±2% RH over entire range of element.

B. Relative humidity elements range shall be 5% RH to 90% RH within operating temperature range of 32 °F - 140 °F [0 °C - 60 °C].

C. Duct mounted sensors shall have stainless steel sheath construction complete with integral shroud to enable specified operation in air streams of up to 2000 ft/m [10 m/s].

D. Sensor shall be located in approximate center of duct.

E. Room relative humidity sensors shall be wall mounted with vented cover, back box and tamper-proof screws.

F. Maintenance of sensor shall be by a simple field method such as solvent or mild detergent solution washing to remove anticipated airborne contaminants.

G. All RH sensors shall be calibrated in the presence of the A/E as part of the commissioning process.

H. RH sensor drift shall not exceed 1% of full scale per year.

2.20 Signal Transmitters

A. Sensing devices requiring transmitters for signal conditioning shall have the following minimum specifications:

1. Input circuit to accept sensor as specified
2. Output signal of 4 - 20 mA into maximum of 500 Ω load
3. Output short circuit and open circuit protection
4. Input short circuit and open circuit protection
5. Output variations of less than 0.2% of full scale output for supply voltage variations of ±10%
6. Maximum output linearity error of ±1.0% of full scale output
7. Integral zero and span adjustments
8. Temperature effect of ±1.0% full scale/120 °F [50 °C] or less
9. Long term output drift of equal to or less than 0.25% of full scale output over six months

B. Transmitters shall be unaffected by external transmitters (e.g. walkie-talkies, cell phones, pagers

C. Transmitters shall use Modbus protocol, Obvius Modhopper R9120-5

2.21 Electronic Signal Isolation Transducers

A. A signal isolation transducer shall be provided whenever an analogue output signal from the DDC panel is to be connected to an external control system as an input (such as a chiller control panel), or is to receive as an input signal from a remote system.

B. The signal isolation transducer shall provide ground plane isolation between systems.

C. Signals shall provide optical isolation between systems.

D. Acceptable Manufacturers: Advanced Control Technologies

2.22 Low Limit Switch (LLS)

A. Provide LLS that is hard-wired interlocked to fan starter circuit. Tie shall be made as follows:

1. For a one pole LLS, install a new two-pole relay to be energized by the LLS circuit. The fan starter circuit shall be rewired to one pole of the new relay and the other pole to the DDC panel so that when the DDC panel fails, the AHU/MUA will default to heating mode. Locate the new relay near the LLS, at the fan starter or in the DDC panel interface cabinet.
2. If there is a multi-pole relay on the LLS with one leg free, use the free set of contacts as the LLS point on the DDC panels.
3. LLS shall be snap acting SPDT, two position, automatic reset type with contacts rated for 15 A, 120 VAC. Provide an additional DPDT relay of equal electrical rating in instances where DDC monitoring and hard wired interlocks are utilized. Provide a Operator specified time delay so there is a delay on restart to minimize anti-cycle timing.
4. Low limit thermostat shall activate alarm and operate equipment in sequence described, should temperature over any 16” [400 mm] length of sensing element drop below preset temperature limit.
5. Locate low limit thermostat after preheat coil and before cooling coil in air systems utilizing outside air.
6. Low limit thermostat shall serpentine entire coil bank with a maximum sensor element spacing of 6” [150 mm]. Low limit thermostats shall be wired in series on coils requiring multiple thermostats.

B. Tie into new/existing LLS if installed on AHU. Tie shall be made as follows:

1. Retain LLS hard wired to fan starter circuit.
2. If there is a one pole LLS, install a new two pole relay to the existing LLS circuit. The fan starter circuit shall be rewired to one pole of the new relay and the other pole to the DDC panel so that when the DDC panel fails, the AHU will fail to heat. Locate the new relay near the existing LLS, at the fan starter or in the DDC panel interface cabinet.
3. If there is a multi pole relay on the LLS with one leg free, use the free set of contacts as the LLS point on the DDC panels. Leave the existing hardware interlock in place.

C. If an LLS is not supplied with the new AHU, Contractor shall install an LLS to protect AHUs in the following manner:

1. LLS shall be snap acting SPDT, two position, automatic reset type with contacts rated for 15 A, 120 VAC. Provide an additional DPDT relay of equal electrical rating in instances where DDC monitoring and hard-wired interlocks are utilized.
2. Low limit thermostat shall activate alarm and operate equipment in sequence described, should temperature over any 16” [400 mm] length of sensing element drop below preset temperature limit.
3. Locate low limit thermostat after heating coil and before cooling coil in air systems utilizing outside air.

D. LLSs on the relief dampers: Install auto-reset electric LLS on each relief damper. Damper shall close when the LLS is tripped. Set LLS to 38 °F [3 °C].

2.23 Differential Pressure (DP) Switches

A. Provide differential static pressure switches with IEC, NEMA 1 approved enclosures for field installation.

B. The switches shall be mounted in the vertical position on a vibration free surface.

C. Switches shall be field adjustable for 0.1" - 1.0" w.g. [20 - 250 Pa] pressure. When used for filter status indication, ensure switches have a range suitable for dirty filter conditions as related to the available fan static.

D. Diaphragm sensing element shall actuate a snap acting SPDT switch with a minimum contact rating of 10 A @120 VAC. The assembly shall operate and reset automatically.

E. For maintenance purposes, all switches sensing media with pressures in excess of 1.0" w.g. [250 Pa] shall have isolation valves installed between the switch and pressure source.

F. The air flow switch shall have over-pressurization protection of 10" w.g. [2.5 kPa] or greater.

G. Provide local gauges to indicate all differential pressures. Select gauges to provide a normal output span to no less than 70% or no more than 100% of maximum gauge reading.

H. Switches shall be of the snap action diaphragm type housed in IEC approved enclosure to facilitate field mounting when required.

I. Minimum contact rating shall be 10 A @120/240 VAC. Use horsepower rated switches where required.

J. Each switch shall be provided with range adjustments for setpoint and differential.

K. All switches shall operate and reset automatically.

L. All switches sensing liquid or steam pressures shall have isolation valves installed between switch and pressure source.

M. Coordinate with Mechanical Contractor to have pete's plug adaptors installed next to any in pipe pressure sensor for testing and troubleshooting.

2.24 Sump/Sewage Level Switch

A. Switch shall be mercury tube switch in waterproof and shockproof enclosure.

B. Suspend float in sump from flexible cord and weight supplied with switch. Casing to be suitable for immersion in measured liquid.

C. Contacts shall be rated at 15 A @120 VAC. IEC approval for up to 250 volt 10 amps AC.

D. Standard of Acceptance: Flygt

2.25 Pressure Monitoring Probes

A. Duct Static Pressure Traverse Probe

1. Duct static traverse probes shall be provided where required to monitor duct static pressure. The probe shall contain multiple static pressure sensors located along exterior surface of the cylindrical probe.
2. Acceptable manufacturers: Cleveland or approved equal

B. Space Static Air Probe: A space static pressure probe shall have multiple sensing ports, an impulse suppression chamber, and airflow shielding.

C. Outdoor Static Pressure Probe

1. Probe shall be of anodized aluminum construction.
2. Sensing accuracy shall not be affected by wind up to 60 mph [100 km/hr].
3. Connect to reference piping system in each building with 2" [a 50 mm] pipe.
4. Mount probe 5 m [15 ft] above roof line specified by the A/E.
5. Probe and sensor combination shall measure outdoor air pressure to within ±1% of actual value.
6. Standard of Acceptance: Air Monitor Corp. Static Outdoor Air Pressure (SOAP). Use Air Monitor Corp transducer if required to achieve the above accuracy and performance requirements.

2.26 Air Flow Monitoring

A. Fan Inlet Air Flow Measuring Stations

1. At the inlet of each fan and near the exit of the inlet sound trap, airflow traverse probes shall be provided that shall continuously monitor the fan air volumes and system velocity pressure.
2. Each traverse probe shall be of a dual manifolded, cylindrical, type 3003 extruded aluminum configuration, having an anodized finish to eliminate surface pitting and unnecessary air friction. The multiple total pressure manifold shall have sensors located along the stagnation plane of the approaching airflow. The manifold should not have forward projecting sensors into the air stream. The static pressure manifold shall incorporate dual offset static tops on the opposing sides of the averaging manifold so as to be insensitive to flow-angle variations of as much as ±20° in the approaching air stream.
3. The airflow traverse probe shall not induce a measurable pressure drop, nor shall the sound level within the duct be amplified by its singular or multiple presences in the air stream. Each airflow-measuring probe shall contain multiple total and static pressure sensors placed at equal distances along the probe length. The number of sensors on each probe and the quantity of probes utilized at each installation shall comply with the ASHRAE Standards for duct traversing.
4. Airflow measuring stations shall be manufactured by Air Monitor Corp., Tek-Air Systems, Inc., Ebtron, Dietrich Standard or approved equal.

B. Single Probe Air Flow Measuring Sensor: The single probe airflow-measuring sensor shall be duct mounted with an adjustable sensor insertion length of up to eight inches. The transmitter shall produce a 4 - 20 mA or 0 - 10 VDC signal linear to air velocity. The sensor shall be a hot wire anemometer and utilize two temperature sensors and a heater element temperature. The other sensor shall measure the downstream air temperature. The temperature differential shall be directly related to airflow velocity.

C. Duct Air Flow Measuring Stations

1. Each device shall be designed and built to comply with, and provide results in accordance with, accepted practice as defined for system testing in the ASHRAE Handbook of fundamentals, as well as in the Industrial Ventilation Handbook.
2. Airflow measuring stations shall be fabricated of 14-gauge galvanized steel welded casing with 90° connecting flanges in configuration and size equal to that of the duct into which it is mounted. Each station shall be complete with an air directionalizer and parallel cell profile suppressor (3/4" [20 mm] maximum cell) across the entering air stream and mechanically fastened to the casing in such a way to withstand velocities up to 6,000 fpm [30.5 m/s]. This air directionalizer and parallel cell honeycomb suppressor shall provide 98% free area, equalize the velocity profile, and eliminate turbulent and rotational flow from the air stream prior to the measuring point.

3. The total pressure measurement side (high side) will be designed and spaced to the Industrial Ventilation Manual 16th Edition, Page 9-5. The self-averaging manifolding will be manufactured of brass and copper components.
4. The static pressure sensing probes (low side) shall be bullet-nosed shaped, per detailed radius, as illustrated in Industrial Ventilation Manual 16th Edition, Page 9-5.
5. The main take-off point from both the total pressure and the static pressure manifolds must be symmetrical.
6. Total and static pressure manifolds shall terminate with external ports for connection to control tubing. An identification label shall be placed on each unit casing, listing model number, size, area, and specified airflow capacity.
7. Installation Considerations:
    a. The maximum allowable pressure loss through the flow and static pressure elements shall not exceed 0.065" w.c. [16.0 Pa] at 1000 fpm [5.0 m/s], or 0.23" w.c. [32.0 Pa] at 2000 fpm [10.0 m/s]. Each unit shall measure the airflow rate within an accuracy of ±2% and shall contain a minimum of one total pressure sensor per 36 in.² [230.0 cm²] of cross sectional area or portion thereof.
    b. The units shall have a self-generated sound rating of less than NC40, and the sound level within the duct shall not be amplified nor shall additional sound be generated.
    c. Where the stations are installed in insulated ducts, the airflow passage of the station shall be the same size as the inside airflow dimension of the duct. Station flanges shall be two inch to three inch to facilitate matching connecting ductwork.
    d. Where control dampers are shown as part of the airflow measuring station, opposed blade precision controlled volume dampers integral to the station and complete with actuator, pilot positioner, and linkage shall be provided.
    e. Stations shall be installed in strict accordance with the manufacturer's published requirements, and in accordance with ASME Guidelines affecting non-standard approach conditions.
8. Acceptable Manufacturers: Air Monitor Corp., Tek-Air, Ebtron, Dietrich Standard, or approved.

2.27 Water Flow Monitoring

A. Requirements:

1. Flow range as specified in I/O summaries
2. Pressure rating: 150 psi [1035 kPa] gauge at 100 °F [38 °C]
3. Temperature rating: 164 to 500 °F [73 to 260 °C]
4. Repeatability of ± 0.1 %
5. Accuracy and linearity of ± 0.5 % up to 1000 gpm [76 L/s]
6. Flow rangeability of at least 10:1
7. Body material to suite application
8. Fittings for 2" NPS and under shall be screwed; 2½" NPS and over shall be flanged

B. Water flow meters shall be electromagnetic type with integral microprocessor-based electronics. The meter shall have an accuracy of 1.0% at 1000 gpm [76 L/s]. The meter shall be the hot tappable type.

C. Acceptable Manufacturers: Onicon.

2.28 Pressure-Electric (PE) Transducers

A. The PE transducers shall convert static or velocity pressure input signals into a proportional, linear analog electric output signal for pressure ranges from 0.5" - 20.0" w.g. [0.12 - 5.0 kPa] or as required.

B. The transducer shall have over-pressure protection to 2 times the full scale value (in either direction) or 10.0” w.g. [2.5 kPa] (whichever is greater) to minimize possible sensor damage due to over-pressurization.

C. Provide short circuit and open circuit protection.

D. The transducer shall be suitable for continuous contact with industrial standard instrument air, compressed air, water, steam and non-combustible, non-corrosive gases as applicable.

E. Water pressure transducer shall have stainless steel diaphragm construction, proof pressure of 150 psi [1035 kPa] minimum. Transducer shall be complete with mounting brackets, and block and bleed valves.

F. Water differential pressure transducer shall have stainless steel diaphragm construction, proof pressure of 150 psi [1035 kPa] minimum. Over-range limit (differential pressure) and maximum static pressure shall be 300 psi [2070 kPa]. Transducer shall be complete with required mounting brackets, and five-valve manifold.

G. The transducer shall be temperature compensated within operating range (40 °F - 130 °F [5 °C - 55 °C]) to eliminate accuracy drifting. Temperature effect shall be ±1.5% full scale/120 °F [50 °C] or less.

H. Minimum static accuracy shall be 2% of span with a repeatability of 0.5% of span. Combined non-linearity, repeatability and hysteresis effects shall not exceed ±0.5% of full scale output over entire range.

I. Provide non-interactive potentiometers to permit adjustment of zero and span of output signal to 0.25% of input span.

J. Transducers that do not have onboard voltage regulation shall be powered by standard 24 VAC transformers or 24 VDC power supplies. Transducer output variation shall be less than ±0.2% full scale for supply voltage variations of ±10%.

K. Transducer pressure input span shall be selected to provide a normal operating span of not less than 80% or more than 100% of full scale.

L. Provide a Dwyer Magnehelic™ gauge on cabinet face for each pressure being monitored. Match gauge range to anticipated operating pressure range.

2.29 Current Transducers

A. Transducers shall convert monitored AC current to a proportional, linear DC current (4 - 20 mA) or voltage (0 - 5 VDC), or other approved output signal.

B. Transducers shall be sized and/or configured to provide a normal operating output span of not less than 70% or more than 100% of full scale.

C. Minimum accuracy shall be 2% of span. Combined non-linearity, repeatability and hysteresis effects shall not exceed ±0.5% of full scale output over entire range.

D. Transducers shall be self-powered combination split-core current transformer type with built-in rectifier and high-gain servo amplifier with 4 - 20 mA two-wire output. Unit ranges shall be 10 A,

20 A, 50 A, 100 A, 150 A, and 200 A full scale, internal zero and span adjustment, and ±1% full scale accuracy at 500 Ω maximum burden.

E. Use CTs with the capability to read amperage draw on all motors (e.g., pumps or AHU motors). One CT or CS on a balanced three phase circuit is sufficient for this application.

F. Transmitter/transducer shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/IEC recognized.

G. Unit shall be split-core type for clamp-on installation on existing wiring.

H. Acceptable Manufacturers: Wattnode

2.30 Voltage Transducers

A. AC voltage transmitters shall be self-powered single loop (two-wire) type, 4 to 20 mA output with zero and span adjustment.

B. Ranges shall include 100 to 130 VAC, 200 to 250 VAC, 250 to 330 VAC, and 400 to 600 VAC full-scale, adjustable, with ±1% full-scale accuracy with 500 Ω maximum burden.

C. Transmitters shall be UL/IEC Recognized at 600 VAC rating, and meet or exceed ANSI/ISA S50.1 requirements.

D. Acceptable Manufacturers: Veris or approved.

2.31 Current Sensing Relays

A. Relays shall be sized to accurately sense amperage range of load, with adjustable latch level, adjustable delay on latch and a minimum differential of 10% of latch setting between latch level and release level.

B. Relay shall be provided with plug in base and shorting shunt (if required) to protect current transformer when relay is removed from socket. Current transformer shall be available for single or three phase metering into single relay.

C. Provide for discrimination between phases to allow detection of worst case selection 3φ application. Current relay shall be powered from control circuit of motor starter being metered and shall be suitable for mounting in the motor starter cabinet.

D. Relay contacts shall handle 10 A @120 VAC minimum.

E. Acceptable Manufacturers: Wattnode

2.32 Surface Liquid Detectors

A. Detectors shall have gold plated adjustable sensing probes to detect liquids from 0 to 1/8 inch above the monitored surface and shall be unaffected by high humidity levels.

B. All electronic circuitry shall be encapsulated in epoxy to protect from dirt, fungus and short term emersion in liquids.

C. Detectors shall be remotely powered by non-battery sources.

D. The detector shall use capacitance measuring circuitry for detecting the presence of liquids and shall have adjustable sensitivity.

E. Acceptable Manufacturers: Veris or approved.

2.33 Intelligent Thermostat

A. Intelligent thermostats for zone tempering coils shall reside on an MS/TP LAN.

B. All intelligent thermostats shall be wall mounted with vented cover, back box and tamper-proof screws.

C. There shall be a keypad to permit the occupant to adjust the temperature within a specified range (65 °F - 75 °F [18 °C - 24 °C]) without removing the cover. The current space temperature shall be displayed on an LCD screen attached to the sensor. The device shall permit the occupant to send a signal to override the occupancy schedule defined in the DDC panel.

D. Devices shall have a built-in analog output for modulating the zone tempering coil valve.

E. The device shall also be connected to the DDC system panel network and shall be addressable and accessible at the Front End. All intelligent thermostats controlling VAV boxes shall contain a communications port.

2.34 Damper End Switch

A. Where damper end switches are required in the specification, a distinct damper end switch shall be provided that is not integral to the damper actuator.

B. DPDT switch with contacts rated at a minimum 10 A@120 VAC. Use horsepower rated relays where required. Size to required current and voltage.

C. Actuating arm shall have a pre-travel rotation of not more than 10° (i.e., the actuator change its state within 10° of movement), differential travel rotation (hysteresis) of not more than 5°, and an over-travel rotation of at least 60° (travel past the endpoint without damaging the switch).

D. Actuating arm shall be configurable to be triggered at any point of rotation.

E. Switches shall have an operating temperature range of 14 °F - 250 °F [-10 °C - 120 °C].

2.35 Control Valves

A. Provide new valves where indicated or replacement is required by the A/E.

B. Complete Table 4 – Motorized Valve Schedule per submittal requirements and submit to A/E as a Shop Drawing according to the provisions of Section 01 33 00.

C. Provide with proper pressure ratings for service encountered and not less than 125 psi [860 kPa]. Bronze trim on all valves; bronze body on all valves to 2” [50 mm] , cast iron bodies c/w flanged connections for all valves 2.5” [62 mm] and over. Bronze discs on all 3-way valves, renewable composition discs on 2-way valves.

D. Close-off (differential) Pressure Rating: Valve actuator and trim shall be furnished to provide the following minimum close-off pressure ratings:

1. Water Valves:

a. Two-way: 150% of total system (pump) head.
b. Three-way: 300% of pressure differential between ports A and B at design flow or 100% of total system (pump) head.

2. Steam Valves: 150% of operating (inlet) pressure

E. Water Valves:

1. Body and trim style and materials shall be per manufacturer's recommendations for design conditions and service shown, with equal percentage ports for modulating service.
2. Sizing Criteria:

a. Two-position service: Line size
b. Two-way modulating service: Pressure drop shall be equal to twice the pressure drop through heat exchanger (load), 50% of the pressure difference between supply and return mains, or 5 psi [35 kPa], whichever is greater.
c. Three-way modulating service: Pressure drop equal to twice the pressure drop through the coil exchanger (load), 5 psi [35 kPa] maximum.
d. Valves 0.5" through 2.0" [12.5 mm through 50.0 mm] shall be bronze body or cast brass ANSI Class 250, spring-loaded, Teflon packing, quick opening for two-position service. Two-way valves to have replaceable composition disc or stainless steel ball.
e. 2.5" [65.0 mm] valves and larger shall be cast iron ANSI Class 125 with guided plug and Teflon packing.

F. Steam Valves:

1. Body and trim materials shall be per manufacturer's recommendations for design conditions and service. Linear ports for modulating service.
2. Sizing Criteria:

a. Two-position service: pressure drop 10% - 20% of inlet pressure
b. Modulating service: 15 psi [100 kPa] or less: pressure drop 80% of inlet pressure
c. Modulating service: over 15 - 50 psi [100 - 345 kPa]: pressure drop 50% of inlet pressure
d. Modulating service: over 50 psi [345 kPa]: pressure drop as scheduled on plans

G. Valve action shall be normally open, normally closed or 3-way mixing to suit the application. The 3-way valves shall come complete with spring return to provide "fail-safe" operation. Terminal unit 2-way valves need not be spring return and can fail in place. Heating valves shall fail NO and cooling valves shall fail NC.

H. Terminal unit 2-way control valves shall have equal percentage flow characteristics and terminal unit 3-way control valves shall have linear flow characteristics such that the total flow through the valve remains constant regardless of valve position. The 2-way valves (such as those supplied on reheats) shall be provided with a union outlet connection to simplify the installation and servicing process.

I. Valves shall be sized for a pressure drop equal to or greater than the coil it serves but not to exceed 3 psi [21 kPa]. Size valves to achieve a pressure drop of 2 - 3 psi [13 - 21 kPa]

J. Rangeability of valves shall be minimum 50:1.

K. The actuator shall be sized to close the valve against the pump head with a maximum leakage of 0.5% of rated flow.

L. Valves shall be complete with stainless steel stems and field replaceable spring loaded Teflon™ packing and composition discs. Operators shall have replaceable/renewable neoprene diaphragms.

M. Where specified, valves shall be sized for a-b operation to improve system performance.

N. Where valves are required for control of unitary devices such as radiator convectors, fin tube convectors, reheat coils, etc., ensure that operator tops are small enough to fit neatly inside corresponding enclosures without cutting.

O. All primary equipment 3-way valve actuators shall come complete with 0 to 10 VDC or 0 to 20 mA position feedback signal. Valves on VAV boxes, reheats, unit heaters or other terminal equipment do not require feedback.

P. Standard of acceptance: Belimo, Honeywell

2.36 Building Control Valves

A. [Used at chilled water connections to campus chilled water loop] Valves shall be fully proportioning, pressure independent type. Shall be ductile iron, 150 psi class with EPR/EPDM seals, and Brass/Teflon/CS/304 SS internals. Shall be provided with pressure/temperature ports in 3 locations. 100:1 rangeability. Shall be electrically actuated. Flow Control Industries Delta PValve.

2.37 Control Dampers

A. General

1. All control dampers shall be sized for the application by the Controls Contractor or as specifically indicated on the Drawings. To reduce pressure drop, use flanged to duct type for sizes under 9 ft.² [0.83m²].
2. All dampers used for throttling airflow shall be of the opposed blade type arranged for normally open or normally closed operation, as required. The damper is to be sized so that, when wide open, the pressure drop is a sufficient amount of its close-off pressure drop to shift the characteristic curve to near linear.
3. All dampers used for two-position, OPEN/CLOSE control shall be parallel blade type arranged for normally open or closed operation, as required.
4. Airfoil blade dampers with linkage out of the air stream shall be used whenever the damper face velocity exceeds 1500 fpm [7.5 m/s] or system pressure exceeds 2.5” w.c. [0.6 kPa], but no more than 4000 fpm [20.5 m/s] or 6” w.c. [1.5 kPa].
5. One piece rolled blade dampers with exposed linkage may be used with face velocities of 1500 fpm [7.5 m/s] or below.

2.38 Control Dampers - General

A. Damper Frames and Blades: Shall be constructed of either galvanized steel or aluminum. Maximum blade length in any section shall be 60” [1.5 m]. Damper blades shall be 16 ga [1.6 mm] minimum and shall not exceed 8” [20.0 mm] in width. Damper frames shall be 16 ga minimum hat channel type with corner bracing. All damper bearings shall be made of reinforced nylon, stainless steel or oil-impregnated bronze. Dampers shall be tight closing, low leakage type, with synthetic elastomeric seals on the blade edges and flexible stainless steel side seals. Dampers shall be Class 1 leakage rated (max 4.0 cfm/sf at 1.0” w.c.) per AMCA Std 511.

B. Construction: blades, 6” [152 mm] wide, 48” [1219 mm] long, maximum. Modular maximum size, 4 feet wide x 8 feet high [1219 mm wide x 2438 mm high]. Multiple sections to have stiffening mullions and jack shafts.

C. Materials:

1. Frame: 12 ga. [2.3 mm] minimum thickness galvanized steel.
2. Blades: galvanized steel with two sheets 26 ga [0.5 mm] thick or otherwise reinforced to ensure specified low leakage when fully closed.
3. Bearings: oil impregnated sintered bronze. Provide thrust bearings for vertical blades.
4. Linkage and shafts: zinc plated steel.
5. Seals: replaceable neoprene or stainless steel spring on sides, top, bottom of frame, along all blade edges and blade ends.

D. Performance:

1. Capacity: refer to I/O Summaries.
2. 0.02 L/s/m² maximum allowable leakage against 1000 Pa static pressure.
3. Temperature range: - 58 °F to 212 °F [- 50 °C to 100 °C].

2.39 Control Dampers – Extreme Cold

A. Control dampers exposed to temperatures below 14 ºF [-10 ºC] shall meet all the requirements specified below.

B. Frames shall be modular with a maximum size of 48” [1.2 m] in width and 96” [2.4 m] in height. Multiple sections shall be fit with stiffening mullions and jack shafts.

C. Extruded aluminum (6063T5) damper frame shall not be less than 0.080” [2.03 mm] in thickness. Damper frame to be 4” [101.6 mm] deep and shall be insulated with polystyrofoam on four sides.

D. Blades to be extruded aluminum (6063T5) profile, internally insulated with expanded polyurethane foam and shall be thermally broken. Complete blade shall have an insulating factor of R-2.29 and a temperature index of 55.

E. Blade seals shall be of extruded EPDM. Frame seals shall be of extruded TPE thermoplastic. Seals to be secured in an integral slot within the aluminum extrusions.

F. Bearings are to be composed of a Celcon inner bearing fixed to an 7/16” [11.11 mm] aluminums hexagon blade pin, rotating within a polycarbonate outer bearing inserted in the frame, resulting in no metal-to-metal or metal-to-plastic contact.

G. Linkage hardware shall be installed in the frame side and constructed of aluminum and corrosion-resistant, zinc-plated steel, complete with cup-point trunnion screws for a slip-proof grip.

H. Dampers are to be designed for operation in temperatures ranging between -40 °F [-40 °C] and 155 °F [68 °C].

I. Air leakage through a 48” x 48” [1.2 m x 1.2 m] damper shall not exceed 4.12 cfm/ft.² [21 L/s m²] against 4” w.g. [1 kPa] differential static pressure at standard air. Leakage shall not exceed 6.7 cfm/ft.² [34 L/s/m²] against 4” w.g. [1kPa] differential static pressure at -40 °F [-40 °C]. Pressure drop of a fully open 48” x 48” [1.2 m x 1.2 m] damper shall not exceed 0.03” w.g. [7 Pa] at 1000 fpm [5.08 m/s]. All leakage tests shall be performed per AMCA Standard 500 D.

2.40 Control Dampers – Low Leakage

A. Extruded aluminum (6063T5) damper frame shall not be less than 0.080" [2.03 mm] in thickness. Damper frame to be 4" [101.6 mm] deep and shall be insulated with polystyrofoam on three sides if "Installed in Duct" type and on four sides if "Flanged to Duct" type.

B. Blades to be extruded aluminum (6063T5) airfoil profiles, internally insulated with expanded polyurethane foam and shall be thermally broken. Complete blade shall have an insulating factor of R-2.29 and a temperature index of 55.

C. Blade seals shall be of extruded EPDM. Frame seals shall be of extruded TPE thermoplastic. Seals to be secured in an integral slot within the aluminum extrusions.

D. Bearings are to be composed of a Celcon inner bearing fixed to an 7/16" [11.11 mm] aluminum hexagon blade pin, rotating within a polycarbonate outer bearing inserted in the frame, resulting in no metal-to-metal or metal-to-plastic contact.

E. Linkage hardware shall be installed in the frame side and constructed of aluminum and corrosion-resistant, zinc-plated steel, complete with cup-point trunnion screws for a slip-proof grip.

F. Dampers are to be designed for operation in temperatures ranging between -40 °F [-40 °C] and 155 °F [68 °C].

G. Dampers shall be available with either opposed blade action or parallel blade action.

H. Air leakage through a 48" x 48" [1.2 m x 1.2 m] damper shall not exceed 10.3 cfm/ft.² [52 L/s.m²] against 4" w.g. [1 kPa] differential static pressure at standard air. Pressure drop of a fully open 48" x 48" [1.2 m x 1.2 m] damper shall not exceed 0.03" w.g. [4 Pa] at 1000 fpm [5.08 m/s]. All leakage tests shall be performed per AMCA Standard 500 D.

I. Dampers shall be available in two mounting types: i.e., "Installed in Duct" or "Flanged to Duct".

J. Intermediate or tubular steel structural support is required to resist applied pressure loads for dampers that consist of two or more sections in both height and width.

2.41 Control Dampers – Return Air

A. Standard Dampers for Return Air: Provide parallel blade type for mixing applications. Size all dampers as NET dimensions (damper blade area = duct cross sectional area) as shown on Drawings.

B. Modulating dampers shall provide a linear flow characteristic where possible.

C. Frames shall be modular with a maximum size of 48" x 60" [1.2 m in width and 1.5 m] in height. Multiple sections shall be fit with stiffening mullions and jack shafts. Frames shall not be constructed of less than 12 ga. [2.3 mm] galvanized steel.

D. Blades shall be constructed of two sheets 26 ga. [0.5 mm] or one sheet of 16 ga. [1.6 mm] galvanized steel, and shall not exceed 6" in width or 48" in length [150mm x 1200 mm].

E. Bearings shall be oil impregnated sintered bronze or nylon with ½" [13 mm] shafts. Provide additional thrust bearings for vertical blades.

F. Dampers shall have replaceable butyl rubber or neoprene seals along all blade edges and stainless steel spring seals on sides of frame.

G. Dampers and seals shall be suitable for temperature ranges of -40 ºF to 200 ºF [-40 ºC to 93 ºC], and shall be capable of withstanding a pressure differential of 4" w. c. [1 kPa] and velocities of 2,000 fpm [10 M/s] without damage.

H. All proportional control dampers shall be opposed or parallel blade type as hereinafter specified and all two-position dampers shall be parallel blade types.

I. Dampers shall be sized to meet flow requirements of the application. The contractor shall furnish and install baffles to fit the damper to duct size. Baffles shall not exceed 6" [15 cm] in width.

J. Dampers shall be minimum leakage type with a 4 cfm/ft.² [20 L/s/m²] maximum allowable leakage against 4" w. c. [1.0 kPa] static pressure with an approach velocity of 1,500 fpm [7.6 m/s].

K. Dampers mixing cold and warm air to be parallel blade mounted at right angles to each other with blades opening to mix the air streams.

L. Provide ready access to all blade linkage hardware for maintenance after installation.

2.42 Variable Speed Drive (VSD)

A. The VSD shall convert three-phase, 60 Hz utility power to adjustable voltage and frequency, three phase power for stepless motor speed control from 10% to 100% of the motor's 60 Hz speed. Input voltage shall be as specified in the electrical specifications. VSD shall be sized to motor nameplate horsepower.

B. The VSD shall include a converter and an inverter section. The converter section shall convert fixed frequency and voltage AC utility power to DC voltage. All VSDs shall include input line reactors.

C. The inverter section of the VSD shall invert the DC voltage into a quality output waveform, with adjustable voltage and frequency for stepless motor speed control. The VSD shall maintain a constant V/Hz ratio.

D. The VSDs and all ancillary options shall be manufactured, tested and listed to comply with the applicable requirements of the latest standards of:

1. 1981 IEEE 519
2. FCC Part 15, Class A
3. UL 508, ETL
4. NEC
5. IEC

E. All standard and optional features shall be included within the VSD enclosure, unless otherwise specified. VSD enclosure shall be sprinkler proof NEMA 3R rated. The unit shall maintain its UL and IEC listings after all specified option features have been added in.

F. The following special features shall be included in the VSD enclosure:

1. When required, Manual bypass shall provide all the circuitry necessary to transfer the motor from the VSD to the power line or from the line to the controller. The bypass circuitry shall be mounted in a separate section of the VSD enclosure. Motor overload protection shall be provided in both drive and bypass modes.

2. A door interlocked, pad lockable drive disconnect switch shall be provided to disconnect power from the VSD only.
3. A second fused disconnect switch or circuit breaker shall be provided as a means of disconnecting all power to both the VSD and bypass circuits, as well as providing short circuit and locked rotor protection to the motor while in the bypass mode.
4. The disconnect and bypass functions may be accomplished via disconnects, contactors and overloads, or with a four position DRIVE/OFF/LINE/TEST switch with motor starter and bypass fuses. Disconnect shall support padlocking in the OFF position.
5. A low speed alarm indicator to indicate that the drive speed has fallen below an adjustable setting.
6. Enclosure air filters

G. Power line noise shall be limited to a voltage distortion factor and line notch depth as defined in IEEE Standard 519-1992, IEEE Recommended Practices And Requirements For Harmonic Control In Electric Power Systems. The total voltage distortion shall not exceed 5%.

H. The VSD shall not emit radiated RFI in excess of the limitations set forth in the FCC Rules and Regulations, Part 15 for Class A computing devices. The VSD shall carry a FCC compliance label.

1. Motor noise as a result of the VSD shall be limited to three dB over across the line operation, measured at three feet from the motor's center line.
2. The VSD full load amp rating shall meet or exceed NEC Table 430-150.

I. Protective Features:

1. Individual motor overload protection for each motor controlled
2. Protection against input power under-voltage, over-voltage, and phase loss
3. Protection against output current overload and instantaneous over-current
4. Protection against over-temperature within the VSD enclosure
5. Protection against over-voltage on the DC bus
6. Protect VSD from sustained power or phase loss. Under-voltage trip activates automatically when line voltage drops more than 10% below rated input voltage
7. Automatically reset faults due to under-voltage, over-voltage, phase loss, or over-temperature
8. Protection against output short circuit and motor winding shorting to case faults, as defined by UL508
9. Status lights or digital display for indication of individual fault conditions
10. Controller capable of operating without a motor or any other equipment connected to the drive output to facilitate start-up and trouble shooting
11. Input line reactors shall be provided to minimize harmonics introduced to the AC line, and to provide additional protection to AC line transients

J. Adjustments:

1. Maximum speed, adjustable 50 to 100% base speed
2. Minimum speed, adjustable 0 to 50% base speed
3. Acceleration time, adjustable 3 to 60 seconds
4. Deceleration time, adjustable 3 to 60 seconds with override circuit to prevent nuisance trips if deceleration time is set too short
5. Current limit, adjustable 0 to 105%
6. Overload trip set point
7. Offset and gain to condition the input speed signal
8. Time delay relay adjustable 0 to 2 minutes for start-up

K. Service Conditions:

1. Ambient temperature, 32 - 104 °F [0 - 40 °C]
2. 0 - 95% relative humidity, non-condensing
3. Elevation to 3,300 ft. [1,000 m] without derating
4. AC line voltage variation, ±10% of nominal

L. Quality Assurance:

1. The complete VSD shall be tested by the manufacturer. The VSD shall operate a dynamometer at full load and the load and speed shall be cycled during the test.
2. All optional features shall be functionally tested at the factory for proper operation.
3. The VSD manufacturer shall provide calculations specific to this installation which show the total harmonic voltage distortion is less than 5%. Prior to installation, the VSD manufacturer shall provide the total estimated harmonic distortion (THD) caused by the VSD. If the voltage THD exceeds 5%, the VSD manufacturer shall recommend what additional equipment is required to reduce the voltage THD to an acceptable level.

M. Control Panel Features:

1. Door mounted Hand/Off/Auto selector switch to start and stop the VSD. In the auto position, the VSD will start/stop from a remote contact closure. In the HAND position, the VSD will run regardless of the remote contact position.
2. Manual speed control
3. Local/Remote selector switch. In the remote position, motor speed is determined by the follower signal. In the local position, motor speed is determined by the manual speed control.
4. Power/on light to indicate that the VSD is receiving utility power
5. Fault light to indicate that the VSD has tripped on a fault condition
6. Digital meter with selector switch to indicate percent speed and percent load
7. A set of form-C, dry contacts to indicate when the VSD is in the run mode
8. A set of form-C, dry contacts to indicate when the VSD is in the fault mode
9. A 0 - 10 VDC output signal to vary in direct proportion to the controller's speed
10. Terminal strip to accept N.C. safety contacts such as freeze stats, smoke alarms, etc. VSD to safely shut down in drive or by-pass mode when contacts open
11. Terminal strip to accept an additional N.C. contact to interface with the Hand-Off-Auto switch for remote Stop/Start control
12. Terminal strip to accept a 4 - 20 mA, 0 - 5 VDC, 0 - 10 VDC or a 3 to 15 psig pneumatic signal (if required)
13. BACnet interface (see Section25 50 00 for specific requirements)

N. Warranty: The VFD shall be warranted by the manufacturer for a period of 24 months from date of shipment. The warranty shall include parts, labor, travel costs, and living expenses incurred by the manufacturer to provide factory authorized service.

O. Standard of Acceptance: ABB or approved.

2.43 Silicon Controlled Rectifiers

A. Firing Mode

1. Burst firing
    a. Contactor
    b. Variable time base (use for nichrome element heaters)
2. Phase Angle (use for tungsten, molybdenum, silicon carbide and graphite element heaters)

B. Current: 18 to 100A

C. Features: Burst firing on 1 and 3 phase. Shorted SCR and open heater detector alarm. Din rail mount SCR power controller in a finger and palm safe package.

D. Approvals

1. UL 508 listed
2. C-UL
3. CE

E. Specifications

1. Power Bases
    a. Single phase, (2 SCRs)
    b. 3 phase, 2 leg control, (4 SCRs)
2. Resistive load only, zero cross firing only
    a. 3 phase, 3 leg control, (6 SCRs)
    b. 3 phase, 3 leg control, (6 SCRs) for 4-wire wye loads
    c. Multizone, two and three single-phase zones
3. Output Control Options
    a. Zero cross contactor, VDC input
    b. Zero cross control, fixed time base
    c. Time base one or four seconds with digital programmer
    d. Zero cross control, variable time base
    e. Phase angle control and phase angle control with current limit (not for 3-phase, 2-leg models)
    f. Soft start factory default four seconds upon power-up, and adjustable from 0.0 to 120 seconds
    g. Soft start upon input signal change, output rate of change adjustable to limit max rate of change from 0.1% - 100% per 0.1 second. Factory default is 10%.
    h. Current transformer included when required
    i. Line voltage compensated (variable time base and phase angle controllers only)
    j. Standby or non-operational mode
4. Output Voltage and Current Rating
    a. 24 to 120VAC (+10%, -15%)
    b. 200 to 480VAC (+10%, -15%)
    c. 200 to 600VAC (+10%, -15%)
    d. 65 through 250 amps per pole, model dependent; see Output Amperage Chart and Rating Curves
    e. Minimum load 1 amp rms ac
    f. Maximum leakage current 5mA
5. Alarms
    a. Single alarm relay
    b. Latching or non-latching
    c. Separate high and low values
    d. Alarm silencing (inhibit) on power up for alarm
    e. Alarm indication LEDs, shorted SCR, open heater, fuse
    f. Electromechanical relay, form C contact, software configurable
    g. Minimum load current 10 mA @ 5VDC

h. Rated resistive loads: 3 amps @ 250VAC or 30 VDC max., inductive load rating 1.5 amps with a power factor 0.4 without contact suppression

6. Heater Bakeout

a. For single-phase (phase to neutral) and 3-phase 6 SCR models only (not for 3-phase, 2-leg models)
b. Soft start with over current trip, runs until programmed bakeout time expires, then goes burst or phase angle firing. Factory default of 24 hours
c. Adjustable 0 - 9999 minutes with over current trip
d. Internal current transformer included

F. Command Signal Input

1. Analog

a. Field selectable linear voltage and current of low and high points within 0-20mA and 0-10VDC
b. Manual control input through front panel
c. Factory default 4 - 20 mA input
d. Voltage input impedance 11kW nominal
e. Current input impedance 100W nominal

2. Digital: On-board digital programmer/display and optional serial communications

3. Retransmit

a. Field selectable and scalable within 0 - 20 mA, 800W maximum or 0 - 10 VDC, load, 1KW minimum load. The default is 4 - 20 mA.
b. Resolution:
   1) mA ranges = ±5µA
   2) VDC = ranges 2.5mV nominal
c. Calibration accuracy:
   1) mA ranges = ±20µA
   2) VDC ranges = 10mV nominal
d. Temperature stability: 100 ppm

G. Digital Programmer/Display and Communications

1. Capabilities

a. Programming functions
b. Adjust input and output control type, alarms and soft start, heater bakeout and current limit prompts
c. Monitoring functions
d. Display input and output values along with actual output current
e. Data retention of digital programmer/display upon power failure via nonvolatile memory

2. Serial Communications

a. RS-232 for single drop control
b. EIA-485 for single or multidrop control
c. 32 units maximum can be connected. With additional 485 repeater hardware, up to 247 units may be connected
d. Isolated
e. Modbus™ RTU protocol
f. 1200, 2400, 4800, 9600, 19200 baud rates

3. Controller Power Supply
    a. Universal line voltage input range 100 to 240VAC (+10%, -15%) at 55VA max
    b. 50/60Hz ± 5 percent line frequency independent
    c. Controller line voltage for electronic power supply can be run on separate line voltage
4. Natural Convection and Fan Cooled Models
    a. Cabinet venting may be required
    b. See Amperage chart on the back page for all models.
5. Power Dissipation (Watts): Approximately 1.25 watts/amp per controlled leg
6. Isolation
    a. Command signal to load and line/load to ground 2200VAC minimum
    b. On-board semiconductor fuses provide SCR protection
7. Mounting
    a. Mounts on a removable sub-plate
    b. Heat sink fins must be mounted in vertical orientation
8. High Current Terminals
    a. Touch safe
    b. 3/8" [10 mm] Allen head compression terminals will accept #6 AWG to 350 MCM wire. Allen wrench adapter (included) for 3/8" [10 mm] socket, 6 point only
    c. Torque to 180 in.-lbs [20.3 Nm]
    d. Wire strip to 1⅛" [30 mm]
9. Controller Terminals
    a. Touch safe
    b. 1/8" [2.5 mm] blade screwdriver, accepts 12-22 AWG or
10. 2 No. 22-18 AWG wires
    a. Torque to 8 in.-lbs [0.9 Nm]
    b. Wire strip to 1/4" [6 mm]
11. Operating Environment
    a. 122 °F [50 °C] base rating
    b. 32 - 140 °F [0 - 60 °C] fan cooled
    c. 32 - 149 °F [0 - 65 °C] natural convection cooled
    d. 0 - 90% RH, non-condensing
    e. Meets EN50178, Pollution degree three
12. Storage Temperature: -40 - 185 °F [-40 - 15 °C]
13. Agency Approvals
    a. UL® 508 listed, File #E73741, Vol. Three, Sec. Two
    b. C-UL® listed to C22.2 NO. 14
    c. VDE EN 50178 License 115054
    d. CE 89/336/EEC (EN61326), Class A with filter, CE 73/23/EEC (EN50178)

2.44 Power Meter

A. Meter shall conform to ANSI C12.1 metering accuracy standards.

B. Meter and included CT(s) shall be factory assembled and calibrated collectedly as a system.

C. System accuracy shall be ±1% from 2 % to 100 % of the rated current over a temperature range of 32-120 °F [0-50 °C], and require no annual recalibration by Operators in the field.

D. Meter shall derive operating power from its metering connections and shall not require a separate control power connection.

E. The meter shall automatically correct for CT phase reversal.

F. Meter shall have a backlit LCD display that is direct read without the need for multipliers, conversion, etc. The LCD display shall continuously show accumulated kWh consumption and scroll through the display of Amps, Voltage, PF, KVAR, KVA, KW Real Power on an ongoing basis.

G. The information and capabilities provided by the meter shall include the following:

1. Current, per phase & three-phase total
2. Voltage, per phase & three-phase total, phase-to-phase & phase-neutral
3. Real Power (kW), per phase & three-phase total
4. Reactive Power (kVAR), three phase total
5. Apparent Power (kVA), three phase total
6. Power Factor, per-phase & three-phase total
7. Real Energy (kWh), three phase total

H. The meter shall directly accept any voltage input from 120-480 VAC, and be internally isolated to 2500 VAC.

I. The meter shall have models available for amperage ranges of 100-2400 Amps.

J. The meter shall be networkable via an Ethernet/BACnet bus connection to a BACnet network.

K. The Energy Meter shall have a N.O. pulse output with selectable pulse output rates of 0.10, 0.25, 0.50, or 1.00 kWh per pulse.

L. The Energy Meter shall have a N.C. phase-loss alarm output operating at 100mA @ 24VAC/DC.

M. Standard of Acceptance: Wattnode Modbus vis Modbus protocol.

2.49 Current Measurement (Amps)

A. Current measurement shall be by a combination current transformer and a current transducer.

B. A split core current transformer shall be provided to monitor motor amps. The transformer shall have the following characteristics:

1. Operating frequency of 50 to 400 Hz
2. Insulation – 0.6 kV class 10 kV BIL
3. UL recognized
4. Five amp secondary
5. Select current ration as appropriate for application

C. A current to voltage or current to mA transducer shall be provided. The current transducer shall have the following characteristics:

1. 6X input over amp rating for AC inrushes of up to 120 amps
2. Manufactured to UL 1244

3. Accuracy: +.5%, Ripple +1%
4. Minimum load resistance 30 kΩ
5. Input 0-20 Amps
6. Output 4-20 mA
7. Transducer shall be powered by a 24VDC regulated power supply (24 VDC +5%)

D. Acceptable Manufacturers: Veris Industries

Installation, Fabrication and Construction

Refer to Standard 25 90 00.

END OF INTEGRATED AUTOMATION INSTRUMENTATION & TERMINAL DEVICES STANDARD

Basis of Design

This standard contains certain design criteria and procedures applicable to integrated automation of building HVAC and electrical systems. This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the PPD Project Manager.

1.1 Definitions

A. BACnet: BACnet is a data communication protocol for Building Automation and Control Networks and Energy Management Control System (EMCS). The standard was developed by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). BACnet provides a standard protocol for communications between building automation devices and systems from different manufacturers. The ASHRAE Project Committee 135 supports and maintains the BACnet standard.

B. Native BACnet: Native BACnet refers to a device that represents data using BACnet standards and communicates using BACnet messaging. Native BACnet devices do not require a gateway or software driver to be connected to a BACnet system. Example: A native BACnet VAV controller at the field level (Tier 2) connected to a BACnet system controller (Tier 1) for the central EMCS/HVAC system would not need any intermediate gateway or software. Only devices certified by the BACnet Testing Laboratories (BTL) and listed on the BTL website will be acknowledged as BACnet devices.

C. Modbus is an acceptable alternative protocol to BACnet

Products, Materials and Equipment

2.1 Integrated Automation, General

A. Each supplier of a controls product is responsible for the configuration, programming, start-up, and testing of that product to comply with the Control Sequences Standard.

2.2 General BACnet HVAC Interface Requirements

A. Projects Defined as New Construction: All new construction projects shall incorporate BACnet/IP or BACnet/MSTP at the HVAC system Tier 1 (Ethernet) level. All HVAC Tier 2 devices shall be native BACnet and listed on the BACnet Testing Laboratories (BTL) certified device list located at https://btl.org/.

B. Projects Defined as Retrofit or Renovation: If the project does not require the replacement of the entire Energy Management Control System (EMCS), the project shall utilize field equipment controllers that will seamlessly integrate to the existing system in the building. Protocols utilized by the field equipment controllers (level 2 devices) shall match that of the existing controllers (i.e., Lonworks) unless the building is in transition to BACnet. Buildings in transition shall use BACnet/ MSTP or BACnet/IP controllers and native BACnet devices where possible

   If the project requires a complete replacement of the Building Automation and Control Network/ EMCS, the project shall follow the new construction standards.

C. If the equipment interface is a native BACnet device, all data shall be represented externally on the network as BACnet objects and services. The Controls Contractor shall also parse the alarms that are represented as AV and BV objects by the equipment interface.

D. If any existing equipment interface is a Modbus, LonWorks, or proprietary device requiring a BACnet Gateway, the Division supplying the equipment shall provide a gateway to support mapping all the points from the device to BACnet AV and BV objects.

E. Existing device data may be represented internally in the interface as SNVTs or proprietary points, but the data shall be represented externally on the network as BACnet objects and services. Device interfaces using LonWorks or Modbus are acceptable only on this basis.

F. The interface shall support the following BACnet Interoperability Building Blocks (BIBBs):

1. Data Sharing - ReadProperty - B (DS-RP-B)
2. Data Sharing - ReadPropertyMultiple - B (DS-RPM-B)
3. Data Sharing - WriteProperty - B (DS-WP-B)
4. Data Sharing - WritePropertyMultiple - B (DS-WPM-B)
5. Alarm and Event - Notification Internal - B (AE-N-I-B)
6. Alarm and Event - ACK - B (AE-ACK-B)
7. Alarm and Event - Information - B (AE-INFO-B)
8. Device Management - Dynamic Device Binding - B (DM-DDB-B)
9. Device Management - Dynamic Object Binding - B (DM-DOB-B)
10. Device Management - DeviceCommunicationControl - B (DM-DCC-B)
11. Device Management - TimeSynchronization - B (DM-TS-B)
12. Device Management - UTCTimeSynchronization - B (DM-UTC-B)
13. Device Management - ReinitializeDevice - B (DM-RD-B)
14. Device Management - Restart - B (DM-R-B)

G. The interface shall support the following Object types:

1. Analog Input
2. Analog Output
3. Analog Value
4. Binary Input
5. Binary Output
6. Binary Value
7. Device
8. Multi-state Input
9. Multi-state Output
10. Multi-state Value

H. Support the required optional properties to comply with the Specification requirements and Control Sequences.

2.3 Variable Speed Drive (VSD) BACnet Interface

A. The VSDs shall be represented externally as a BACnet MS/TP, BACnet 8802-3 or BACnet/IP device on the Contractor’s network.

B. The VSDs shall be a BACnet device with the capability of connecting to the BACnet-based DDC system via Ethernet:

C. The Contractor is responsible for providing the final network connection to the BACnet device.

D. Provide the following Objects at a minimum:

BACnet Variable Speed Drive Required Objects (Typical for each drive)				
Object List	**Read/ Write**	**Object Type**	**Alarmable Y/N**	**Description (acceptable value range)**
START/STOP	R/W	B	Y	ON/OFF
Forward/Reverse	R/W	B	Y	ON/OFF
External Control Source	R/W	B	Y	ON/OFF
HAND/AUTO Control	R	B	Y	ON/OFF
Alarm Status	R	B	Y	ON/OFF
Fault	R/W	B	Y	ON/OFF
Last Fault	R	MS	Y	BACnet defined
Previous Fault	R	MS	Y	BACnet defined
Oldest Fault	R	MS	Y	BACnet defined
Fault Reset	W	B		ON/OFF
Maintenance Status	R	B	Y	ON/OFF
Drive Ready	R	B	Y	ON/OFF
At Setpoint	R	B	Y	ON/OFF
Run Enable	R/W	B	N	ON/OFF
BACnet Control Override	R/W	B	Y	ON/OFF
Prevent Parameter Changes	W	B	N	ON/OFF
Prevent HAND control	W	B	Y	ON/OFF
START Enable (as required)	W	B	N	ON/OFF
Analog Control (one per point)	R/W	A	Y	
Motor speed	R	A	Y	0% - 100%
Output frequency	R	A	Y	
DC Bus Volt DC	R	A	Y	
Output Volt AC	R	A	Y	
Drive Output Current	R	A	Y	
Motor Output Torque	R	A	Y	0% - 100%
Output Power in kW	R	A	Y	
Drive Heatsink Temperature	R	A	Y	
Current KWH	R/W	A	Y	
Cumulative KWH	R	A	N	
Process PID feedback signal	R	A	Y	
Deviation of Process PID output signal from its setpoint	R	A	Y	
External PID feedback signal	R	A	Y	
External PID controller Setpoint	R/W	A	Y	
Deviation of External PID output signal from its setpoint	R	A	Y	
Current Run Time	W	A	Y	
Motor temperature	R	A	Y	
Input Reference Select	R/W	B	N	0=Input Ref 1, 1=Input Ref 2
Input Reference 1	R/W	A	Y	
Input Reference 2	R/W	A	Y	
Relay (one per output)	R/W	B	Y	ON/OFF
Digital Input (one per input)	R	B	Y	ON/OFF
Ramp acceleration time	W	A	Y	
Ramp deceleration Time	W	A	Y	

Notes: A= analog, B=Binary, MS=multi-state

2.4 Roof Top Unit (RTU) BACnet Interface

A. The RTU shall be represented externally as a BACnet MS/TP, BACnet 8802-3 or BACnet/IP device on the Owner's network.

B. The RTU interface shall be a BACnet device with the capability of connecting to the BACnet-based DDC system via Ethernet:

1. The RTU interface shall reside on the Owner's network. The Owner will provide a network drop within 3 ft. of the RTU interface. The Contractor is responsible for providing the final network connection to the Owner's network. The Owner will provide IT personnel to assist with the commissioning of the network connection.
2. The RTU interface shall support use of a static IP address for remote access through the Owner's firewall. The RTU interface shall have an Annex J router to support BACnet/IP.

C. Provide the following objects at a minimum:

BACnet Roof Top Unit Required Objects (Typical for each RTU)				
Object List	**Read/ Write**	**Object Type**	**Alarmable Y/N**	**Description (acceptable value range)**
Unit Address	R	A	N	1 - 99
Unit Address	R	MS	N	
Write to Flash	R/W	B	N	
Primary Setpoint	R/W	A	Y	0 °F - 255 °F
Secondary Setpoint	R/W	A	Y	0 °F - 255 °F
Economizer Minimum Position Setpoint	R/W	A	Y	0% - 100%
Unit ON/OFF	R/W	B	Y	0 = OFF, 1 = ON
Dehumidification	R/W	B	Y	0 = OFF, 1 = ON
Disable Operating Modes	R	A	Y	
Disable Economizer	R/W	B	Y	0 = OFF, 1 = ON
Disable Cooling	R/W	B	Y	0 = OFF, 1 = ON
Disable Heating	R/W	B	Y	0 = OFF, 1 = ON
Reset Lockouts	W	B	N	0 = OFF, 1 = ON
Primary Application Mode	R/W	MS	Y	0=None, 1=Heat, 2=Economizer, 3=Cool
Secondary Application Mode	R/W	MS	Y	0=None, 1=Heat, 2=Economizer, 3=Cool
Unit ON/OFF	R/W	MS	Y	0=OFF, 1=Unoccupied, 2=Occupied,
Cooling Mode Disabled	R	B	Y	0 = OFF, 1 = ON
Economizer Operation Disabled	R	B	Y	0 = OFF, 1 = ON
Heating Disabled	R	B	Y	0 = OFF, 1 = ON
Occupied Mode Enabled	R	B	Y	0 = OFF, 1 = ON
Unoccupied Mode Enabled	R	B	Y	0 = OFF, 1 = ON
Dehumidification Mode Enabled	R	B	Y	0 = OFF, 1 = ON
Outdoor Temperature	R	A	Y	-46°F - 160 °F
Discharge Air Temperature	R	A	Y	-46°F - 205 °F
Secondary Temperature Sensor	R	A	Y	-46°F - 205 °F
Discharge Air Temp Base Setpoint	R	A	Y	
Secondary Air Temp Base Setpoint	R	A	Y	

BACnet Roof Top Unit Required Objects (Typical for each RTU)				
Object List	**Read/ Write**	**Object Type**	**Alarmable Y/N**	**Description (acceptable value range)**
Primary Air Temp Effective Setpoint	R	A	Y	
Secondary Air Temp Effective Setpoint	R	A	Y	
Blower Operating Status	R	B	Y	0 = OFF, 1 = ON
Blower Operating Mode	R	A	Y	
VSD Speed	R/W	A	Y	0% - 100%
Duct Static Pressure	R/W	A	Y	
Cooling Mode	R	A	Y	
Mechanical Cooling ON/OFF	R	B	Y	0 = OFF, 1 = ON
External Cooling Lockout	R	B	Y	0 = OFF, 1 = ON
Low Ambient Temperature Lockout	R	B	Y	0 = OFF, 1 = ON
Compressor ON Delay	R	B	Y	0 = OFF, 1 = ON
Compressor OFF Delay	R	B	Y	0 = OFF, 1 = ON
Cooling Stages ON	R	A	Y	0% - 100%
Cooling Output	R	A	Y	0% - 100%
Damper Status	R	A	Y	0% - 100%
Damper Minimum Position Setpoint	R	A	Y	0% - 100%
Damper Motor Contact Closed	R	B	Y	0 = OFF, 1 = ON
Damper Low Discharge Temperature Override	R	B	Y	0 = OFF, 1 = ON
Damper Output	R	A	Y	0% - 100%
Heating Mode	R	A	Y	
Heating Modulating Output	R	A	Y	0% - 100%
Heating ON/OFF	R	B	Y	0 = OFF, 1 = ON
High Ambient Temperature Lockout	R	B	Y	0 = OFF, 1 = ON
External Heating Lockout	R	B	Y	0 = OFF, 1 = ON
Dehumidification Reheat	R	B	Y	0 = OFF, 1 = ON
Heat Failure	R	B	Y	0 = OFF, 1 = ON
Heat Wheel	R	B	Y	0 = OFF, 1 = ON
Override Flags	R	A	Y	
Lockout Alarm	R	A	Y	
Heat Failure Alarm	R	A	Y	
Heat Safety Alarm	R	A	Y	
External Alarms	R	A	Y	

Notes: A= analog, B=Binary, MS=multi-state

2.5 Humidifier BACnet Interface

A. The humidifier shall be represented externally as a BACnet MS/TP, BACnet 8802-3 or BACnet/IP device on the Owner's network.

B. The humidifier interface shall be a BACnet device with the capability of connecting to the BACnet-based DDC system via Ethernet:

1. The humidifier interface shall reside on the Owner's network. The Owner will provide a network drop within 3 ft. of the humidifier interface. The Contractor is responsible for providing the final network connection to the Owner's network. The Owner will provide IT personnel to assist with the commissioning of the network connection.

2. The humidifier interface shall support use of a static IP address for remote access through the Owner's firewall. The humidifier interface shall have an Annex J router to support BACnet/IP.

C. Provide the following objects at a minimum:

Humidifier - Required BACnet Objects (Typical)				
Object List	**Read/ Write**	**Object Type**	**Alarmable Y/N**	**Description (acceptable value range)**
Change Cylinder	R	B	Y	0=no service needed, 1=change cylinder
Channel Setting	R/W	B	N	0=Single Channel, 1=Dual Channel
Cylinder	R	B	Y	Indication of high water level or nearing end of cylinder life. 0=OFF, I=ON
Remote Disable	R/W	B	Y	0=humidifier enabled, 1=humidifier disabled by network
Fault	R	B	Y	Reads Fault status. 0=fault, 1=fault
Input Type	R/W	B	N	Type of control signal the unit is configured for. 0=Demand Signal, 1= %RH Signal
Net Sensor	R/W	B	N	Respond to local or network sensor input. 0=Local Sensor, 1=Network Sensor
RH Demand 1	R/W	A	Y	%RH in space or %demand to humidifier.
RH Demand 2	R/W	A	Y	Duct %RH or secondary space %RH, or secondary % demand to humidifier. (0%-100%)
Setpoint 1	R/W	A	N	Setpoint for relative humidity in space. (0%-100%)
Setpoint 2	R/W	A	N	Setpoint for duct hi-limit %RH, or setpoint for secondary space %RH. (0% - 100%). Requires Channel (Input) to be ON.
Status	R	B	Y	Reads humidifier status. 0=standby, 1=humidifying
System Demand	R	A	N	Reads humidifier system demand. (0%-100%)

Notes: A= analog, B=Binary, MS=multi-state

2.6 Computer Room A/C Unit BACnet Interface

A. The Computer Room A/C unit shall be represented externally as a BACnet MS/TP, BACnet 8802-3 or BACnet/IP device on the Owner's network.

B. The Computer Room A/C unit interface shall be a BACnet device with the capability of connecting to a the BACnet-based DDC system via Ethernet:

1. The Computer Room A/C unit interface shall reside on the Owner's network. The Owner will provide a network drop within 3 ft. of the Computer Room A/C unit interface. The Contractor is responsible for providing the final network connection to the Owner's network. The Owner will provide IT personnel to assist with the commissioning of the network connection.
2. The Computer Room A/C unit interface shall support use of a static IP address for remote access through the Owner's firewall. The Computer Room A/C unit interface shall have an Annex J router to support BACnet/IP.

C. Provide the following objects at a minimum:

BACnet Computer Room A/C Required Objects (Typical for each RAC)

Object List	Read/ Write	Object Type[1]	Alarmable Y/N	Description (acceptable value range)
Unit Run	R/W	B	Y	1=ON/0=OFF
Temperature	R	A	Y	
Humidity	R	A	Y	0% - 100%
Cooling	R	B	Y	1=ON/0=OFF
Heating	R	B	Y	1=ON/0=OFF
Humidification	R	B	Y	1=ON/0=OFF
Dehumidification	R	B	Y	1=ON/0=OFF
Econ-o-Cycle	R	B	Y	1=ON/0=OFF
Stages	R	MS	Y	
% Capacity	R	A	Y	0% - 100%
Communications	R	B	Y	1=ON/0=OFF
Local Off	R	B	Y	1=ON/0=OFF
Remote Off	R	B	Y	1=ON/0=OFF
High Head Pressure 1	R	A	Y	
High Head Pressure 2	R	A	Y	
Loss of Airflow	R	B	Y	1=ON/0=OFF
Standby Glycol Unit On	R	B	Y	1=ON/0=OFF
Liquid Detected	R	B	Y	1=ON/0=OFF
Change Filters	R	B	Y	1=ON/0=OFF
High Temperature	R	B	Y	1=ON/0=OFF
Low Temperature	R	B	Y	1=ON/0=OFF
High Humidity	R	B	Y	1=ON/0=OFF
Low Humidity	R	B	Y	1=ON/0=OFF
Humidifier Problem	R	B	Y	1=ON/0=OFF
No Water In Humidifier Pan	R	B	Y	1=ON/0=OFF
Compressor 1 Overload	R	B	Y	1=ON/0=OFF
Compressor 2 Overload	R	B	Y	1=ON/0=OFF
Main Fan Overload	R	B	Y	1=ON/0=OFF
Manual Override	R	B	Y	1=ON/0=OFF
Smoke Detected	R	B	Y	1=ON/0=OFF
Loss of Water	R	B	Y	1=ON/0=OFF
Standby Unit On	R	B	Y	1=ON/0=OFF
Low Suction	R	B	Y	1=ON/0=OFF
Short Cycle	R	B	Y	1=ON/0=OFF
Loss of Power	R	B	Y	1=ON/0=OFF
Inverter on Bypass	R	B	Y	1=ON/0=OFF
Standby Fan On	R	B	Y	1=ON/0=OFF
Loss of Emergency Power	R	B	Y	1=ON/0=OFF
Local Alarm 1	R	B	Y	1=ON/0=OFF
Local Alarm 2	R	B	Y	1=ON/0=OFF
Off by Remote Shutdown	R	B	Y	1=ON/0=OFF
Compressor 1 Run Hours	R	A	Y	0 - 10,000
Compressor 2 Run Hours	R	A	Y	0 - 10,000
Glycol Run Hours	R	A	Y	0 - 10,000
Fan Motor Run Hours	R	A	Y	0 - 10,000
Humidifier Run Hours	R	A	Y	0 - 10,000
Reheat 1 Run Hours	R	A	Y	0 - 10,000
Reheat 2 Run Hours	R	A	Y	0 - 10,000
Reheat 3 Run Hours	R	A	Y	0 - 10,000

Chilled Water Valve Run Hours	R	A	Y	0 - 10,000
Temperature Setpoint	R/W	A	N	
Temperature Tolerance	R/W	A	N	
Humidity Setpoint	R/W	A	N	0% - 100%
Humidity Tolerance	R/W	A	N	0% - 100%
High Temperature Alarm Setpoint	W	A	N	
Low Temperature Alarm Setpoint	W	A	N	
High Humidity Alarm Setpoint	W	A	N	0% - 100%
Low Humidity Alarm Setpoint	W	A	N	0% - 100%
Reheat Lockout	W	B	N	1=ON/0=OFF
Humidifier Lockout	W	B	N	1=ON/0=OFF

Notes: A= analog, B=Binary, MS=multi-state

2.7 Chiller BACnet Interface

A. The chiller shall be represented externally as a BACnet MS/TP, BACnet 8802-3 or BACnet/IP device on the Owner's network.

B. The chiller interface shall be a BACnet device with the capability of connecting to the BACnet-based DDC system via Ethernet:

1. The chiller interface shall reside on the Owner's network. The Owner will provide a network drop within 3 ft. of the chiller interface. The Contractor is responsible for providing the final network connection to the Owner's network. The Owner will provide IT personnel to assist with the commissioning of the network connection.
2. The chiller interface shall support use of a static IP address for remote access through the Owner's firewall. The chiller interface shall have an Annex J router to support BACnet/IP.
3. Network reset of individual chiller lockouts due to alarms shall not be allowed. Network resets shall be limited to sequences only.

C. Provide the following objects at a minimum:

BACnet Chiller Required Objects (Typical for each chiller)				
Object List	**Read/ Write**	**Object Type**	**Alarmable Y/N**	**Description (acceptable value range)**
Active Setpoint	R	A	Y	-40 - 93 °C [-40 - 199 °F]
Actual Capacity	R	A	Y	0 - 160%
Capacity Limit	R	A	Y	0 - 160%
Capacity Limit Setpoint	W	A	N	0 - 160%; Default=100%
Chiller Enable	R/W	B	Y	0=Off, 1=On; Default=Off
Chiller Common Alarm	W	B	Y	0=Off, 1=On; Default=Off
Chiller Pump status	R	B	Y	0=Off, 1=On;
Chiller Pump Start/Stop	R/W	B	Y	0=Off, 1=On; Default=Off
Chiller Limited Enable	R	B	Y	0=Not Limited, 1=Limited
Chiller Local/Remote	R	B	Y	0=OFF, 1=ON
Chiller Mode	R/W	MS	Y	1=HEAT, 3=COOL, 5=PRE_COOL, 11=ICE; Default=Cool
Chiller On Off	R	B	Y	0=Off, 1=On
Chiller Status	R	MS	Y	1 = Off, 2 = Start, 3 = Run, 4 = Pre Shutdown, 5 = Service

BACnet Chiller Required Objects (Typical for each chiller)				
Object List	**Read/ Write**	**Object Type**	**Alarmable Y/N**	**Description (acceptable value range)**
Compressor Discharge Temperature	R	A	Y	-273.17 - 327.66 °C [-460 - 621 °F]
Chiller Type	R/W	MS	N	Manufacturer Specific
Compressor Percent RLA	R	A	Y	-3276.8 - 3276.7
Compressor Run Hours	R	A	Y	0 - 65,535
Compressor Select	R/W	MS	Y	0 - 65,535; Default=0 (Pump 1)
Compressor Lead/Lag control	R/W	MS	Y	0=Both OFF, 1=Compressor #1 lead; 2=Compressor #2 lead;
Compressor Starts	R	A	Y	0 - 65,535
Compressor Suction Line Temperature	R	A	Y	-40 - 118 °C [-40 - 244 °F]
Condenser Entering Water Temperature	R	A	Y	-40 - 118 °C [-40 - 244 °F]
Condenser Flow Switch Status	R	B	Y	0=No Flow, 1=Flow
Condenser Leaving Water Temperature	R	A	Y	-40 - 118 °C [-40 - 244 °F]
Condenser Pump Run Hours	R	A	Y	0 - 65,535
Condenser Refrigerant Pressure	R	A	Y	-155.76 - 155.76 MPA [-22,592 - 22,591 psi]
Condenser Saturated Refrigerant Temperature	R	A	Y	-40 - 118 °C [-40 - 244 °F]
Condenser Water Pump Status	R	B	Y	0=No Flow, 1=Flow
Cool Setpoint	R/W	A	Y	10 - 120 °F; Default=44 °F
Chilled Water Supply Setpoint	R	A	Y	10 - 120 °F; Default=44°F
Evaporator Entering Water Temperature	R	A	Y	-40 - 118 °C [-40 - 244 °F]
Evaporator Flow Switch Status	R	B	Y	0=No Flow, 1=Flow
Evaporator Leaving Water Temperature for Unit	R	A	Y	-40 - 118 °C [-40 - 244 °F]
Evaporator Leaving Water Temperature for Compressor	R	A	Y	-40 - 118 °C [-40 - 244 °F]
Evaporator Pump Run Hours	R	A	Y	0 - 65,535
Evaporator Pump Run Hours	R	A	Y	0 - 65,535
Evaporator Refrigerant Pressure	R	A	Y	-155.76 - 155.76 MPA [-22,592 - 22,591 psi]
Evaporator Saturated Refrigerant Temperature	R	A	Y	-40 - 118 °C [-40 - 244 °F]
Evaporator Water Pump Status	R	B	Y	0=No Flow, 1=Flow
Heat Recovery Entering Water Temperature	R	A	Y	-40 - 118 °C [-40 - 244 °F]
Heat Recovery Leaving Water Temperature	R	A	Y	-40 - 118 °C [-40 - 244 °F]
Heat Setpoint	R/W	A	Y	50–120°F; Default=95 °F
Ice Setpoint	R/W	A	Y	15 – 35°F, Default=25°F
Liquid Line Refrigerant Pressure	R	A	Y	-155.76 - 155.76 MPA [-22,592 - 22,591 psi]
Liquid Line Refrigerant Temperature	R	A	Y	-40 - 118 °C [-40 - 244 °F]

BACnet Chiller Required Objects (Typical for each chiller)				
Object List	**Read/ Write**	**Object Type**	**Alarmable Y/N**	**Description (acceptable value range)**
Oil Feed Pressure	R	A	Y	-155.76 - 155.76 MPA [-22,592 - 22,591 psi]
Oil Feed Temperature	R	A	Y	-40 - 118 °C [-40 - 244 °F]
Oil Sump Pressure	R	A	Y	-155.76 - 155.76 MPA [-22,592 - 22,591 psi]
Oil Sump Temperature	R	A	Y	-40 - 118 °C [-40 - 244 °F]
Outdoor Air Temperature	R	A	Y	-40 - 118 °C [-40 - 244 °F]
Pump Select	R/W	MS	Y	0=Pump No. 1, 1=Pump No. 2; Default=0
Run Enabled	R	B	Y	0=OFF, 1=Run Allowed
Warning Alarms, Analog Input Object	R	A	Y	Alarm Index
Problem Alarms, Analog Input Object	R	A	Y	Alarm Index
Fault Alarms, Analog Input Object	R	A	Y	Alarm Index
Warning Alarms, Multi-state Input Object	R	MS	Y	Alarm Index and Alarm Text (30 characters max)
Problem Alarms, Multi-state Input Object	R	MS	Y	Alarm Index and Alarm Text (30 characters max)
Fault Alarms, Multi-state Input Object	R	MS	Y	Alarm Index and Alarm Text (30 characters max)
BACnet Clear Alarm	R	B	Y	0= Normal,1=Clear Alarm
Notes: A= analog, B=Binary, MS=multi-state				

2.8 Boiler BACnet Interface

A. The boiler shall be represented externally as a BACnet MS/TP, BACnet 8802-3 or BACnet/IP device on the Owner's network.

B. The boiler interface shall be a BACnet device with the capability of connecting to the BACnet-based DDC system via Ethernet:

1. The boiler interface shall reside on the Owner's network. The Owner will provide a network drop within 3 ft. of the boiler interface. The Contractor is responsible for providing the final network connection to the Owner's network. The Owner will provide IT personnel to assist with the commissioning of the network connection.
2. The boiler interface shall support use of a static IP address for remote access through the Owner's firewall. The boiler interface shall have an Annex J router to support BACnet/IP.

C. Provide the following objects at a minimum:

BACnet Boiler Required Objects (Typical for each boiler)				
Object List	**Read/ Write**	**Object Type**	**Alarmable Y/N**	**Description (acceptable value range)**
Current operating cycle	R	MS	Y	
Position of currently active fuel motor	R	A	Y	0% - 100%
Position gas motor	R	A	Y	0% - 100%
Position air motor	R	A	Y	0% - 100%
Actual rating	R	A	N	

BACnet Boiler Required Objects (Typical for each boiler)				
Object List	**Read/ Write**	**Object Type**	**Alarmable Y/N**	**Description (acceptable value range)**
Actual set value temperature	R/W	A	N	
Actual set value pressure	R/W	A	N	
Actual temperature	R	A	Y	
Actual pressure	R	A	Y	
Flame signal	R	B	Y	1=ON/0=OFF
Actual fuel throughput	R	A	Y	
O2 value	R	A	Y	
Volume unit for gas	R	A	Y	
Unit temperature	R	A	Y	
Unit pressure	R	A	Y	
Total start ups	R	A	Y	0 - 99,999
Operating hours counter	R/W	A	Y	0 - 99,999
Current fault: fault code	R	MS	Y	
Current fault: diagnostic code	R	MS	Y	
Current fault class	R	MS	Y	
Operating cycle in which the fault occurred	R	MS	N	
Supply air temperature	R	A	Y	
Flue gas temperature	R	A	Y	
Combustion efficiency	R	A	Y	0% - 100%
Pressure switch	W	B	Y	1=ON/0=OFF
Boiler thermostat	W	B	Y	1=ON/0=OFF
Fuel valves	R	B	Y	1=ON/0=OFF
Alarm	R	B	Y	1=ON/0=OFF
Ignition	R	B	Y	1=ON/0=OFF
Fan	R	B	Y	1=ON/0=OFF
Oil pump	R	B	Y	1=ON/0=OFF
Selection manual or automatic operation	R/W	B	Y	1=ON/0=OFF
Control Mode: local / remote	R/W	B	Y	1=ON/0=OFF
Operating type in remote mode	R	B	Y	1=ON/0=OFF
Day of the week	R/W	MS	N	
Date	R/W	MS	N	
Time	R/W	MS	N	
Operating hours	R/W	A	Y	0 - 99,999
Operating hours total	R/W	A	Y	0 - 99,999
Operating hours total	R	A	Y	0 - 99,999
Start ups gas, start counter	R/W	A	Y	0 - 99,999
Total start ups, start counter	R/W	A	Y	0 - 99,999
Total start ups, start counter	R	A	Y	0 - 99,999
Fuel volume gas	R	A	Y	0 - 99,999
Number of lockouts	R	A	Y	0 - 99,999
Lockout history (last 8 lockouts)	R	MS	Y	
Fault history (last 20 faults)	R	MS	Y	

Notes: A= analog, B=Binary, MS=multi-state

2.9 Power Meter BACnet Interface

A. The power meter shall be represented externally as a BACnet MS/TP, BACnet 8802-3 or BACnet/IP device on the Owner's network.

B. The meter shall be a BACnet device with the capability of connecting to the BACnet-based DDC system via Ethernet:

1. The meter shall reside on the Owner's network. The Owner will provide a network drop within 3 ft. of the meter. The Contractor is responsible for providing the final network connection to the Owner's network. The Owner will provide IT personnel to assist with the commissioning of the network connection.
2. The meter shall support use of a static IP address for remote access through the Owner's firewall. The meter shall have an Annex J router to support BACnet/IP or Modbus/IP.

C. It shall support the following BACnet Interoperability Building Blocks (BIBBs):

1. Data Sharing - ReadProperty - B (DS-RP-B)
2. Data Sharing - ReadPropertyMultiple - B (DS-RPM-B)
3. Data Sharing - WriteProperty - B (DS-WP-B)
4. Data Sharing - WritePropertyMultiple - B (DS-WPM-B)
5. Alarm and Event - Notification Internal - B (AE-N-I-B)
6. Alarm and Event - ACK - B (AE-ACK-B)
7. Alarm and Event - Information - B (AE-INFO-B)
8. Device Management - Dynamic Device Binding - B (DM-DDB-B)
9. Device Management - Dynamic Object Binding - B (DM-DOB-B)
10. Device Management - DeviceCommunicationControl - B (DM-DCC-B)
11. Device Management - TimeSynchronization - B (DM-TS-B)
12. Device Management - UTCTimeSynchronization - B (DM-UTC-B)
13. Device Management - ReinitializeDevice - B (DM-RD-B)
14. Device Management - Restart - B (DM-R-B)

D. Support the following objects. Support the required optional properties to comply with the Specification requirements and Sequence of Operations:

1. Analog Input
2. Analog Output
3. Analog Value
4. Binary Input
5. Binary Output
6. Binary Value
7. Device
8. Multi-state Input
9. Multi-state Output
10. Multi-state Value

E. Provide the following objects at a minimum:

F. Acceptance of Standard: Veris or approved equal.

BACnet Electrical Meter Required Objects (Typical for each meter)				
Object List	**Read/ Write**	**Object Type**	**Alarmable Y/N**	**Description (acceptable value range)**
kWh, Consumption	R	A	Y	Configurable
kW, Real power	R	A	Y	Configurable
kVAR, Reactive power	R	A	Y	Configurable
kVA, Apparent power	R	A	Y	Configurable
Power factor	R	A	Y	Configurable
Voltage, line to line	R	A	Y	Configurable
Voltage, line to neutral	R	A	Y	Configurable
Amps, Average current	R	A	Y	Configurable
kW, Real Power ØA	R	A	Y	Configurable
kW, Real Power ØB	R	A	Y	Configurable
kW, Real Power ØC	R	A	Y	Configurable
Power factor ØA	R	A	Y	Configurable
Power factor ØB	R	A	Y	Configurable
Power factor ØC	R	A	Y	Configurable
Voltage, ØA to ØB	R	A	Y	Configurable
Voltage, ØB to ØC	R	A	Y	Configurable
Voltage, ØA to ØC	R	A	Y	Configurable
Voltage, ØA to Neutral	R	A	Y	Configurable
Voltage, ØB to Neutral	R	A	Y	Configurable
Voltage, ØC to Neutral	R	A	Y	Configurable
Amps, Current ØA	R	A	Y	Configurable
Amps, Current ØB	R	A	Y	Configurable
Amps, Current ØC	R	A	Y	Configurable

Notes: A= analog, B=Binary, MS=multi-state

Installation, Fabrication and Construction

Refer to Standard 25 90 00.

END OF INTEGRATED AUTOMATION FACILITY CONTROLS STANDARD

Basis of Design

This standard contains certain design criteria and procedures applicable to integrated automation control sequences including integrated automation for HVAC and lighting. This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the PPD Project Manager.

Products, Materials and Equipment

No specific requirements.

Installation, Fabrication and Construction

3.1 General

A. Control strategies required to be implemented are outlined in this Standard. These strategies represent the minimum required to comply with the Contract obligations.

B. This Standard is organized to provide general guideline for start/stop, setpoint reset, alarming, etc. following the I/O Hardware Object List. In addition there are specific sequences for each piece of equipment that outline the requirements unique to that piece of equipment. Contractor shall use both guidelines to prepare programming.

C. Equipment to be controlled by the Control Sequences outlined is scheduled in the Graphics List/Points List.

D. The programming for the Control Sequences in each building shall be approved by the A/E before programming work commences. Programming shall be considered a Shop Drawing and submitted in accordance with provisions of Section 01 33 00.

E. The Control Sequences shall be implemented on a building basis and on an HVAC zone basis as required by the A/E.

F. Sequence shall be prepared in the latest version of Word™ and AutoCAD™ or Visio™. The final version shall be integrated into the OWS graphics and shall also be available as an E file per these Standards. Files shall be placed on a CD.

G. Require Contractor to provide all Control Sequences files with a complete Bill of Materials of all materials provided in the Work. Bill of Materials shall be prepared in the latest version of Word™ or Excel™ and AutoCAD™ or Visio™. The final version of the Bill of Materials shall be integrated into the OWS graphics and shall also be available on a CD.

3.2 Scheduled Stop/Start

A. All equipment listed in the Input/Output Hardware Object Lists submitted by the Contractor shall operate according to predefined schedules described in other parts of the Contract Documents.

1. These schedules shall be based on time-of-day, time-of-week, time-of-year, occupancy schedule, holiday schedule or any schedule the operator wishes to use.
2. The DDC system in each building shall be programmed to use one or more schedules for equipment operation.
3. All Air Handling Units (AHUs) shall have three daily schedules:

a. A day side or occupied schedule including a space pre-conditioning schedule described in the Control Sequences Sections
b. A night side or unoccupied schedule
c. An *"after hours"*, cleaning or *"coast"* schedule (e.g., lasting from 6 PM to 11 PM). The purpose is to provide ventilation air for maintenance or cleaning staff. In this schedule the AHUs shall run but the building shall be kept at a lower Operator-defined temperature (e.g., 65 °F) in winter and at a higher Operator-defined temperature in summer (e.g., 75 °F)
d. Allow the schedule to be set so the building can be in the occupied cycle 24 hours per day, seven days per week, when required.

4. It shall be possible to assign AHUs and different pieces of equipment to different schedules as described elsewhere.

B. The DHW and domestic water system shall have its own schedule that is initially programmed to follow the schedule selected by the A/E.

C. Provide alarm lockout software to prevent nuisance alarms.

1. On initial start-up of an AHU and other mechanical equipment, a timed lockout period shall be assigned to analog points to allow them to reach a stable condition before activating alarm comparison logic.
2. Lockout period shall be programmable on a per point basis from 0 to 90 minutes in one minute increments.
3. Provide a "soft lockout" to positively lock out alarms when equipment is turned OFF in commissioning mode or when a trace alarm is dependent on the condition of an associated point. Hard lockout points and lockout initiators shall be operator programmable at administration level. Add an expiration timer to ensure the lockout doesn't get left in place.

3.3 Optimum Start/Stop (Heating And Precool), Unoccupied Setback, Unoccupied Setup, Recirculation, Night Purge System Modes

A. Each AHU zone shall have unoccupied limits below or above which the AHU do not run. The unoccupied limits shall be as follows:

1. An occupied setback routine for "after hours" or "coast" periods (i.e. from 6pm to 11pm) shall be programmed. The AHU systems will continue to run but the space setpoints will be set back to 60 F heating and 75 F (or higher) cooling during the occupied setback schedule.
2. There shall be a low space temperature limit of 60 °F (or as assigned by administrator) as the minimum unoccupied space temperature.

a. The AHU shall not run except in extreme outdoor air conditions, where the terminal heat cannot maintain minimum setback or if low space temperatures due to infiltration occur.
b. The unoccupied cycle program shall be structured to heat the space with terminal heat first. The AHU shall run only when heating the space using the main radiation valve cannot be accomplished within a Operator defined period (e.g., one hour). Once the AHU is running to raise the minimum space temperature above the night setback temperature, it shall not shut off for a Operator defined period (e.g., one hour). During unoccupied cycle operation, outdoor air and relief air dampers shall remain closed. The AHU heat source shall modulate to heat the air as required.

3. There shall be a higher night setup temperature of 80 °F (or as assigned by operator) in the mechanical cooling season. If the maximum space setpoint exceeds 80 °F and the outside air temperature is above the purge conditions, the AHUs shall start to pre-cool the space prior

to occupancy. During unoccupied cycle operation, outdoor air and relief air dampers shall remain closed.

4. A high limit of 85 °F shall be assigned as the upper limit and 50 °F shall be assigned as the lower limit for unoccupied cycle operation for each AHU zone. The AHU shall run to preheat or precool the building as required. If these temperature extremes continue for a Operator defined period after the AHUs have tried to run to correct the problem, the DDC system shall trigger a critical alarm that is sent to the Front End.

B. Each AHU zone shall have an optimum start/stop or morning pre-conditioning strategy that is unique to each zone. The optimum start/stop program shall operate in heating, free cooling and mechanical cooling modes.

1. The optimum start/stop program during the heating season is called preheat. This program shall have the following features.

   a. Preheat shall have a window that will not allow preheat to start earlier than a Operator defined period (set initially to 120 minutes).
   b. The actual equipment start-up time prior to the scheduled occupancy shall be based on outdoor temperature, minimum zone space temperature and system response history to ensure that comfort conditions are reached not more than 30 minutes before the scheduled occupancy time.
   c. An algorithm shall be employed which automatically adjusts according to the previous 15 days actual start time and whether comfort conditions were reached prior to or after scheduled occupancy time. The program shall automatically assign longer lead times for weekend and holiday shutdowns.
   d. Once the AHU is running, it shall not cycle ON and OFF during preheat mode. It may be necessary to modulate the AHU heating coil valve open to preheat the space to about 2 °F below the space setpoint prior to the start of occupancy. At this point the heating coil valve shall modulate closed so that the space does not overshoot setpoint when the building occupants enter the building.
   e. Preheat shall also include modulating the VAV reheat coil valves to achieve the space temperature setpoint. The preheat program shall be structured to preheat the space with radiant heat first (e.g. for one hour). The AHU shall run only when preheating the space using the main radiation valve is inadequate.
   f. Preheat shall not run unless the zone is scheduled for occupancy that day.

2. The morning purge program shall apply to cooling cycle only. The program shall test both outdoor and space conditions listed below to determine if a purge cycle is beneficial.

   a. Under morning purge, the AHU shall start. The outdoor air dampers shall open to introduce 100% outdoor air and the relief air damper shall open fully. In systems with static pressure control of relief air, the outdoor air dampers shall open to introduce 100% outdoor air and the relief air damper shall modulate to the setpoint. Modulate return fan speed to track supply fan speed (offset to be determined by TAB). The VAV reheat coil and heat coil valves shall be closed and the heat recovery ventilation exhaust fan shall run continuously during purge. The VAV boxes shall open fully in purge mode. Purge shall start when all of the following conditions are met:

      1) Outdoor air is between 46 °F and a Operator defined maximum
      2) Maximum space temperature is above 68 °F in summer and 72 °F in the spring and the fall
      3) Outdoor air temperature is at least 5 °F below maximum space temperature
      4) Within four hours of scheduled occupancy period and not before 4 AM

   b. Purging shall stop when one or more of the following conditions are met:

1) Outdoor air is outside the 46 °F and a Operator defined maximum range
2) Minimum space temperature is below 66 °F in summer and 68 °F in the spring and the fall
3) Outdoor air temperature is less than 5 °F cooler than maximum space temperature
4) There shall be a Operator defined minimum run time

c. The same conditions shall apply during the occupied cycle and is referred to as free cooling in this Specification. VAV boxes shall operate per normal occupied mode.

3. The optimum start/stop program during the mechanical cooling season is called precool. This program shall operate in the following manner:

a. Precool shall have a window that will not allow precool to start earlier than a Operator defined period (set initially to 120 minutes).
b. There shall be a precool temperature setpoint of 73 °F (or as assigned by operator) in the mechanical cooling season. If the maximum zone space setpoint exceeds 73 FC and the outside air temperature is above the purge conditions defined above, the cooling shall be cycled to precool the space prior to occupancy. During this mode, the outdoor air and relief air dampers shall remain closed.
c. Once the AHU is running, it shall not cycle during precool. The DDC system will be programmed to cycle the cooling to precool the space to the space setpoint prior to the start of occupancy. Once the setpoint is reached, the cooling shall cycle so that the space does not overshoot temperature when the building occupants enter the building.
d. Precool shall not run unless the AHU zone is scheduled for occupancy that day.

C. Preheat, purge and precool shall not run on unoccupied days. The AHUs shall only run on unoccupied days when the space temperatures exceed the minimums and maximums specified elsewhere.

D. The administrator selected maximum zone space temperature inputs shall control cooling in any cycle. The minimum zone space temperature shall control heating in any cycle.

E. Dead bands shall be defined by the Administrator and programmed by Contractor.

3.4 Duty Sequencing

A. Duty sequencing shall permit multi-staged pieces of equipment or equipment groupings to be staged ON and OFF to level the amount of runtime to satisfy load requirements. It is used to determine which individual machine acts as the lead, and the sequencing pattern to run additional machines in order to satisfy load requirements.

3.5 Electrical Demand Limiting

A. A control function that enables management of peak electrical demand level by shedding predefined loads when the building/facility demand nears a preset maximum.

3.6 Control Variable Regulation

A. This is proportional, PI and PID control and applies to calculation of temperature setpoints. All setpoints shall utilize PID control.

B. Account for hysteresis, relaxation time, maximum and minimum limits of sensors and output devices in the programming.

C. All control loops shall maintain measured variable at setpoint within the tolerances listed in TABLE 1.

TABLE 1 : CONTROL STABILITY AND ACCURACY

Controlled Variable	Control Accuracy	Range of Medium
Air Pressure	±0.2” w.g. [±50 Pa]	0-6” w.g. [0-1.5 kPa]
	±0.01” w.g. [±3 Pa]	-0.1 to 0.1” w.g. [-25 to 25 Pa]
Airflow	±10% of full scale	
Space Temperature	±2.0 °F [±1.0 °C]	
Duct Temperature	±3 °F [±1.5 °C]	
Humidity	±5% RH	
Fluid Pressure	±1.5 psi [±10 kPa]	0-150 psi [0-1 MPa]
	±1.0” w.g. [±250 Pa]	0-50” w.g. [0-12.5 kPa] differential

3.7 Setpoint Reset

A. Provide a setpoint reset program to ensure that only the minimum amount of heating and cooling energy is supplied to satisfy zone temperature requirements. Provide individual programs to sense the worst case zone requirements and then to provide only the minimum temperature required to satisfy the zone.

1. The min/max zones and time variable driving the reset shall be adjustable from the graphics.
2. Zones can be removed from the reset calculation via a checkbox on the graphic

B. Setpoint reset shall be applicable to AHUs (single and multi-zone units of all types), chillers, boilers, valves, humidification and dehumidification and other equipment as necessary to meet the Control Sequences.

C. The following setpoints shall have a reset schedule that is acceptable to the A/E:

1. Supply air temperature
2. Mixed air temperature
3. Night setback temperature
4. Night setup temperature
5. Extreme high and low space temperature setpoints
6. Minimum damper position
7. Heat exchanger supply water temperature reset
8. Humidification setpoints
9. 3-way valve modulation setpoint (e.g., reheats)
10. 2-way valve modulation setpoint
11. Differential between analog output value and the feedback signal
12. Differential between the space temperature setpoints and the measured space value
13. Static pressure setpoints for supply, return and relief air
14. Other setpoints as required by the Control Sequences and I/O Hardware Object List

D. The setpoints shall all be controlled by an equation that has both mathematical and logical formulas. The following data shall be used in optimizing the setpoints to maintain comfortable conditions while minimizing utility costs.

1. Outdoor conditions

2. Space conditions
3. Time of day and utility rates
4. Occupancy schedules
5. Electrical demand consumption
6. Other setpoints
7. Historical data
8. Other data as required

E. Heating Loop supply water setpoint control calculations:

1. Heating Loop supply water temperature reset and duty sequencing of heat exchangers in buildings with more than one heat exchanger providing the same function shall be done using a combination of outside air temperatures and supply/return water temperature differential. Duty sequencing of multiple heat exchangers shall be based on declining return water temperature (a measure of load changes). Contractor shall provide an equation using these two variables to reset supply water temperature setpoints. The supply water temperature shall not fall below the Manufacturer's recommended minimum setpoint, which shall be obtained in writing by the Contractor from the Manufacturer.

F. The 2-way and 3-way valve setpoints that modulate water for heating purposes shall be based on outside and minimum space temperatures.

1. Provide unoccupied and occupied setpoints (outlined in other Sections of this Standard) for each valve under DDC control. Contractor shall provide an equation to reset the valves based on these setpoints. The setpoint parameters for the main radiation supply water loop shall also consider outdoor air conditions.

G. Provide a setpoint alarm for each setpoint that varies more than a Operator specified amount for a specified time.

1. Transmit an alarm as described elsewhere in this Standard.
2. The alarm format and parameters shall be approved by the A/E via the Shop Drawing process in Section 01 33 00.

H. Setpoints shall not be hard coded in programming.

3.8 Enthalpy Control

A. This control strategy monitors outside and return air temperature and humidity to determine when it is more energy efficient to use outside air for cooling than to use mechanical cooling. Based the enthalpy calculation, the outside air, return air and exhaust air dampers are modulated to achieve mixed air temperature setpoint when the outdoor air enthalpy is less than return air enthalpy by a preset offset. When outside air enthalpy is greater than return air enthalpy by the predetermined offset, the outdoor air dampers will return to minimum position and mechanical cooling is utilized.

3.9 Zero Energy Band

A. This control strategy monitors outside air temperature and space temperatures to decide when neither heating nor cooling are needed.

B. Provide zero energy band control over all equipment in the Input/Output Hardware Object Lists.

3.10 Soft Start/Ramp

A. This strategy ensures that equipment on start-up will not overshoot setpoint or unduly stress equipment. This strategy shall apply to modulation of AHU dampers and axial flow fan vanes, staggered start-up of AHUs, boilers and chillers at the beginning of the season or after a prolonged power outage.

B. Provide soft start/ramp control over all equipment in the Input/Output Hardware Object Lists.

3.11 Local Hardware Override

A. Local overrides have been provided in the Points List where needed. Local overrides shall place controlled equipment in the occupied cycle. All overrides specified shall be three-hour (adjustable) timers. Contractor may use momentary contact switch, with the override time in software, to start the occupied cycle instead of a mechanical timer.

3.12 Power-Fail Restart

A. When the DDC system is running on AC power, provide a flag that can be checked to show that the AC power is being supplied.

B. On a loss of AC power, transmit an alarm saying that there is a power failure and the controller(s) is running on UPS battery backup. Send alarm to the OWS, printer and pager. Include in the message that the Operator must reset the counter for all utility pulse meters as meter data would have been lost due to the power failure. Provide a feature on the graphic to reset the utility meter counter.

C. On a loss of AC power (either utility or emergency generator power), all mechanical equipment under DDC controlled shall be disabled. On a return of AC power, mechanical equipment operation shall be started in a controlled sequential manner to prevent a large power load on the electrical system. Sequence equipment in no larger than [_] kW groupings with at least 1½ minutes between each equipment group start-up. Provide the proposed start-up sequence as a submittal in the Shop Drawings, complete with calculations on equipment power loads.

1. Chiller plant start-up, whether Central Plant or stand alone buildings, shall not commence until the following conditions are satisfied:

   a. Actual cooling demand exists;

   b. Ambient air temperature is above ambient temperature lockout set point;

   c. Schedule whether lockout or setback, of any ambient or demand settings.

   The only exceptions would be for any chiller cooling data rooms, UPS rooms or any 24/7 applications which would not be comfort cooling of the occupied building space.

3.13 Run Times

A. Provide a run time report of each piece of equipment listed in the Points List. Provide runtime alarm as described elsewhere in the Specification.

B. The run time report shall provide a summary of all run times when requested by the Operator. Report format is specified elsewhere and shall be approved by the A/E.

C. Provide an alarm for all fans, pumps, motors, sump pumps etc. stating that the piece of equipment has run longer than the Operator-specified limit set for that piece of equipment. Set all runtime limits initially to 1,000 hours. Final runtime limits shall be approved by the A/E.

3.14 Alarm Sequencing And Transmission

A. This section outlines the general requirements for alarm sequencing and transmission. Each building shall have different alarm requirements based upon the equipment that is controlled by the DDC system. Alarm sequencing shall be approved by the A/E.

B. The following conditions shall generate alarms:

BAS Alarm Name	BAS Alarm Description	Latching/ Non Latching	Time Delay (adj)	Alarm Priority (Low, Med, High)
Space Temperature	During Occupied hours when space temperature deviates +/- 3°F (adj) from the cooling or heating setpoint an alarm on the BAS shall be generated.	Non-Latching	10 Minutes	Low
Mixed air low limit Alarm	Alarm the BAS if the mixed air temperature is below 38°F	Latching	1 min	High
Supply Air Temperature Alarm	When the unit is occupied, generate an alarm on the BAS if the supply air temperature deviates +/- 4°F (adj) from setpoint	Non-Latching	5 Min	Med
Low Limit Alarm	Alarm if a low limit trips	Latching	0 Min	High
Fire Alarm	When the general fire alarm input to the BAS is activated an alarm should be generated within the BAS	Non-Latching	0 Min	High
Heating or Chilled Water Supply Temp Alarm	When the heating or chilled water system is enable, generate an alarm on the BAS if the supply water temperature deviates +/- 3° (adj) from setpoint	Non-Latching	10 Min	Med
Chiller Failure Alarm	Alarm the BAS upon a chiller failure	Non-Latching	0 Min	High
DHW Supply	Alarm the BAS if DHW supply is -4°F from setpoint when the systems is	Non-	10 Min	Med

	occupied	Latching		
Fan Failure	Alarm the BAS if the fan is commanded to run and run proof does not activate	Non-Latching	5 Min	High
Sump Level Alarm	Alarm the BAS when high level is reached within sumps	Latching	0 Min	High
Refrigerant Alarm	Alarm the BAS when the refrigerant monitoring system alarms	Latching	0 Min	High

Smoke and Fire Damper Alarm	Alarm the BAS when the damper position is opposite of its command	Latching	0 Min	Med
General Alarm Points	Alarm the BAS when monitored equipment general alarm is activated	Non-Latching	0 Min	Med
Humidity Alarm	For systems with humidity control, during Occupied hours when space humidity deviates +/- 7% RH (adj) from the RH setpoint an alarm on the BAS shall be generated.	Non-Latching	10 Min	Med
Space Static Pressure Alarm	During Occupied hours when space static pressure deviates +/- .02"WC (adj) from the space static pressure setpoint an alarm on the BAS shall be generated.	Non-Latching	5 Min	Med
Duct Static Pressure	During Occupied hours when duct static pressure deviates +/- 10% (adj) from the duct static pressure setpoint an alarm on the BAS shall be generated.	Non-Latching	5 Min	Med
Filter Alarms	When the differential pressure across the filters exceeds the alarm limit (determined by filter supplier) generate an alarm on the BAS	Non-Latching	5 Min	Low
Pump Status Alarm	Alarm the BAS if the pump is commanded to run and run proof does not activate	Non-Latching	2 Min	High
Controller Failure Alarm	If a controller goes offline, generate an alarm on the BAS	Non-Latching	0 Min	High
Generator Run Alarm	Alarm the BAS when the generator starts	Non-Latching	0 Min	High
Generator Fail or General Alarm	If the generator is commanded to run and it doesn't or a general alarm is active on it create an alarm on the BAS	Non-Latching	0 Min	High
Fuel Oil Tank Level	If the oil tank reached it's lower limit, alarm the BAS	Non-Latching	0 Min	High
Fuel Oil pump alarm	Alarm the BAS if the pump is commanded to run and run proof does not activate	Non-Latching	0 Min	High

C. Additionally, the following conditions shall generate alarms. Consumption of water, steam and electricity (consumption and demand) overused defined limits
   a. Water consumption: Provide a water consumption alarm based on the weekday average and the weekend average for the past weekly period. The weekday and weekend averages are rolling averages that are recalculated every 24 hours. In addition, provide an alarm based on a daily fixed maximum. The A/E shall provide all alarm limits.
   b. Steam/condensate consumption: Provide a steam/condensate consumption alarm based on the weekday average and the weekend average for the past weekly period. The weekday and weekend averages are rolling averages that are recalculated every 24 hours. In addition, provide an alarm based on a daily fixed maximum. The A/E shall provide all alarm limits. The data used for alarming and the alarm setpoints shall be normalized for weather conditions.
   c. Electricity demand and consumption: Provide an electrical demand and consumption alarm based on the weekday average and the weekend average for the past weekly period. The weekday and weekend averages are rolling averages that are recalculated every 24 hours. In addition, provide an alarm based on a daily fixed maximum. The A/E shall provide all alarm limits. The data used for alarming and the alarm setpoints shall be normalized for weather conditions and corrected for power factor. In the case of demand, the alarm needs to be based on the demand reading parameters used by the electrical utility. A winter and a summer demand ceiling for each building is required.

D. Alarms shall be processed and transmitted as follows:

1. Flexible time delays defined by the A/E shall be used before generating an alarm to insure that it is a true alarm.
2. All alarms shall be automatically printed out on the local site alarm printer or per Owner's required destination.
3. All alarm messages shall show a time and date of occurrence.
4. Alarm messages shall be sent to the Front End, or other remote locations (as specified elsewhere).
5. DDC system shall send messages to different devices based on type of message, time of day, or if the previously transmitted message was not acknowledged as described elsewhere in the Specification.
6. All alarms defined as critical by the Owner shall be transmitted to the pager(s) at any time the alarm occurs. These alarms would also be sent to the Front End as critical alarms. Critical alarms include but are not necessarily restricted to:

   a. Chiller failure in summer (i.e., out of range chilled or condenser supply water temperature). DX equipment alarms
   b. Critical equipment alarms (e.g., oil tank level, oil leak, cathode protection, etc.)
   c. Low heating loop supply water temperature
   d. Primary heating circulating pump failures (including ground loop pumps) in winter and cooling circulating pump failures (including ground loop pumps) in summer
   e. High static pressure alarms
   f. Refrigerant gas alarm
   g. Sump/sewage alarm
   h. Space temperatures above 85 ºF and/or below 50 ºF
   i. Transformer room exhaust fan and high/low electrical room temperature
   j. Controller power out
   k. UPS alarm
   l. Generator set run/fail status
   m. Oil tank level alarm, oil leak alarm, oil pump status failure when there is an oil tank alarm
   n. Domestic water panel alarm
   o. Smoke damper status failures in a fire alarm condition
   p. Low and high heat exchanger loop water temperatures

E. Provide a “return to normal” message complete with time and date stamp for each alarm when the alarm condition returns to normal. Retain all alarms in the log file on the Front End.

F. All alarms shall be passed to the Front End or dialed out or reported for each piece of equipment.

G. All alarms shall be assigned an alarm type, class or level based on Table 7 – Alarm Classes. The alarm classification process shall be approved via the Shop Drawing process.

H. All alarm logic and messages shall be approved by the A/E via the Shop Drawing process.

3.15 Static Pressure Control

A. Contractor shall obtain the A/E’s approval for the location of sensors prior to installation. Contractor shall work with the TAB contractor to set static pressure settings.

B. Measure all static pressures relative to the single outside reference (the SOAP sensor) located approximately 5 m above the highest point of the tower.

3.16 Fail Safe Standards

A. All systems shall be wired/piped to be fail-safe in case the DDC system loses programming or power. Unless otherwise stated, the following conditions shall be considered fail-safe:

1. Hot water heating valves - OPEN
2. Cooling valves - CLOSED
3. DX cooling - OFF
4. Humidifier valves or humidification system (if shown on Points List) - CLOSED
5. Exhaust air dampers - CLOSED. Exhaust air dampers may have to fail OPEN on some buildings where the relief air damper forms part of the smoke removal system
6. Relief air dampers - CLOSED. Relief air dampers may have to fail OPEN on some buildings where the relief air damper forms part of the smoke removal system. See Control Sequences Sections for further details.
7. Outside air dampers - CLOSED
8. Return air dampers - OPEN
9. Reclaim pumps - OFF
10. Supply fan - OFF
11. Exhaust fan - OFF
12. Return fan - OFF

B. All heating valves for preheat coils in fresh air systems under DDC shall assume a 25% open position, and associated pumps and heating sources shall be enabled, during fan shut-down conditions when outdoor air temperature is 33 °C or less and when the mixed air temperature is 40 °F or less, to prevent false low temperature alarm signaling upon fan system start-up.

3.17 Integrated Automation For HVAC

A. General

1. The Contractor shall provide a fully operational DDC system complete with Operator Work Station, Portable Operator Terminal and other Level 0 devices to the A/E’s satisfaction, for the buildings or site referred to as the Place of the Work in the Project Manual.
2. Contract documents include all Architectural, Mechanical and Electrical documents prepared for the Work.

B. Project-Specific Interlocks: Contractor is responsible for providing the following interlocks.

Document all interlocks in the Shop Drawing Submissions.

1. Interlock the LLS and fan stop/start. Typical of all AHUs.
2. Interlock the DX and fan stop/start. Typical of all AHUs.
3. Interlock the humidifier and fan stop/start. Typical of all AHUs.

C. AHU 1 & 2

D. Non-DDC Control

END OF INTEGRATED AUTOMATION CONTROL SEQUENCES STANDARD

Basis of Design

This standard contains certain design criteria and procedures for electrical systems and applies to the general electrical requirements for all work of Division 26. This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the PPD Project Manager. Exceptions to this standard will be made only upon specific written approval using the "Facilities Design Guidelines and Construction Standards Exception Request" form included in these Design Guidelines and Construction Standards.

1.1 Design Criteria

A. The construction is permanent and electrical systems must be designed for an anticipated 30 to 40 year life span before major repairs or replacement is required.

B. Both primary (above 1000 volts) and secondary Capitol Campus electrical distribution systems are owned by the State. Include all required primary and secondary service revisions in the project scope.

C. Locate all electrical equipment in dedicated electrical rooms or closets. Unless otherwise exempted by code, provide two means of egress from electrical rooms containing equipment rated 1200 amperes or more and over 6 feet in width containing switching devices, control devices, relays, and similar equipment. Provide four-inch concrete housekeeping pads for transformers and all freestanding electrical equipment.

D. Provide sumps with duplex pump stations for below grade electrical rooms.

E. Where transformers are located indoors, provide mechanical ventilation to maintain ambient air temperature below 85 degrees F (30 degrees C).

F. Design the electrical system with the following features:

1. Maintain source impedance as low as possible with low impedance transformers and full capacity conductors and busses.
2. Provide separate raceways and circuits to lighting, motors and drives, and receptacle loads.
3. Electrical systems rated below 150 volts to ground shall not share same conduit with systems rated above 150 volts to ground. Provide separate conduit for power and low voltage wiring.
4. Provide separate neutral conductor for each 120 volt and 277 volt branch circuit.
5. Provide minimum 100% rated neutral conductors and neutral busses in feeders, switchboards and panelboards. Contractor shall coordinate termination lug sizes required with the equipment supplier prior to submitting for approval.
6. Provide insulated ground conductors.
7. Consider K-rated distribution transformers for significant non-linear loads.

G. As part of the as-built drawing package, provide updated one-line diagram of entire building electrical system, clearly identifying existing and proposed new equipment and connection. Color code the various electrical systems as follows:

Black	280Y/120V System
Yellow	480/277 Volt System
Purple	240/120Volt System
Red	Emergency Power
Green	UPS

H. Provide minimum 7 (seven) days advance notice of delivery, and access to staging area, for Owner inspection of the following equipment: Medium voltage switchgear; Transformers; Switchboards; Panelboards; Motor Control Centers; and Lighting Control Panels.

I. All electrical equipment shall be U.L. listed.

J. Overhead raceways shall be run perpendicular or parallel to the building structure. Raceways are not to run diagonal to the structure.

K. Conduit Support

1. Threaded rod and/or a trapeze supported with threaded rod shall be used to support overhead raceways. Above suspended ceilings, wires attached to the ceiling grid shall not be used for support.

2. #8 minimum solid wire may be used to support up to three (3) 3/4-inch diameter conduit and smaller above accessible ceiling spaces. Supports for power shall be identified with yellow paint.

3. Keep all installed material a minimum of 12 inches above ceiling grid to facilitate acoustical panel removal and access.

L. Outlet and Switch Heights unless otherwise directed:

1. The height above finished floor for all general use switches shall be 48 inches to top of the box.

2. The height above finished floor for all outlet receptacles shall be 20 inches to top of receptacle box.

M. Outlets: It is desired that electrical outlets be provided at regular intervals in hallways maximum 30 feet on center, adjacent to elevators, and in stairwells at each landing.

N. Spare Parts: Provide spare lamps, fluorescent ballasts, and LED drivers for spare parts. Provide 10% of quantity furnished, minimum of one but not to exceed five, for each type and size.

O. Arc Flash Label Requirements for Switchgear, Panelboards, and Motor Control Centers: ANSI Z535.4, NFPA 70E; Provide self adhesive vinyl labels consisting of arc flash information based on an approved hazard study. Labels shall include Flash Category, Arc Flash Rating (cal/cm^2), Protection Boundary, and required Personal Protection Equipment (PPE).

1.2 Power Outages

- Refer to Guide Specifications Section 01 50 00, Temporary Facilities & Controls..

1.3 Demolition

A. DES shall have first right of refusal for all removed electrical equipment and materials.

B. All disconnected wiring, cable, including low voltage power limited, telephone, and computer wiring shall be completely removed from conduits, wireways, and underfloor raceways, except leave one identified wire in conduit run as a future pull wire.

C. Concealed conduit may be left in place if not damaged. Remove exposed conduit.

1.4 Grounding and Bonding

A. Grounding shall be in accordance with NEC Article 250 and related sections of other NEC Articles. Soares book on grounding may be used for additional guidance.

B. The electrical service grounding electrode system for new construction shall include a concrete encase electrode per NEC 250.52(A)(3).

1.5 Underfloor Wiring Systems

A. Unused wiring shall be removed from existing underfloor raceway systems as part of remodel or tenant improvement work.

B. Receptacles shall be installed with separate wiring taps from the nearest underfloor raceway junction box. Do not daisy chain wiring between receptacles.

C. Spare Parts: Provide spare underfloor raceway system service fittings and insert mud caps, 10% of quantity furnished, minimum one but not to exceed five, for each type. Deliver spare parts to Maintenance Operations.

D. Flat Conductor Cable (FCC) shall not be used.

E. Carpet squares or other approved covering shall be used to cover access openings. Floor coverings shall not be run continuous over access openings.

1.6 Boxes

A. Branch circuit outlet and junction boxes in dry, concealed locations shall be zinc-coated steel with steel mud rings and covers. Mark each box and cover with the panelboard and branch circuit number.

B. Boxes in exposed and wet locations shall be cast metal with gasketed, weatherproof covers.

C. Color code boxes as follows:

1. Fire Alarm Box: Red.
2. Emergency Power Box: Orange.

1.7 Power Generation

A. Emergency power systems shall be provided to supply life/safety loads (egress and emergency exit lighting, fire alarm systems, smoke fans, and elevators used for building egress.) Standby power systems shall be provided to supply Owner-specified optional loads (e.g. computers, HVAC, etc.), and shall be separate from the emergency power system. HVAC systems shall be capable of being load shed from its standby power system.

B. Emergency sources shall be diesel engine generators. Standby sources may be engine generators or fuel cells. A common generator may serve both emergency and standby power systems

C. Engine generator and accessories shall be located indoors in a clean, dry area accessible for maintenance and service. Provide adequate measures to isolate engine vibration and sound from occupied building areas.

D. Where a new generator is provided, or loads are added to an existing generator, load bank testing is to be included in the bid documents. Confirm with Owner if they have a portable load bank, or the Contractor is to provide, The design shall provide clearances as needed for testing.

E. All transfer switches shall be automatic.

1.8 Phase Monitoring

- Provide phase loss / phase unbalance / phase reversal protection for 3 phase pumps, motors, and compressors.

1.9 Lightning Arresters and Surge Protection Devices

A. Provide arresters in medium voltage switchgear.

B. Provide surge protective device (SPD) in service equipment and in distribution panels which serve electronic ballasts, LED drivers, and computers.

1.10 Primary Load Interrupters

A. Medium voltage switchgear shall be equipped with a viewing window to provide visible break of all phases.

B. Provisions shall be made for grounding disconnected portions of the medium voltage system.

1.11 Panelboards

A. Locate panelboards in electrical rooms or closets to allow for maintenance and for future changes. Leave space in enclosure end walls for future conduit additions.

B. Provide full-rated feeder to match panelboard bus capacity. (E.G. 4/0 AWG feeder to serve 225A panelboard.)

C. Identify circuit breaker mounting positions with industry standard Odd (left) - Even (right) system. Multi-pole circuit breakers shall be identified by the positions they occupy (E.G. 38/40/42). Newly installed panels shall have a minimum of 20% spare breaker space for future use.

D. Provide typewritten or computer printed panel schedules with specific room and equipment identification for each circuit breaker. Place on inside cover of panel.

1.12 Busway

A. Busway shall be copper with separate 100 percent rated neutral buss and 50% housing and 50% internal ground busses. Voltage rating shall be 600 volts ac, regardless of whether application voltage is 208 or 480 volts.

B. Disconnect switch covers shall open a full 90 degrees or be removable for service. Disconnects shall be provided with phenolic labels stating the name(s) of equipment served.

1.13 Lighting

A. Lighting controls shall be supplied with Horton (G.E.) “Complete” model control panels Lighting controls shall comply with Washington State Energy Code. Each zone in an open office area (maximum of 2200 square feet) shall have its own bypass switch located within its area. If multiple after hours access approaches lead into a lighting zone, bypass switches shall be installed at each access point.

B. Emergency egress and exit lighting shall be supplied with separate emergency branch circuits from an engine generator and its distribution system. Identify egress light fixtures with an orange label with black letter “EMERGENCY” visible from the floor. Identify emergency branch circuits conduit and junction boxes by applying similar labels at ten foot intervals.

1. All exit sign and emergency egress lighting shall be provided and installed in accordance with and meet the minimum standards of the International Building Code, ADA, and U.L. 924.
2. Exit sign and emergency egress lighting shall be connected to the building emergency lighting electrical panel, unless unit batteries are otherwise approved by DES
3. Whenever an area is renovated and existing exit lighting is proposed to be re-used, exit lights shall be retrofit or replaced.
4. Exit lights shall be LED. Confirm with DES style and type.

C. Where engine generator emergency power is not available, provide Lithonia or DES approved unit battery emergency egress and exit lighting. Confirm with GA DES style and type.

D. Provide emergency lighting in all electrical, mechanical, penthouse, generator rooms, and restrooms with more than one toilet..

E. Locate lighting fixtures such that maintenance can be accomplished with standard step and extension ladders.

1.14 Closeout Submittals

All sub-consultants to the prime consultant are not to include their own requirements regarding close-out submittals. Division 26 specification sections regarding closeout submittals including project record documents, operation and maintenance manuals, warranties, bonds, etc., are only to reference seeing Section 01 78 00. Extra stock is to be identified in respective Division 26 sections. If the consultant has specific criteria they need beyond Section 01 78 00, they can specifically identify it at the same time as being in addition to requirements of Section 01 78 00.

Products, Materials and Equipment

2.1 Wiring

A. All wiring shall be stranded copper only, no solid wire or aluminum wire. Minimum size 12 AWG for power circuits, 14 AWG for controls.

B. Insulation shall be Type THHN/THWN for branch circuits. Feeder conductor insulation shall be THHN/THWN or XHHW-2.

C. Identify wiring in each accessible location with panelboard and branch circuit number, and color code each phase according to the following table:

	Voltage		
Phase	**480Y/277V**	**208Y/120V**	**208Y/120V Computer Branch Circuits**
A	Brown	Black	Black w/ Yellow Stripe
B	Orange	Red	Red w/ Yellow Stripe
C	Yellow	Blue	Blue w/ Yellow Stripe
Neutral	Gray	White	White w/ Yellow Stripe
Ground	Green	Green	Green w/ Yellow Stripe

D. Provide a separate neutral conductor for each single phase branch circuit.

E. Provide dedicated branch circuits to receptacle outlet serving appliances rated greater than 8 amps.

F. MC cabling is not permitted for branch circuits and feeders

2.2 Conduit

A. PVC conduit (Schedule 40 or better) shall only be used underground. Elbows and vertical conduit risers shall be Galvanized Rigid steel Conduit (GRC).

B. GRC conduit shall be used above ground outdoors and in areas subject to damage from vehicles or equipment.

C. EMT conduit shall be used indoors where not subject to damage. Minimum size shall be 3/4". Couplings and connectors shall be steel compression-type only. Zinc-die-cast, malleable, set-screw, and indent couplings and connectors shall not be used.

2.3 Wiring Devices

A. General: Wiring devices shall be premium specification grade with molded nylon body and cover, locked-in metal strap, heavy duty power contacts and large head terminal screws able to accept up to 10 AWG conductors. Color shall be ivory for utility circuits and orange with isolated ground for computer circuits. Stainless steel cover plates or cover plates matching building décor shall be used.

B. Switches shall be rated 20 ampere, 120/277 volts ac, quiet operation.

C. Receptacles shall be Leviton or DES approved, rated 20 ampere, 125 volt ac. Confirm with DES style and type.

D. Label receptacles, switches, and furniture whips with panel and circuit number. Use labeler to produce small letters and numbers. Use black letters with a clear background for general circuits, red letters with clear background for computer circuits.

2.4 Motors and Motor Controls

A. New and replacement motors shall be premium efficiency with copper windings and 1.15 service factors. Aluminum windings shall not be used. Motors shall have sealed bearings.

B. Motor starters shall be provided for controlling all 3-phase motors and all single phase motors rated larger the ½ HP.

C. Motor starters shall be installed in a Motor Control Center for three or more motors located within 50 feet of each other. . Minimum starter size shall be size one. Maximum starter control voltage shall be 120 volts ac. Starters shall be equipped with motor circuit protectors with adjustable magnetic-only trip.

D. Provide indicating lights and Hand-Off-Automatic switch for each motor starter. Provide metering package (current, etc.) at each motor starter serving a 5 HP or larger motor. Provide phase protection for 3 phase motors.

E. Motors 50 HP and larger shall be equipped with a solid state soft start or Variable Speed Drive (VSD) as appropriate to the application. A complete spare parts package and spare fuses for each type and size of VSD or soft starter shall be provided to Maintenance Operations.

F. Motor fuses shall be class RK5 time delay type.

2.5 Power Generation

A. Replacement engine generator systems shall match existing. Engine generator systems for new building construction shall be manufactured by Cummins/Onan (no exceptions). All electrical and control components shall be supplied with the generator.

1. Transfer switches, regardless of generator manufacturer, shall be Cummins/Onan.

B. Provide critical grade silencer and Schedule 10 stainless steel exhaust system. Wrap exhaust and silencer with industrial grade thermal insulation and lagging with grommets, hooks and wire lacing. Locate exhaust outlet a sufficient distance from building to avoid infiltration and induction into HVAC system.

C. Above ground or underground fuel storage tanks shall comply with all U.S.T. regulations for installation and monitoring. Tank shall be sized for 72 hours generator run time at full load fuel consumption rate. Provide dial type fuel gauge and calibrated dip stick.

2.6 Transformers

A. Transformers shall be UL listed, ANSI/NEMA ST20 dry type conforming to NEMA TP-1 Class I efficiency requirements.

B. Insulation system shall be 220 degrees C with 150 degrees C temperature rise (above 40 degrees C ambient) at rated KVA.

C. Windings shall be copper only.

D. Enclosure temperature shall not exceed 35 degrees C above ambient.

E. Provide winding taps per ANSI/NEMA ST 20.

F. Sound levels shall not exceed 35 dB where located adjacent to normally occupied spaces.

G. Basic Impulse Level of windings shall be 10 kV.

H. Core and Coil assembly shall be grounded to enclosure by means of a visible flexible copper strap. Isolate core and coil from enclosure using vibration-absorbing mounts.

I. Enclosure shall be constructed of manufacturer standard heavy gauge steel with ANSI grey enamel finish. Enclosure shall be ventilated and rodent-resistant, suitable for anchoring to a concrete pad. Include lifting eyes or brackets bolted to the enclosure sides.

J. Engraved metal nameplate with transformer ratings and connection diagrams shall be provided.

K. K-rated transformers shall be used where applicable for non-linear loads.

2.7 Panelboards

A. Panelboards shall be commercial quality circuit breaker type in accordance with NEMA PBI.

B. Bus shall be copper only. Provide separate insulated copper neutral and ground busses; size neutrals to 100% rating Contractor shall coordinate termination lug sizes to meet feeder requirements with the equipment supplier prior to submitting for approval.

C. Molded case circuit breakers shall be bolt-on for all 208Y/120V and 480Y/277V applications.

D. Panelboards shall be Square D, Cutler Hammer, Siemens, or GE. Lighting panelboards shall be compatible with DES's control system.

1. Finish shall be gray enamel paint over galvanized sheet metal. Cover shall have concealed hardware and locking door.

2. Provide hinged door-in-door construction for all panelboards.

2.8 Switchboards

A. Switchboards shall be factory-assembled, dead front distribution switchboards in accordance with NEMA PB 2, U.L. labeled and listed, suitable for use as service entrance (SUSE).

B. Voltage rating shall be 600 volts ac, regardless of whether application voltage is 208 or 480 volts.

C. Line and load terminations shall be accessible from the front. Rear access shall not be required.

D. Bus shall be copper only, sized in accordance with NEMA PB2. Bus connections shall be welded or bolted with Belleville washers, accessible from the front for maintenance. Provide separate 100% rated neutral and ground busses.

E. Main circuit breakers shall be molded case, individually mounted. Circuit breakers rated 1000 amperes and larger for 480-volt systems shall be equipped with ground fault protection. If electronic trip units are used, provide test set and software to Owner at project completion.

F. Feeder circuit breakers shall be molded case, group mounted.

G. Switchboards shall be equipped with multi-function electronic meters, such as Square D Power Logic, including communication module to interface directly to a local and global energy management system.

2.09 Lighting

A. General lighting fixtures shall be premium specification grade to provide long service life and high efficiency.

B. Fluorescent Lighting: Fixtures shall be provided with a lens suitable for the application and existing building. Ballasts shall be electronic, high-power factor and listed on the Lighting Design Lab's approved ballast list. Lamps shall be four-foot T8, 3500 Kelvin color temperature, minimum 82 color rendering index. Fixtures shall allow one lamp to be removed without affecting the other lamps in that fixture. Specialty lamps beyond normal equipment stocked by DES shall have the approval of the Electrical Technical Superintendent. Fluorescent light fixtures utilizing compact fluorescent, T12, or T5 lamps are not permitted.

C. LED Lighting: LED fixtures shall be provided for new construction. Interior fixtures shall have 3500K color temperature, 80 CRI minimum, listed for 25 degree C ambient operation, integral surge protection, rated L70 at 50,000 hours or better per IESNA LM-80, with 5-year minimum manufacturer warranty. Provide LED fixtures with dimmable drivers suitable for 0–10-volt control. Outdoor fixtures shall have 4000K color temperature, 70 CRI minimum, listed for -20 degree C to 40 degree C ambient or better operation, integral surge protection, rated L70 at 50,000 hours or better per IESNA LM-80, with 5-year minimum manufacturer warranty. Outdoor fixtures in wet locations shall be IP65 rated or better.

Installation, Fabrication and Construction

- Refer to requirements specified in individual Electrical Sections.

END OF GENERAL ELECTRICAL REQUIREMENTS STANDARD

Basis of Design

This standard contains certain design criteria and procedures for variable frequency drives. This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the PPD Project Manager. Exceptions to this standard will be made only upon specific written approval using the "Facilities Design Guidelines and Construction Standards Exception Request" form included in these Design Guidelines and Construction Standards.

1.1 Design Criteria

- Variable frequency drives shall be compatible with the building integrated automation system. Coordinate requirements with 25 00 00 series standards.
- Provide on site operation and maintenance training for (2) identical 4-hour sessions.
- A representative located within 60 miles of the installed location shall service the VFD.
- Qualified technical support shall be available on site within 24 hours of request.
- During the warranty period, replacement parts shall be available on site within 48 hours of initial request for service.

Products, Materials and Equipment

A. The adjustable speed drive and all equipment shall be UL listed.

1. All VFD's shall a have integral disconnecting means with lockout /tagout feature and manual by-pass in case of failure or maintenance.
2. All VFD's shall use one type of common user interface.
3. Provide complete programming software for use in a laptop PC so that changes to the VFD program can be made by directly connecting the laptop to the VFD.
4. Primary control of ON/OFF, speed and failure annunciation shall be through a hardware connection to the environmental control system. Provide (1) a dry contact output enunciating VFD failure, (2) an ON/OFF input which responds to a remote dry contact closure and (3) a speed control input which responds to a remote 4-20 milliamp and 0-10 VDC signal.
5. The environmental control system will be used to diagnose VFD conditions and to reconfigure resident VFD software. Provide all hardware, software, and connecting cables as necessary to communicate and exchange information with the existing environmental control system. The exchanged information shall include motor speed, electric load in KW, Volts, Amps, VFD fault description, Hand/Off/Auto/Bypass mode and network point address; control system override shall only tie into the 'Auto' mode. It shall be possible to modify the VFD settings including acceleration and deceleration time and skip frequency ranges using the environmental control system operator workstation.
6. Fire alarm interface
    a. Provide an override input so that opening dry contacts will absolutely stop the motor under any operating conditions.
    b. Provide an override input so that closing dry contacts will cause the motor to operate at a speed predetermined by VFD programming.
    c. Provide a summary alarm dry contact, for connection to the fire alarm system, indicating that the VFD is not operable.
7. The VFD shall not create a voltage rate of change greater than 1000 volts/microsecond nor a peak voltage greater than 1000 volts to ground at the motor when the motor is connected to the VFD by less than 60 feet of wire.

8. The carrier frequency of pulse width modulated VFD's shall be variable and adjusted so motor noise resulting from the VFD, measured at 3 feet from the motor, is less than 3 db. greater than motor noise when operating across the line. Carrier frequency adjustment shall be available such that the average carrier frequency can be maintained at less than 9 kHz while meeting acoustical noise requirements.
9. Configure the VFD so, when turned ON, it will accommodate for motor rotation in either direction and drive the motor to Control set point.

Installation, Fabrication and Construction

A. The VFD shall be sized to continually operate at greater or equal to 105% of the nameplate load of the motor to which it is applied.

B. Installation and field wiring
   1. Mounting and control wiring shall be mounted so power wires connecting the VFD to the motor are less than 60 feet in length.
   2. The VFD shall be mounted to rigid support channel and/ or building structures.
   3. Wiring shall be in accordance with the NEC and the Division of Capital Facilities boiler plate.

C. Factory Start-up and Testing
   1. Start up and testing shall be provided at the installation site by the manufacturer or other agent acceptable by Maintenance Operations. The appropriate person or persons from Maintenance Operations shall witness the final operational demonstration.
   2. Verify all installation connections and controls.
   3. Field adjust all safety controls.
   4. Field adjust VFD parameters as follows.
      a. Acceleration time- 60 seconds for fans and 10 seconds for pumps.
      b. Deceleration time-65 seconds for fans and 20 seconds for pumps.
      c. Minimum fan speed- 12 Hz for supply fans and 6 Hz for return/exhaust fans.
      d. Minimum pump speed – as stated by pump manufacturer or 450 RPM as default.
      e. Program the VFD so that, upon reapplication of power after a power failure, the VFD shall automatically reapply power and drive the motor to the control set point.
      f. Program the VFD so that no more than 3 automatic restart attempts will be made within one hour after a shutdown due to input power problems.
      g. Adjust the carrier frequency to provide optimum efficiency while not increasing motor noise more than 3 dB measured at 3 feet from the motor.

END OF VARIABLE FREQUENCY DRIVES STANDARD

Basis of Design

This standard contains certain design criteria and procedures for the installation and maintenance of data, telecommunications, and signaling cable on the Capitol Campus. This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the PPD Project Manager. Exceptions to this standard will be made only upon specific written approval using the "Facilities Design Guidelines and Construction Standards Exception Request" form included in these Design Guidelines and Construction Standards.

1.1 Design Criteria

A. All cable installations shall conform to these standards. All wiring and cabling for data and telecommunications shall be installed in accordance with Computing and Telecommunications Architecture Standards – Building Wiring as published by the Office of Chief Information Officer (OCIO) which incorporates by reference various applicable standards as prepared by the Electronic Industries Alliance (EIA) and the Telecommunications Industry Association (TIA), in addition to the currently adopted National Electric Code, Labor & Industries regulations, FCC regulations, and other pertinent and applicable regulations. Prior approval for installation is required.

B. Once installed, conduit or raceways shall become part of the campus infrastructure and will be managed by Maintenance Operations (MO). The owner of the cable shall be totally responsible for the maintenance, repair and removal of the cabling system. Any cabling taken out of service shall be removed from the conduit. Cable shall not be tie wrapped to the outside of conduit for support.

C. All cabling of length greater than 50 feet shall be identified at or close to its mid-way point, and at all cable entrance and exit points. Labeling shall identify 1) cable owner and 2) destination.

D. Cabling system owner shall be responsible for any FCC testing and reporting requirements.

E. All telecommunications installations shall be planned to complement the Consolidated Technology Services Agency (CTS) long-range plan for cabling on the campus. Installations shall be reviewed and approved by CTS.

F. As-builts for cabling installations shall be submitted to Maintenance Operations, detailing the cable route, location of cabling within duct bank, labeling legend, and the name and phone number of person(s) to assist MO in utility locations. The as-built documents shall be submitted as an AutoCAD file on electronic media as directed. All costs of the submittals shall be borne by the installer/tenant involved in the project.

1.2 Standards for Cabling External to Buildings

A. All cabling shall be installed in the existing campus duct bank.

B. The first user to occupy an empty duct shall fill the conduit with inner duct prior to the installation of any cabling. Inner duct sizing shall be coordinated with MO.

C. No cable shall be installed within the campus steam tunnels without prior express written permission from MO.

D. If permission is granted to install cable within a steam tunnel, cable shall be installed within an approved raceway. Raceway shall be securely fastened to the tunnel wall or ceiling as approved by MO.

1.3 Standards for Cabling Internal to Buildings

A. All exposed cabling shall be installed in EMT conduit. Installation shall comply with NEC requirements and voice data vendor or OCIO (TIA/EIA) standards for conduit systems, except all couplings and connectors shall be steel compression-type only. Zinc-diecast, malleable, set-screw, and indent couplings and connectors shall not be used.

B. Where physical protection is not required, plenum rated open cabling may be installed.

C. Where inner duct or open cabling is installed, it shall be run with the building lines a minimum of twelve inches above accessible ceilings. Inner duct shall be supported every 3 feet, and open cable shall be supported every 4.5 feet using bridal ring or equivalent type hooks if other means, such as cable trays. Securing to ceiling panels or suspended ceiling grid shall not be permitted.

D. Where cabling is run under raised floor (except computer rooms) it shall be run with the building lines to ensure continuity with existing voice/data cabling.

E. Where cabling is run in floor raceway systems (e.g., Walker Duct) special attention shall be given to the physical protection of the cable at the hand hole points and at the entry and exit points.

Products, Materials and Equipment

- Refer to requirements specified in individual Division 27 Communications Sections.

Installation, Fabrication and Construction

- Refer to requirements specified in individual Division 27 Communications Sections.

END OF STRUCTURED CABLING STANDARD

Basis of Design

This standard contains certain design criteria and procedures for the installation and maintenance of electronic safety and security systems cabling on the Capitol Campus. This information is intended to help the project design team during the design process as well as the Capitol Security & Visitor Services (CSVS) and Building and Grounds maintenance staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the FPS Project Manager. Exceptions to this standard will be made only upon specific written approval using the "Facilities Design Guidelines and Construction Standards Exception Request" form included in these Design Guidelines and Construction Standards.

1.1 Design Criteria

A. All cable installations shall conform to these standards. All wiring and cabling for access control, intrusion detection, CCTV/VMS and fire detection and alarm systems shall be installed in accordance with currently adopted National Electric Code, Labor & Industries regulations, National Fire Protection Association or International Fire Code, or Locality have jurisdiction, and system product manufacturer requirements. Prior approval for installation is required.

B. DES goals of sustainability, life-cycle costs, maintainability, serviceability, high performance, quality equipment, and efficient inventory must be maintained. First costs may be impacted slightly as a result, but a better product will follow.

B. Separate conduit runs shall be installed for access control, intrusion detection, CCTV/VMS and fire detection and alarm systems, etc. Additional conduit runs for future expansion shall be provided to each floor in number and of sizes as to be determined by A/E design team.

C. Once installed, conduit or raceways shall become part of the campus infrastructure and will be managed by CSVS and Maintenance Operations. The owner of the cable shall be totally responsible for the maintenance, repair and removal of the cabling system. Any cabling taken out of service shall be removed from the conduit. Cable shall not be tie wrapped to the outside of conduit for support.

D. All cabling of length greater than 50 feet shall be identified at or close to its mid-way point, and at all cable entrance and exit points. Labeling shall identify 1) cable owner and 2) destination.

E. Cabling system owner shall be responsible for any FCC testing and reporting requirements.

F. All Telecommunication installations shall be planned to complement the DES Enterprise Technology Solutions, Capitol Security & Visitor Services group and Consolidated Technology Services (CTS) long-range plans for cabling on the campus. Installations shall be reviewed and approved by DES ETS, DES CSVS and CTS.

G. As-built for cabling installations shall be submitted to the DES Capitol Security Assistant Director or designee within CSVS and Maintenance Operations (MO), detailing the cable route, location of cabling within duct bank, labeling legend, and the name and phone number of person(s) to assist MO in utility locations. The as-built documents shall be submitted as an AutoCAD file on electronic media as directed. All costs of the submittals shall be borne by the installer/tenant involved in the project.

H. All installed cabling shall be properly terminated, tested and certified.

1.2 Standards for Cabling External to Buildings

A. All cabling shall be installed in the existing campus duct bank.

B. The first user to occupy an empty duct shall fill the conduit with inner duct prior to the installation of any cabling. Inner duct sizing shall be coordinated with MO.

C. No cable shall be installed within the campus steam tunnels without prior express written permission from MO.

D. If permission is granted to install cable within a steam tunnel, cable shall be installed within an approved raceway. Raceway shall be securely fastened to the tunnel wall or ceiling as approved by MO.

1.3 Standards for Cabling Internal to Buildings

A. All exposed cabling shall be installed in EMT conduit of minimum 1 inch diameter size or size as directed. Installation shall comply with NEC requirements except all couplings and connectors shall be steel compression-type only. Zinc-diecast, malleable, set-screw, and indenter couplings and connectors shall not be used.

B. Plenum rated open cable may be installed for access control, duress, intrusion detection and CCTV/VMS where physical protection is not required.

C. Where inner open cabling is installed, it shall be supported every 4.5 feet using bridal ring or equivalent type hooks. Securing to ceiling panels or suspended ceiling grid shall not be permitted.

D. Where cabling is run in floor raceway systems (e.g., Walker Duct) special attention shall be given to the physical protection of the cable at the hand-hole points and at the entry and exit points.

E. Where cabling is terminated in buildings, all cables must return to network enclosures that are lockable. This shall be coordinated with CSVS, ETS and the building owner/tenant.

Products, Materials and Equipment

- Refer to requirements specified in individual Division 28 Electronic Safety and Security Sections.

Installation, Fabrication and Construction

- Refer to requirements specified in individual Division 28 Electronic Safety and Security Sections.

END OF ELECTRONIC SAFETY & SECURITY CABLING STANDARD

Basis of Design

This standard contains certain design criteria and procedures for the selection and installation of electronic access control for Capitol Campus facilities or those facilities connecting to the campus system. This information is intended to help the project design team during the design process as well as the Capitol Security & Visitor Services staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the FPS Project Manager. Exceptions to this standard will be made only upon specific written approval using the "Facilities Design Guidelines and Construction Standards Exception Request" form included in these Design Guidelines and Construction Standards. All deviations must be approved by the DES Capitol Security Assistant Director or designee.

1.1 Design Criteria

A. DES goals of sustainability, life-cycle costs, maintainability, serviceability, high performance, quality equipment, and efficient campus inventory must be maintained. First costs may be impacted slightly as a result, but a better product will follow.

B. Access control installations for Capitol Campus facilities or those facilities connecting the campus system must use Mercury Security open supervised device protocol (OSDP) security hardware and HID Global Multiclass SE card readers that are configured for HID iClass Seos card types.

1. System designs should include, at a minimum, one Mercury Security Ethernet connected door controller per floor or wing with downstream Mercury Security door controllers.
2. All access control hardware devices shall be located in the same, secured location.
3. All proposed designs shall be review by the DES Capitol Security Assistant Director or designee before installation.

C. Access ID Badge Type:

1. HID iClass Seos Corporate 1000 card stock.
2. If project requires card ordering, DES Capitol Security & Visitor Services will coordinate the procurement of these resources.

D. DES to provide all network switches.

E. Access Control Software:

1. All electronic access control equipment will connect to the campus Genetec Security Center platform with Synergis module.

Products, Materials and Equipment

2.1 Access Control Hardware Products

A. Access Control Hardware products:

1. All access control hardware and wire will be Owner Provided Equipment (OPE).
2. The appropriate product models are to be approved by the DES Capitol Security Assistant Director or designee during project design and specification.
3. Mercury Security MR16in multi-device interface panel for OEMs providing the ability to monitor high concentrations of inputs together with a low requirement for output control.

Mercury Security MR16out multi-device interface panel for OEMs providing the ability to control high concentrations of outputs.

Locations	Equipment Type	Required Manufacturer/Model	Notes
All building exteriors, critical infrastructure areas, conference rooms with A/V, and offices	Card reader	HID RP40 multiCLASS SE (in locations where space is limited - HID RP10 multiCLASS SE is allowed) (OPE)	
Parking lots, garages, and secured roadways	Card reader for vehicle access control (parking lots/garages)	Post mounted HID long-range reader that supports HID SEOS badge technology (OPE)	To be installed at each parking entry point (garage or surface lot).
Building MDF's, IDF's, electrical closets	Controller secured enclosures (combined enclosure for controllers and power supply)	Altronix Trove Enclosure (OPE)	Requires coordination and specification with CSVS. Requires room for expansion on backplane. If enclosure is full, require additional Altronix Trove enclosure with power supply located adjacent to full enclosure. Enclosure/power supply shall be connected to building UPS and Generator system.
	Access control system appliance	Genetec Synergis Cloud Link (OPE)	Coordination required with CSVS on install location and configuration. Requires 1 appliance per 150 card readers.
Building MDF's, IDF's, electrical closets	Controller	Genetec Mercury EP-1502 or latest version (OPE)	Must come with pre-installed Genetec license. Connected MR-52's must be on same floor.
Building MDF's, IDF's, electrical closets	Door Controller	Genetec Mercury MR-52 (OPE)	Must come with pre-installed Genetec license. No more than 7 MR-52 devices can be connected to a single EP-1502.
All exterior doors and critical infrastructure areas	Door position switch	Schlage door position switch 679 for all building doors. (OPE)	
		Schlage door position switch 674-OH for all overhead doors. (OPE)	
Building MDF's, IDF's, electrical	Power Supply	Altronix Trove Power Supply (OPE)	Requires coordination and specification with CSVS.

closets			
	Electric strikes (All strikes to be fail secure unless AHJ requires fail safe operation. Must be 24 volts.)	HES 4500 (OPE)	For use with all single leaf doors.
		HES 9600 (OPE)	For use with removable secured mullions.
		HES 1006 (OPE)	For use with heavy duty doors such as ballistic resistant doors.
	PIR	Bosch DS150i (OPE)	

B. Access Control Hardware Cabling Requirements:

1. The appropriate product models are to be approved by the DES Capitol Security Assistant Director or designee during project design and specification.
2. Electric Strikes: Shall comply with Standard 08 70 00.
3. Electric strikes shall be powered from Altronix Trove power supply fed by Belden New Generation twisted shielded plenum 18/2 with drain copper wire unless allowing for voltage drop. All wiring shall be concealed.
3. Card readers shall be fed by Belden New Generation twisted shielded plenum 22/6 with drain copper wire unless allowing for voltage drop.
4. Processors (Mercury Security controller boards) shall be powered from Altronix ALTV1224 DC2 power supply.
5. A maximum of 7 accessory boards (MR boards) downstream from the EP-1502 board unless approved by the card access personnel.

Equipment Type	**Equipment Sub Type**	**Required Manufacturer/Model**	**Notes**
Electronic Access Control	Card readers	Belden new generation 22/6 (OPE)	Twisted, shielded, copper, plenum rated with drain.
	IP controllers (Mercury Security EP-1502 or newer model)	Cat6 Ethernet - color pink (OPE)	
	RS485 Door controllers (Mercury Security MR 52 or newer model)	Belden new generation 18/2 (OPE)	Twisted, shielded, copper, plenum rated with drain.
	Lock power	Belden new generation 18/2 (OPE)	Twisted, shielded, copper, plenum rated with drain.
	Door position switch	Belden new generation 18/4 (OPE)	Twisted, shielded, copper, plenum rated with drain.

	Single Multiconductor cabling	Belden new generation	Twisted, shielded, copper, plenum rated with drain. Minimum 22/6 for reader, 18/2 for lock power, and 18/4 for ADA operator.
	ADA Operator	Belden new generation 18/4 (OPE)	Twisted, shielded, copper, plenum rated with drain.

Installation, Fabrication and Construction

1. Quality Assurance: All workers involved with installation must have completed manufacturer training and have current manufacturer certification.
2. Install all equipment and cabling in a manner consistent with manufacturer recommendations and instructions.
3. Install all devices and components shown on drawings required for proper operation of the system.
4. Mount devices level and in a uniform fashion.
5. All passwords or access codes for the system shall remain at factory default unless the factory default poses a security risk, in which case all passwords shall be communicated in writing and give written CSVS approval of such change. If passwords remain at factory default, CSVS will change password(s) during programming phase.

3.1 Intercom Entry System Products

A. This specification section covers the furnishing and installation of local audio/video door entry intercom system.

B. Contractor shall use Owner Provided Equipment (OPE) and install hardware devices, mounting brackets, power supplies, controls, and other components of the system as shown and specified.

C. Contractor shall furnish and install access control integration related connections to allow this system reporting.

D. Furnish and install outlets, junction boxes, conduit, connectors, wiring, and other accessories necessary to complete the system installation. Requirements shall be in accordance with Division 26, Electrical.

E. Furnish and install connectors, wiring and other accessories necessary to complete the system installation. Requirements shall be in accordance with Division 27, Communications.

F. Intercom entry system products:

1. The appropriate product models are to be approved by the DES Capitol Security Assistant Director or designee during project design and specification.
2. Intercom system shall provide communications between the remote calling station(s) and answering unit station(s). System shall be hands free at the remote station after initiation. System shall utilize both audio and video capability between remote and answering locations.
3. Intercom answering station(s):
    a. Shall receive audio video calls from remote stations by selective indication of the calling location.
    b. Shall be provided with a door open feature that will allow the answering station(s), while in communication with the remote station, to unlock the door. Note: This is only allowed for internal doors. Answering stations are strictly prohibited from directly unlocking an exterior door without approval by the DES Capitol Security Assistant Director or designee.

c. Shall automatically annunciate the calling station.

4. Intercom System:
   a. 2N IP Verso intercom with 2N Indoor Touch 2.0 answering unit (OPE).
   b. Aiphone IX Series (OPE).
   c. If utilizing on an exterior door, the solution shall include 2N products with licensing to integrate with Genetec Security Center (OPE).

END OF ACCESS CONTROL STANDARD

Basis of Design

This standard contains certain design criteria and procedures for the selection and installation of video and electronic surveillance hardware for Capitol Campus facilities or those facilities connecting to the campus system. This information is intended to help the project design team during the design process as well as the Capitol Security & Visitor Services staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the FPS Project Manager. Exceptions to this standard will be made only upon specific written approval using the "Facilities Design Guidelines and Construction Standards Exception Request" form included in these Design Guidelines and Construction Standards. Any deviations must be approved by the Capitol Security & Visitor Services DES Capitol Security Assistant Director or designee.

1.1 Design Criteria

A. Camera Integration Design on the Capitol Campus shall include all labor, equipment, materials, documentation and services necessary for a complete and operational Closed-Circuit TV (CCTV)/video management system (VMS). Work will include the installation of wiring, cabling, cameras, power supplies, POE injectors, digital video controllers, flat panel displays, and other components necessary to provide fully operational CCTV/VMS monitoring. All proposed designs shall be reviewed and approved by DES Capitol Security & Visitor Services before installation.

B. The system wiring, equipment, and installation shall comply with all listed requirements as well as any and all applicable national, state and local codes and standards.

C. Future accepted IP network camera models are to be approved by the DES Capitol Security Assistant Director or designee for interoperability and compliance with standards.

D. DES shall provide all network POE+ switches and IP address schema in support of video surveillance cameras and VMS equipment.

E. System Description:
- The CCTV/VMS monitoring system installed shall integrate with the existing campus Genetec Security Center platform.
- The CCTV/VMS system components shall connect to the campus network video recorders (NVR). Depending on project scale, a new NVR may be required. NVR equipment shall have the following characteristics:
    - Capable and pre-installed with Genetec Security Center and compatible with the DES CSVS Genetec Security Center platform.
    - Successfully record at 30 frames per second with NVR system for all connected cameras.
    - Standard recording setup shall be 6am-6pm Monday-Friday and recording on motion afterhours for cameras installed inside buildings.
    - Standard recording setup shall be 24/7 continuous recording for building entry/exit locations and all exterior cameras.
    - NVR shall have a minimum of 191 TB of usable capacity.
    - Stored video shall be retrievable from the DVR/NVR indexed by time and have fast-forward and rewind functions.
    - DVR/NVR shall allow live monitoring and continuous recording while viewing stored video.

F. Cameras shall:
- Have a minimum specification of 8-megapixel (MP) 4K resolution.
- Ability to perform at up to 120 frames per second (fps) at 1080p.
- Have IR illumination up to 50 meters.
- Built-in electronic image stabilization.
- Support H.265, H.264, and MJPEG encoding with compression.

- Have varifocal lenses and auto-iris to allow for field-of-view optimization and ability to automatically adjust to changing lighting conditions. Lenses shall be those recommended by camera manufacturer.
- Be powered over limited energy conductors from a central power supply mounted in the communications closets of Point of Entry or utilize Power over Ethernet (PoE) injector.
- Mini-dome cameras are to be used interior of buildings.
- Dome, thermal imaging, panoramic and PTZ are to be used on building exteriors and grounds.
- Camera selection and locations will be determined by each project and require Capitol Security & Visitor Services review and approval.

G. Required Submittals:

- Manufacturer's specifications and technical data for all components.
- List of programming decisions that need to be made by CSVS for proper operation of the hardware.
- Panel and power supply drawings layouts on backboard allocated for CCTV/VMS and in telecommunications closet.
- One-line diagram showing all devices, controllers, and cable types between devices.

Products, Materials and Equipment

2.1 Camera Hardware

A. Camera Hardware to be used:

1. All video management system hardware and wire will be Owner Provided Equipment (OPE).
2. Genetec Streamvault SV-2000E appliances (OPE) required for projects that exceed 20 new video surveillance cameras as part of the design.
3. OPE monitoring workstation(s) pre-installed with Genetec Security Center, monitor(s) and UPS backup power.
4. IONODES ION-R200 Secure Display Station decoder (OPE).
5. Owner provided network switches with UPS backup power.
6. All video management system components shall be connected to emergency generator power.
7. The appropriate product models are to be approved by the DES DES Capitol Security Assistant Director or designee during project design and specification.

Equipment Type	Equipment Sub Type	Required Manufacturer/Model	Notes
Video Surveillance for Exterior Doors	Camera on exterior of door	Pelco Optera 360-degree 12-megapixel multi-sensor panoramic (OPE)	Installed at appropriate height/distance from door to show head shots of all individuals who enter facility.

	Camera on interior of door	Pelco 4K 8 megapixel mini dome (OPE)	
Video Surveillance for reception/public interaction areas (required physical separation/secured entry)	Cameras for lobby	Pelco 4K 8-megapixel mini dome (OPE)	Cameras shall show coverage of entire lobby area and interactions between the public and reception staff.
	Camera at door to secured space	Pelco 4K 8-megapixel mini dome (OPE)	Camera shall show coverage of entry into secured space. Location of camera shall be in secured space.
Video Surveillance for mechanical rooms/MDF/IDF/ electrical rooms/ generator rooms/fire control rooms	Camera on exterior of door	Pelco 4K 8-megapixel mini dome (OPE)	
Video Surveillance for vehicle access control (parking lots/ garages)	Camera located at vehicle barrier	Pelco Optera 360-degree 12 megapixel multi-sensor panoramic (OPE)	To be installed at all vehicle access control points.
	Camera located at vehicle barrier	Genetec SharpV ALPR fixed camera (OPE)	To be installed at all vehicle access control points.
	Camera coverage of parking area	Pelco Optera 360-degree 12 megapixel multi-sensor panoramic (OPE)	
	Camera coverage of visitor parking/drop off zones	Pelco Optera 360-degree 12 megapixel multi-sensor panoramic (OPE)	

B. System Cabling Requirements:

1. Cat6 standard or better wiring (Network B color coding for all terminations).
2. 1GB/s – 1000Mb/s connectivity between control devices and network switches.
3. 100Mb/s connectivity from edge devices to head-end.

Equipment Type	Equipment Sub Type	Required	Notes
Video Surveillance	Video surveillance cameras	Cat6 minimum terminated and certified in dark green color. (OPE)	

2.2 Electronic Intrusion Detection Hardware

1. Duress components shall be provided for real-time duress notification to security and law enforcement personnel. All duress components shall be physically wired unless approved by CSVS. All new construction must use wired components.
2. Duress and Intrusion hardware shall provide remote monitor capability by 24/7 UL rated monitoring station.
3. Intrusion detection devices shall provide controlled access to building interior and real-time monitoring of doors and windows at multiple locations simultaneously.
4. All intrusion detection devices shall integrate into the existing Genetec Security Center system. All hardware installed under this scope must be compatible with current version and have expanded capacity to support future growth.
5. Required Submittals:
   - Manufacturer's specifications and technical data for all components.
   - List of programming decisions that need to be made by CSVS for proper operation of the hardware.
   - Panel and power supply drawings layouts on backboard allocated for Duress and Intrusion Detection in telecommunications closet. Indicate desired location of 120 VAC power receptacles on this drawing for coordination.
   - One-line diagram showing all devices, controllers, and cable types between devices.
6. Duress and Intrusion Hardware to be Used:
   - All duress and intrusion hardware and wire will be Owner Provided Equipment (OPE).

Equipment Type	Equipment Sub Type	Required	Notes
Duress – General for interior office spaces	Controller	DMP XR 150 with dialer and network panel in large enclosure with battery backup (OPE)	Must include one-time licensing for Genetec Security Center integration. Install location in building MDF. Must be connected to building UPS and Generator systems. Can be combined/ shared with Intrusion Detection devices.

	Button	DMP HUB-M Hold-Up Button (OPE)	Physically mounted button to be located under desk at public reception area. Additional buttons may be installed with coordination with CSVS.

Duress/Intrusion Detection for Exterior Doors	Controller	DMP XR 150 with dialer and network panel in large enclosure with battery backup (OPE)	Must include one-time licensing for Genetec Security Center integration. Install location in building MDF. Must be connected to building UPS and Generator systems.
	Intrusion Motion Detectors	DMP CDX-DAM Dual Tech Motion Detector (OPE)	For use at exterior doors/ lobby areas/in-building loading docks and garages
	Glassbreak Detectors	Interlogix 5820A Shatter Pro (OPE)	Located on interior building
Duress/Intrusion Detection for Reception/Public Interaction Areas	Controller	DMP XR 150 with dialer and network panel in large enclosure with battery backup (OPE)	Must include one-time licensing for Genetec Security Center integration. Install location in building MDF. Must be connected to building UPS and Generator systems.
	Button	DMP HUB-M Hold-Up Button (OPE)	Physically mounted button to be located under desk at public reception area. Additional buttons may be installed with coordination with CSVS.

	Keypad	DMP 7873H-W High Security Touchscreen Keypad (OPE)	Based on full duress/Intrusion Detection implementation for building. Requires coordination with CSVS.

	Intrusion Motion Detectors	DMP CDX-DAM Dual Tech Motion Detector (OPE)	For use at exterior doors/lobby areas/in-building loading docks and garages.
	Glassbreak Detectors	Interlogix 5820A Shatter Pro (OPE)	To be located on or adjacent to interior building windows.

Installation, Fabrication and Construction

During design and pre-construction meetings, camera locations in existing west campus historical buildings shall be reviewed by the state Historic Preservation Specialist in consultation with Capitol Security & Visitor Services.

END OF VIDEO SURVEILLANCE STANDARD

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Basis of Design

This standard contains certain design criteria and procedures for the selection and installation of fire detection and alarm hardware for Capitol Campus facilities or those facilities connecting to the campus system. This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the PPD Project Manager. Exceptions to this standard will be made only upon specific written approval using the "Facilities Design Guidelines and Construction Standards Exception Request" form included in these Design Guidelines and Construction Standards.

1.1 Design Criteria

A. The existing campus wide JCI Notifier fire alarm system is a dedicated, propriety fire alarm network using Johnson Controls brand fire alarm panels.

Products, Materials and Equipment

2.1 Fire Alarm Hardware

A. Fire Alarm Panels: Shall be Johnson Controls; no substitute.

Installation, Fabrication and Construction

- No specific requirements.

END OF FIRE DETECTION AND ALARM STANDARD

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Basis of Design

This standard contains certain design criteria and procedures for the design and installation of general site work items. This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the PPD Project Manager. Exceptions to this standard will be made only upon specific written approval using the "Facilities Design Guidelines and Construction Standards Exception Request" form included in these Design Guidelines and Construction Standards.

1.1 Design Criteria

A. Coordinate with the Project Manager for work hour limitations on noise and use of heavy equipment on campus roads, sidewalks and planting areas, site access, and staging areas.

B. Protection of existing trees, plants and other vegetation shall be in accordance with provisions of Guide Specification Section 01 50 00, Temporary Facilities & Controls.

C. The Department of Ecology (DOE) requires a Construction Storm Water Discharge Permit for any project disturbing more than one (1) acre, although the local AHJ may require it on even smaller projects. The application form is to be applied for by the "Owner", but requirements include a description of how the contractor will manage the storm water discharge from the site. This process can require between 60 and 90 days to accomplish prior to any work beginning. 60 days for DOE and 30 days for public notice.

   1. The A/E and PM will review the Project and determine if this permit is needed. If it is needed, what process will be incorporated to apply for the permit in relation to bidding, construction and completion timeframes.

D. As dictated by site conditions or as otherwise directed by governing authorities or Owner, adjacent properties and any identified cultural or historic resources shall be protected from erosion and sediment damage by installing erosion and sedimentation control systems. Maintain until final stabilization is achieved.

Products, Materials and Equipment

No specific requirements.

Installation, Fabrication and Construction

3.01 Utility Locating

A. Private DES Utilities: Contact DES for locating DES owned utilities.

B. Public Utilities: Contact Utility Notification Center (1-800-424-5555) or submit a Utility Locate Request online at www.callbeforeyoudig.org/washington/.

3.02 Utility Marking

Locator wire along with warning tape shall be placed above all utility lines during backfilling process.

END OF EARTHWORK STANDARD

Basis of Design

This standard contains certain design criteria and procedures for the design and installation of general site work items. This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the PPD Project Manager.

1.1 Design Criteria

A. Coordinate with the Project Manager for work hour limitations on noise and use of heavy equipment on campus roads, sidewalks and planting areas, site access, and staging areas.

B. Protection of existing trees, plants and other vegetation shall be in accordance with provisions of Guide Specification Section 01 50 00, Temporary Facilities & Controls.

Products, Materials and Equipment

- No specific requirements.

Installation, Fabrication and Construction

3.1 Saw Cutting Existing Paving

Wherever saw cutting of existing sidewalk or roadway paving occurs, all slurry resulting from the saw cutting process shall be vacuumed and removed off site and disposed of in a lawfully manner. Do not allow slurry to enter storm drainage sewer system.

END OF EXTERIOR IMPROVEMENTS STANDARD

Basis of Design

This standard applies to the design and installation of site pavements and appurtenances, including associated paving bases and ballasts.

1.1 Design Criteria

A. Sidewalks shall be designed and constructed to be able to withstand a driving load of 36,000 lbs. without cracking.

1. Sidewalks shall be placed on minimum 4" of compacted structural fill, compact subgrade and structural fill to minimum 95% of maximum dry density as determined by ASTM D1557.
2. For edges of sidewalks without integral curbs, thicken outer 12 inches to 6-inch depth.
3. Capitol Campus. At ADA curb cuts, a truncated dome granite insert is to occur at the point adjoining the crosswalk. The granite is to be dark, surrounded by lighter colored concrete, matching the standard installed on the campus.

B. Sidewalk and street finish, texture, and control joint grid pattern shall match existing adjacent surfaces. Isolation and score joints shall be sized and located to match existing adjoining or adjacent condition.

C. Sidewalks and streets in certain areas will require the addition of color additive in the concrete mix to match color of existing concrete; verify need for color additive with the Project Manager.

D. Sidewalks in certain areas on East Campus will require the addition of "Miami Buff" color additive in the concrete mix to match color of existing concrete; verify need for color additive with Owner's Project Manager.

E. The use of colored sealer to obtain colored concrete is not permitted.

F. Painted curb markings of appropriate colors shall be used to delineate any parking restrictions such as fire hydrant zones, bus stops, loading zones, approaches to corners, and other zones where parking is to be prohibited.

G. All existing pavement markings within the project limit lines or adjacent thereto shall be reviewed. Conflicting markings shall be removed, and other markings moved due to revised pathways. This shall include, but not be limited to, parking stall divisions, assigned stall markers, ADA markings, stop line markings, direction arrows, pedestrian walkways, no parking hatching, and speed bumps. To determine number of accessible van and car spaces see IBC 1106.1-1106.5.

1.2 Submittals

A. Colored Concrete: Require minimum three (3) samples of proposed concrete mix with color additive added in three slightly varying amounts, recording amount of additive per cubic yard for each sample mix, for selection of matching mix design. Include texture finish for matching existing texture finish, for approval.

B. Approved color and texture sample are to remain on site and be used as work control sample for actual construction. Remove panels at the end of the Project.

Products, Materials and Equipment

2.1 Concrete

Minimum 3,000# f'c Portland cement concrete of materials including admixtures per requirements of Division 3 for cast-in-place concrete, or greater if required by design.

A. West Campus Coloring / Mix– Sidewalks:

Cement (Ash Grove Type I – II	564 pounds/cubic yard
Course Aggregate (3/8 inch)	1,880 pounds/cubic yard
Fine Aggregate (sand)	1,240 pounds/cubic yard
MBAE90 air entrainment	7 ounces/cubic yard
Water	262.4 pounds/cubic yard
Rockwood Pigment Supra-Instant Black	3 pounds/cubic yard

Slump = 4 inches, plus or minus 1 inch
Water to Cement Ratio = 0.47

B. West Campus Coloring / Mix– Streets: A formula has not been established. Consultant and PM shall develop a strategy for determining appropriate color if one has not been established at time of project.

2.2 Light Bases

Concrete bases are to match appearance and clearance from ground of existing adjoining fixtures.

Installation, Fabrication and Construction

3.1 Saw Cutting Existing Paving

Wherever saw cutting of existing sidewalk or roadway paving occurs, all slurry resulting from the saw cutting process shall be vacuumed and removed off site and disposed of in a lawfully manner. Do not allow slurry to enter storm drainage sewer system.

3.2 Pavement – Sidewalks, Ramps, Curbs, Stairs

A. Install all walks and curbs in accordance with Standards of Local Jurisdiction and ADA requirements. Truncated domes shall be used the last foot of curb cut, to let people who are blind know that there is danger.

B. Begin curing immediately after placement, protect concrete from premature drying, excessively hot and cold temperatures, and mechanical injury.

C. Maintain curing procedures for seven (7) days at minimum temperature of 50 degrees F; keep moist and protect from vehicle and pedestrian traffic.

D. Cleaning of concrete mixers will not be allowed on campus grounds. Contractor shall submit methods of cleaning concrete equipment including delivery equipment.

E. Where appropriate, temporary storm drain catch basin filters shall be installed to prevent construction materials from entering into the system.

END OF PAVING, BASES & APPURTENANCES STANDARD

Basis of Design

This standard contains certain design criteria and procedures for the design and installation of underground irrigation systems for landscape areas and lawns, including restoration and/or repair of existing systems. This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the PPD Project Manager. Exceptions to this standard will be made only upon specific written approval using the "Facilities Design Guidelines and Construction Standards Exception Request" form included in these Design Guidelines and Construction Standards.

1.1 Design Criteria

A. Irrigation piping flow velocity shall not exceed 5 feet per second.

B. Provide an irrigation system water header with isolation valves, strainer, pressure reducing valves, double check valve assembly and gauges. Where possible, install the water header in an adjacent building. If this is not possible, provide an adequately sized valve vault to facilitate equipment repair/maintenance.

C. Design irrigation systems with a 3-inch or larger mainline to permit gravity drainage.

D. Irrigation system static pressure range shall not vary by more than 10%.

E. Design irrigation system lateral piping to limit pressure drops to less than 20% of the average sprinkler operating pressure.

F. Provide quick coupler valves every 100 feet or less.

G. Install sprinkler heads of the same manufacturer and psi rating within the same irrigation zone.

H. Zone the irrigation system according to microclimate. Zone incompatible and unique microclimates separately and/or grouped based on microclimate compatibility. Zone turf and bed areas separately.

I. Install a manual shutoff valve to isolate the irrigation system from the water supply main.

J. Design irrigation systems to avoid over spray, and to avoid spray blockage from adjacent aboveground utilities (e.g., electric transformers, light standards, etc.).

K. Record "as-built" drawings shall be provided for all newly installed, removed and/or relocated irrigation sprinkler piping including location and type designation of all associated sprinkler heads, valves, controllers, etc.

L. Systems shall be provided with appropriate backflow preventers.

1.2 Reclaimed Water

A. Design, materials and workmanship for the construction, operation and maintenance of reclaimed water systems on the capital campus shall be in accordance with the current edition of the City of Olympia Engineering Design and Development Standards (City "EDDS") as set forth in the Olympia Municipal Code, Chapter 13.24 – Reclaimed Water, except where these DES standards provide otherwise. The City of Olympia's reclaimed water standards have been developed with the Washington State Department of Transportation (WSDOT) Standard Specifications for Road, Bridge, and Municipal Construction as their basis, providing exceptions, clarifications, and enhancements as necessary.

Products, Materials and Equipment

2.1 Piping & Fittings

A. All main line and lateral line piping shall be Schedule 40 PVC.

B. Fittings for Rain Bird 1800 Series heads shall be EZP flexible tubing with E-Z Pipe Elbow.

C. Fittings for Hunter sprinkler heads shall be elbow nipple swing joint.

2.2 Sprinkler Heads

A. For Plant Areas: Rain Bird 1812 pop-up sprinkler head with 12” pop-up clearance.

B. For Small Lawn Areas: Rain Bird 1804 pop-up sprinkler head with 4” pop-up clearance.

C. For Large Lawn Areas: Hunter I-20 / I-40 Series rotary sprinkler head.

2.3 Controllers

Rain Bird ESP-MC Series with “MAXICOM” programmable software compatibility.

2.4 Wiring

14-gauge UF single strand controller wire.

Installation, Fabrication and Construction

A. Install all piping and equipment per manufacturer’s instructions.

B. Restore all disturbed lawn and planting areas to original “as-is” condition.

C. Install locate wire or trace wire in over top of all main line and lateral line piping.

END OF PLANTING IRRIGATION STANDARD

Basis of Design

This standard contains certain design criteria and procedures for the design and installation of landscaping trees, plants and lawns, including restoration and/or repair of existing landscape/lawn areas. This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the PPD Project Manager. Exceptions to this standard will be made only upon specific written approval using the "Facilities Design Guidelines and Construction Standards Exception Request" form included in these Design Guidelines and Construction Standards.

1.1 Design Criteria

A. Landscaping shall be species which grow in USDA Zone 4, drought and freeze resistant. Low-water design is encouraged.

B. The minimum top 8 inches of planting bed soil shall have an organic amendment content of 20 to 25%.

C. Sodded lawn is preferred over seeded lawn including hydroseeding.

D. Provide for 2 to 3 fertilizations of new plantings (trees, shrubs, lawn) through maintenance period following final project acceptance. Provide for minimum 60-day maintenance period following final project acceptance.

E. Proper Identification: All plants shall be true to name as ordered or shown on planting plans and shall be labeled individually or in groups by genus, species, variety and cultivar.

F. Compliance: All plants shall comply with federal and state laws and regulations requiring observation for plant disease, pests, and weeds. Observation certificates required by law shall accompany each shipment of plants.

G. Planting Season: Planting shall only be performed when weather and soil conditions are suitable for planting the materials specified in accordance with locally accepted practice. Install plants during the planting time as described below unless otherwise approved in writing by the Owner's Representative. In the event that the Contractor request planting outside the dates of the planting season, approval of the request does not change the requirements of the warranty.

H. Adverse Weather Conditions: No planting shall take place during extremely hot, dry, windy or freezing weather.

Products, Materials and Equipment

2.1 Plants - General

A. Standards and Measurement:

1. All plants including the root ball dimensions or container size to trunk caliper ratio shall conform to ANSI Z60.1 "American Standard for Nursery Stock" latest edition, unless modified by provisions in the project specification.
2. Plants larger than specified may be used if acceptable to the Owner's Representative. Use of such plants shall not increase the contract price. If larger plants are accepted the root ball size shall be in accordance with ANSI Z-60.1. Larger plants may not be acceptable if the resulting root ball cannot be fit into the required planting space.
3. If a range of size is given, no plant shall be less than the minimum size and not less than 50 percent of the plants shall be as large as the maximum size specified.

B. Plant Quality:
   1. General: Provide healthy stock, grown in a nursery and reasonably free of die-back, disease, insects, eggs, bores, and larvae. At the time of planting all plants shall have a root system, stem, and branch form that will not restrict normal growth, stability and health for the expected life of the plant.
   2. Plant Quality Above the Soil Line:
      a. Plants shall be healthy with the color, shape, size and distribution of trunk, stems, branches, buds and leaves normal to the plant type specified. Tree quality above the soil line shall comply with the project Crown Acceptance details and the following:
         1) Crown: The form and density of the crown shall be typical for a young specimen of the species or cultivar pruned to a central and dominant leader.
            a) Crown specifications do not apply to plants that have been specifically trained in the nursery as topiary, espalier, multi-stem, clump, or unique selections such as contorted or weeping cultivars.
         1) Leaves: The size, color, and appearance of leaves shall be typical for the time of year and stage of growth of the species or cultivar. Trees shall not show signs of prolonged moisture stress or over watering as indicated by wilted, shriveled, or dead leaves.
         1) Branches: Shoot growth (length and diameter) throughout the crown should be appropriate for the age and size of the species or cultivar. Trees shall not have dead, diseased, broken, distorted, or otherwise injured branches.
            a) Main branches shall be distributed along the central leader not clustered together. They shall form a balanced crown appropriate for the cultivar/species.
            a) Branch diameter shall be no larger than two-thirds (one-half is preferred) the diameter of the central leader measured 1 inch above the branch union.
            a) The attachment of the largest branches (scaffold branches) shall be free of included bark.
         1) Trunk: The tree trunk shall be relatively straight, vertical, and free of wounds that penetrate to the wood (properly made pruning cuts, closed or not, are acceptable and are not considered wounds), sunburned areas, conks (fungal fruiting bodies), wood cracks, sap leakage, signs of boring insects, galls, cankers, girdling ties, or lesions (mechanical injury).
         1) Temporary branches, unless otherwise specified, can be present along the lower trunk below the lowest main (scaffold) branch, particularly for trees less than 1 inch in caliper. These branches should be no greater than 3/8-inch diameter. Clear trunk should be no more than 40% of the total height of the tree.
      b. Trees shall have one central leader. If the leader was headed, a new leader (with a live terminal bud) at least one-half the diameter of the pruning cut shall be present.
         1) All trees are assumed to have one central leader trees unless a different form is specified in the plant list or drawings.
      c. All graft unions, where applicable, shall be completely closed without visible sign of graft rejection. All grafts shall be visible above the soil line.
      d. Trunk caliper and taper shall be sufficient so that the lower five feet of the trunk remains vertical without a stake. Auxiliary stake may be used to maintain a straight leader in the upper half of the tree.

3. Plant Quality at Or Below The Soil Line:
    a. Plant roots shall be normal to the plant type specified. Root observations shall take place without impacting tree health. Root quality at or below the soil line shall comply with the project Root Acceptance details and the following:
        1) The roots shall be reasonably free of scrapes, broken or split wood.
        2) The root system shall be reasonably free of injury from biotic (e.g., insects and pathogens) and abiotic (e.g., herbicide toxicity and salt injury) agents. Wounds resulting from root pruning used to produce a high-quality root system are not considered injuries.
        3) A minimum of three structural roots reasonably distributed around the trunk (not clustered on one side) shall be found in each plant. Root distribution shall be uniform throughout the root ball, and growth shall be appropriate for the species.
            a) Plants with structural roots on only one side of the trunk (J roots) shall be rejected.
        4) The root collar shall be within the upper 2 inches of the substrate/soil. Two structural roots shall reach the side of the root ball near the top surface of the root ball. The grower may request a modification to this requirement for species with roots that rapidly descend, provided that the grower removes all stem girdling roots above the structural roots across the top of the root ball.
        5) The root system shall be reasonably free of stem girdling roots over the root collar or kinked roots from nursery production practices.
        6) At time of observations and delivery, the root ball shall be moist throughout. Roots shall not show signs of excess soil moisture conditions as indicated by stunted, discolored, distorted, or dead roots.

2.2 **Root Ball Package Options:** The following root ball packages are permitted. Any type of root ball packages that is not specifically defined in this Standard shall not be permitted.

A. Balled And Burlapped Plants
    1. All Balled and Burlapped Plants shall be field grown, and the root ball packaged in a burlap and twine and/or burlap and wire basket package.
    2. Plants shall be harvested with the following modifications to standard nursery practices.
        a. Prior to digging any tree that fails to meet the requirement for maximum soil and roots above the root collar, carefully removed the soil from the top of the root ball of each plant, using hand tools, water or an air spade, to locate the root collar and attain the soil depth over the structural roots requirements. Remove all stem girdling roots above the root collar. Care must be exercised not to damage the surface of the root collar and the top of the structural roots.
        b. Trees shall be dug for a minimum of 4 weeks and a maximum of 52 weeks prior to shipping. Trees dug 4 to 52 weeks prior to shipping are defined as hardened-off. Digging is defined as cutting all roots and lifting the tree out of the ground and either moving it to a new location in the nursery or placing it back into the same hole. Tress that are stored out of the ground shall be placed in a holding area protected from extremes of wind and sun with the root ball protected by covering with mulch or straw and irrigated sufficiently to keep moisture in the root ball above wilt point and below saturation.
        c. If wire baskets are used to support the root ball, a “low profile” basket shall be used. A low-profile basket is defined as having the top of the highest loops on the basket no less than 4 inches and no greater than 8 inches below the shoulder of the root ball package.

The top 2/3 of the wire basket should be removed after tree is placed into the planting hole.

1.) At nurseries where sandy soils prevent the use of “low profile baskets”, baskets that support the entire root ball, including the top, are allowable.

d. Twine and burlap used for wrapping the root ball package shall be natural, biodegradable material. If the burlap decomposes after digging the tree, then the root ball shall be re-wrapped prior to shipping if roots have not yet grown to keep root ball intact during shipping.

B. Spade Harvested and Transplanted.
   1. Spade Harvested and Transplanted Plants shall meet all the requirements for field grown trees. Root ball diameters shall be of similar size as the ANSI Z60.1 requirements for Balled and Burlapped plants.
   2. Trees shall be harvested prior to leafing out (bud break) in the spring or during the fall planting period except for plants know to be considered as fall planting hazards. Plants that are fall planting hazards shall only be harvested prior to leafing out in the spring.
   3. Trees shall be moved and planted within 48 hours of the initial harvesting and shall remain in the spade machine until planted.

C. Container (Including Above-Ground Fabric Containers and Boxes) Plants
   1. Container plants may be permitted only when approved by the Owner’s Representative.
   2. Provided plants shall be established and well rooted in removable containers.
   3. Container class size shall conform to ANSI Z60.1 for container plants for each size and type of plant.

D. Bare Root Plants
   1. Harvest bare root plants while the plant is dormant and a minimum of 4 weeks prior to leaf out (bud break).
   2. The root spread dimensions of the harvested plants shall conform to ANSI Z60.1 for nursery grown bare root plants for each size and type of plant. Just prior to shipping to the job site, the root system shall be dipped into a slurry of hydrogel (cross linked polyacrylamide) and water mixed at a rate of 15 oz. of hydrogel in 25 gallons of water. Do not shake off the excess hydrogel. Place the root system in a pleated black plastic bag and tie the bag snugly around the trunk. Bundle and tie the upper branches together.
   3. Keep the trees in a cool dark space for storage and delivery. If daytime outside temperatures exceeds 70 degrees F, utilize a refrigerated storage area with temperature between 35 and 50 degrees.
   4. Where possible, plan time of planting to be before bud break. For trees to be planted after bud break, place the trees before bud break in an irrigated bed of pea gravel.
      a. The pea gravel bed shall be 18 inches deep over a sheet of plastic.
      b. Space trees to allow the unbundled branches to grow without shading each other.
      c. Once stored in pea gravel, allow the trees sufficient time for the new root system to flush and spring growth of leaves to fully develop before planting.
      d. Pea gravel stored trees may be kept for up to one growing season.
      e. Pea gravel stored trees shall be dipped, packaged and shipped similar to the requirements for freshly dug bare root trees above.

E. In-Ground Fabric Bag-Grown
   1. In-ground fabric container plants may be permitted only when indicated on the drawing or approved by the Owner's Representative.
   2. Provide plants established and well rooted.

F. Annual Flowering and Seasonal Color Plants: Container or flat-grown plants should be sized as noted in the planting plan. Plants shall be well-rooted and healthy.

2.3 Compost

A. Shall meet Washington State Department of Ecology Grade A Standard. As a general rule, the following guidelines should be used in selecting a compost:
   1. Appearance, Size, and Color: Brown to black in color, 1/4" to 1/2" in size, with an "earthy" odor.
   2. Physical Appearance: 30 to 50 percent moisture content, 30 percent or greater organic matter, and less than 70 percent ash content.
   3. Chemical Properties: Carbon-to-nitrogen ratio below or equal to 30:1, nitrogen content between 0.5 and 3.0 percent, phosphorus content greater than 0.2 percent, and a pH level between 6.0 and 8.0. Metals content shall conform to state and federal regulations.

2.4 Existing Topsoil

Where the project affects planting areas with existing topsoil, the consultant shall confirm with PM and Owner the reuse of such soil. If reused, soil shall not be taken from a greater depth than one foot from the existing ground level, unless authorized by Owner. Prior to removal, the contractor shall reduce any native vegetation to a height not exceeding one foot. All vegetative material remaining, except larger brush and trees over four feet in height, shall become part of the topsoil. Noxious weeds shall be removed and disposed of so none become part of the topsoil.

2.5 Imported Topsoil

Imported topsoil shall be a 3-way composted mix containing an organic amendment content of 20 to 25%.

A. The base topsoil shall be a friable sandy loam typical of topsoil cultivated locally, free of objectionable subsoil materials, weeds, noxious weed seeds, refuse, sticks, brush, and rocks larger than 1" across the greatest dimension, and shall contain no more than 10% rocks or gravel by volume.

2.6 Sod

A. Shall be field grown one calendar year or longer, have a well-developed root structure, and be free of all weeds, disease, and insect damage.

B. Prior to cutting, the sod shall be green, in an active and vigorous state of growth, and mowed to a height not exceeding one inch.

C. The sod shall be cut with a minimum of one inch of soil adhering. Provide sod composed of the following:

   60% Perennial Turf Type Rye Grass.
   20% Hard Fescue.
   20% Bluegrass.

D. Sod shall be equal to that as grown by Country Green Turf Farms, 7725- B Yelm Highway S.E., Olympia, Washington 98513, (360) 456-1006.

E. Sod shall be non-netted.

2.7 Mulch

A. Mulch shall be "Walk on" grade, coarse, ground, from tree and woody brush sources. The size range shall be a minimum (less than 25% or less of volume) fine particles 3/8 inch or less in size, and a maximum size of individual pieces (largest 20% or less of volume) shall be approximately 1 to 1-1/2 inch in diameter and maximum length approximately 4 to 8". Pieces larger than 8 inch long that are visible on the surface of the mulch after installation shall be removed.

It is understood that mulch quality will vary significantly from supplier to supplier and region to region. The above requirements may be modified to conform to the source material from locally reliable suppliers as approved by the Owner's Representative.

2.8 Tree Staking and Guying Material

A. Tree guying to be flat woven polypropylene material, 3/4 inch wide, and 900 lb. break strength. Color to be Green. Product to be ArborTie manufactured by Deep Root Partners, L.P. or approved equal.

B. Stakes shall be lodge pole stakes free of knots and of diameters and lengths appropriate to the size of plant as required to adequately support the plant.

C. Below ground anchorage systems to be constructed of 2 x 2-dimensional untreated wood securing (using 3 inch long screws) horizontal portions to 4 feet long vertical stakes driven straight into the ground outside the root ball. See **PLATE 1**.

2.9 Tree Bark Protector

A. Tree Bark Protectors shall be black extruded resin mesh, 4 inches in diameter, 5 feet long. As manufactured by Industrial Netting, Minneapolis, MN, USA or approved.

B. Fasten the split side of the Tree Bark Protector together in three places with black plastic tape.

Installation, Fabrication and Construction

3.1 Soil Preparation of Existing On-Site Soils (first option is a minimum; second option is preferred)

A. Minimum Requirement: For existing subsoils including reused topsoil, spread a 2-inch layer (6.2 cubic yards per 1000 sq.ft.) of compost over existing finish subsoil and rototill into top 4 to 6 inches of soil for a finished organic amendment content of 20 to 25% in the finished top 6 to 8 inches of soil. Rototill with minimum 2 passes to thoroughly mix compost with soil and eliminate layering of compost at the soil surface.

B. Preferred Requirement: For existing subsoils including reused topsoil, spread a 4-inch layer (12.4 cubic yards per 1000 sq.ft.) of compost over existing finish subsoil and rototill into top 6 to 8 inches of soil for a finished organic amendment content of 20 to 25% in the finished top 10 to 12 inches of soil. Rototill with minimum 2 passes to thoroughly mix compost with soil and eliminate layering of compost at the soil surface. **Note:** This requirement is substantially more expensive than the 'minimum' requirement as it requires special rototilling equipment to reach the 12-inch depth.

C. Where subsoil is clay or compacted soils, rototill top 6 inches of subsoil first, prior to application and incorporation of compost.

D. Soil prep at planting/lawn areas over East Campus Plaza areas shall follow 'minimum' requirement due to the depth of the existing soils over the underlying waterproof membrane.

E. After soil has been placed and compacted, and all other finish materials have been placed, finish grade shall be level with adjoining paved surfaces.

3.2 Soil Moisture

A. Volumetric soil moisture level, in both the planting soil and the root balls of all plants, prior to, during and after planting shall be above permanent wilting point and below field capacity for each type of soil texture within the following ranges.

Soil type	Permanent wilting point	Field capacity
Sand, Loamy sand, Sandy loam	5-8%	12-18%
Loam, Sandy clay, Sandy clay loam	14-25%	27-36%
Clay loam, Silt loam	11-22%	31-36%
Silty clay, Silty clay loam	22-27%	38-41%

1. Volumetric soil moisture shall be measured with a digital moisture meter. The meter shall be the Digital Soil Moisture Meter, DSMM500 by General Specialty Tools and Instruments, or approved equivalent.

B. Require Contractor to confirm the soil moisture levels with a moisture meter. If the moisture is too high, suspend planting operations until the soil moisture drains to below field capacity.

3.3 Installation Of Plants - General

A. No more plants shall be distributed about the planting bed area than can be planted and watered on the same day.

B. The root system of each plant, regardless of root ball package type, shall be observed by the Contractor, at the time of planting to confirm that the roots meet the requirements for plant root quality required by this Standard. Require Contractor to undertake at the time of planting, all modifications to the root system required by the Owner's Representative to meet these quality standards.

1. Modifications, at the time of planting, to meet the specifications for the depth of the root collar and removal of stem girdling roots and circling roots may make the plant unstable or stress the plant to the point that the Owner's Representative may choose to reject the plant rather than permitting the modification.
2. Any modifications required by the Owner's Representative to make the root system conform to the plant quality standards outlined in this Standard or other requirements related to the permitted root ball package, shall not be considered as grounds to modify or void the plant warranty.
3. The resulting root ball may need additional staking and water after planting. The plant may be rejected if the root modification process makes the tree unstable or if the tree is not healthy at the end of the warranty period. Such plants shall still be covered under the warranty.
4. The Contractor shall remain responsible to confirm that the grower has made all required root modifications noted during any nursery observations.

C. Container and Boxed Root Ball Shaving: The outer surfaces of ALL plants in containers and boxes, including the top, sides and bottom of the root ball shall be shaved to remove all circling, descending, and matted roots. Shaving shall be performed using saws, knives, sharp shovels or

other suitable equipment that is capable of making clean cuts on the roots. Shaving shall remove a minimum of one inch of root mat or up to 2 inches as required to remove all root segments that are not growing reasonably radial to the trunk.

D. Exposed Stem Tissue after Modification: The required root ball modifications may result in stem tissue that has not formed trunk bark being exposed above the soil line. If such condition occurs, wrap the exposed portion of the stem in a protective wrapping with a white filter fabric. Secure the fabric with biodegradable masking tape. DO NOT USE string, twine, green nursery ties or any other material that may girdle the trunk if not removed.

E. Excavation of the Planting Space: Using hand tools or tracked mini-excavator, excavate the planting hole into the Planting Soil to the depth of the root ball measured after any root ball modification to correct root problems, and wide enough for working room around the root ball or to the size indicated on the drawing or as noted below.
   1. For trees and shrubs planted in soil areas that are NOT tilled or otherwise modified to a depth of at least 12 inches over a distance of more than 10 feet radius from each tree, or 5 feet radius from each shrub, the soil around the root ball shall be loosened as defined below and indicated in **PLATE 2**.
      a. The area of loosening shall be a minimum of 3 times the diameter of the root ball at the surface sloping to 2 times the diameter of the root ball at the depth of the root ball.
      b. Loosening is defined as digging into the soil and turning the soil to reduce the compaction. The soil does not have to be removed from the hole, just dug, lifted and turned. Lifting and turning may be accomplished with a tracked mini excavator, or hand shovels.
   2. For trees being planted in poorly drained soils, follow **PLATE 3** planting diagram.
   3. For trees being planted on a slope with unmodified soils, follow **PLATE 4** planting diagram.
   4. If an auger is used to dig the initial planting hole, the soil around the auger hole shall be loosened as defined above for trees and shrubs planted in soil areas that are NOT tilled or otherwise modified.
   5. The measuring point for root ball depth shall be the average height of the outer edge of the root ball after any required root ball modification.
   6. If motorized equipment is used to deliver plants to the planting area over exposed planting beds or used to loosen the soil or dig the planting holes, all soil that has been driven over shall be tilled to a depth of 6 inches.

F. For trees to be planted in prepared Planting Soil that is deeper than the root ball depth, compact the soil under the root ball using a mechanical tamper to assure a firm bedding for the root ball. If there is more than 12 inches of planting soil under the root ball excavate and tamp the planting soil in lifts not to exceed 12 inches.

G. Set top outer edge of the root ball at the average elevation of the proposed finish. Set the plant plumb and upright in the center of the planting hole. The tree graft, if applicable, shall be visible above the grade. Do not place soil on top of the root ball.

H. The Owner's Representative may request that plants orientation be rotated when planted based on the form of the plant.

I. Backfill the space around the root ball with the same planting soil or existing soil that was excavated for the planting space.

J. Brace root ball by tamping Planting Soil around the lower portion of the root ball. Place additional Planting Soil around base and sides of ball in six-inch (6") lifts. Lightly tamp each lift using foot pressure or hand tools to settle backfill, support the tree and eliminate voids. DO NOT over compact the backfill or use mechanical or pneumatic tamping equipment. Over compaction shall

be defined as greater than 85% of maximum dry density, standard proctor or greater than 250 psi as measured by a cone penetrometer when the volumetric soil moisture is lower than field capacity.

1. When the planting hole has been backfilled to three quarters of its depth, water shall be poured around the root ball and allowed to soak into the soil to settle the soil. Do not flood the planting space. If the soil is above field capacity, allow the soil to drain to below field capacity before finishing the planting. Air pockets shall be eliminated and backfill continued until the planting soil is brought to grade level.

K. Build a 4-inch high, level berm of Planting Soil around the outside of the root ball to retain water. Tamp the berm to reduce leaking and erosion of the saucer.

L. Thoroughly water the Planting Soil and root ball immediately after planting.

M. Remove all nursery plant identification tags and ribbons as per Owner's Representative instructions. The Owner's Representative's seals are to remain on plants until the end of the warranty period.

N. Remove corrugated cardboard trunk protection after planting.

O. Follow additional requirements for the permitted root ball packages.

3.4 Permitted Root Ball Packages and Special Planting Requirements

The following are permitted root ball packages and special planting requirements that shall be followed during the planting process in addition to the above General planting requirements.

A. Balled And Burlapped Plants
   1. After the root ball has been backfilled, remove all twine and burlap from the top of the root ball. Cut the burlap away; do not fold down onto the Planting Soil.
   2. If the plant is shipped with a wire basket that does not meet the requirements of a "Low Rise" basket, remove the top 6 - 8 inches of the basket wires just before the final backfilling of the tree.
   3. Earth root balls shall be kept intact except for any modifications required by the Owner's Representative to make root package comply with the requirement in Part 2 Products.

B. Spade Harvested and Transplanted Plants
   1. After installing the tree, loosen the soil along the seam between the root ball and the surrounding soil out to a radius from the root ball edge equal to the diameter of the root ball to a depth of 8 - 10 inches by hand digging to disturb the soil interface.
   2. Fill any gaps below this level with loose soil.

C. Container (Includes Boxed and Above-Ground Fabric Containers) Plants
   1. This specification assumes that most container plants have significant stem girdling and circling roots, and that the root collar is too low in the root ball.
   2. Remove the container.
   3. Perform root ball shaving as defined in Installation of Plants: General above.
   4. Remove all roots and substrate above the root collar and the main structural roots according to root correction details so root system conforms to root observations detail.
   5. Remove all substrate at the bottom of the root ball that does not contain roots.
   6. Using a hose, power washer or air excavation device, wash out the substrate from around the trunk and top of the remaining root ball and find and remove all stem girdling roots within the root ball above the top of the structural roots.

D. Bare Root Plants
   1. Dig the planting hole to the diameter of the spread of the roots to a depth in the center that maintains the root collar at the elevation of the surrounding finished grade and slightly deeper along the edges of the hole.
   2. Spread all roots out radial to the trunk in the prepared hole making the hole wider where needed to accommodate long roots. Root tips shall be directed away from the trunk. Prune any broken roots removing the least amount of tissue possible.
   3. Maintain the trunk plumb while backfilling soil around the roots.
   4. Lightly tamp the soil around the roots to eliminate voids and reduce settlement.

E. In-Ground Fabric Containers
   1. Remove the fabric container from the root ball. Cut roots at the edge of the container as needed to extract the fabric from the roots. Make clean cuts with sharp tools; do not tear roots away from the fabric.
   2. Observe the root system after the container is removed to confirm that the root system meets the quality standards.

3.5 Ground Cover, Perennial and Annual Plants

A. Assure that soil moisture is within the required levels prior to planting. Irrigation, if required, shall be applied at least 12 hours prior to planting to avoid planting in muddy soils.

B. Assure that soil grades in the beds are smooth and as shown on the plans.

C. Plants shall be planted in even, triangularly spaced rows, at the intervals called out for on the drawings, unless otherwise noted. The first row of Annual flower plants shall be 6 inches from the bed edge unless otherwise directed.

D. Dig planting holes sufficiently large enough to insert the root system without deforming the roots. Set the top of the root system at the grade of the soil.

E. Schedule the planting to occur prior to application of the mulch. If the bed is already mulched, pull the mulch from around the hole and plant into the soil. Do not plant the root system in the mulch. Pull mulch back so it is not on the root ball surface.

F. Press soil to bring the root system in contact with the soil.

G. Spread any excess soil around in the spaces between plants.

H. Apply mulch to the bed being sure not to cover the tops of the plants with or the tops of the root ball with mulch.

I. Water each planting area as soon as the planting is completed. Apply additional water to keep the soil moisture at the required levels. Do not over water.

3.6 Staking And Guying

A. Do not stake or guy trees unless specifically required by the Contract Documents, or in the event that the Contractor feels that staking is the only alternative way to keep particular trees plumb.
   1. The Owner’s Representative shall have the authority to require that trees are staked or to reject staking as an alternative way to stabilize the tree.
   2. Trees that required heavily modified root balls to meet the root quality standards may become unstable. The Owner’s Representative may choose to reject these trees rather than utilize staking to temporarily support the tree.

B. Trees that are guyed shall have their guys and stakes removed after one full growing season or at other times as required by the Owner's Representative.

C. Tree guying shall utilize the tree staking and guying materials specified. Guying to be tied in such a manner as to create a minimum 12-inch loop to prevent girdling. Refer to manufacturer's recommendations and the planting detail for installation.
   1. Plants shall stand plumb after staking or guying.
   2. Stakes shall be driven to sufficient depth to hold the tree rigid.

D. For trees planted in planting mix over waterproofed membrane, use dead men buried 24 inches to the top of the dead man, in the soil. Tie the guy to the dead man with a double wrap of line around the dead man followed by a double half hitch. When guys are removed, leave the dead men in place and cut the guy tape 12 inches above the ground, leaving the tape end covered in mulch.

3.7 Tree Bark Protection

A. For all street trees in commercial areas where indicted on the drawings, apply a Tree Bark Protector to each tree.

3.8 Straightening Plants

A. Maintain all plants in a plumb position throughout the warranty period. Straighten all trees that move out of plumb including those not staked. Plants to be straightened shall be excavated and the root ball moved to a plumb position, and then re-backfilled.

B. Do not straighten plants by pulling the trunk with guys.

3.9 Installation Of Fertilizer and Other Chemical Additives

A. Do not apply any soluble fertilizer to plantings during the first year after transplanting unless soil test determines that fertilizer or other chemical additives is required. Apply chemical additives only upon the approval of the Owner's Representative.

B. Controlled release fertilizers shall be applied according to the manufacturer's instructions and standard horticultural practices.

3.10 Pruning Of Trees and Shrubs

A. Prune plants as directed by the Owner's Representative. Pruning trees shall be limited to addressing structural defects as shown in detail; follow recommendations in "Structural Pruning: A Guide For The Green Industry" published by Urban Tree Foundation, Visalia CA.

B. All pruning shall be performed by a person experienced in structural tree pruning.

C. Except for plants specified as multi-stemmed or as otherwise instructed by the Owner's Representative, preserve or create a central leader.

D. Pruning of large trees shall be done using pole pruners or if needed, from a ladder or hydraulic lift to gain access to the top of the tree. Do not climb in newly planted trees. Small trees can be structurally pruned by laying them over before planting. Pruning may also be performed at the nursery prior to shipping.

E. Remove and replace excessively pruned or malformed stock resulting from improper pruning that occurred in the nursery or after.

F. Pruning shall be done with clean, sharp tools.

G. No tree paint or sealants shall be used.

3.11 Mulching Of Plants

A. Apply 4 inches of mulch before settlement, covering the entire planting bed area. Install no more than 1 inch of mulch over the top of the root balls of all plants. Taper to 2 inches when abutting pavement.

B. For trees planted in lawn areas the mulch shall extend to a 5-foot radius around the tree or to the extent indicated on the plans.

C. Lift all leaves, low hanging stems and other green portions of small plants out of the mulch if covered.

3.12 Planting Bed Finishing

A. After planting, smooth out all grades between plants before mulching.

B. Separate the edges of planting beds and lawn areas with a smooth, formed edge cut into the turf with the bed mulch level slightly lower, 1 and 2 inches, than the adjacent turf sod or as directed by the Owner's Representative. Bed edge lines shall be a depicted on the drawings.

3.13 Watering

A. Require Contractor to be fully responsible to ensure that adequate water is provided to all plants from the point of installation until the date of Substantial Completion acceptance. The Contractor shall adjust the automatic irrigation system, if available, and apply additional or adjust for less water using hoses as required.

B. Hand water root balls of all plants to assure that the root balls have moisture above wilt point and below field capacity. Test the moisture content in each root ball and the soil outside the root ball to determine the water content.

3.14 Plant Maintenance Prior To Substantial Completion

A. Require Contractor maintenance during the period prior to Substantial Completion to consist of pruning, watering, cultivating, weeding, mulching, removal of dead material, repairing and replacing of tree stakes, tightening and repairing of guys, repairing and replacing of damaged tree wrap material, resetting plants to proper grades and upright position, and furnishing and applying such sprays as are necessary to keep plantings reasonably free of damaging insects and disease, and in healthy condition. The threshold for applying insecticides and herbicide shall follow established Integrated Pest Management (IPM) procedures. Mulch areas shall be kept reasonably free of weeds, grass.

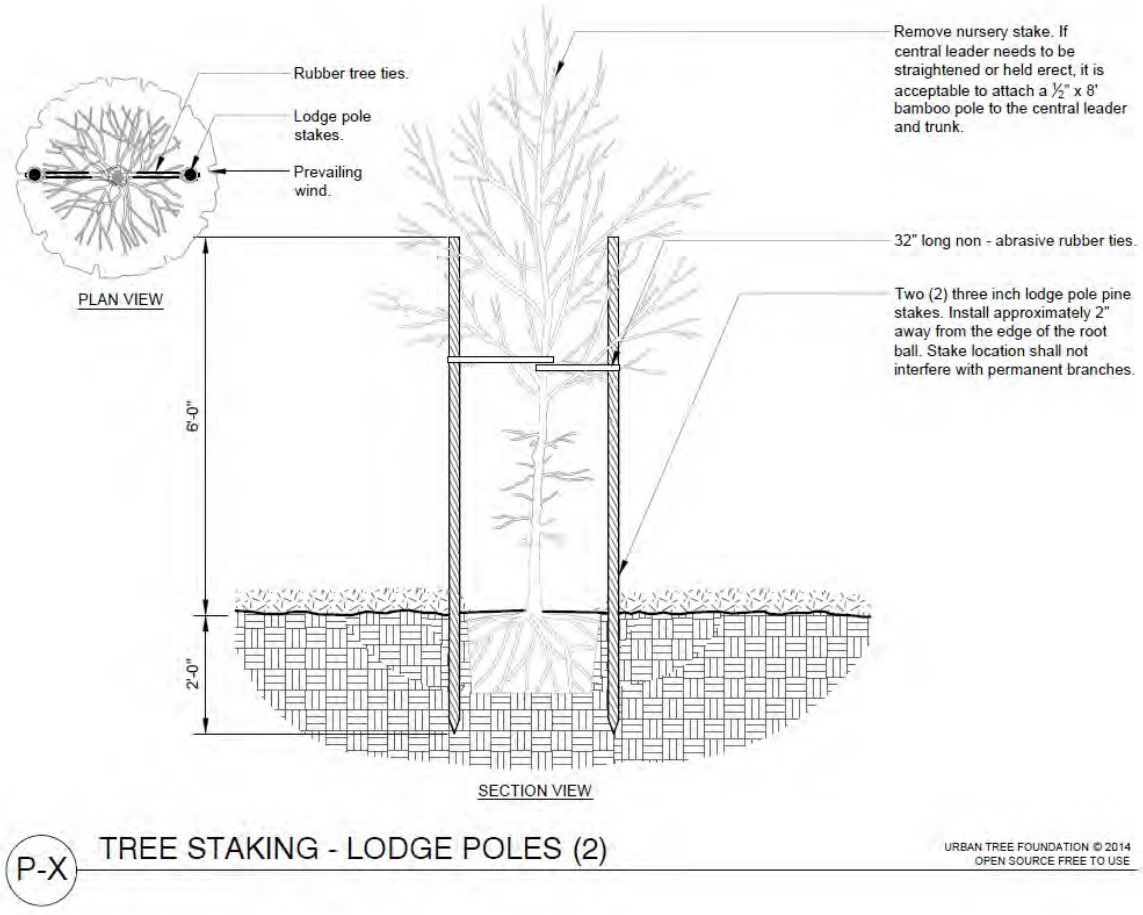

Rubber tree ties.
Lodge pole stakes.
Prevailing wind.
PLAN VIEW
Remove nursery stake. If central leader needs to be straightened or held erect, it is acceptable to attach a ½" x 8' bamboo pole to the central leader and trunk.
32" long non - abrasive rubber ties.
Two (2) three inch lodge pole pine stakes. Install approximately 2" away from the edge of the root ball. Stake location shall not interfere with permanent branches.
6'-0"
2'-0"
SECTION VIEW
P-X
TREE STAKING - LODGE POLES (2)
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PLATE 1

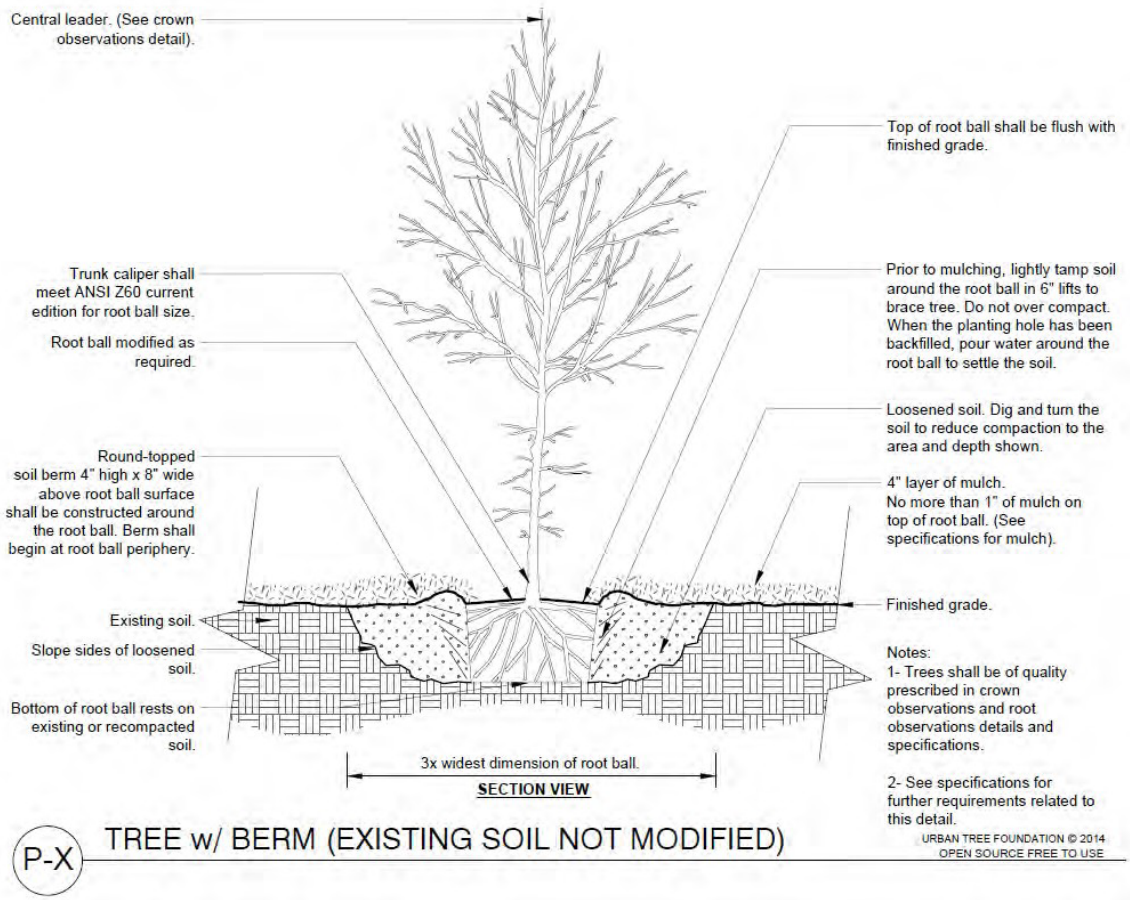

Central leader. (See crown observations detail).
Top of root ball shall be flush with finished grade.
Trunk caliper shall meet ANSI Z60 current edition for root ball size.
Root ball modified as required.
Prior to mulching, lightly tamp soil around the root ball in 6" lifts to brace tree. Do not over compact. When the planting hole has been backfilled, pour water around the root ball to settle the soil.
Loosened soil. Dig and turn the soil to reduce compaction to the area and depth shown.
Round-topped soil berm 4" high x 8" wide above root ball surface shall be constructed around the root ball. Berm shall begin at root ball periphery.
4" layer of mulch. No more than 1" of mulch on top of root ball. (See specifications for mulch).
Finished grade.
Existing soil.
Slope sides of loosened soil.
Bottom of root ball rests on existing or recompacted soil.
3x widest dimension of root ball.
SECTION VIEW
Notes:
1- Trees shall be of quality prescribed in crown observations and root observations details and specifications.
2- See specifications for further requirements related to this detail.
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P-X
TREE w/ BERM (EXISTING SOIL NOT MODIFIED)

PLATE 2

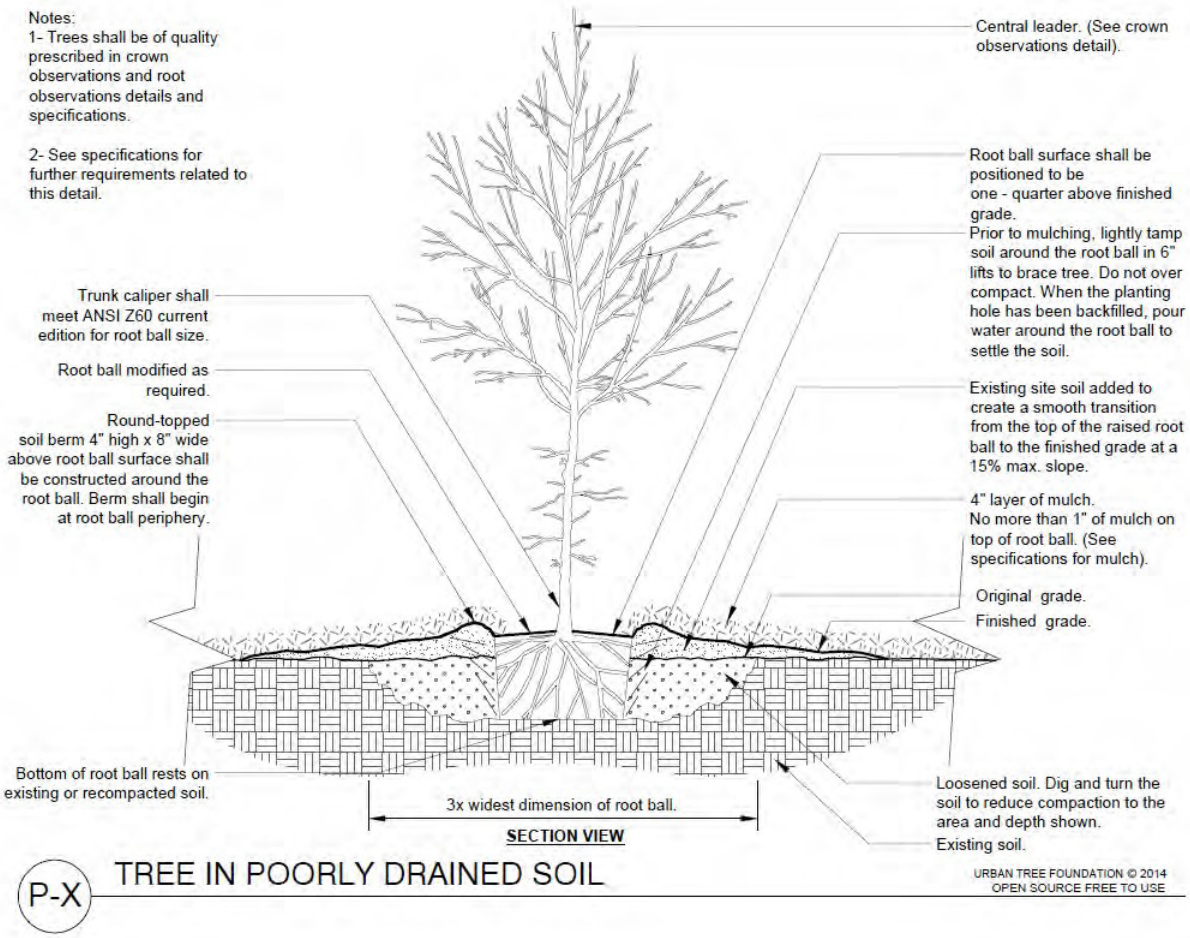

Notes:
1- Trees shall be of quality prescribed in crown observations and root observations details and specifications.
2- See specifications for further requirements related to this detail.
Central leader. (See crown observations detail).
Root ball surface shall be positioned to be one - quarter above finished grade.
Prior to mulching, lightly tamp soil around the root ball in 6" lifts to brace tree. Do not over compact. When the planting hole has been backfilled, pour water around the root ball to settle the soil.
Existing site soil added to create a smooth transition from the top of the raised root ball to the finished grade at a 15% max. slope.
4" layer of mulch. No more than 1" of mulch on top of root ball. (See specifications for mulch).
Original grade.
Finished grade.
Trunk caliper shall meet ANSI Z60 current edition for root ball size.
Root ball modified as required.
Round-topped soil berm 4" high x 8" wide above root ball surface shall be constructed around the root ball. Berm shall begin at root ball periphery.
Bottom of root ball rests on existing or recompacted soil.
3x widest dimension of root ball.
SECTION VIEW
Loosened soil. Dig and turn the soil to reduce compaction to the area and depth shown.
Existing soil.
P-X
TREE IN POORLY DRAINED SOIL
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PLATE 3

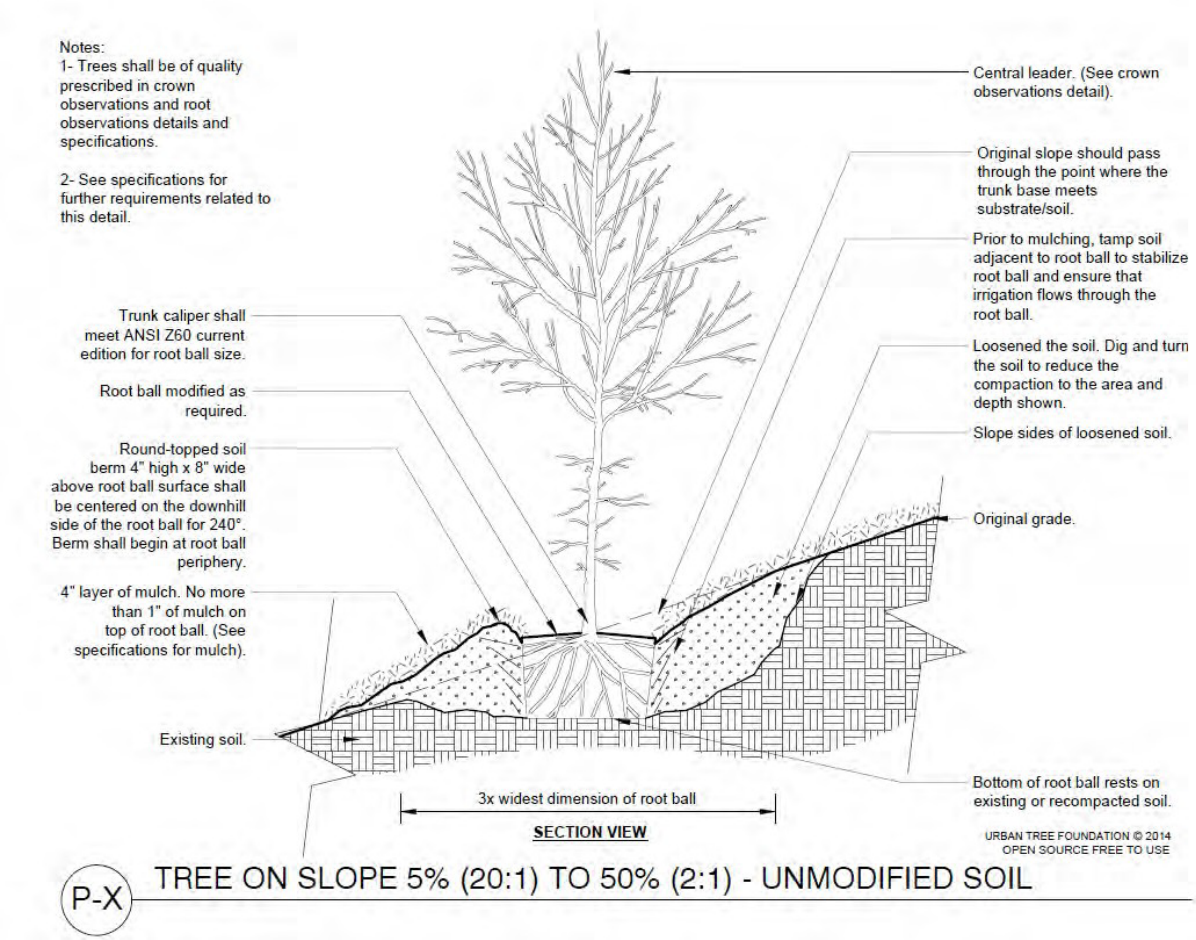


PLATE 4

END OF PLANTING STANDARD

Basis of Design

This standard contains certain design criteria and procedures in connection with furnishing, delivery, and installation of Planting Soil and /or the modification of existing site soil for use as Planting Soil. This information is intended to help the project design team during the design process as well as the Building and Grounds maintenance staff in performing associated maintenance and repair work. Alternate solutions may be discussed with the PPD Project Manager. Exceptions to this standard will be made only upon specific written approval using the "Facilities Design Guidelines and Construction Standards Exception Request" form included in these Design Guidelines and Construction Standards.

1.1 References

A. ASTM: American Society of Testing Materials cited section numbers.

B. U.S. Department of Agriculture, Natural Resources Conservation Service, 2003. National Soil Survey Handbook, title 430-VI. Available Online.

C. US Composting Council *www.compostingcouncil.org and* http://compostingcouncil.org/admin/wp-content/plugins/wp-*pdfupload/pdf/191/LandscapeArch_Specs.pdf.*

D. *Methods of Soil Analysis*, as published by the Soil Science Society of America (http://www.soils.org/).

E. Up by Roots: healthy soils and trees in the built environment. 2008. J. Urban. International Society of Arboriculture, Champaign, IL.

1.2 Soil Compaction – General Requirements

The following parameters shall define the general description of the threshold points of soil compaction in existing, modified or installed soil and subsoil. The following are threshold levels of compaction as determined by each method.

A. Acceptable Compaction: Good rooting anticipated, but increasing settlement expected as compaction is reduced and/or in soil with a high organic matter content.
   1. Bulk Density Method – Varies by soil type see Chart on page 32 in Up by Roots.
   2. Standard Proctor Method – 75-85%; soil below 75% is unstable and will settle excessively.
   3. Penetration Resistance Method – about 75-250 psi, below 75 psi soil becomes increasingly unstable and will settle excessively.

B. Root limiting Compaction: Root growth is limited with fewer, shorter and slower growing roots.
   1. Bulk Density Method – Varies by soil type see Chart on page 32 in Up by Roots.
   2. Standard Proctor Method – above approximately 85%.
   3. Penetration Resistance Method – about 300 psi.

C. Excessive Compaction: Roots not likely to grow but can penetrate soil when soil is above field capacity.
   1. Bulk Density Method – Varies by soil type see Chart on page 32 in Up by Roots.
   2. Standard Proctor Method – Above 90%.
   3. Penetration Resistance Method – Approximately above 400 psi

Products, Materials and Equipment

2.1 Imported Topsoil

A. Imported Topsoil definition: Fertile, friable soil containing less than 5% total volume of the combination of subsoil, refuse, roots larger than 1 inch diameter, heavy, sticky or stiff clay, stones.

larger than 2 inches in diameter, noxious seeds, sticks, brush, litter, or any substances deleterious to plant growth. The percent (%) of the above objects shall be controlled by source selection not by screening the soil. Topsoil shall be suitable for the germination of seeds and the support of vegetative growth. Imported Topsoil shall not contain weed seeds in quantities that cause noticeable weed infestations in the final planting beds. Imported Topsoil shall meet the following physical and chemical criteria:

1. Soil texture: USDA loam, sandy clay loam or sandy loam with clay content between 15 and 25%. And a combined clay/silt content of no more than 55%.
2. pH value shall be between 5.5 and 7.0.
3. Percent organic matter (OM): 2.0-5.0%, by dry weight.
4. Soluble salt level: Less than 2 mmho/cm.
5. Soil chemistry suitable for growing the plants specified.

B. Imported Topsoil shall be a harvested soil from fields or development sites. The organic content and particle size distribution shall be the result of natural soil formation. Manufactured soils where Coarse Sand, Composted organic material or chemical additives has been added to the soil to meet the requirements of this specification section shall not be acceptable. Retained soil peds shall be the same color on the inside as is visible on the outside.

C. Imported Topsoil for Planting Soil shall NOT have been screened and shall retain soil peds or clods larger than 2 inches in diameter throughout the stockpile after harvesting.

D. Stockpiled Existing Topsoil at the site meeting the above criteria may be acceptable.

E. Provide a two-gallon sample from each Imported Topsoil source with required soil testing results. The sample shall be a mixture of the random samples taken around the source stockpile or field. The soil sample shall be delivered with soil peds intact that represent the size and quantity of expected peds in the final delivered soil.

2.2 Compost

A. Compost: Blended and ground leaf, wood and other plant-based material, composted for a minimum of 9 months and at temperatures sufficient to break down all woody fibers, seeds and leaf structures, free of toxic material at levels that are harmful to plants or humans. Source material shall be yard waste trimmings blended with other plant or manure-based material designed to produce Compost high in fungal material.

1. Compost shall be commercially prepared Compost and meet US Compost Council STA/TMECC criteria or as modified in this section for “Compost as a Landscape Backfill Mix Component”.

   http://compostingcouncil.org/admin/wp-content/plugins/wp-pdfupload/pdf/191/LandscapeArch_Specs.pdf

2. Compost shall comply with the following parameters:
   a. pH: 5.5 - 8.0.
   b. Soil salt (electrical conductivity): maximum 5 dS/m (mmhos/cm).
   c. Moisture content %, wet weight basis: 30 – 60.
   d. Particle size, dry weight basis: 98% pass through 3/4-inch screen or smear.
   e. Stability carbon dioxide evolution rate: mg CO_2-C/ g OM/ day < 2.
   f. Solvita maturity test: > 6.
   g. Physical contaminants (inerts), %, dry weight basis: <1%.
   h. Chemical contaminants, mg/kg (ppm): meet or exceed US EPA Class A standard, 40CFR. § 503.13, Tables 1 and 3 levels.

i. Biological contaminants select pathogens fecal coliform bacteria, or salmonella, meet or exceed US EPA Class A standard, 40 CFR § 503.32(a) level requirements.

B. Provide a two-gallon sample with manufacturer's literature and material certification that the product meets the requirements.

2.3 Coarse Sand

A. Clean, washed, sand, free of toxic materials.
1. Coarse concrete sand, ASTM C-33 Fine Aggregate, with a Fines Modulus Index of 2.8 and 3.2.
2. Coarse Sands shall be clean, sharp, natural Coarse Sands free of limestone, shale and slate particles. Manufactured Coarse Sand shall not be permitted.
3. pH shall be lower than 7.0.
4. Provide Coarse Sand with the following particle size distribution:

Sieve	Percent passing
3/8 inch (9.5 mm)	100
No 4 (4.75 mm)	95-100
No 8 (2.36 mm)	80-100
No 16 (1.18 mm)	50-85
No 30 (.60 mm)	25-60
No 50 (.30 mm)	10-30
No 100 (.15 mm)	2-10
No 200 (0.75 mm	2-5

2.4 Lime

A. ASTM C 602, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent and as follows:
1. Class: Class T, with a minimum 99 percent passing through No. 8 (2.36-mm) sieve and a minimum 75 percent passing through No. 60 (0.25-mm) sieve.
2. Provide lime in form of dolomitic limestone.

B. Provide manufacturer's literature and material certification that the product meets the requirements.

2.5 Existing Soil (Acceptable for planting with minimum modifications)

A. General definition of existing soil: Surface soil in the areas designated on the soils plan as existing soil, that is not altered, compacted to root limiting density, graded or contaminated before or during the construction process and considered acceptable for planting and long term health of the plants specified either as it exists or with only minor modification.
1. The Owner's Representative shall verify that the soil in the designated areas is suitable at the beginning of planting bed preparation work in that area. In the event that the work of this project construction has damaged the existing soil in areas designated for use as Planting Soil to the point where the soil is no longer suitable to support the plants specified, the Owner's Representative may require modification of the damaged soil up to and including removal and replacement with soil of equal quality to the soil that existed prior to construction. Examples of damage include further compaction, contamination, grading, creation of hard pan or drainage problems, and loss of the O, and or A horizon.
a. Do not begin work on additional modifications until changes to the contract price are approved by Owner's Representative.

2. Soil testing results and soil observation notes that describe the pre-construction soil conditions in the existing soil areas are included as an appendix to this specification:

B. Protect existing soil from compaction, contamination, and degradation during the construction process.

C. Unless otherwise instructed, remove all existing plants, root thatch, and non-soil debris from the surface of the soil using equipment that does not increase compaction of soil to root limiting levels.

D. Modifications:
   1. When results of soil tests recommend chemical adjustments, till surface soil to six inches or greater after chemical adjustments have been are applied.
   2. Remove existing turf thatch, ground cover plants and weeds.
   3. Provide pre-emergent weed control if indicated.
   4. Make chemical adjustment as recommended by the soil test.

2.6 Modified Existing Soil (Soil Suitable for Planting With Indicated Modification)

A. General definition: Surface soil in the areas designated on the soils plan as Modified Existing Soil has been altered and or graded before or during the construction process but is still considered acceptable for planting and long-term health of the plants specified with the proposed modifications. Modifications respond to the soil problems expected or encountered. The Owner's Representative shall verify that the soil in the designated areas is suitable for modification at the beginning of planting bed preparation work in that area.
   1. The Owner's Representative shall verify that the soil in the designated areas is suitable for the specified modification at the beginning of planting bed preparation work in that area. In the event that the work of this project construction has damaged the existing soil in areas designated for modification to the point where the soil is no longer suitable to support the plants specified with the specified modification, the Owner's Representative may require further modification of the damaged soil up to an including removal and replacement with soil of equal quality to the soil that would have resulted from the modification. Damage may include further compaction, contamination, grading, creation of hard pan or drainage problem, and loss of the O, and or A horizon.
   2. General requirements for all soil modifications:
      a. Take soil samples, test for chemical properties, and make appropriate adjustments.
      b. Unless otherwise instructed, remove all existing plants, root thatch, and non-soil debris from the surface of the soil using equipment that does not add to the compaction in the soil.
      c. All soil grading, tilling and loosening must be completed at times when the soil moisture is below field capacity. Allow soil to drain for at least two days after any rain event more than 1 inch in 24 hours, or long enough so that the soil does not make the hand muddy when squeezed.
      d. Provide pre-emergent weed control after the soil work is complete and plants planted but prior to adding mulch to the surface, if indicated by weed type and degree of threat.

B. Modified existing soil – soil removed, stockpiled, and spread.
   1. Description of condition to be modified: Existing soil that is suitable for reuse as Planting Soil but is in the wrong place of elevation or cannot be adequately protected during construction. Soil is to be harvested, stockpiled and re-spread with or without further modifications as indicated.

2. Modifications:
    a. Excavate existing soil from the areas and to depths designated on the drawings. Stockpile in zones noted on the drawings or in areas proposed by the Contractor.
        1) Prepare a soil stockpile plan for approval.
    b. Excavate soil using equipment and methods to preserve the clumps and peds in the soil. Generally, this means using the largest piece of equipment that is practical for the project size and scope.
    c. Protect stockpiles from erosion by compacting or tracking the soil surface, covering with breathable fabric or planting with annual grasses as appropriate for the season, location, and length of expected time of storage.
    d. Re-spread soil as required in Part 3 of this specification.

C. Modified existing soil – compacted surface soil (Tilling Option)
    1. Description of condition to be modified: Surface soil compaction to a maximum of 6 inches deep from traffic or light grading. Original A horizon may be previously removed or graded but lower profile intact with acceptable compaction levels and limited grading. The soil organic matter, pH and chemistry in the A horizon may not be suitable for the proposed plants and may need to be modified as required.
    2. Modifications:
        a. Till top 6 inches or deeper of the soil surface, with a *roto tiller, spade tiller,* ripper or agricultural plow. Spread 2 - 3 inches of Compost on the surface of the tilled soil and make any chemical adjustment as recommended by the soil test.
        b. Till or disk the Compost into the loosened soil. Smooth out grades with a drag rake or drag slip.

D. Modified existing soil – compacted surface soil (Radial Trenching Option – **PLATE 1**)
    1. Description of condition to be modified: Surface soil compaction to a maximum of 24 inches deep from traffic or light grading. Original A horizon may be previously removed or graded but lower profile below 24 inches intact with acceptable compaction levels and limited grading. The soil organic matter, pH and chemistry in the A horizon may not be suitable for the proposed plants and may need to be modified as required.
    2. Modifications:
        a. Using a trenching machine, dig trenches to the extent and depth shown on the plans and details.
        b. Backfill the trench with the soil removed from the trench. Add additional site soil if needed to fill the trench to be flush to the existing grade after the soil settlement.

E. Modified existing soil – compacted subsoil (**PLATE 2**)
    1. Description of condition to be modified: Deep soil compaction the result of previous grading, filling and dynamic or static compaction forces. Original A horizon likely removed or buried. The soil organic matter, pH and chemistry in the A horizon is likely not suitable for the proposed plants and should be modified as required.
    2. Soil Ripping:
        a. Step one: After grading and removing all plants and debris from the surface, using a tracked dozer or similar large grading equipment, loosen the soil by dragging a ripping shank or chisel thru the soil to depths of 24 inches with ripping shanks spaced 18 inches or less apart in two directions. The number of shanks per pull is dependent on the degree of soil compaction and the size of the dozer.
        b. Step 2: Spread 3-4 inches of Compost over the ripped area and till into the top 6 inches of the soil surface.

3. Soil Fracturing: (**PLATE 3**)
    a. Step one: After grading and removing all plants and debris from the surface, spread 2 – 3 inches of Compost over the surface of the soil. Loosen the soil to depth of 18 - 24 inches, using a backhoe to dig into the soil through the Compost. Lift and then drop the loosened soil immediately back into the hole. The bucket then moves to the adjacent soil and repeats the process until the entire area indicated has been loosened.
    b. Step 2: Spread 3-4 inches of Compost over the ripped area and till into the top 6 inches of the soil surface.
4. Trenching: (**PLATE 4**)
    a. Step one: After grading and removing all plants and debris from the surface using a chain trenching machine, dig 24-inch-deep trenches, 24 inches apart across the entire area. Maintain an 18-inch standoff from the edges of all curbs, paving and structures. Backfill the trenches with Compost.
    b. Step 2: Spread 3-4 inches of Compost over the trenches area and till into the top 6 inches of the soil surface. Compost tilling treatment shall extend to the edges of curbs, paving and structures.
5. Following soil ripping or fracturing the average penetration resistance should be less than 250 psi to the depth of the ripping or fracturing.
6. Do not start planting into ripped or fractured soil until soil has been settled or leave grades sufficiently high to anticipate settlement of 10 – 15% of ripped soil depth.

F. Modified existing soil – low organic matter.
1. Description of condition to be modified: Low soil organic matter and/or missing A horizon but soil is not compacted except for some minor surface compaction. The soil organic matter, pH and/or chemistry are likely not suitable for the proposed plants and should be modified as required.
2. Modifications:
    a. Spread 3 - 4 inches of Compost over the surface of the soil and make chemical adjustment as recommended by the soil test.
    b. Till Compost into the top 6 inches of the soil.

G. Modified existing soil – soil within the root zone of existing established trees (**PLATE 5**)
1. Description of condition to be modified: Surface compaction near or above root limited levels in the upper soil horizon the result of traffic or other mechanical compaction.
2. Modifications:
    a. Remove the tops of all plants to be removed from the root zone. Remove sod with a walk behind sod cutter. Do not grub out the roots of plats to be removed.
    b. Use a pneumatic air knife to loosen the top 9 – 12 inches of the soil. Surface roots may move and separate from soil during this process but the bark on roots should not be broken
        1) Pneumatic air knife shall be as manufactured by:
        Concept Engineering Group, Inc., Verona, PA (412) 826-8800
        or
        Supersonic Air Knife, Inc., Allison Park, PA (866) 328 5723
    c. Make chemical adjustment as recommended by the soil test and add 2 - 3 inches of Compost over the soil.
    d. Using the pneumatic air knife, mix the Compost into the top 6 – 8 inches of the loosened soil.
    e. Work in sections such that the entire process - including irrigation - can be completed in one day. Apply approximately one inch of water over the loosened soil at the completion

of each day's work. Apply mulch or turf as indicated on the drawings within one week of the completion of work.

2.7 Planting Soil Mixes

A. General Definition: Mixes of Existing Soil or Imported Topsoil, Coarse Sand, and or Compost to make a new soil that meets the project goals for the indicated planting area. These may be mixed off site or onsite, and will vary in Mix components and proportions as indicated.

B. Planting Mix - moderately slow draining soil for trees and shrub beds

1. A Mix of Imported Topsoil, Coarse Sand and Compost. The approximate Mix ratio shall be:

Mix component	% by moist volume
Imported Topsoil unscreened	45-50%
Coarse sand	40-45%
Compost	10%

2. Final tested organic matter between 2.75 and 4% (by dry weight).
3. Mix the Coarse Sand and Compost together first and then add to the Topsoil. Mix with a loader bucket to loosely incorporate the Topsoil into the Coarse Sand/Compost Mix. DO NOT OVER MIX! Do not mix with a soil blending machine. Do not screen the soil. Clumps of Soil, Compost and Coarse Sand will be permitted in the overall Mix.
4. At the time of final grading, add fertilizer if required to the Planting Soil at rates recommended by the testing results for the plants to be grown.
5. Provide a two gallon sample with testing data that includes recommendations for chemical additives for the types of plants to be grown. Samples and testing data shall be submitted at the same time.

2.8 Pre-Emergent Herbicides

A. Chemical herbicides are designed to prevent seeds of selective plants from germinating. Exact type of herbicide shall be based on the specific plants to be controlled and the most effective date of application.

B. Submit report of expected weed problems and the recommendation of the most effective control for approval by Owner's Representative. Provide manufacturer's literature and material certification that the product meets the requirements.

Installation, Fabrication and Construction

3.1 Grade And Elevation Control

A. Provide grade and elevation control during installation of Planting Soil. Utilize grade stakes, surveying equipment, and other means and methods to assure that grades and contours conform to the grades indicated on the plans.

3.2 Site Preparation

A. Excavate to the proposed subgrade. Maintain all required angles of repose of the adjacent materials as shown on the drawings or as required by this specification. Do not over excavate compacted subgrades of adjacent pavement or structures. Maintain a supporting 1:1 side slope of compacted subgrade material along the edges of all paving and structures where the bottom of the paving or structure is above the bottom elevation of the excavated planting area.

B. Remove all construction debris and material including any construction materials from the subgrade.

C. Confirm that the subgrade is at the proper elevation and compacted as required. Subgrade elevations shall slope approximately parallel to the finished grade and/or toward the subsurface drain lines as shown on the drawings.

D. In areas where Planting Soil is to be spread, confirm subgrade has been scarified.

E. Protect adjacent walls, walks and utilities from damage or staining by the soil. Use 1/2 inch plywood and or plastic sheeting as directed to cover existing concrete, metal and masonry work and other items as directed during the progress of the work.
   1. At the end of each working day, clean up any soil or dirt spilled on any paved surface.
   2. Any damage to the paving or site features or work shall be repaired at the Contractor's expense.

3.3 Soil Moisture

A. Refer to Standard 32 90 00.

3.4 Planting Soil And Planting Soil Mix Installation

A. Prior to installing any Planting Soil from stockpiles or Planting Soil Mixes blended off site, the Owner's Representative shall approve the condition of the subgrade and the previously installed subgrade preparation and the installation of subsurface drainage.

B. All equipment utilized to install or grade Planting Soils shall be wide track or balloon tire machines rated with a ground pressure of 4 psi or less. All grading and soil delivery equipment shall have buckets equipped with 6 inch long teeth to scarify any soil that becomes compacted.

C. In areas of soil installation above existing subsoil, scarify the subgrade material prior to installing Planting Soil.
   1. Scarify the subsoil of the subgrade to a depth of 3 – 6 inches with the teeth of the back hoe or loader bucket, tiller or other suitable device.
   2. Immediately install the Planting Soil. Protect the loosened area from traffic. DO NOT allow the loosened subgrade to become compacted.
   3. In the event that the loosened area becomes overly compacted, loosen the area again prior to installing the Planting Soil.

D. Install the Planting Soil in 12 - 18 inch lifts to the required depths. Apply compacting forces to each lift as required to attain the required compaction. Scarify the top of each lift prior to adding more Planting Soil by dragging the teeth of a loader bucket or backhoe across the soil surface to roughen the surface.

E. Phase work such that equipment to deliver or grade soil does not have to operate over previously installed Planting Soil. Work in rows of lifts the width of the extension of the bucket on the loader. Install all lifts in one row before proceeding to the next. Work out from the furthest part of each bed from the soil delivery point to the edge of the each bed area.

F. Where possible place large trees first and fill Planting Soil around the root ball.

G. Installing soil with soil or mulch blowers or soil slingers shall not be permitted due to the over mixing and soil ped breakdown cause by this type of equipment.

H. Where travel over installed soil is unavoidable, limit paths of traffic to reduce the impact of compaction in Planting Soil. Each time equipment passes over the installed soil it shall reverse out of the area along the same path with the teeth of the bucket dropped to scarify the soil. Comply with the paragraph "Compaction Reduction" (section 3.9) in the event that soil becomes over compacted.

I. The depths and grades shown on the drawings are the final grades after settlement and shrinkage of the compost material. The Contractor shall install the Planting Soil at a higher level to anticipate this reduction of Planting Soil volume (see **PLATE 6**). A minimum settlement of approximately 10 - 15% of the soil depth is expected. All grade increases are assumed to be as measured prior to addition of surface Compost till layer, mulch, or sod.

3.5 Compaction Requirements For Installed Or Modified Planting Soil

A. Compact installed Planting Soil to the compaction rates indicated and using the methods approved for the soil mockup. Compact each soil lift as the soil is installed.

B. Existing soil that is modified by tilling, ripping or fracturing shall have a density to the depth of the modification, after completion of the loosening, such that the penetrometer reads approximately 75 to 250 psi at soil moisture approximately the mid-point between wilting point and field capacity. This will be approximately between 75 and 82% of maximum dry density standard proctor.

C. Installed Planting Soil Mix and re-spread existing soil shall have a soil density through the required depth of the installed layers of soil, such that the penetrometer reads approximately 75 to 250 psi at soil moisture approximately the mid-point between wilt point and field capacity. This will be approximately between 75 and 82% of maximum dry density standard proctor.

D. Planting Soil compaction shall be tested at each lift using a penetrometer calibrated to the mockup soil and its moisture level. The same penetrometer and moisture meter used for the testing of the mockup shall be used to test installed soil throughout the work.

E. Maintain moisture conditions within the Planting Soil during installation or modification to allow for satisfactory compaction. Suspend operations if the Planting Soil becomes wet. Apply water if the soil is overly dry.

F. Provide adequate equipment to achieve consistent and uniform compaction of the Planting Soils. Use the smallest equipment that can reasonably perform the task of spreading and compaction. Use the same equipment and methods of compaction used to construct the Planting Soil mockup.

G. Do not pass motorized equipment over previously installed and compacted soil except as authorized below.
   1. Light weight equipment such as trenching machines or motorized wheel barrows is permitted to pass over finished soil work.
   2. If work after the installation and compaction of soil compacts the soil to levels greater than the above requirements, follow the requirements of the paragraph "Over Compaction Reduction" below.

3.6 Over Compaction Reduction

A. Any soil that becomes compacted to a density greater than the specified density and/or the density in the approved mockup shall be dug up and reinstalled. This requirement includes compaction caused by other sub-contractors after the Planting Soil is installed and approved.

B. Surface roto tilling shall not be considered adequate to reduce over compaction at levels 6 inches or greater below finished grade.

3.7 Installation Of Chemical Additives

A. Following the installation of each soil and prior to fine grading and installation of the Compost till layer, apply chemical additives as recommended by the soil test, and appropriate to the soil and specific plants to be installed.

B. Types, application rates and methods of application shall be approved by the Owner’s Representative prior to any applications.

3.8 Fine Grading

A. The Owner's Representative shall approve all rough grading prior to the installation of Compost, fine grading, planting, and mulching.

B. Grade the finish surface of all planted areas to meet the grades shown on the drawings, allowing the finished grades to remain higher (10 – 15% of depth of soil modification) than the grades on the grading plan, as defined in paragraph Planting Soil Installation, to anticipate settlement over the first year.

C. Utilize hand equipment, small garden tractors with rakes, or small garden tractors with buckets with teeth for fine grading to keep surface rough without further compaction. Do not use the flat bottom of a loader bucket to fine grade, as it will cause the finished grade to become overly smooth and or slightly compressed.

D. Provide for positive drainage from all areas toward the existing inlets, drainage structures and or the edges of planting beds. Adjust grades as directed to reflect actual constructed field conditions of paving, wall and inlet elevations. Notify the Owner's Representative in the event that conditions make it impossible to achieve positive drainage.

E. Provide smooth, rounded transitions between slopes of different gradients and direction. Modify the grade so that the finish grade before adding mulch and after settlement is one or two inches below all paving surfaces or as directed by the drawings.

F. Fill all dips and remove any bumps in the overall plane of the slope. The tolerance for dips and bumps in shrub and ground cover planting areas shall be a 2 inch deviation from the plane in 10 feet. The tolerance for dips and bumps in lawn areas shall be a 1 inch deviation from the plane in 10 feet.

3.9 Installation Of Compost Till Layer

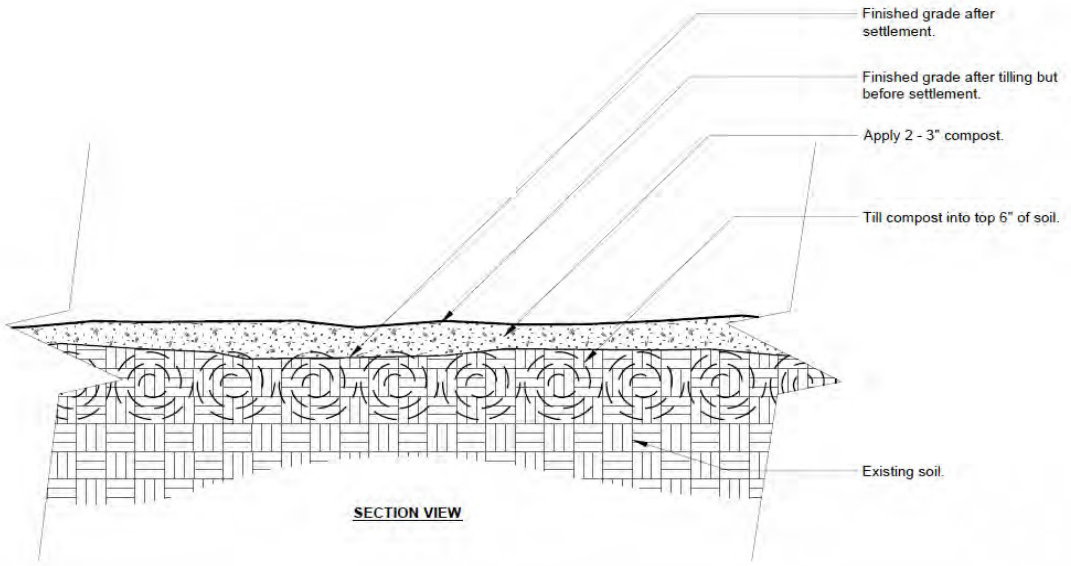
A. After Planting Soil Mixes are installed in planting bed areas and just prior to the installation of shrub or groundcover plantings, spread 3 – 4 inches of Compost over the beds and roto till into the top 4 - 6 inches of the Planting Soil. This step will raise grades slightly above the grades required in paragraph "Fine Grading". This specification anticipates that the raise in grade due to this tilling will settle within a few months after installation as Compost breaks down. Additional settlement as defined in paragraph "Planting Soil and Planting Soil Mix installation" must still be accounted for in the setting of final grades.

3.10 Planting Soil And Modified Existing Soil Protection

A. The Contractor shall protect installed and/or modified Planting Soil from damage including contamination and over compaction due to other soil installation, planting operations, and operations by other Contractors or trespassers. Maintain protection during installation until acceptance. Utilize fencing and matting as required or directed to protect the finished soil work. Treat, repair or replace damaged Planting Soil immediately.

B. Loosen compacted Planting Soil and replace Planting Soil that has become contaminated as determined by the Owner's Representative. Planting Soil shall be loosened or replaced at no expense to the Owner.

1. Till and restore grades to all soil that has been driven over or compacted during the installation of plants.
2. Where modified existing soil has become contaminated and needs to be replaced, provide imported soil that is of similar composition, depth and density as the soil that was removed.



Notes:
1- See planting soil specifications for additional requirements.

S-X MODIFIED EXISTING SOIL - COMPACTED SURFACE SOIL

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PLATE 1

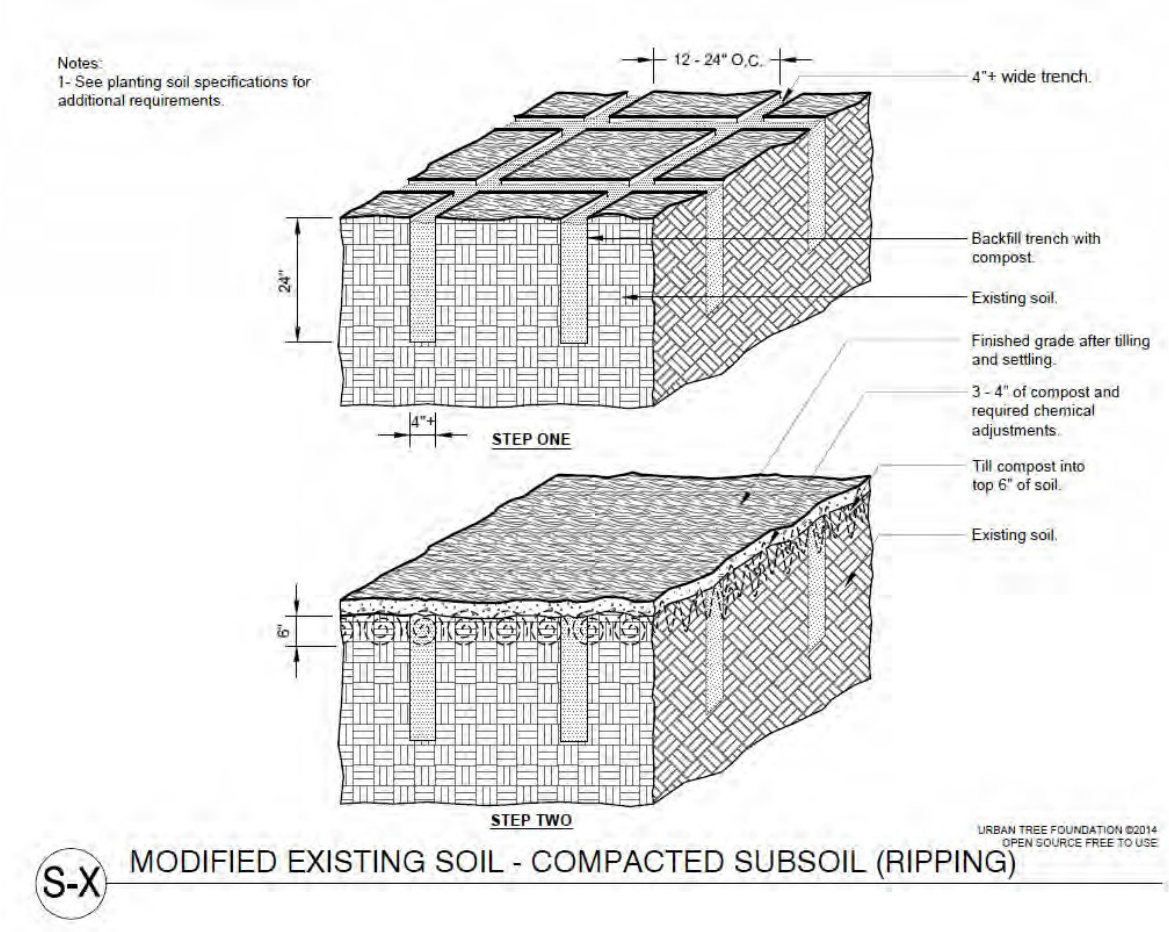

Notes:
1- See planting soil specifications for additional requirements.
12 - 24" O.C.
4"+ wide trench.
24"
Backfill trench with compost.
Existing soil.
4"+
STEP ONE
Finished grade after tilling and settling.
3 - 4" of compost and required chemical adjustments.
Till compost into top 6" of soil.
Existing soil.
6"
STEP TWO
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S-X
MODIFIED EXISTING SOIL - COMPACTED SUBSOIL (RIPPING)

PLATE 2

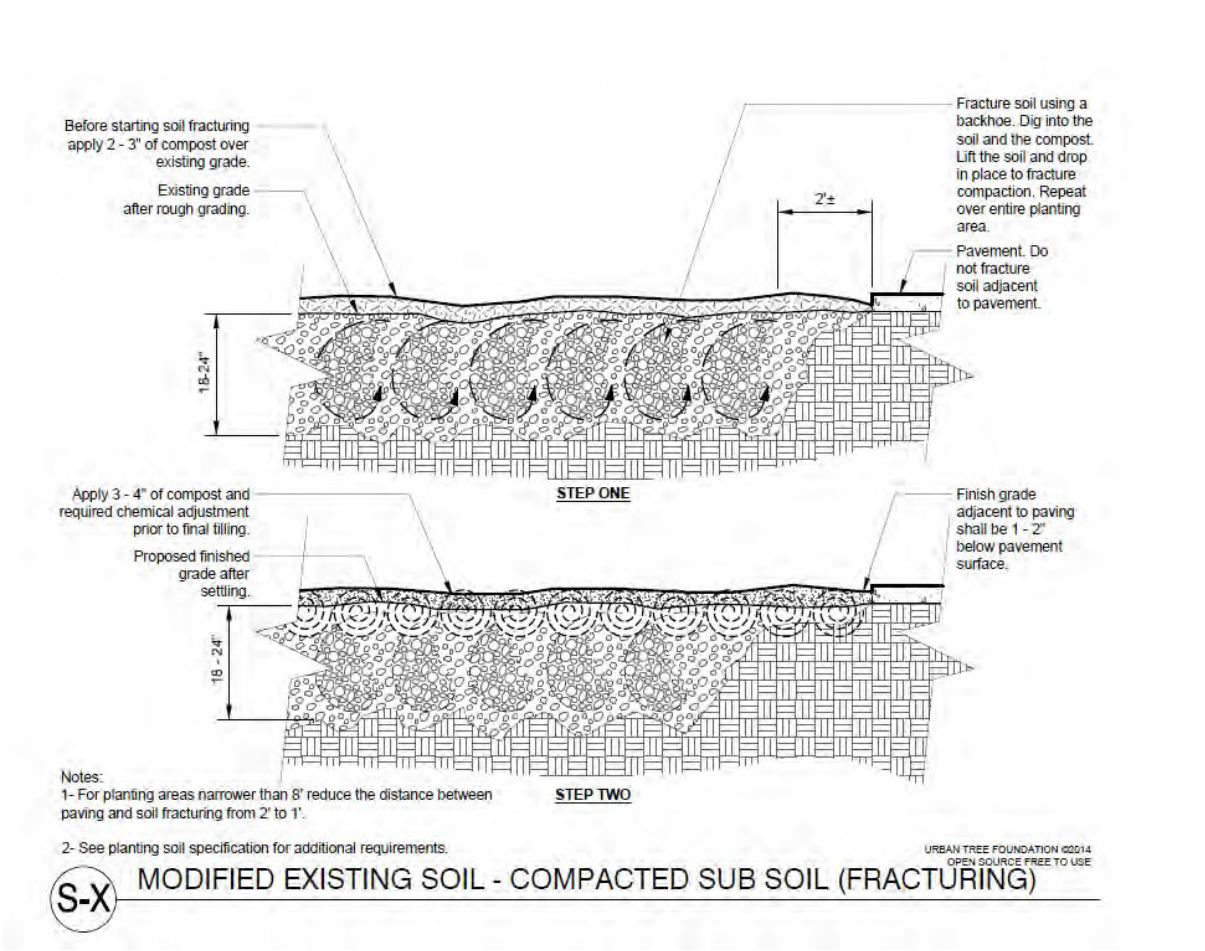

Before starting soil fracturing apply 2 - 3" of compost over existing grade.
Existing grade after rough grading.
Fracture soil using a backhoe. Dig into the soil and the compost. Lift the soil and drop in place to fracture compaction. Repeat over entire planting area.
2'±
Pavement. Do not fracture soil adjacent to pavement.
18-24"
STEP ONE
Apply 3 - 4" of compost and required chemical adjustment prior to final tilling.
Proposed finished grade after settling.
Finish grade adjacent to paving shall be 1 - 2" below pavement surface.
18 - 24"
STEP TWO
Notes:
1- For planting areas narrower than 8' reduce the distance between paving and soil fracturing from 2' to 1'.
2- See planting soil specification for additional requirements.
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S-X
MODIFIED EXISTING SOIL - COMPACTED SUB SOIL (FRACTURING)

PLATE 3

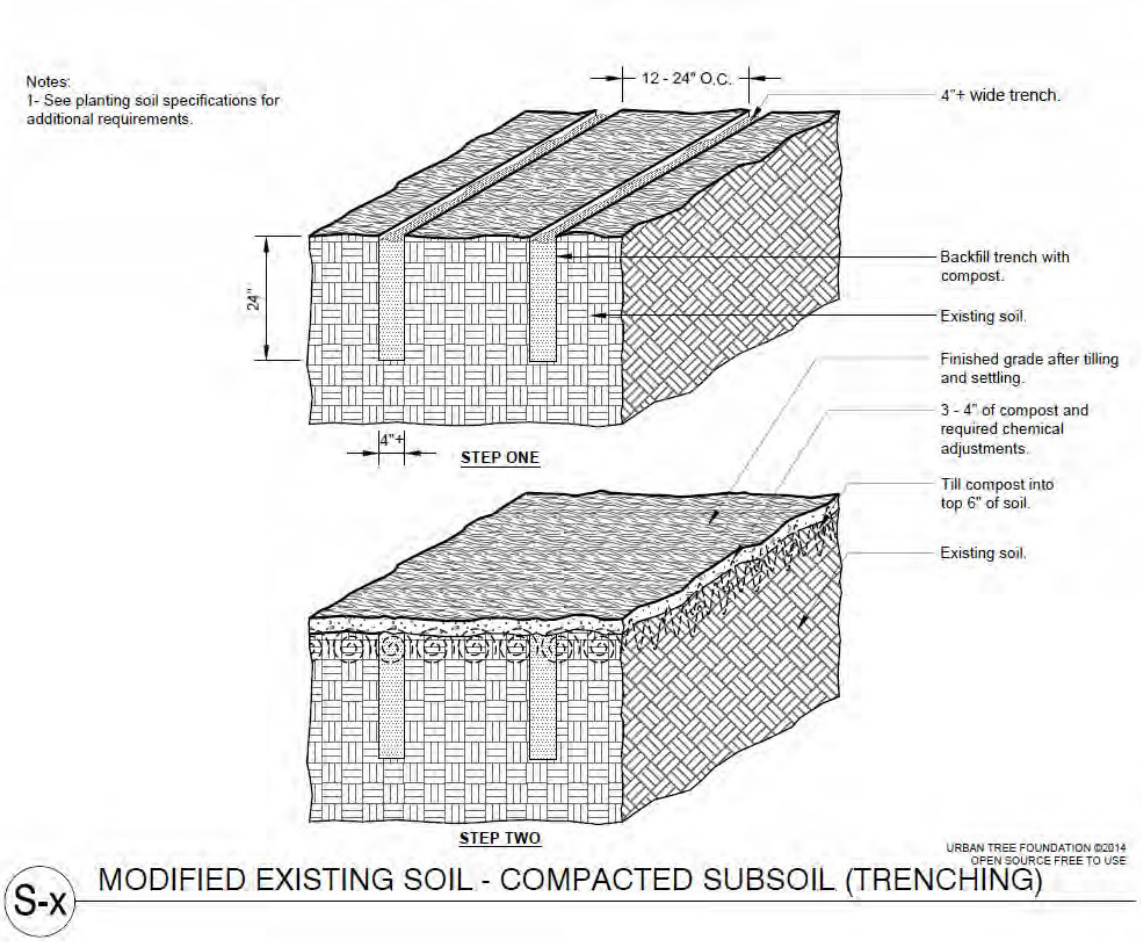
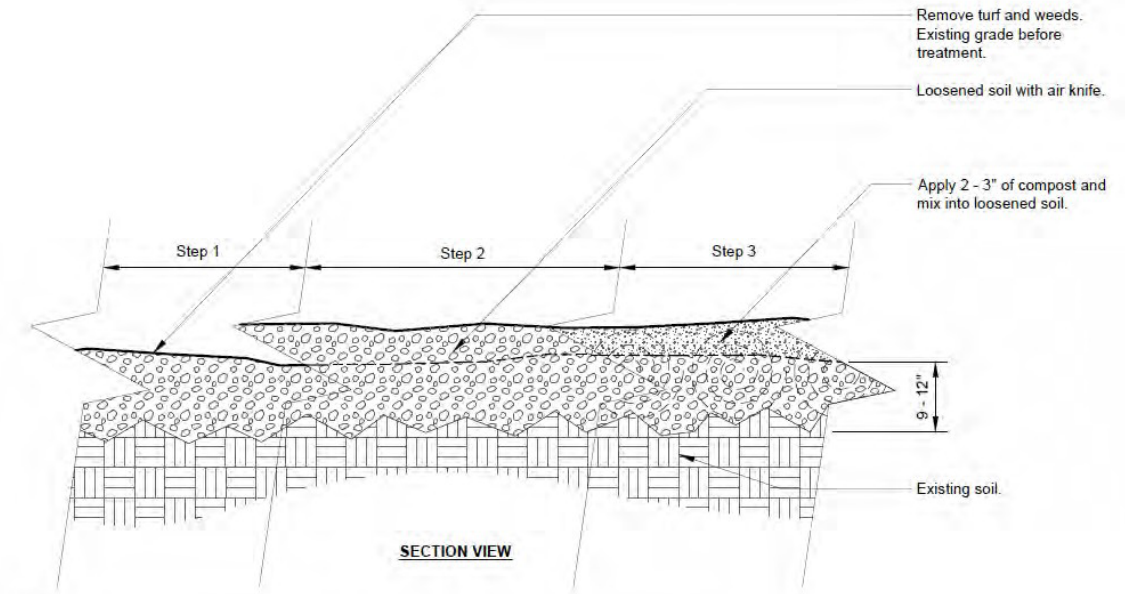

Notes:
1- See planting soil specifications for additional requirements.
12 - 24" O.C.
4"+ wide trench.
24"
Backfill trench with compost.
Existing soil.
Finished grade after tilling and settling.
3 - 4" of compost and required chemical adjustments.
4"+
STEP ONE
Till compost into top 6" of soil.
Existing soil.
STEP TWO
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S-x
MODIFIED EXISTING SOIL - COMPACTED SUBSOIL (TRENCHING)

PLATE 4



Notes:
1- Prior to the start of work remove all thatch, sod, and/or weeds.

2- Loosen soil with Air Knife or approved equal to a depth of 9 - 12" and work around encountered roots.

3- Apply 2 - 3" of compost over loosened soil. Using an air knife mix compost into loosened soil.

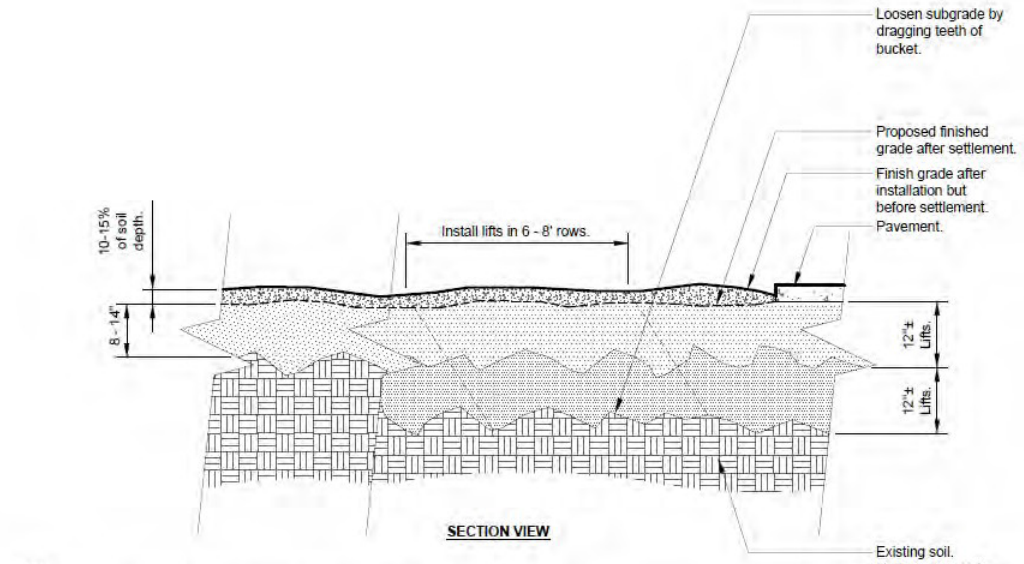
4- Water entire root zone at end of each work day.

5- See planting soil specifications for additional requirements.

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S-X MODIFIED EXISTING SOIL - COMPACTED SOIL IN TREE DRIPLINE

PLATE 5



Notes:
1- Means and methods of soil compaction shall be determined at time of soil mock up.

2- Soil compaction after installation shall be 75 - 250 PSI at soil moisture between field capacity and wilting point.

3- For soil depths see planting soil specifications.

4- See planting soil specification for additional requirements.

S-x MODIFIED EXISTING SOIL - INSTALLED PLANTING MIX

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PLATE 6

END OF PLANTING SOILS STANDARD