

0700-PERFORMANCE SPECIFICATIONS

Facility Performance

PERFORMANCE

A. Basic Function:

1. Provide built elements and Site modifications in conformance with the following performance specifications, as required to fulfill needs described in the Project program.
2. The complete Project comprises the following elements:
 - a) Substructure: Elements below grade and in contact with the ground.
 - b) Shell: The superstructure, exterior enclosure, and the roofing.
 - c) Interiors: Interior construction, stairs, finishes, and fixtures, except fixtures associated with services and specialized equipment.
 - d) Services: Mechanized, artificial, automatic, and unattended means of supply, distribution, transport, removal, disposal, protection, control, and communication.
 - e) Equipment and Furnishings: Fixed and movable elements operated or used by occupants in the functioning of the Project.
 - f) Site work: Modifications to the Site, Site improvements, and utilities.
3. Code: Make all portions of the Project comply with the applicable IBC, State of Oregon building codes and federal statutes and regulations (the “Code”).
 - a) Non-Regulatory Criteria Documents: In addition to specific regulatory requirements, the following documents/ORS are also incorporated into the definition of the Code for the purposes of this Project.
 - a. NG Pam 415-12, Army National Guard Facilities Allowances (<http://www.ngbpmc.ng.mil/Portals/Publications/NGPAM/ngpam%20415-12.pdf?ver=6OLqgGTmJ7nhA%3D%3D>).
 - b. Design Guide 415-1, Readiness Centers Design Guide (<http://www.wbdg.org/ffc/army-coe/army-national-guard-criteria/dg-415-1>).
 - c. Design Guide 415-5, General Facilities Information Design Guide (<http://www.wbdg.org/ffc/army-coe/army-national-guard-criteria/dg-415-5>).
 - d. UFC 3-230-01, Water Storage and Distribution (<http://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc/ufc-3-230-01>).
 - e. UFC 1-200-02, High Performance and Sustainable Building Requirements (<http://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc/ufc-1-200-02>).
 - f. UFC 3-230-03, Water Treatment (<http://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc/ufc-3-230-03>).
 - g. UFC 3-230-06A, Subsurface Drainage (<http://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc/ufc-3-230-06a>).
 - h. UFC 3-240-01, Wastewater Collection (<http://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc/ufc-3-240-01>).
 - i. UFC 3-240-02, Domestic Wastewater Treatment (<http://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc/ufc-3-240-02>).
 - j. UFC 3-310-04, Seismic Design of Buildings (<http://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc/ufc-3-310-04>).
 - k. UFC 3-410-01, Heating, Ventilating, And Air Conditioning Systems (<http://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc/ufc-3-410-01>).
 - l. UFC 3-530-01, Interior and Exterior Lighting Systems and Controls (<http://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc/ufc-3-530-01>).
 - m. UFC 3-600-01, Fire Protection Engineering for Facilities (<http://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc/ufc-3-600-01>).
 - n. UFC 4-021-01 Design and O&M: Mass Notification Systems (<http://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc/ufc-4-021-01>).

- o. UFC 4-010-01, DoD Minimum Antiterrorism Standards for Buildings (<http://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc/ufc-4-010-01>).
 - p. USACE ECB 2008-15 Design of Surface Drainage Facilities (<https://www.wbdg.org/ffc/dod/engineering-and-construction-bulletins-ecb/usace-ecb-2008-15>).
 - q. UFC 4-023-03, Design of Buildings to Resist Progressive Collapse (<http://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc/ufc-4-023-013>).
 - r. OMD Control System Specifications – Instrumentation and Control for HVAC. (Request from OMD).
 - s. OMD MDF_IDF Communications Room Voice-Data-Video Cabling Standard 2014 (Request from OMD).
 - t. The Oregon Department of Energy (“ODOE”) 1.5% Green Energy Technology in Public Building Construction Contracts requirements pursuant to ORS 279C.527, 279C.528 and OAR 330-135-0010 to 330-135-0055, at (<https://www.oregon.gov/energy/energy-oregon/pages/get.aspx>).
 - u. The completed Project must meet The State of Oregon energy efficiency design (“SEED”) requirements set forth at Oregon Revised Statutes (“ORS”) 276.900 through 276.915 and Oregon Administrative Rules (“OAR”) 330-130-0010 through 330-130-0100 (which can be reviewed at (<https://www.oregon.gov/energy/energy-oregon/Pages/SEED-Program-Guidelines.aspx>)).
 - v. The completed Project must achieve the rating of LEED Silver, a Certification from the US Green Building Council (“USGBC”) Leadership in Energy and Environmental Design (“LEED”®). (<https://www.usgbc.org/leed/rating-systems/new-buildings>).
4. Environmentally Responsible Design: In addition to other requirements, provide design and construction that minimizes adverse effects on the exterior environment, enhances the quality of the indoor environment, and minimizes consumption of energy, water, construction materials, and other resources.
- a) Achieve 20% or better of the State of Oregon energy code and according to the State Energy Efficient Design program (“SEED”) requirements to minimize the long-term operation and maintenance costs. SEED rules are described in the Department of Energy’s publication of the SEED Program Guidelines, available at <http://www.energy.state.or.us/SEEDhome.htm>.
 - b) Substantiation:
 - 1) Proposal Stage: LEED and SEED Checklist annotated to show specific credits, systems, and efficiencies with a brief description of how they will achieve the intended requirements.
 - 2) At Completion: LEED and SEED Certification and report from the State Energy Efficient Design program that validates that the facility is compliant with all SEED requirements.
5. Food Preparation, Storage, and Serving Facilities: Located, designed, and constructed to allow efficient operations, to minimize contamination and spoilage of foods, to allow easy maintenance and cleaning, and to provide effective protection against the entrance and harborage of pests.
- a) Provide a facility that is flexible enough to allow changes and adjustments due to modification of production procedures from time to time.
 - b) Provide a design in accordance with the latest published criteria from the U.S. Army Quartermaster Center and School (“USAQMC&S”).
 - c) Substantiation:
 - 1) Proposal: Identification of design consultants.
 - 2) Preliminary Design: Space allocations and detailed program, if not already established; analysis of traffic flows of users and supplies.
 - 3) Design Development: Layouts and work flow diagrams, including methods of protecting against contamination of foodstuffs.
 - 4) Construction Documents: Material and equipment specifications.
6. Athletic Spaces: Refer to DG 415-5, Chapter 5; and NG PAM 415-12, Chapter 2 for design guidance regarding the physical fitness area.
- a) Physical Fitness Area

B. Amenity and Comfort:

1. Thermal Performance: Design and construct to provide comfortable interior environment in accordance with the Code and the following:
 - a) Summer Interior Design Conditions:
 - 1) Daytime Set point: 22 deg C (72 deg F), plus or minus 1 deg C (2 deg F) except as specified in the Project program.
 - 2) Night Setback: 25 deg C (78 deg F).
 - 3) Interior Relative Humidity: 50 percent, maximum.
 - b) Outside Air Design Conditions:
 - 1) Summer Outside Air Design Temperature: 0.4 percent cooling design condition listed in the ASHRAE Fundamentals Handbook.
 - 2) Winter Outside Air Design Temperature: 99.6 percent heating design condition listed in the 2013 ASHRAE Fundamentals Handbook.
 - c) Energy Design Wind Speed: 40 km/h (25 mph).

C. Health and Safety:

1. Prevention of Accidental Injury: As required by the Code and as follows:
 - a) Safety Glazing: As defined by 16 CFR 1201; provide in locations required by the Code, glazed areas subject to human impact, glazed areas at grade, and doors.
 - b) Substantiation:
 - 1) Preliminary Design: Identification of building elements that require special accident prevention measures.
 - 2) Design Development: Identification of safety measures taken, detailed description of design criteria, and structural analysis of load-resisting elements prepared by licensed structural engineer.
 - 3) Construction Documents: For load-resisting elements, structural design calculations and drawings sealed by licensed structural engineer.
2. Lightning Hazard: Design to prevent damage to occupants, structure, services, and contents due to lightning strikes.
 - a) Provide protection equivalent to that specified in NFPA 780; supplementary strike termination devices, ground conductors, and grounding electrodes are required only where the integral portions of the structure cannot perform those functions.
 - b) Ground Resistance Measurement Methods: As described in NFPA 780, Appendix I.
 - c) Substantiation:
 - 1) Design Development: If methods prescribed by NFPA 780 are not used, description of engineering basis of design, including grounding terminal design.
 - 2) Design Development: Diagrams showing locations of strike (air) terminals and zones of protection; identification of internal components that require bonding to equalize potential.
 - 3) Construction Documents: Drawings showing locations and sizes of conductors, bonding of metal bodies, and components; detailed installation specifications.
3. Health Hazards:
 - a) Design to prevent growth of fungus, mold, and bacteria on surfaces and in concealed spaces.
 - b) Indoor Air Quality: Design and construct to comply with the Code and the following:
 - 1) Acceptable air quality as defined by ANSI/ASHRAE 62.1.
 - 2) Substantiation:
 - (a) Design Development: Identification of methods to be used to comply with requirements; ventilation design calculations. Identification of unusual indoor contaminants or sources and methods to mitigate their effects on occupants.
 - (b) Construction Documents: Specifications showing that construction materials are not contaminant sources and do not adversely affect air quality.
 - (c) Occupancy: Field testing to show compliance, after full occupancy.
4. Physical Security: In addition to any provisions that may be required by law or Code, design and construct both exterior and interior spaces to incorporate accepted principles of crime prevention through environmental design (“CPTED”), using natural (as opposed to technological) methods of providing surveillance, access control, and territorial reinforcement wherever possible.

- a) Definition of Elements at Ground Level: For purposes of physical security, any element within 6 m (20 feet) of the ground, grade, or adjacent paving.
 - b) Security Zones:
 - 1) Public Access Zone: That area to which the public has free access, including public corridors, grounds, and parking lots.
 - 2) Reception Zone: The area to which the general public has access but beyond which access is restricted at all times.
 - 3) Operations Zone: The area to which only employees and visitors with a legitimate reason to be there have access.
 - 4) Secure Zone: The area to which access is always controlled and which is monitored continuously.
 - 5) High-Security Zone: Areas indicated in Project program and areas named "vault" and "secure file room".
5. Electrically-Operated Equipment and Appliances: UL listed for application or purpose to which they are put; suitable for wet locations listing for exterior use.
- D. Structure:
1. Earthquake Loads: Accommodate loads as prescribed by the Code.
 2. Substantiation:
 - a) Proposal: Identification of major structural materials and systems.
 - b) Preliminary Design: Detailed listing of design criteria and preliminary analysis, prepared by a licensed structural engineer.
 - c) Construction Documents: Detailed design analysis by licensed structural engineer.
- E. Durability:
1. Expected Service Life Span: Expected functional service life of the built portions of this Project is 50 years.
 - a) Service life spans of individual elements that differ from the overall Project life span are defined in other Sections.
 - b) Substantiation: Since actual service life cannot be proven, substantiation of actual service life is not required; however, the following are reasonable indicators of anticipatable service life:
 - 1) Preliminary Design or Design Development: Service life expectancy analysis, for each element for which life span is specified; including:
 - (a) Length of effective service life and aesthetic service life if specified, with action required at end; e.g. complete replacement, partial replacement, and refurbishment.
 - (b) Conditions under which estimate will be valid; e.g. expected uses, inspection frequency, maintenance frequency, etc.
 - 2) Design Development: Replacement cost, in today's dollars, for each major element that has a service life expectancy less than that of the Project; include both material and labor cost, but not overhead or profit; base costs on installing in existing building, not as a new installation.
 - 3) Design Development: Life cycle cost of Project, over the specified Project service life, excluding operating staff costs; include costs of:
 - (a) Replacement of each element not expected to last the life of the Project; identify the frequency of replacement.
 - (b) Deduct salvage value of replaced elements.
 - (c) Calculate costs in today's dollars, disregarding the time value of money, inflation, taxes, and insurance.
 2. Biological Factors:
 - a) Animals: Do not use materials that are attractive to or edible by animals or birds.
 - b) Insects: Do not use materials that are edible by insects, unless access by insects is prevented.
 - c) Wood: When wood is used, provide at least the protection recommended by AWWA as contained in AWWA U1.
- F. Operation and Maintenance:
1. Space Efficiency: Minimize floor area required while providing specified spaces and space relationships, plus circulation and services areas required for functions.

- a) Substantiation: Areas and ratios measured and calculated in accordance with ANSI/BOMA Z65.1.
 - 1) Proposal: Calculation of Gross Building Area, Building Common Area, Floor Common Areas, Floor Rentable Areas, and Building Rentable Area, R/U Ratio, and net area of each space.
 - 2) Design Development: Calculation of Gross Building Area, Building Common Area, Floor Common Areas, Floor Rentable Areas, and Building Rentable Area, R/U Ratio, and net area of each space.
2. Energy Efficiency: Minimize energy consumption while providing function, amenity, and comfort specified.
 - a) Provide energy efficient design using procedures and values specified in ASHRAE 90.1.
 - b) Substantiation:
 - 1) Proposal: Identification of method of calculation of energy efficiency to be employed.
 - 2) Design Development: Detailed listing of design criteria and design analysis showing compliance, prepared by a licensed mechanical engineer.
 - 3) Design Development: Energy cost of all energy-consuming equipment and systems over the first year of operation; include analysis of probable change in annual cost over time due to aging but disregarding inflation and rate changes.
3. Energy Monitoring: Install utility meter monitoring systems for water, gas, and electricity as prescribed by U.S. Army Corps of Engineers (“USACE”) Meter Data Management System (“MDMS”) Specifications.
4. Water Consumption: Minimize water consumption.
5. Ease of Operation: Provide facility, equipment, and systems that are easily operated by personnel with a reasonable level of training for similar activities.
 - a) Minimize the need for specialized training in operation of specific equipment or systems; identify all equipment and systems for which the manufacturer recommends or provides training programs.
 - b) Train Owner's personnel in operation of equipment and systems.
 - c) Substantiation:
 - 1) Proposal: Type of operating personnel and amount of training required; identification of each equipment item or system for which more than one day of training is required; identify source of data.
6. Ease of Maintenance: Minimize the amount of maintenance required.
 - a) Substantiation:
 - 1) Proposal: Estimated maintenance cost for first year of operation, based on use of outside maintenance contracts; estimate of the impact that aging materials will have on maintenance costs; description of maintenance activities included in estimated cost.
7. Ease of Repair: Elements that do not meet the specified requirements for ease of repair may be used, provided they meet the specified requirements for ease of replacement of elements not required to have service life span equal to that specified for the Project as a whole; the service life expectancy analysis and life cycle cost substantiation specified for service life are provided; and Owner' acceptance is granted.
8. Ease of Replacement:
 - a) Elements Not Required to have the Expected Service Life Span Equal to that Specified for the Project as a Whole: Make provisions for replacement without undue disruption of building operation.

ELEMENTS AND PRODUCTS

- A. In addition to requirements specified in other Sections, provide products and elements that comply with the following.
- B. Where "no substitutions" is indicated, use only the product (or one of the products) specified.
- C. Elements Made Up of More Than One Product:

1. Where an element is specified by performance criteria, use construction either proven-in-use or proven-by-mock-up, unless otherwise indicated.
 - a) Proven-In-Use: Proven to comply by having actually been built to the same or very similar design with the same materials as proposed and functioning as specified.
 - b) Proven-by-Mock-Up: Compliance reasonably predictable by having been tested in full-scale mock-up using the same materials and design as proposed and functioning as specified. Testing need not have been accomplished specifically for this Project; when published listings of independent agencies include details of testing and results, citation of test by listing number is sufficient (submittal of all test details is not required).
 - c) The DBC may choose whether to use elements proven-in-use or proven-by-mock-up, unless either option is indicated as specifically required.
 - d) Where test methods accompany performance requirements, use those test methods to test the mock-up.
 2. Where a type of product is specified, without performance criteria specifically applicable to the element, use the type of product specified.
 3. Where more than one type of product is specified, without performance criteria specifically applicable to the element, use one of the types of products specified.
 4. Where a type of product is specified, with applicable performance criteria, use either the type of product specified or another type of product that meets the performance criteria as proven-in-use or proven-by-mock-up.
 5. Where more than one type of product is specified, with applicable performance criteria, use either one of the types of products specified or another type of product that meets the performance criteria as proven-in-use or proven-by-mock-up.
 6. Where neither types of products nor performance criteria are specified, use products that will perform well within the specified life span of the building.
- D. Products:
1. Where a product is specified only by a manufacturer name and model number/brand name, use only that model/brand product.
 2. Where the properties of a product are specified by description and/or with performance criteria, use products that comply with the description and/or performance criteria.
 3. Where manufacturers are listed for a particular product, use a product made by one of those manufacturers that also complies with other requirements.

SUBSTANTIATION

- A. Definition: Substantiation is any form of evidence that is used to predict whether the design will comply with the requirements or to verify that the construction based on the design actually does comply. During Preliminary Design, Design Development, and Construction Documents, requirements to submit substantiation are primarily intended to forestall use of designs or constructions that will not comply. At any time before completion of construction, substantiation is presumed to be only a prediction and may subsequently be invalidated by actual results.
1. Regardless of whether substantiation is specified or not, the actual construction must comply with the specified requirements and may, at the Owner's discretion, be examined, inspected, or tested to determine compliance.
 2. Substantiation submittals will not be approved or accepted, except to the extent that they are part of documents required to be approved or accepted in order to proceed to the next stage of design or construction. However, approval or acceptance of substantiation will not constitute approval or acceptance of deviations from the specified requirements unless those deviations are specifically identified as such on the submittal.
 3. The Owner accepts the responsibility to review substantiation submittals in a timely manner and to respond if they are unacceptable.

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- B. In addition to the requirements stated in other Sections, provide the following substantiation of compliance at each stage of the Project:
1. If a substantiation requirement is specified without an indication of when it is to be submitted, submit or execute it before the end of Construction Documents.
- C. Previous Construction: Where elements proven-in-use are used to comply with performance requirements:
1. In the Proposal, identify which elements will be accomplished using proven-in-use elements.
 2. During Design Development, identify proven-in-use elements proposed for use, including building name, location, date of construction, owner contact, and description of design and materials in sufficient detail to enable reproduction in this Project.
- D. Mock-Up Testing: Where elements proven-by-mock-up are used to comply with performance requirements:
1. In the Proposal, identify which elements will be accomplished using proven-by-mock-up elements.
 2. During Design Development, identify proven-by-mock-up elements proposed for use, with test report including date and location of test, name of testing agency, and description of test and mock-up.
 3. Mock-up testing need not have been performed specifically for this Project, provided the mock-up is substantially similar in design and construction to the element proposed.
- E. Design Analyses (including Engineering Calculations):
1. Where a design analysis or calculation is specified without identifying a particular method, perform analysis in accordance with accepted engineering or scientific principles to show compliance with specified requirements, and submit report that includes analysis methods used and the name and qualifications of the designer.
 2. Where engineering design is allowed to be completed after commencement of construction, substantiation may be in the form of shop drawings or other data.
 3. Submit design analyses at the end of Design Development unless otherwise indicated.
 4. Where design analysis is specified to be performed by licensed design professional, use a design professional licensed in Oregon.
- F. Special Inspections will be contracted separately by the Owner. DBC shall coordinate tests, inspections, and approvals directly with the special inspection firm.
- G. Products:
1. Where actual brand name products are not identified by either the Owner or the Design-Builder, identify the products to be used.
 2. In the Proposal:
 - a) Identify one or more product types for each system, assembly, or element.
 - b) For each product type, provide brief descriptive or performance specifications.
 - c) For major manufactured products that are commonly purchased by brand name, and any other products so indicated, identify at least one manufacturer that will be used.
 3. During Preliminary Design or Design Development:
 - a) Where more than one product type is identified for a particular system, assembly, or element, identify exactly which type will be used.
 - b) For each product type, provide descriptive or performance specifications; early submittals may be brief specifications, but complete specifications are required prior to completion of construction documents.
 - c) For each product type, identify at least one manufacturer that will be used.
 - d) For major manufactured products that are commonly purchased by brand name, and any other products so indicated, provide manufacturer's product literature on at least one actual brand

name product that meets the specifications, including performance data and sample warranty.

4. During Construction:
 - a) Identify actual brand name products used for every product, except commodity products specified by performance or description.
 - b) Where a product is specified by performance requirements with test methods, and if so specified, provide test reports showing compliance.
 - c) Provide manufacturer's product literature for each brand name product.
 - d) Provide the manufacturer's certification that the product used on the Project complies with the Contract Documents.
5. Before End of Closeout:
 - a) Provide copies of all manufacturer warranties that extend for more than one year after completion.

END OF FACILITY PERFORMANCE

Substructure

PERFORMANCE

A. Basic Function:

1. Provide substructure as required to support the completed and occupied building safely and without uncontrolled subsidence or other movement.
2. Where substructure is integral with elements defined within another element group, meet requirements of both element groups.
3. In addition to the requirements of this section, comply with all applicable requirements of Section Facility Performance.

B. Amenity and Comfort:

1. Thermal Performance: Provide thermal resistance as necessary to maintain interior comfort levels specified and in accordance with the Code and the following:
 - a) Substantiation:
 - 1) Preliminary Design: Identification of major thermal resistant materials and systems.
 - 2) Design Development: Detailed listing of design criteria and design analysis, prepared by licensed mechanical engineer.
 - 3) Construction Documents: Product data on thermal materials and details of continuous thermal barrier.
 - (a) Water Penetration: Prevent ground water penetration into the interior of the building, under any circumstances.
 - (i) Substantiation:
 - 4) Preliminary Design: Identification of major water resistant assemblies and drainage features.

C. Health and Safety:

1. Fire Resistance: Design and select materials to provide fire resistance in accordance with the Code.

D. Structure:

1. Capacity: Provide load bearing substructure members as required by the Code and designed to distribute dead loads, live loads, and environmental loads so that bearing capacity of soil is not exceeded.
 - a) Extend bearing portions of substructure to levels below frost line at Project location; not less than 1 foot below grade.
2. Dead Loads: Accommodate loads from weights of building materials, construction itself, and all fixed service equipment.
3. Live Loads: Accommodate loads from use and occupancy of the building, either uniformly distributed loads as prescribed by the Code or concentrated loads, whichever are more demanding structurally.
4. Environmental Loads: Accommodate loads from all environmental forces in accordance with the Code.

END OF SECTION - SUBSTRUCTURE

Foundations

Foundations comprise the following elements:

PERFORMANCE

A. Basic Function:

1. Provide foundations as required to support the completed and occupied building safely and without uncontrolled subsidence or other movement.
 - a) Standard Foundations: Includes spread footings below columns, linear spread footings below load-bearing walls, foundation walls not part of basements, caisson (pier) caps, and pile caps.
 - b) Other Foundations: All types of special foundation systems, including permanent shoring and underpinning, raft foundations, piles, drilled piers (caissons), cofferdams, and permanent dewatering systems.
 - c) Floors on Grade: All elements necessary for slab foundations, including trenches, pits, and sumps, equipment bases, integral thermal insulation, slab moisture protection, and sub-drainage system.
2. Where foundations are integral with elements defined within another element group, meet requirements of both element groups.
3. In addition to the requirements of this section, comply with all applicable requirements of Facility Performance Section and Section A - Substructure.

B. Amenity and Comfort:

1. Thermal Performance:
 - a) Thermal Resistance: (per code or, whichever is greater) R-value of 1.23 SI (7.0 IP), minimum, for portions of foundation above grade or within 450 mm (18 in) below grade and enclosing conditioned space.
 - b) Minimum thermal performance values for individual foundation elements are also specified in other Substructure and Facility Performance.

C. Structure:

1. Capacity: Provide load-bearing foundation members as required by Section A - Substructure.

END OF SECTION - FOUNDATIONS

Floors On Grade

PERFORMANCE

A. Basic Function:

1. Provide floors on grade as required to enclose habitable spaces and support interior functions without subsidence, structural cracking, or other uncontrolled movement.
2. Floors on grade comprise structural slabs, individual pavers, and framed flooring systems that are installed over fill or at excavated and compacted grade, including all depressions in the floor, such as trenches, pits, and sumps. Floors on grade also include equipment bases, under floor and perimeter drainage, thermal insulation at floor edge, and moisture barriers installed integrally with floor system.
 - a) Floor Flatness (“FF”): Provide floors on grade engineered and constructed to achieve degree of flatness as follows, when measured in accordance with ASTM E 1155:
 - 1) Specified Overall Value (“SOV”) at 35.
 - 2) Minimum Localized Value (MLV) at 24.
 - b) Floor Levelness (“FL”): Provide floors on grade engineered and constructed to achieve degree of levelness as follows, when measured in accordance with ASTM E 1155:
 - 1) SOV: 25.
 - 2) Minimum Localized Value (“MLV”): 17.
3. Where floors on grade are integral with elements defined within another element group, meet requirements of both element groups.
4. In addition to the requirements of this section, comply with all applicable requirements of Facility Performance, Substructure, and Foundations.

B. Amenity and Comfort:

1. Thermal Performance: Provide thermal properties at edges of floors on grade as necessary to maintain interior comfort levels specified and in accordance with the Code.
 - a) Vapor Retardation: Limit vapor transmission through floor construction to maximum rate of 6 ng/Pa s sq m (0.1 perms) at locations where impermeable applied interior finishes such as resilient flooring, wood flooring, or acrylic terrazzo are used.
 - 1) Use supplementary vapor retarder if necessary to meet requirements.
 - 2) Use method of sealing joints between vapor retarder elements that will be effective given available construction practices.
 - b) Substantiation:
 - 1) Design Development: Design criteria and design analysis, prepared by licensed mechanical engineer.

C. Durability:

1. Floor Classifications: For concrete floors on grade, comply with composition and finishing recommendations of ACI 302.1R for floor classifications based on type of anticipated traffic and intended use.
2. Water-Cement Ratio: For concrete slabs on grade that are partly or completely exposed to freezing conditions, limit water-Cementitious materials ratio as recommended by ACI 302.1R.
3. Air Content: For concrete slabs on grade that are partly or completely exposed to freezing conditions, provide air content in accordance with recommendations of ACI 201.2R.

END OF SECTION - FLOORS ON GRADE

Shell

PERFORMANCE

A. Basic Function:

1. Provide permanently enclosed spaces for all functional areas shown in the Project program, unless otherwise indicated. Provide a physical enclosure that keeps out weather, unwelcome people, animals, and insects without requiring specific action by occupants, while providing convenient movement of occupants between inside and outside, desirable natural light, and views from inside to outside. Provide level floor areas, comfortable ceiling heights, and essentially vertical walls.
2. The elements forming usable enclosed space and separating that space from the external environment comprise the shell and consist of:
 - a) Superstructure: All elements forming floors and roofs above grade and within basements, and the elements required for their support, insulation, fireproofing, and fire-stopping.
 - b) Exterior Enclosure: All essentially vertical elements forming the separation between exterior and interior conditioned space, including exterior skin, components supporting weather barriers, and jointing and interfacing components; not including the interior skin unless an integral part of the enclosure.
 - c) Roofing: All elements forming weather and thermal barriers at horizontal and sloped roofs and decks, and roof fixtures.
3. Exterior Surfaces Exposed to View: Surfaces visible from street or ground level, plus surfaces visible from windows of same building and adjacent existing buildings.
4. Where shell elements also function as elements defined within another element group, meet requirements of both groups.
5. In addition to the requirements of this section, comply with all applicable requirements of Facility Performance.

B. Amenity and Comfort:

1. Thermal Performance: Provide construction that will have thermal resistance as necessary to maintain interior comfort levels specified and in accordance with the Code and the following:
 - a) Energy Efficiency: As specified in Facility Performance.
 - b) Condensation: None on interior surfaces under normal interior temperature and relative humidity conditions, during 98 percent of the days in the coldest 3 months of the year.
 - c) Components That Have Surfaces Facing Both Interior and Exterior Environment: Condensation Resistance Factor (CRF) as required to meet requirement above, when tested in accordance with AAMA 1503.
 - d) Minimum thermal performance values for individual shell elements are also specified in other Sections.
 - e) Substantiation:
 - 1) Preliminary Design: Identification of major thermal resistant materials and systems.
 - 2) Design Development: Detailed listing of design criteria and design analysis, prepared by licensed mechanical engineer.
 - 3) Construction Documents: Product data on thermal materials and details of continuous thermal barrier.
2. Water Penetration: Design and select materials to prevent water penetration into the interior of the building, under conditions of rain driven by 80 km/h (80 mph) wind.
 - a) Substantiation:
 - 1) Preliminary Design: Identification of major water resistant assemblies.
3. Natural Light: Provide fenestration in shell as required to meet the requirements for natural light as specified by the Code, Facility Performance, and Interiors.
4. Natural Ventilation: Design and construct shell to provide natural ventilation in accordance with the Code.
 - a) Design ventilation to provide cross ventilation where possible.

5. Acoustical Performance: Design and construct the shell to limit sound transmission as follows:
 - a) Ambient Sound Level: Maintain ambient sound levels in perimeter spaces within Noise Criteria (NC) ranges specified in Interiors during normal hours of occupancy.
 - b) Substantiation:
 - 1) Preliminary Design: Measurements of ambient site noise levels over full range of audible frequencies, identification of acoustic properties of major interior and exterior sound and vibration generators, and preliminary analysis prepared by an acoustical engineer.
 - 2) Construction Documents: Acoustical analysis prepared by an acoustical engineer.
 - 3) Construction Documents: Drawings showing details required for acoustic performance.
 - 4) Construction: Field tests of representative spaces to verify compliance with performance requirements.
 6. Cleanliness of Exterior Surfaces: Design and select materials to:
 - a) Prevent attraction and adherence of dust and air-borne dirt and soot, and minimize appearance of settled dust and dirt.
 - b) Be washed reasonably clean by normal precipitation.
 - c) Prevent precipitation from washing settled dust and dirt over surfaces exposed to view.
 7. Appearance: Design and select materials to provide exterior appearance with characteristics as follows:
 - a) Compatible with adjacent buildings on same campus.
 - b) Concealing mechanical equipment, plumbing equipment, electrical equipment, and piping, conduit, and ducts from view from the street.
 - c) Concealing rooftop mechanical equipment, plumbing equipment, electrical equipment, and piping, conduit, and ducts from view from the street, windows in the Project that overlook the roof, and windows in adjacent buildings that overlook the roof.
 - d) Substantiation:
 - 1) Proposal: Concept drawings of proposed solution indicating overall building configuration, massing, scale, and relationship to surrounding buildings.
 - 2) Preliminary Design: Drawings showing facade treatment for principal elevations identifying visible materials.
 - 3) Construction Documents: Details of building shell, annotated to show compliance with performance requirements.
- C. Health and Safety:
1. Fire Resistance: Design and select materials to provide fire resistance in accordance with the Code.
 2. Accidental Injury: Design and select materials to protect pedestrians and building occupants in accordance with the Code and the following:
 - a) Prevent ice and snow from falling off building elements onto pedestrians, building occupants, and vehicles.
 - b) Protect pedestrians, building occupants, and vehicles from objects accidentally dropped from elevated observation decks, balconies, or plazas.
 3. Physical Security: Design and construct to provide protection as required by the Anti-Terrorism Force Protection Guidelines (“ATFP”).
 - a) Substantiation:
 - 1) Proposal: Identification of proposed methods of meeting security requirements.
 - 2) Design Development: Identification of materials to be used, the physical properties that accomplish the security requirements, and details of anchorage to the structure.
 4. Ventilation of Special Spaces: Design and construct shell to provide outside air movement through enclosed shell volumes in accordance with the Code.
 5. Explosion: Design and construct shell to provide relief from explosion hazards so as to minimize effect on occupants and structural members.
 - a) Substantiation:
 - 1) Proposal: Identification of explosion hazards and proposed methods of relief.
 - 2) Construction Documents: Engineering design calculations and drawings prepared by licensed engineer.

D. Structure:

1. Structural Performance: Design and select materials to support all loads without damage due to loads, in accordance with the Code.
 - a) Special Loads: In addition to loads defined by the Code, design for loads from moving machinery, elevators, cranes, vehicles, and military tracked vehicles.
 - b) Substantiation:
 - 1) Proposal: Identification of major structural materials and systems.
 - 2) Preliminary Design: Detailed listing of design criteria and preliminary analysis, prepared by a licensed structural engineer.
 - 3) Construction Documents: Detailed design analysis by licensed structural engineer.
2. Construction Loads and Erection Stresses: Accommodate temporary construction loads and erection stresses during construction.

E. Durability:

1. Service Life Span: Same as building service life, except as follows:
 - a) Load-Bearing Structural Members: Minimum of 100 years.
 - 1) No anticipated deterioration when protected as specified.
 - 2) Protective Elements: Minimum 25 years.
 - b) Wall Primary Weather-Barrier Elements: Minimum 50 years functional and aesthetic service life, excluding joint sealers.
 - c) Joint Sealers: Minimum 20 years before replacement.
 - d) Surfaces Exposed to View: Minimum 20 years aesthetic service life; in addition, deterioration includes color fading, crazing, and delamination of applied coatings.
 - e) Roof Covering Weather-Barriers: Minimum 20 years, fully functional.
2. Water Penetration: Design and select materials to prevent water penetration into the interior of shell assemblies, under conditions of rain driven by 80 km/h (80 mph) wind.
 - a) Exception: Controlled water penetration is allowed if materials will not be damaged by presence of water or freezing and thawing, if continuous drainage paths to the exterior are provided, and water passage to the building interior is prevented.
 - b) Substantiation: In addition to requirements specified for proven-in-use and proven-by-mock-up construction, drawings showing paths of water movement, with particular attention to changes in direction or orientation and joints between different assemblies.
3. Weather Resistance: Design and select materials to minimize deterioration due to precipitation, sunlight, ozone, normal temperature changes, salt air, atmospheric pollutants.
 - a) Deterioration includes corrosion, shrinking, cracking, spalling, delamination, abnormal oxidation, decay and rot.
 - b) Surfaces Exposed to View: Deterioration adversely affecting aesthetic life span includes color fading, crazing, and delamination of applied coatings.
 - c) Joint Components and Penetration Seals: Capable of resisting expected thermal expansion and contraction; use overlapping joints that shed water wherever possible.
 - d) Freeze-Thaw Resistance: Adequate for climate of Project.
 - e) Corrosion Resistance: In locations exposed to the outdoor air or in potential contact with moisture inside shell assemblies, use only corrosion-resistant metals as defined in this section.
 - f) Ozone Resistance: Do not use materials that are adversely affected by ozone.
 - g) Substantiation:
 - 1) Proposal: Identification of weather-exposed elements and proposed materials.
4. Impact Resistance: Design and select materials to resist damage due to impact in accordance with the Code.
5. Moisture Vapor Transmission: Design to prevent deterioration of materials due to condensation of moisture vapor inside assemblies.
6. Wear Resistance: Design and select materials to provide resistance to normal wear-and-tear in accordance with the Code and the following:
 - a) Elements Within Reach of Pedestrians: Minimize degradation from rubbing and scratching caused by pedestrians.

END OF SECTION - SHELL

Superstructure

PERFORMANCE

A. Basic Function:

1. Provide structural elements, above grade and within basements, capable of supporting all anticipated loads without failure or damage.
2. Do not use any electrically-operated or fuel-powered construction for support of floor or roof members.
3. The superstructure comprises:
 - a) Elevated Floors: Floor construction above grade and within basements, including balcony, mezzanine, and ramp floors, floors elevated for access, stair construction if part of the structure, and roof decks intended for occupant live load; and the elements required for their support, insulation, fireproofing, and fire stopping.
 - b) Roofs: Roof construction, including canopies, and elements required for their support, insulation, fireproofing, and fire stopping.
 - 1) Where superstructure elements also must function as elements defined within another element group, meet requirements of both element groups.
 - 2) In addition to the requirements of this section, comply with all applicable requirements of Facility Performance and Shell.

B. Amenity and Comfort:

1. Water Penetration: Where roof coverings as specified are not used over roofs provide supplementary waterproof construction providing equivalent protection.
2. Vibration: Isolate structure from sources of vibration.

C. Health and Safety:

1. Fire: Provide members with combustibility, flame spread, and smoke generation characteristics not greater than allowed by the Code.
2. Fire Resistance: Design and select materials to provide fire resistance in accordance with the Code.
 - a) Substantiation:
 - 1) Proposal: Identification of major fire resistive materials and systems.
 - 2) Design Development: List of laboratory tested fire resistive assemblies to be used.
3. Explosion: Design for and provide resistance to forces generated by explosion hazards specified in Facility Performance.
4. Grounding: When grounding of electrical systems is accomplished using structural members, design to prevent shock to occupants.

D. Structure:

1. Capacity: Design and provide load-bearing structural members of capacities required by the Code.
2. Dead Loads: Design to resist loads from weights of materials, construction, and fixed service equipment.
3. Live Loads:
 - a) Floors: Resist uniformly distributed, concentrated, and impact loads without live load reductions.
 - b) Roofs: Resist uniformly distributed, concentrated, and impact loads.
4. Structural Design: In addition to the requirements of the Code, design to comply with ASCE 7.
5. Structural Serviceability: Comply with requirements and recommended design procedures of ASCE 7.

E. Durability:

1. Moisture Resistance of Load-Bearing Members: Use materials that are not damaged by contact with water or moisture vapor.
2. Impact Resistance of Load-Bearing Members: Use materials that are not easily damaged by common hand tools.
3. Portions of Superstructure Exposed on Exterior: Comply with requirements of the Shell for water penetration, weather resistance, impact resistance, and wear resistance.

END OF SECTION - SUPERSTRUCTURE

Exterior Enclosure

PERFORMANCE

A. Basic Function:

1. Provide an essentially vertical separation between exterior and interior conditioned space, that keeps out weather, uninvited people, and animals and insects, without unusual action by occupants, while providing convenient movement of occupants between inside and outside, desirable natural light, and views from inside to outside.
2. The elements forming the vertical separation comprise the exterior enclosure and consist of:
 - a) Exterior Walls.
 - b) Exterior Windows and Other Openings.
 - c) Exterior Doors.
3. Where exterior enclosure elements also must function as elements defined within another element group, meet requirements of both element groups.
4. In addition to the requirements of this section, comply with all applicable requirements of Facility Performance and Shell.

B. Amenity and Comfort:

1. Thermal Performance:
 - a) Minimum performance values for individual enclosure elements are also specified in other Sections.
2. Water Penetration: As specified in Shell.

C. Health and Safety:

1. Safety Glazing: Do not use fully tempered glass more than 7.6 m (25 feet) above grade.
2. Fire Resistance:

D. Structure:

1. Structural Performance: No requirements in addition to those specified in Shell.

E. Durability:

1. Ambient Temperature Change: Allow for daily expansion and contraction within and between elements caused by temperature range from most extreme low temperature to 39 degrees C (70 degrees F) greater than the most extreme high temperature, in any year, without causing detrimental effect to components and anchorage.
2. Impact Resistance:
 - a) Elements Adjacent to Traffic Lanes: Resist damage from accidental passenger vehicular impact at 8 km/hr (5 mph) maximum velocity.

END OF SECTION - EXTERIOR ENCLOSURE

Roofing

PERFORMANCE

A. Basic Function:

1. Provide a weather-proof enclosure over the entire "top-side" of building that also excludes unwelcome people, animals, and insects without requiring specific action by occupants, while shedding water and preventing uncontrolled water infiltration, withstanding anticipated loading conditions, providing required access, and permitting the entry of desirable natural light.
2. Provide all fixtures needed on the roof due to the design or indicated in the Project program.
3. Roofing comprises the following elements:
 - a) Roof Coverings: Weather barriers, vapor retarders, insulation, wearing surfaces, water collectors and conductors; including coverings over plaza decks, balconies, and other exposed floors.
 - b) Roof Openings: Skylights, ventilation openings, access openings, and other roof opening elements.
 - c) Roof Fixtures: All elements attached to the roof, unless equipment or services.
4. Where roofing elements also must function as elements defined within another element group, meet requirements of both element groups.
5. In addition to the requirements of this section, comply with all applicable requirements of Facility Performance and Shell.
6. Substantiation:
 - a) Post-Construction: Roof inspection conducted in the first spring after completion of roofing, after chance of snow has passed.

B. Amenity and Comfort:

1. Noise of Precipitation: Design and select materials that dampen the sound of precipitation on the roof to maintain interior ambient sound levels as specified in Shell.

C. Health and Safety:

1. Roof Worker Safety: Design to provide safe design and safety measures as required by the Code and the following:
 - a) Provide permanently installed supports for equipment used for cleaning windows and other glazed areas of the shell.
2. Fire Resistance: In addition to fire resistance specified in Shell, provide materials that will prevent:
 - a) Roof surface catching fire due to external fire sources.
 - b) Roof coverings catching fire due to internal fire sources.
 - c) Substantiation:
 - 1) Design Development: Identification of assemblies or methods used.

D. Durability:

1. Weather Resistance: Provide weather-exposed roof coverings and other components that comply with weather resistance specified in Shell and the following:
 - a) Minimization of Deterioration Due to Weather: For weather-barrier materials, minimization means no deterioration that adversely affects water penetration resistance at any time during the specified service life span.
2. Water Penetration: None, under conditions of rain driven at 80 km/h (80 mph), unless water paths are completely accessible.
 - a) Substantiation:
 - 1) Construction: Reports of first 3 significant rainfalls after completion of each roofing element, including rainfall amount and intensity, wind speed and direction, and results of inspection of roof and underside.
3. Ice: Design to avoid damage due to ice formation and buildup on roofing and in water conductors.

E. Operation and Maintenance:

1. Ease of Service:

- a) All components of roofing (not just roof covering) easily accessible by maintenance persons on foot without the use of portable ladders or other portable devices.
- b) Rooftop fixtures serviceable by simple replacement of parts, minimizing time required on roof, and eliminating need for repair work in the weather.

END OF SECTION - ROOFING

Roof Coverings

PERFORMANCE

A. Basic Function:

1. Provide a weather-resistive covering over the top side of the roof superstructure and any exposed floor superstructure.
2. Roof covering comprises all weather-resistive components, including the primary weather barrier, vapor retarders, insulation, water collectors and conductors, wearing surfaces, trim and accessories, but not including roof opening elements or roof fixtures.
3. Where roof covering elements also must function as elements defined within another element group, meet requirements of both element groups.
4. In addition to the requirements of this section, comply with all applicable requirements of Facility Performance, Shell, and Roofing.

B. Structure:

1. Roof Covering Substrate: Sufficiently rigid or dense to support water barrier in a manner that prevents puncture due to traffic on roof.

C. Durability:

1. Life Span: As specified in Shell, and the following:
 - a) Aesthetic Life Span: Significant degradation of appearance during the functional life span is not acceptable.
 - b) Manufacturer Approval of Design: Where roof covering manufacturer recommends or requires certain design features for satisfactory performance or for warranty, with manufacturer's requirements.
 - c) Manufacturer Warranty:
 - 1) Materials: 25 years, minimum.
 - 2) Installation and Workmanship: 2 years, minimum.
 - d) Substantiation:
 - 1) Proposal: Material type, expected functional life span, expected changes in appearance over life span, and manufacturer warranty available, installation quality control plan.
 - 2) Design Development: Material type and specification, expected functional life span, and manufacturer warranty available.
 - 3) Construction: Actual manufacturer warranty.

D. Operation and Maintenance:

1. Water Conductor Capacity: As required by the Code or SMACNA Architectural Sheet Metal Manual ("ASMM"), whichever is greater, based on 10 year 5 minute intensity.
 - a) Substantiation:
 - 1) Design Development: Calculations of capacity.

END OF SECTION - ROOF COVERINGS

Interiors

PERFORMANCE

A. Basic Function:

1. Provide appropriately finished interiors for all spaces indicated in the program, equipped with interior fixtures as required to function properly for specific occupancies.
2. Interiors comprise the following assemblies:
 - a) Interior Construction: All elements necessary to subdivide and finish space enclosed within the shell, including applied interior surfaces of the exterior enclosure.
 - b) Interior Fixtures: All elements attached to interior construction that add functionality to enclosed spaces, except for elements classified as equipment or services fixtures.
3. Provide physical separation between spaces, constructed to achieve fire ratings required by the Code, appropriate security between adjacent spaces, and visual, acoustical, olfactory, and atmospheric isolation as necessary to maintain desirable conditions in each space.
4. Provide finishes for interior surfaces that are appropriate for the functions of each space.
5. Provide interior fixtures that are necessary for the proper functioning of each space.
6. Where interior elements also must function as elements defined within another element group, meet requirements of both element groups.
7. In addition to the requirements of this section, comply with all applicable requirements of Facility Performance.

B. Amenity and Comfort:

1. Natural Ventilation: Design and construct interiors to permit air movement between exterior openings positioned to enhance warm weather thermal comfort of occupants in all major spaces.
 - a) SR1 (Sanitary Facilities), SS (Storage), SV (Vehicular), SC (Circulation), and SU (Utility, Building Services) spaces are exempt from natural ventilation requirements.
 - b) Substantiation:
 - 1) Proposal: Information on overall building configuration that will permit natural ventilation of all major spaces.
 - 2) Design Development: Engineering calculations for representative spaces, predicting anticipated air movement under weather conditions typical for Project Site.
2. Access: Provide access to all primary interior spaces from Circulation spaces (SC Spaces) (no access to any primary interior space exclusively through another primary interior space).
3. View: Provide views to the building exterior or interior atria from most locations within primary interior spaces.
 - a) View spaces include the following types:
 - 1) Customer Contact (SP1 Spaces).
 - 2) Occupant Work (SP2 Spaces).
 - 3) Equipment Utilization (SP3 Spaces).
 - 4) Assembly (SP5 Spaces).
 - 5) Meeting and Instruction (SP5 Spaces).
 - 6) Physical Fitness Area (SP3 Spaces).
 - 7) Residential (SR Spaces), except for bathrooms, showers and locker rooms.
4. Natural Light:
 - a) Day-lighting: Provide ambient natural lighting in primary spaces that is of intensity adequate for essential tasks when measured on a typical overcast winter day in mid-afternoon.
 - 1) Spaces for day-lighting include the following types:
 - (a) Customer Contact (SP1 Spaces).
 - (b) Occupant Work (SP2 Spaces).
 - (c) Equipment Utilization (SP3 Spaces).
 - (d) Assembly (SP5 Spaces).

- (e) Meeting and Instruction (SP5 Spaces).
- (f) Physical Fitness Area (SP3 Spaces).
- (g) Occupant Services (SR Spaces).
- (h) Residential (SR Spaces), except for bathrooms.
- 2) Light Levels: Provide minimum light levels for activities as follows:
 - (a) Public Spaces: 30 lux (3 foot candles).
 - (b) Working Spaces including Basic Administrative, General Administrative, Offices, Inspection, Library, Tool Rooms, and Supply Rooms with Simple Visual Tasks: 50 lux (500 foot candles).
 - (c) Working Spaces with Visual Tasks of High Contrast and Large Size including heated storage, work bays, vault, and toilet/shower: 300 lux (30 foot candles).
- b) Visual Comfort: Provide ambient natural light in primary spaces that is free of excessive direct or reflected glare, as defined in IESNA RP-5, Recommended Practice of Day-lighting.
- c) Daylight Control: Provide local devices to enable occupants to control brightness and glare from direct day-lighting.
- d) Substantiation:
 - 1) Proposal: Information on overall building configuration that will permit day-lighting to levels specified.
 - 2) Design Development: Engineering calculations for representative spaces, predicting anticipated day-lighting levels under specified conditions.
 - 3) Construction Documents: Details of lighting control mechanisms.
- 5. Acoustical Performance:
 - a) Background Noise: Provide interiors that maintain ambient sound levels in primary spaces within the following Noise Criteria (NC) ranges, as defined in ASHRAE HVAC Applications Handbook, when adjacent spaces are occupied and are being used normally:
 - 1) Theater, Music Room: 20-25.
 - 2) Executive Office: 20-30.
 - 3) Classroom, Lecture Hall: 25-30.
 - 4) Conference Room: 25-30.
 - 5) Assembly Hall, Auditorium: 25-35.
 - 6) Semiprivate Office: 30-35.
 - 7) Library: 30-35.
 - 8) Large Open Office: 35-45.
 - 9) Open Office: 40-45.
 - 10) Physical Fitness Area: 45-50.
 - 11) Maintenance workdays: 50-60.
 - b) Impact Insulation: Provide floor-ceiling construction, including floor structure, floor finish, and ceiling finish, to insulate primary spaces from undesirable impact noise when adjacent spaces are occupied and are being used normally.
 - c) Articulation Index: Provide articulation index (AI) of not less than 0.05 when measured in accordance with ASTM E 1130.
 - 1) Application: Open office areas where multiple work stations occur without intervening full-height partitions.
 - d) Substantiation:
 - 1) Preliminary Design: Engineering calculations for representative spaces, predicting acoustical conditions.
 - 2) Construction: Field test of acoustical conditions, verifying compliance with performance requirements.
- 6. Odor Control: Prevent unpleasant odors generated within a space from affecting occupants of adjacent spaces, by providing physical isolation of the spaces, separate ventilation, or a combination of isolation and ventilation.
 - a) Control odors from spaces of the following types:
 - 1) Commercial kitchen.
 - 2) Break Room.
 - 3) Toilet rooms.
 - 4) Locker or changing rooms.
 - 5) Trash collection.

- 6) Trash removal or incineration.
 - 7) Maintenance Workdays
7. Appearance: Provide interiors that are pleasing in appearance and do not detract from the primary functions performed in each space.
 8. Texture: Provide interior elements and surfaces that are textured appropriately for primary functions to be accommodated within each space.
 - a) For surfaces that are within normal reach of occupants, provide textures that are safe for occupants and require minimum maintenance.
 - b) For surfaces that are not within normal reach of occupants, provide textures that are comparable to those within normal reach.
- C. Health and Safety:
1. Egress: Provide egress from all interior spaces in accordance with the Code.
 2. Fire Resistance: Design and select materials to provide fire resistance in accordance with the Code.
 - a) Minimum performance values for individual interior elements are also specified in other Sections.
- D. Structure:
1. Structural Performance: Provide interior construction and fixtures to support without damage all loads required by the Code.
 - a) Special Loads: In addition to loads defined by the Code, provide for adequate support of wall-mounted or ceiling-mounted furnishings and equipment in spaces where such equipment is required by program or is likely to be installed after construction because of intended function.
 - 1) Adequate support is defined as the ability to sustain 150 percent of design loads without damage to building or equipment.
- E. Durability:
1. Service Life Span: Same as building service life, except as follows:
 - a) Interior Doors and Other Operable Elements: Minimum 15 years functional and aesthetic service life.
 - b) Interior Ceiling Finishes: Minimum 15 years functional and aesthetic service life; including suspended ceilings.
 - c) Interior Wall and Floor Finishes: Minimum 10 years functional and aesthetic service life.
 - d) Other Interior Construction: Minimum 15 years functional and aesthetic service life.
 - e) Substantiation: As specified in Facility Performance, including service life analysis and life cycle cost analysis.
 2. Wear Resistance: Provide interior construction and fixtures that are suitable in durability for the degree and type of traffic to be anticipated in each space.
 3. Vandal Resistance: In spaces accessible to the public and not subject to continuous surveillance, provide interior construction and fixtures that are inherently vandal resistant or designed to be difficult to access or damage.
- F. Operation and Maintenance:
1. Cleaning: Provide interior construction and fixtures that will not be damaged by ordinary cleaning and maintenance operations.

END OF SECTION - INTERIORS

Interior Construction

PERFORMANCE

A. Basic Function:

1. Provide physical separation between spaces required by the program, constructed to achieve fire ratings required by the Code, appropriate security between adjacent spaces, and visual, acoustical, olfactory, and atmospheric isolation as necessary to maintain desirable conditions in each space.
2. Provide appropriately finished interiors for all spaces required by the program.
3. Interior construction comprises the following elements:
 - a) Partitions: All types of space dividers, including demountable and operable partitions.
 - b) Interior Doors: All interior doors, including hardware and frames, except for elevator doors.
 - c) Interior Windows: All interior fixed and operable windows, including frames and casings.
 - d) Other Interior Openings: Interior utility openings such as hatches and access panels, louvers and vents.
 - e) Stairs and Ramps: Those interior and exterior stair and ramp elements not a part of superstructure or exterior enclosure.
 - f) Interior Finishes: All functional and decorative applied interior finishes, including secondary support structures.
4. Where interior construction elements also must function as elements defined within another element group, meet requirements of both element groups.
5. In addition to the requirements of this section, comply with all applicable requirements of Facility Performance Section and Section C - Interiors.

B. Amenity and Comfort:

1. Airborne Sound Isolation: Design and construct interior construction to achieve the following minimum noise isolation class ("NIC") values between adjacent spaces, when tested in accordance with ASTM E 336 and classified in accordance with ASTM E 413.
 - a) Spaces of Like Function and Similar NC Value: NIC 36.
 - b) Quiet Space (NC Values of 20-30) and Moderately Noisy Space (NC Values of 30-40): NIC 39.
 - c) Quiet Space (NC Values of 20-30) and Noisy Space (NC Values of 40-50): NIC 42.
 - d) Quiet Space (NC Values of 20-30) and Very Noisy Space (NC Values of 50-60): NIC 48.
 - e) Moderately Noisy Space (NC Values of 30-40) and Noisy Space (NC Values of 40-50): NIC 36.
 - f) Moderately Noisy Space (NC Values of 30-40) and Very Noisy Space (NC Values of 50-60): NIC 42.
 - g) Noisy Space (NC Values of 40-50) and Very Noisy Space (NC Values of 50-60): NIC 36.
 - h) Exceptions:
 - 1) Adjacent Music Practice Rooms: NIC 55.
 - 2) Adjacent Theaters: NIC 45.
 - 3) Adjacent Offices Requiring High Speech Confidentiality: NIC 50.
 - i) Substantiation:
 - 1) Proposal: Proposed STC values for major building elements.
 - 2) Design Development: Drawings indicating proven-in-use STC values for construction separating primary spaces and separating primary spaces from noise sources such as mechanical equipment.
2. Cross Ventilation: Provide interior construction to facilitate natural cross ventilation required in Shell.

C. Health and Safety:

1. Fire Resistance: Design and provide interior construction to achieve fire resistance required by the Code.
2. Safety: Design and provide interior construction to protect building occupants in accordance with

the Code and the following:

- a) Heights: Protect building occupants from falling from elevated interior observation decks.
- b) Tripping: Protect building occupants from tripping hazards due to uneven floor surfaces or abrupt changes in floor elevation of more than 3.2 mm (1/8 inch).
- c) Minimum performance values for individual interior construction elements are specified in other Sections.

D. Structure:

1. Structural Performance: No requirements in addition to those specified in Interiors.

E. Operation and Maintenance:

1. Cleaning: At toilet rooms, shower rooms, bathrooms, trash collection rooms, and janitorial closets, provide interior construction that will allow harsh chemical cleaning without damage.
 - a) Substantiation:
 - 1) Preliminary Design: Identification of primary materials intended for use in these spaces.

END OF SECTION - INTERIOR CONSTRUCTION

Interior Finishes

PERFORMANCE

A. Basic Function:

1. Provide appropriately finished interiors for all spaces required by the program.
2. Interior finishes comprise the following elements:
 - a) Wall finishes, including those applied to the interior face of exterior walls and to the vertical faces of superstructure elements.
 - b) Floor finishes, except for access floors.
 - c) Suspended ceilings and soffits.
 - d) Applied ceiling finishes.
 - e) Stair finishes, except for integral stair surfaces.
 - f) Finishes applied to other interior surfaces.
3. Where interior finishes are integral with elements defined within another element group, meet requirements of both element groups.
4. In addition to the requirements of this section, comply with all applicable requirements of Facility Performance, Interiors, and Interior Construction.

B. Amenity and Comfort:

1. Reflectivity:
 - a) Glare: Provide interior finishes that will not result in discomfort glare due to excessive contrast with light sources.
 - 1) Ceiling Surfaces: Not less than 80 percent reflectivity, when measured in accordance with ASTM E 1477.
 - 2) Wall Surfaces: Not less than 50 percent reflectivity.
 - 3) Floor Surfaces: Not less than 30 percent reflectivity.
 - 4) Exceptions: SR Resident/Occupant Services, SS Storage, SV Vehicular, SC Circulation, and SU Utility spaces.
2. Acoustical Performance:
 - a) Sound Absorption: Provide acoustical absorption within interior spaces to achieve reverberation times within the limits specified in Interiors.
3. Cleanliness:
 - a) For kitchens, provide wall, ceiling, and floor surfaces that are USDA approved.
 - b) For spaces such as treatment rooms, laboratories, toilet rooms, bathrooms, and maintenance rooms, provide wall, ceiling, and floor surfaces that are inherently resistant to moisture and that can be cleaned by caustic agents without damage.

C. Health and Safety:

1. Slip Resistance: For spaces subject to floor wetting, including entry lobbies, provide floor finishes with inherent slip resistance under wet conditions.
 - a) At building entries, provide means for reducing or minimizing moisture and debris on shoe soles.
 - b) At spaces such as kitchens, treatment rooms, laboratories, toilets, and maintenance rooms, provide floor surfaces with minimum static coefficient of friction of 0.60 when wet, measured in accordance with ASTM C 1028 or ASTM D 2047.

D. Durability:

1. Wall Protection: In corridors, mail rooms, and freight receiving rooms, provide impact resistant wall bumpers, and corner guards or wall surfaces that are inherently resistant to impact damage due to rolling carts, gurneys, and hand trucks.
2. Opening Protection: At partition openings intended to accommodate pedestrian or vehicular traffic, provide protection of opening edges in the form of door frames (cased openings), or corner guards.
3. Flooring: Provide floor finishes that are appropriate for anticipated usage and traffic in each area,

based on a 10 year replacement cycle.

PRODUCTS

- A. Design and construct interiors using the following materials and systems:
1. Ceramic tile at restrooms, shower facilities, lobbies and corridors.
 2. Ceramic wall tile at toilets and showers to ceiling.
 3. Quarry tile at kitchen.
 4. Vinyl Composition Tile at locker rooms, audio/visual room, training aid storage.
 5. Athletic flooring at assembly hall.
 6. Athletic rubber flooring at physical fitness area.
 7. Carpet tile at library classrooms, family readiness center, RAPIDS Office, Recruiting office, basic administrative spaces, general administrative spaces, and classrooms.
 8. Exposed concrete flooring at clean and repair rooms, vaults, tool rooms, supply rooms, supervisor's office, work bays, heated storage, flammable storage, table/chair storage, simulation center, and unheated storage.

END OF SECTION - INTERIOR FINISHES

Interior Fixtures

PERFORMANCE

A. Basic Function:

1. Provide elements fixed to interior construction that are necessary for complete and proper functioning of spaces required by the program.
2. Interior fixtures are functional items that are permanently attached to interior walls, ceilings, and floors, except for equipment items and items that are integral components of service systems, and comprise the following elements:
 - a) Identifying Devices: Informational accessories, including room numbers, signage, and directories.
 - b) Storage Fixtures: Non-furniture items intended primarily for storing or securing objects, materials, and supplies, including cabinets, casework, wardrobes, closet fixtures, lockers, and shelving.
 - c) Window Treatment: Non-furnishing accessories for control of light, solar heat gain, privacy, and view at interior and exterior windows, including blinds, shades, shutters, and curtain tracks.
 - d) Accessory Fixtures: Specialty items intended to provide service or amenity to building interiors, including toilet and bath accessories, postal fixtures, visual display surfaces, and telecommunications fixtures.
3. Where interior fixtures are integral with elements defined within another element group, meet requirements of both element groups.
4. In addition to the requirements of this section, comply with all applicable requirements of Facility Performance Section and Section C - Interiors.

B. Amenity and Comfort:

1. Accessibility: Provide interior fixtures that are easily usable by disabled persons without outside assistance.
 - a) Provide interior fixtures that comply with ADAAG.
2. Convenience: Provide interior fixtures with fittings and controls that are manageable without special instruction or the need for excessive force.
3. Appearance: Provide interior fixtures that are coordinated in design with other elements of interior construction, using compatible materials, colors, textures, and design features.
4. Texture: Provide durable, low maintenance exposed surfaces for interior fixtures that are within reach of occupants engaged in activities normal for the particular space in which they are installed.
 - a) Flat Metal Surfaces: Coatings not permitted.
 - b) Hardware and Other Rounded Metal Surfaces: Coatings not permitted.

C. Structure:

1. Live Loads: Provide suspended interior fixtures or portions of fixtures designed for storage or support of persons or objects that have been engineered and installed to withstand 1.5 times the anticipated live loads without excessive deflection or permanent distortion.

D. Operation and Maintenance:

1. Ease of Repair: Provide interior fixtures at all locations that are designed to permit repair or replacement of individual components without removal of fixture.
2. Ease of Replacement or Relocation: Provide interior fixtures at all locations that are modular in form, detachable from substrate without damage to fixtures.
3. Theft Resistance: Provide interior fixtures at all locations that are attached to substrates with concealed, tamper-resistant, or tamperproof fasteners to minimize theft and vandalism.

END OF SECTION - INTERIOR FIXTURES

Services

PERFORMANCE

A. Basic Function:

1. Provide the following services:
 - a) Conveying Systems: Mechanized means of conveying people and goods, as specified in the Project program.
 - b) Water and Drainage: Means of delivery of water to points of utilization; automatic heating and conditioning of domestic water; and unattended removal of water, rainwater, and liquid waste.
 - c) HVAC: Artificial means of maintaining interior space comfort and air quality, including heating, cooling, ventilation, and energy supply.
 - d) Fire Protection: Automatic fire detection, suppression, and warning; automatic smoke control; and manual fire-fighting equipment.
 - e) Electrical Power: Energy to operate all electrically-operated devices, including those included under other services and those provided separately by the Owner.
 - f) Artificial Lighting: Means of illuminating spaces and tasks, both interior and exterior, independent of reliance on natural light.
 - g) Telecommunications: Services that include voice and data transmission, telephone equipment, sound reinforcement, television reception, and television distribution.
 - h) Process Utilities: Services that include specially processed water, special waste removal or treatment, air and gases, fuels, HVAC, special fire protection, special telecommunications, and special measurement and control.
 - i) Other Services: Services that include integrated facility controls, surveillance and security controls, special grounding, and cathodic protection.
2. Utility Sources and Outlets:
 - a) Water Source: Existing public utility.
 - b) Sewage Disposal: Connect building sewer to the existing public sewage system.
 - c) Rain Water Drainage Outlet: Existing public utility storm drainage system independent of sanitary sewer.
 - d) Electrical Power Source: Existing public utility.
3. Equipment That is Not Part of Services Systems: Specified in the Project program and in Services.
4. Where services elements must also function as elements defined within another element group, meet the requirements of both element groups.
5. In addition to the requirements of this section, comply with all applicable requirements of Facility Performance.

B. Amenity and Comfort:

1. Artificial Illumination: Provide illumination for all interior spaces that is adequate in level and quality for comfortable performance of tasks typical for each space, regardless of the availability of natural light.
 - a) Light Levels: Provide maintained ambient luminance values for various activities that are within the ranges specified in the IESNA Lighting Handbook.
 - b) Accent Lighting: In addition to general and task illumination, provide lighting on architectural features, displays, and artwork in focal areas to produce luminances that are within the range of 5:1 with respect to ambient background.
 - c) Substantiation:
 - 1) Design Development: Overall lighting scheme, including types of luminaires and lamps for primary spaces.
2. Equipment Producing By-Product Heat: Ventilate housings and cabinets as required by equipment manufacturer and rooms and spaces as required to maintain specified environmental conditions.
3. Moisture: Prevent condensation from forming on service elements.
4. Airborne Sound:
 - a) Maintain the sound transmission characteristics of assemblies through which services must

- pass; comply with requirements of Section where penetrated assembly is specified.
- b) Prohibited Plumbing Noises: All sounds of flushing and of liquid running through pipes ("bathroom sounds") are prohibited outside of the rooms housing toilets, bathtubs, and showers, with the exception of when doors to those rooms are open.
 - c) Equipment Noises: Noise level below that which will be objectionable, based on occupancy of spaces.
5. Structure-Borne Sound and Vibration: Prevent transmission of perceptible sound and vibration from services equipment that rotates, vibrates, or generates sound, by isolating such equipment from superstructure or by isolating equipment support foundations from building foundations.
- a) Substantiation:
 - 1) Preliminary Design: Identification of sound- and vibration-generating equipment and method of isolation.
 - 2) Construction Documents: Details of isolation methods.
6. Cleanliness: Prevent accumulation of debris and dirt at floor mounted equipment, such as air handlers, chillers, pumps, switchgear, and panelboards by one or more of the following methods.
- a) Provide 100 mm (4 inch) thick, concrete housekeeping pads.
7. Odors: Eliminate, isolate, or exhaust odors produced by occupant functions and building services.
8. Appearance:
- a) Conceal services elements from view to greatest extent possible, with exposed portions of simple, neutral design and color.
 - 1) Exception: Standard designs of manufacturers, without consideration for appearance, may be used for fire suppression sprinkler heads.
 - b) Cover annular spaces around pipes, ducts, and conduits, where they pass through walls, ceilings, and floors with escutcheons or cover plates.
 - c) Mountings: On finished surfaces, use concealed attachments with cover plates, frames, or trim overlapping finishes.
- C. Health and Safety:
1. Fire Safety:
 - a) Maintain fire resistance of walls, floors, ceilings, and other fire-rated assemblies that services must pass through, in accordance with requirements of the Section in which the fire-rated assembly is specified.
 - b) Provide fire-rated separations between equipment rooms and other spaces where required, and as specified by, the Code.
 - c) Provide products which are fire rated for the specific locations where they are installed.
 2. Safety Hazards: Avoid safety hazards wherever possible; where services must involve flammable materials or hazardous operations, comply with the Code.
 3. Electric Shock: Provide equipment which protects personnel from electrical shock.
- D. Structure:
1. Supports for Piping, Conduit, Ducts, and Components: Attached to, and supported by, the superstructure, not to or by non-structural construction or sheet metal elements, so that they do not move or sag, using the following:
 - a) Supports that allow movement of the rigid linear elements (pipe, etc.) without undue stress on the piping, tubes, fittings, components, or the superstructure.
 - b) Intermediate supports mounted between structural members to limit distance between supports.
 - c) Supports capable of handling seismic forces in accordance with the Code.
 - d) Mounting frames, bases, or pads, designed for ease of anchorage or mounting.
 - e) Rigid sway bracing at changes in direction of more than one-half of a right-angle, for all pipes.
 - f) Substantiation:
 - 1) Design Development: Details of supports, including engineering analysis.
 2. Structural Design of Components and Their Supports: In accordance with the Code.
- E. Durability:

1. Expected Service Life Span: Same as the service life of the building, except as follows:
 - a) Ducts, Piping, and Wiring in All Services: Same as the service life of the building.
 - b) All Components Permanently Installed Underground or Encased in Concrete: Same as service life of building.
 - c) Conveying Systems: Minimum 20 years.
 - d) Plumbing:
 - 1) Shut-Off Valves and Similar Components: Same as service life of building.
 - 2) Electrically- and Fuel-Operated Equipment: Minimum 20 years.
 - 3) Other Moving Components: Minimum 20 years.
 - 4) Plumbing Fixtures: Same as building service life.
 - e) HVAC:
 - 1) Shut-Off Valves: Minimum 10 years.
 - 2) Dampers, Louvers, Registers, Grilles: Same as service life of building.
 - 3) Main Heat Generation and Cooling Equipment: Minimum 20 years.
 - 4) Secondary Equipment: Minimum 10 years.
 - 5) Control Components, Except Wiring: Minimum 10 years.
 - f) Fire Protection:
 - 1) Sprinkler Heads, Valves, and Other Inlet and Outlet Components: Same as building service life.
 - 2) Pumps and Other Operating Components: Minimum 20 years.
 - 3) Fire Hoses: Minimum 20 years.
 - g) Electrical:
 - 1) Power Distribution Equipment: Same as building service life.
 - 2) Power Generation Equipment: Minimum 20 years.
 - 3) All Components of Life Safety-Related Systems: Minimum 20 years.
 - h) Lighting Fixtures: Minimum 15 years.
 - i) Telecommunications Systems: Minimum 10 years.
 - j) Integrated Facility Controls: Minimum 15 years.
 - k) Security and Surveillance Controls: Minimum 15 years.
 - l) Lightning Protection and Special Grounding Systems: Same as building service life.
 - m) Software and Firmware Integral to Operation of Services Equipment: Minimum 20 year's functional life without reprogramming required.
2. Weather Resistance:
 - a) All components exposed to outdoor environment must comply with the requirements of Shell and Exterior Enclosure; equipment enclosures are considered the equivalent of the exterior enclosure.
 - b) Liquid Storage and Distribution Components: Prevent freezing during longest duration of low temperature anticipated, based on historical weather data; if necessary, provide automatically controlled supplemental heating.
 - c) Buried Water Piping: Minimum of 15 mm (6 inches) below lowest recorded level at which the ground freezes.
 - d) Services Passing From Inside to Outside: Openings through shell sealed as required to meet performance specified, and using materials specified, in Shell.
3. Condensation: Provide insulated drain pans and piping to remove condensation from cooling coils.
4. Moisture Resistance: Where components are mounted to surfaces that are required to be moisture-resistant, seal mounting surface of components to finish surface so that moisture cannot penetrate under or behind component, using material that is not affected by presence of water, that is mildew-growth resistant, and that has a minimum service life of 10 years.
5. Temperature and Humidity Endurance: Design equipment to endure temperature and humidity that will be encountered and to resist damage due to thermal expansion and contraction.
6. Accidental Water Leakage: Locate components that would be damaged by water leakage from pipes or through foundations or roof out of likely paths of water and at least 100 mm (4 inches) above floor level.
7. Abuse Resistance:
 - a) Buried Components: Minimum of 300 mm (12 inches) below surface of ground.

- b) Underground Piping and Conduit: Watertight and root proof.
- c) Finishes on Exposed Components Subject to Touching by Occupants: Durable enough to withstand regular scrubbing using ordinary methods.

F. Operation and Maintenance:

1. Capacity:
 - a) Conveying Systems: As required for the number of occupants.
 - b) Water and Drainage: As required by the Code.
 - c) Heating, Cooling, and Ventilating: Maintain interior environment within ranges specified in Facility Performance.
 - d) Fire Suppression: As required by the Code.
 - e) Electrical: As required by the Code.
 - 1) Power: Non-interruptible power supply.
 - f) Telecommunications: As specified in Project program.
 - g) Substantiation:
 - 1) Proposal: Description of systems required, sources, input-side capacities, and means of distribution.
 - 2) Design Development: Engineering calculations showing input- and output-side capacities and loads and sizes of distribution elements.
 - 3) Construction and Closeout: Functional performance testing, as specified in Design and Coordination Procedures.
2. Efficiency:
 - a) Energy efficiency as specified in Facility Performance.
 - b) Water consumption as specified in Facility Performance.
 - c) Substantiation: As specified in Facility Performance.
3. Ease of Use:
 - a) Access: All mechanical and electrical equipment located to allow easy access. Provide access doors for equipment accessed through walls, partitions, or fixed ceilings.
 - b) Valves and Other Control Devices: Accessible handles, switches, control buttons; valve handles on top/upper side; chain or other remote operators where located out of normal reach above floor level in SU1 and SU2 spaces.
 - c) Space Around Components: Working clearances and access routes as required by the Code and as recommended by component manufacturer.
 - d) Testing: After completion of installation, prepare services for starting-up by testing appropriately for proper operation.
 - e) Preparation for Operation: Provide assistance for the Owner's preparations for operation, as specified in Design and Coordination Procedures and as follows:
 - 1) Demonstration of all services to Owner personnel.
 - 2) Training Owner personnel in the operation of all service systems.
 - 3) Substantiation:
 - (a) Construction Documents: Schedule of demonstrations.
 - (b) Construction Documents: Training plan and schedule.
4. Ease of Cleaning: Where not otherwise specified, design equipment mountings to allow easy cleaning around, and under, equipment, if applicable, without crevices, cracks, and concealed spaces where dirt and grease can accumulate and with raised, closed bases for equipment mounted on the floor.
 - a) equipment with removable access panels to allow cleaning.
5. Ease of Equipment Service: As specified in Facility Performance and the following:
 - a) Lighting: Adequate for locating and operating equipment; emergency lighting for critical components.
 - b) Do not locate any equipment requiring maintenance in attics, in crawl spaces, where access must be through attics or crawl spaces, or where access is not possible using removable panels or doors.
 - c) Substantiation:
 - 1) Construction Documents: Identification of parts normally replaced during routine maintenance and parts replaced only when damaged or unexpectedly worn out; location

of stocking distributors.

2) [RESERVED]

END OF SECTION - SERVICES

Water And Drainage

PERFORMANCE

A. Basic Function:

1. Provide delivery of hot and cold domestic water to points of utilization and the removal of water, rainwater, and liquid waste.
2. Water and drainage elements comprise the following:
 - a) Water Supply: Water sources and storage.
 - b) Plumbing Fixtures: All fixtures necessary for sanitation, occupancy, and use, that are connected to water supply or drainage; not including water heating or conditioning equipment or kitchen appliances.
 - c) Domestic Water: All elements required to distribute water to fixtures, including piping and equipment for water cooling, heating and storage.
 - d) Sanitary Waste: All elements required for removal of sanitary waste, including piping, venting, discharge and disposal, and equipment.
 - e) Rain Water Drainage: All elements required for drainage of rain water from building areas in which it may accumulate and drainage of clear wastes from building services; not including gutters and downspouts or sub drainage.
3. Where plumbing elements also must function as elements defined within another element group, meet the requirements of both element groups.
4. In addition to the requirements of this section, comply with requirements specified in Facility Performance Section and Services.

B. Amenity and Comfort:

1. Hot Water Supply:
 - a) Provide pressure balanced shower valves which limit the water temperature to 49 deg C (120 deg F).
2. Convenience:
 - a) Fixture Heights: As specified in the Code.
 - b) Fixture Configurations: As specified in the Code.
 - c) Water Connections: Hot water on the left side of fixtures and cold water on the right side of fixtures.
3. Odors:
 - a) Locate odor producing elements in areas separate from human occupancy in dedicated equipment rooms.
 - b) Do not locate sanitary waste vent openings where odors are noticeable by occupants or by occupants of adjacent properties or where odor-bearing air may enter building spaces.
 - c) Connect fixtures to prevent entry of sewer gases into occupied spaces.

C. Health and Safety:

1. Health: Provide potable water.
2. Waste Disposal: Connect each fixture to sanitary drainage system for proper disposal of waste and harmful materials.
3. Pressure Control: Control pressures to protect the building, fixtures, equipment, and occupants from harm.
 - a) Maximum Water Distribution Working Pressure: 550 kPa (80 psi).
 - b) Air Removal: Remove air trapped in water distribution system.
4. Prevention of Sewer Gas Leaks:
 - a) Provide waste system vents as required by the Code to avoid trap siphonage or compression.
 - b) Prevent entry of sewer gases from the sanitary sewer into building's sewer system.
5. Protection of Potable Water Supply: As required by the Code.

0700 – Water and Drainage

6. Waste Drainage: Provide food handling equipment, food storage equipment, commercial dishwashing, cooler and freezer floor drains, drinking fountains, and water coolers with indirect waste pipe for drainage.
 7. Burn Hazards:
 - a) Maximum Fixture Discharge Temperature: 49 degrees C (120 degrees F).
 - b) Maximum Exposed Surface Temperature: 40 deg C (105 deg F).
 8. Hazard Labeling: Clearly label domestic hot water, domestic cold water, rain water drainage, and sanitary waste and vent systems indicating the nature of contents and direction of flow.
 - a) Conform to requirements of ANSI/ASME 13.1-2015.
 9. Hazardous Material Drainage: Prevent damage to public utility drainage systems by removing or neutralizing hazardous materials before discharging.
- D. Durability:
1. Joint Durability: Provide watertight joints.
 2. Electrical Component Protection:
 - a) Do not route piping through electrical rooms, switchgear rooms, transformer vaults, and elevator equipment rooms unless it is absolutely necessary.
 - 1) Where piping must be routed near electrical equipment, shield the electrical equipment with drip pans which drain to the nearest floor drain.
- E. Operation and Maintenance:
1. Capacity of Water Service: Provide adequate water flow and pressure to supply peak demand requirements. Comply with requirements specified in the Code.
 - a) Water Delivery: If the water source has insufficient flow or pressure, provide means of increasing to required level.
 - 1) Substantiation:
 - (a) Design Development: Identification of pressure and flow requirements (design conditions) for the building; verification of source availability at design conditions.
 - (b) Construction: Test of system flow and pressure; submit report verifying performance.
 - b) Water Flow:
 - 1) Maximum Velocity: 2.4 m/s (8 fps) at the design flow rate.
 - c) Substantiation:
 - 1) Preliminary Design: Analysis and documentation of water supply source and flow conditions.
 - 2) Design Development: Piping design calculations and entrance locations.
 - 3) Construction: Prior to installation of plumbing fixtures and prior to concealment of piping, air and water tests of piping systems at 110 percent of operating pressure, maintaining pressure for 2 hours to demonstrate system is watertight.
 2. Waste Pipe Sizing:
 - a) Size piping as required by the Code.
 - b) Buried Piping Below Slabs: 75 mm (3 inches) diameter, minimum.
 - c) Substantiation:
 - 1) Preliminary Design: Analysis and documentation of sewer discharge method and locations.
 - 2) Design Development: Drainage design calculations and documentation of piping outlets.
 3. Rain Water Drainage Capacity: As specified in the Code.
 4. Ease of Maintenance and Repair:
 - a) Provide devices at each branch take-off which allow insertion of measurement devices to monitor flow and pressure levels in the water distribution system.
 - b) Isolation of Piping Segments and Equipment: Provide a means of isolating the following:
 - 1) Each building from main water service. Provide a shut-off valve located inside a valve box whose removable access cover is at grade level.
 - 2) Water meter from building piping.
 - 3) Individual fixtures and equipment. Provide an isolation device within 900 mm (3 feet) of

pipe connection to item.

- c) Provision for Cleaning of Drainage Piping: Provide a cleanout as required by the Code and as follows:
- 1) At the upstream end of each horizontal sanitary drainage pipe, for cleaning in direction of flow.
 - 2) Pipe 75 mm (3 inches) and Smaller: At intervals of 15 m (50 foot), maximum.

END OF SECTION - WATER AND DRAINAGE

Heating, Ventilating, and Air Conditioning

PERFORMANCE

A. Basic Function:

1. Provide artificial means of controlling temperature, relative humidity, velocity, and direction of air motion in the interior spaces enclosed by the shell, and reduction of airborne odors, particulates, and contaminant gases.
2. The HVAC system consists of the following elements:
 - a) Energy Supply: Elements which provide energy used to maintain building comfort.
 - b) Heat Generation: Elements required to heat building to maintain space comfort.
 - c) Cooling Generation: Elements necessary to generate the cooling required to maintain building comfort.
 - d) Air Distribution: Elements required to distribute air to maintain building comfort.
 - e) HVAC Controls: Elements required to control equipment which maintains building comfort.
3. Where HVAC elements also must function as elements defined within another element group, meet the requirements of both element groups.
4. In addition to the requirements of this section, comply with all applicable requirements of Facility Performance and Services.

B. Amenity and Comfort:

1. Space Temperature Set point: As indicated in Facility Performance and the Program-Space Criteria Sheets.
 - a) Computer Room: 22 deg C (72 deg F), plus or minus 0.5 deg C (0.3 deg F).
2. Substantiation:
 - a) Closeout: Measurement of temperature and humidity in spaces with unacceptable temperature fluctuations.

C. Health and Safety:

1. Emergency Power: Provide emergency power in accordance with the Code.
2. Electrical Shock Prevention:
 - a) Provide a means of disconnecting power at each piece of equipment.
3. Smoke Control: Coordinate control of ventilation fans, supply fans, return fans, exhaust fans, and dampers with smoke control system.
4. Refrigerants:
 - a) Comply with the requirements of ASHRAE 15.
 - b) Prevent release of refrigerant to atmosphere.
 - c) Prevent exposure of occupants to hazardous refrigerants.
 - 1) Substantiation:
 - (a) Construction: Measurement of refrigerant concentration in mechanical equipment rooms where refrigerants are located.
5. Indoor Air Quality: Provide sufficient ventilation to obtain acceptable indoor quality, determined using the Ventilation Rate Procedure of ANSI/ASHRAE 62.1.
 - a) Substantiation:
 - 1) Design Development: Engineering analysis.
 - 2) Occupancy: Field testing and survey of occupants.

D. Operation and Maintenance:

1. HVAC Reliability:
 - a) Substantiation:
 - 1) Construction: Functional performance testing.
 - 2) Occupancy:
 - (a) If equipment is damaged or malfunctions within one year after completion, reporting of

- the cause of equipment damage or malfunctions.
- (b) Corrective Action: Provide corrective measures necessary to eliminate equipment damage and malfunctions.

END OF SECTION - HVAC

Building Automation System

PERFORMANCE

A. Basic Function:

1. Provide the elements necessary to engineer, design, install, control, monitor, and report the building's indoor environment and utility consumption. in conjunction with the following performance requirements follow the standards in referenced manual **Instrumentation and Control for HVAC – Oregon Military Department Control System Specifications** (supplied as part of the RFP):
2. Provide a fully integrated Building Automation System (“BAS”) incorporating direct digital control (“DDC”) for:
 - a) Energy management
 - b) Equipment monitoring
 - c) Temperature control
 - d) The following subsystems:
 - 1) Indoor environment
 - 2) Manages energy consumption
 - 3) Schedules preventative maintenance
 - 4) Controls interior lighting
 - 5) Controls exterior lighting
 - 6) Integrates fire alarm
 - 7) Integrates security functions
 - 8) Monitors fuel consumption
 - 9) Monitors water usage
3. DDC Controllers shall have ability to perform each of the following energy management routines:
 - a) Time-of-day scheduling
 - b) Calendar-based scheduling
 - c) Temporary schedule overrides
 - d) Automatic Daylight Savings Time Switch-over
 - e) Peak demand limiting
 - f) Temperature-compensated duty cycling
 - g) Energy conservation routines including:
 - 1) Water temperature reset.
 - 2) Air temperature reset.
 - 3) Economizer cycle.
 - 4) Unoccupied hour temperature set-back.
 - 5) Night flush.

0700 – Building Automation System

4. Provide alarm management to monitor and direct alarm information to operator devices. Each DDC Controller shall perform distributed, independent alarm analysis and filtering to minimize operator interruptions due to non-critical alarms, minimize network traffic and prevent alarms from being lost.
 - a) At no time shall the DDC Controllers ability to report alarms be affected by either operator or activity at PC workstation, local I/O device or communications with other panels on network.
- B. Amenity and Comfort:
1. Design BAS to network operator work stations and stand-alone DDC Controllers. Network architecture shall consist of three levels, building wide Ethernet network based on TCP/IP protocol, high performance peer-to-peer network, and DDC Controller floor level local area networks. Access across networks should be transparent to user when accessing data or developing control programs.
 2. Design of BAS shall allow co-existence of new DDC Controllers with existing DDC Controllers in same network without use of gateways or protocol converters.
 3. The BAS shall allow for dial up modem access for terminal mode (text) automatic control system monitoring and adjustment. Remote device shall be allowed to function without having BAS software installed at remote site.
 4. BAS should include color graphic floor plan displays and system schematics for each piece of mechanical equipment including, but not limited to, air handling systems, chilled water systems, heating water systems, general exhaust systems, boiler systems and domestic water heating systems. Package shall include pop-up menu prompting, archiving, point, and program editing. Graphics shall include overall building architecture with keys to individual floors, system schematics for systems and equipment serving the areas, flow diagrams and control system panel layout diagram.
- C. Operations & Maintenance:
2. Provide training in operation, maintenance, and programming of the DDC system for the Owner's Designated Personnel. Training shall conform to, and include, the following:
 - a) Provide 16 hours of training for Owner's designated operating personnel.
 - b) Students shall be provided with binder containing product and system specific training modules for system installed. Minimum of one copy per student plus one extra copy.
 3. Software programs shall be provided as an integral part of DDC Controllers and shall not be dependent upon any higher-level computer for execution. DDC Controllers shall be able to execute custom, job-specific processes defined by user, to automatically perform calculations and special control routines. A variety of historical data collection utilities shall be provided to manually or automatically sample, store and display system data for points specified in I/O summary.
- D. Reliability:
2. BAS system shall be designed, installed, commissioned and serviced by factory trained employees of the BAS system manufacturer.
 3. Materials and equipment shall be catalogued products of manufacturers regularly engaged in production and installation of automatic temperature control systems. Materials and equipment used shall be standard components, regularly manufactured for this and/or other systems and not custom designed specially for this Project. Systems and components shall have been thoroughly tested, proven in actual use for at least two years, and shall be manufacturer's latest standard design that complies with specification requirements.
 4. BAS shall comply with UL 864 UUKL, UL 916 PAZX and 864 UDTZ, and other subsystem listings as applicable.
 5. Electronic equipment shall conform to requirements of FCC Regulation, Part 15, Section 15, Governing Radio Frequency Electromagnetic Interference and be so labeled.
 6. BAS devices and installation shall be warranted to be free from defects in workmanship and

0700 – Building Automation System

material for a period of one year from date of job acceptance by Owner. Any equipment, software, or installation found to be defective during this period shall be repaired or replaced without additional expense to Owner. Factory authorized warranty service shall be available on site within 60 minutes of a call for service.

PRODUCTS

1. MANUFACTURER - DDC system components and architecture shall be as manufactured by Automated Logic

END OF SECTION – BUILDING AUTOMATION SYSTEM

Fire Protection

PERFORMANCE

- A. NOTE TO PROPOSERS:** It is the Proposers responsibility to propose a structure that complies with all Fire life and safety codes. If the Proposer determines to propose a facility that utilizes an automatic fire sprinkler system then the proposal shall be based on the relevant fire suppression specifications in this section. Please note that this will be an exception to NGB criteria and will require Code compliance certification as well as economic justification.
- B. Basic Function:**
1. Provide services systems to protect life and property.
 2. Fire protection comprises the following elements:
 - a) Fire Sprinkler and Extinguishing Systems: Elements which automatically extinguish fires.
 - b) Fire Detection and Alarm: Elements required to detect fires and communicate fire location to building occupants, building management, and public fire fighting agencies.
 - c) Fire Protection Specialties: Elements required for manual fire-fighting by occupants.
 3. Provide automatic fire suppression for the entire building.
 4. Water Use:
 - a) Provide a permanent water supply for standpipes as required by the Code.
 - b) Provide a water supply to sprinkler systems that is sufficient to extinguish fires inside the structure.
 5. Where fire protection elements also must function as elements defined within another element group, meet the requirements of both element groups.
 6. In addition to the requirements of this section, comply with all applicable requirements of Facility Performance and Services.
- C. Amenity and Comfort:**
1. Leakage: Provide systems that are leak-free.
 2. Accessibility: Provide clearances around system components for service and use.
 3. Sound: Provide audible alarm system to signal building occupants of fire hazard.
 4. Convenience: Provide an automatic system to signal building occupants of fire.
 5. FACP: Provide a Fire Alarm Control panel with fire location map, and first responder building call handset. Locate the FACP's in the main lobby, maintenance office, and in the Mechanical Electrical room.
 6. Hazards: Provide systems which minimize risk of injury and damage to property.
 7. Substantiation:
 - a) Preliminary Design: Fire protection areas identified.
 - b) Design Development: Fire protection zones indicated on the drawings with riser locations identified.
 - c) Construction: Functional performance testing in accordance with the Code.
- D. Health and Safety:**
1. Path of Egress: Provide systems which safeguard path of egress.
 2. Fire Source: Provide system materials which do not contribute to the spread of the fire.
 3. Fire Spread: Provide systems to limit spread of fire from storage area to office area.
- E. Structural:**
1. Seismic Design: Provide support systems which sustain static (dead) loads twice the wet weight

of the system.

F. Durability:

1. Corrosion Resistance: Use corrosion resistant materials; ferrous metal is not considered corrosion resistant unless it is hot dipped galvanized, chrome plated, or coated with rust inhibitive paint.
2. Vandalism: Provide systems which are tamper-resistant.

G. Operation and Maintenance:

1. Ease of Use: Provide easy access to and working clearances around system components.
2. Unauthorized Use: Provide systems which minimize activation and use by unauthorized persons.
3. Substantiation:
 - a) Preliminary Design: System layout indicating operator interface locations.
 - b) Design Development: System equipment locations indicated on the drawings and manufacturer's product data indicating products to be used.

END OF SECTION - FIRE PROTECTION

Electrical Power

PERFORMANCE

A. Basic Function:

1. Provide electrical power with the appropriate characteristics to operate all electrically operated devices, including those in other services.
2. The electrical system comprises the following elements:
 - a) Electrical Energy Generation: Utility power sources, engine-generator systems, battery power systems, uninterruptible power supply systems and unit power conditioners.
 - b) Service and Distribution: Service entrance equipment, distribution equipment, transformers, motor control equipment, service and feeder wiring (conductors and raceways), monitoring, safety and control equipment, and other elements required for a complete functional system.
 - c) Branch Circuits: Branch circuit wiring and receptacles and other branch circuit wiring systems.
3. Utility Revenue Meters: Meter incoming electrical service on the low-voltage side of the service transformer (secondary metering).
4. Where electrical power elements also must function as elements defined within another element group, meet the requirements of both element groups.
5. Power Distribution: All electrical power distribution shall be underground. All existing above grade power lines within the Project Site shall be removed and reinstalled below grade.
6. In addition to the requirements of this section, comply with all applicable requirements of Facility Performance and Services.
7. Substantiation:
 - a) Construction: Continuity test of wiring systems prior to functional performance test. Functional performance test of wiring systems.

B. Amenity and Comfort:

1. Convenience:
 - a) Provide means of reading power meters and demand meters from inside the building.
 - b) Provide an interface between the electrical monitoring and the building automation system including the following:
 - 1) Switchboard Monitoring:
 - (a) Power Analysis Values:
 - (i) Output voltage of each phase; line-to-line and line-to-neutral.
 - (ii) Output current; each phase and ground.
 - (iii) Real power; per phase.
 - 2) Real-Time Readings of:
 - (a) Fundamental voltages; per phase.
 - (b) Fundamental real power; per phase.
 - (c) Unbalance; current and voltage.
 - 3) Demand Readings:
 - (a) Demand current; per phase and peak.
 - (b) Average power factor; 3-phase total.
 - (c) Demand real power; 3-phase total.

C. Health and Safety:

1. Electrical Hazards: Design in accordance with all NFPA standards that apply to the occupancy, application, and design.
 - a) Control access to spaces housing electrical components and allow access only by qualified personnel.
 - b) Provide electrical distribution equipment with locking cabinets, doors, and panels when it is located in public areas.
 - c) Hazardous Locations: Comply with the Code.

2. Emergency Systems: Provide emergency power when normal power is interrupted, for the following:
 - a) Systems and areas as required by the Code.
 3. Hazardous Locations: Comply with requirements of NFPA 70 chapter on Hazardous (Classified) Locations, in the following areas:
 - a) Maintenance Bays.
- D. Durability:
1. Moisture Resistance: Water-resistant equipment includes transformers, raceways, enclosures, panel boards, and switchgear.
 2. Enclosures: As required to protect equipment from environment in which it is installed, complying with NEMA 250 and:
 - a) Areas to be Hosed-Down, or Equivalent, Exterior or Interior: Type 4.
 - b) Exterior, Exposed to Weather and Wind: Type 3S.
 - c) Exterior, Other Locations: Type 3R.
 - d) Interior, Subject to Settling Dust, Falling Dirt, or Dripping Liquids: Type 5.
 - e) Interior, Subject to Circulating Dust: NEMA Type 12.
 - f) Interior, Other Locations: Type 1.
- E. Operation and Maintenance:
1. Capacity: Calculated in accordance with NFPA 70.
 2. Power Consumption and Efficiency:
 - a) Comply with requirements of ASHRAE 90.1.
 3. Protection Against Disturbances:
 - a) Provide circuits which serve sensitive electronic equipment with electrical characteristics within the ranges defined in IEEE Standard 1100.
 - 1) Substantiation:
 - (a) Preliminary Design: Identification of design strategies to minimize electrical disturbances.
 - (b) Design Documents: Identification of circuits which require power conditioning equipment.
 - (c) Construction: Functional performance testing.
 - (d) Occupancy:
 - (i) If equipment is damaged or malfunctions within one year after completion, reporting of the cause of equipment damage or malfunctions.
 - (ii) Corrective Action: Provide corrective measures necessary to eliminate electrical disturbances which caused equipment damage and malfunctions.
 - (iii) Retest Report: Identification of electrical characteristics after corrective equipment has been installed and all equipment is operating properly and without damage.
 - b) Noise Protection: Limit frequency excursions between 90 to 110 percent of design frequency.
 - c) Surge Protection: Voltage excursion limit of 2 times design voltage.
 4. General Receptacle System Voltage: 120 volts/3-phase/60 Hz.
 - a) Provide 240 volt/3-phase/60 Hz receptacles in the following locations:
 - 1) Copier room.
 - 2) Maintenance area.
 - 3) Kitchen area.
 - b) Equipment Voltage: 480 volts/3-phase/60 Hz.
 5. Ease of Use:
 - a) Branch-Circuit Panelboards:
 - 1) Provide a dedicated panelboard for lighting which is separate from panelboards serving equipment and sensitive electronic equipment.
 - 2) Provide one for each tenant unit, located inside unit.
 6. Availability: Provide an electrical system which is available to deliver power at least 99 percent of the time.

7. Allowance for Change and Expansion:
 - a) Spare Capacity - System Wide:
 - 1) Load: 20 percent, minimum.
 - b) Future Capacity - System Wide:
 - 1) Number of Additional Circuits: 20 percent, minimum.

END OF SECTION - ELECTRICAL POWER

Solar Photovoltaic System

PERFORMANCE

A. Basic Function:

1. Provide a complete Code-compliant solar photovoltaic (“PV”) system with all interconnection gear and web-based monitoring. Include net metering switchgear consisting of a utility power consumption meter and a solar power production meter with separate disconnecting means for each meter. Include all utility company applications and procedures, solar PV nameplate rating and net metering switchgear configuration in accordance with the utility company requirements.
2. PV System Goals:
 - a) Maximize Lifetime Energy Production (“LEP”) within the available budget
 - b) Maximize all available solar incentives and grants
 - c) Minimize Operations and Maintenance (O&M) costs
 - d) Minimize Levelized Cost of Electricity (“LCOE”)
 - e) Net Zero Energy (“NZE”): Future expansion capability to achieve NZE goal with total annual electrical production equal to annual electrical usage.
3. Design:
 - a) Lifetime Energy Production (“LEP”): Optimize within the available budget
 - 1) Production Modeling: It is desirable to use a software simulation tool to optimize system performance, and calculate annual energy production.
 - (a) Accepted software: PV*SOL, PVsyst, PVWatts, System Advisor Model (“SAM”)
 - (b) Provide product information if using software not listed above
 - 2) Aesthetics: Minor trade-offs in system performance due to sub-optimal tilt and orientation that enhance aesthetics of the installation are acceptable.
 - b) System Losses: Calculate losses for categories listed below - Target ≤ 15.0 percent total
 - 1) Soiling:
 - 2) Shading:
 - 3) Light Induced Degradation (“LID”):
 - 4) Thermal Losses:
 - 5) Module Mismatch:
 - 6) Nameplate Rating Variance: Select modules with a positive power tolerance that deliver or exceed the nominal rated power under Standard Test Conditions (“STC”).
 - 7) Wiring & Connection Losses: Minimize resistive losses in DC and AC wiring and connections.
 - 8) System Availability: Minimize outages and downtime for scheduled and unscheduled maintenance
 - c) Array-to-Inverter Power Ratio: Target 1.20 to 1.35
 - 1) Maximize the system Specific Yield in kWh/kW
 - 2) Maximize the annual energy production by balancing additional generation from a higher DC-to-AC ratio against potential clipping losses due to inverter power limiting.
4. The solar PV system comprises the following elements:
 - a) Solar PV modules: STC nameplate rating of 250 watts, Voc = 37.8, Isc = 8.28 amps, NOCT 47 degrees C. Measuring tolerance of +/- 3%. 60 cell module, monocrystalline with tempered glass, 25 year linear performance guarantee. Include structural racking and mounting hardware.
 - 1) Certified by California Energy Commission (“CEC”) http://www.gosolarcalifornia.ca.gov/equipment/pv_modules.php
 - 2) Module Efficiency: 16 percent minimum
 - 3) Performance Guarantee: 20 year minimum
 - 4) Product Warranty: 20 year minimum
 - b) Line Condition Filter (“LCF”): Enclosure with lugs for terminating panelboard feeder conductors and for conductors from the LCF to the net metering switchgear. The communications gateway for monitoring the micro inverters is also enclosed in the LCF.
 - c) Web based monitoring: web site monitoring of the micro inverters. Includes a communications

- gateway and ethernet data cabling and/or fiber optic cabling for distances exceeding 300 feet between the LCF and the data patch panel in the building.
- d) Circuit breaker panelboard: Panelboard with door-in-door trim for terminating the 3-phase source circuits from the inverters. Includes feeder conductors from the panelboard to the LCF and from the LCF to the net metering switchgear.
 - e) Inverters:
 - 1) Certified by California Energy Commission
<http://www.gosolarcalifornia.ca.gov/equipment/inverters.php>
 - 2) CEC Efficiency: 96 percent minimum
 - (a) Product Warranty: 20 year minimum, with option to extend for additional 10 years
5. Net Meter: Comply with all utility interconnection requirements
 6. Net Metering Switchgear: Switchgear with two utility meters: one to measure utility power consumption and the other to measure solar power production. Each meter with its own disconnecting means. Also include a customer owned digital meter with LCD display at each utility meter for the customers use in observing real-time electrical data on each utility meter. The digital meters shall also be connected to the building automation system. Coordinate switchgear configuration and nameplate ratings with the utility company.
 7. Dry-type Transformers: include transformers where needed to change voltage of the output of the solar pv system to match the voltage of the electrical utility and net metering switchgear.
 8. In addition to the requirements of this section, comply with all applicable requirements of Section 0700 Facility and Services Performance Specifications.
 9. Wiring: Maximum AC & DC voltage drop not to exceed 3%.
 10. Roof Penetrations:
 - a) Coordinate all roof penetrations with original roof manufacture/installer to maintain roofing warranty.
- B. Amenity and Comfort:
1. Convenience:
 - a) Performance Monitoring: Provide web based system with following capabilities:
 - 1) System performance dashboard
 - 2) Daily energy production
 - 3) Lifetime energy production
 - 4) Inverter status and operational data
 - 5) Sub-array DC current
 - 6) Email alerts for alarm conditions
 - 7) Data export capability
 - b) Provide an interface between the digital meters in the net metering switchgear and the building automation system per building including the following:
 - c) Monitoring at the net metering switchgear for both meters:
 - 8) Voltage of each phase; line-to-line and line-to-neutral.
 - 9) Current of each phase.
 - 10) Total Real power.
- C. Health and Safety:
1. Electrical Safety: Design in accordance with NEC Article 690.
 - a) Control access to spaces housing electrical components and allow access only by qualified personnel.
 - b) Signage: Provide required system labels, and warning signs for Control of Hazardous Energy.
 - c) Provide electrical distribution equipment with locking cabinets, doors, and panels when it is located in public areas.
 2. Grounding & Bonding:
 - a) Provide system grounding per the NEC.
 - b) Provide an unspliced stranded copper bonding conductor for all solar pv modules and metallic mounting hardware.

- c) Provide active grounding as required by local utility or the Code (i.e. grounding transformer)

D. Durability:

- 1. Enclosures: As required to protect equipment from environment in which it is installed, complying with NEMA 250-2003 and:
 - a) Areas to be Hosed-Down, or Equivalent, Exterior or Interior: Type 4.
 - b) Exterior: Type 12.
 - c) Interior, Subject to Circulating Dust: NEMA Type 12.
 - d) Interior, Other Locations: Type 1.

E. Operation and Maintenance:

- 1. Allowance for Change and Expansion:
 - e) Spare capacity: Plan the layout of the solar pv modules and size the panelboards, feeder conductors, net metering switchgear, transformers, etc. to allow the addition of 20 percent more solar PV modules.

END OF SECTION – SOLAR PHOTOVOLTAIC SYSTEM

Artificial Lighting

PERFORMANCE

A. Basic Function:

1. Provide artificial means of lighting interior and exterior spaces.
2. Artificial lighting comprises the following elements:
 - a) Interior Lighting: General room lighting, emergency lighting, and accent lighting.
 - b) Exterior Area Lighting: General lighting of exterior spaces including roadways, driveways, walkways, parking areas, and recreation areas.
3. Portable lamps (not permanently attached to the building or other building furnishings) may not be used to accomplish required artificial lighting.
4. Where artificial lighting elements also must function as elements defined within another element group, meet the requirements of both element groups.
5. In addition to the requirements of this section, comply with all applicable requirements of Facility Performance and Services.

B. Amenity and Comfort:

- a) Light Levels: Provide maintained ambient luminance values for various activities that are within the ranges specified in the IESNA Lighting Handbook.

C. Health and Safety:

1. Electrical Hazards: Design in accordance with all NFPA standards that apply to the occupancy, application, and design.
 - a) Comply with NFPA 70 requirements for hazardous locations applications.
2. Emergency Systems: Provide backup lighting for periods of normal power interruption, for the following:
 - a) Systems and areas as required by the Code.

D. Operation and Maintenance:

1. Capacity: Design lighting to deliver required illumination while operating within intended ratings.
2. Power Consumption and Efficiency:
 - a) Comply with requirements for energy efficiency of lighting in ASHRAE 90.1.
3. Allowance for Change and Expansion:
 - a) Spare Capacity: 10 percent, minimum.

END OF SECTION - ARTIFICIAL LIGHTING

Telecommunications

PERFORMANCE

A. Basic Function:

1. Provide the following telecommunications services in conjunction with the referenced manual **MDF - IDF Communications Room Voice – Data - Video Cabling Standard** (supplied as part of the RFP):
 - a) Voice and Data: Infrastructure for voice, data transmission and telephone equipment. Each data outlet shall contain a port for telecom, printer, and network.
 - b) Sound Reinforcement: Public address and music systems.
 - c) Television: Television distribution, reception, and equipment.
2. Where telecommunications elements also must function as elements defined within another element group, meet the requirements of both element groups.
3. In addition to the requirements of this section, comply with all applicable requirements of Facility Performance and Services.

B. Amenity & Comfort:

- 1.

C. Health and Safety:

1. Electrical Hazards: Design in accordance with all NFPA standards that apply to the occupancy, application, and design.
 - a) Control access to spaces housing electrical components and allow access only by qualified personnel.
 - b) Comply with NFPA 70 requirements for hazardous locations applications.
2. Emergency Systems: Provide emergency power when normal power is interrupted, for the following:
 - a) Systems and areas as required by the Code.

D. Structure:

E. Durability:

1. Enclosures: As required to protect equipment from environment in which it is installed, complying with NEMA 250.

F. Operation and Maintenance:

1. Capacity: Design systems to deliver required performance while operating within their intended ratings.
 - a) Substantiation:
 - 1) Construction: Testing of wiring systems for continuity, prior to functional performance testing; functional performance testing.
2. Power Consumption and Efficiency:
 - (a) Comply with requirements for energy efficiency of electrical equipment in ASHRAE 90.1.
3. Ease of Use:
 - a) Zoning: Arrange wiring and protective devices so that outages caused by local faults do not affect unrelated areas or systems.
 - b) Main Telecommunications Panel: Provide one for each building.
 - c) Branch Telecommunications Panels:
 - 1) Provide one for each tenant unit, located inside unit.
4. Allowance for Change and Expansion:
 - a) Spare Distribution Capacity: 10 percent, minimum.
 - b) Future Distribution Capacity: 20 percent, minimum.

END OF SECTION - TELECOMMUNICATIONS

Electronic Surveillance System

PERFORMANCE

A. Basic Function:

1. Provide a digital closed circuit television (“CCTV”) surveillance system consisting of cameras, data transmission wiring, and a control station with its associated equipment to monitor the Site, Site perimeter, Site improvements, facility entry points, and secure areas.
2. The Site CCTV system should be installed in a manner to eliminate obstructed view of the base entry, and surrounding area of new facility.
 - a) The Site CCTV system should include pan tilt zoom (“PTZ”) cameras.
 - b) The Site CCTV system should be capable of monitoring POV and military vehicle parking lots, all out buildings including but not limited to unheated storage, flammable materials, controlled waste, maintenance workbays, emergency generator pad, etc.
3. The indoor facility CCTV system should be installed in a manner to eliminate obstructed view of all persons entering the new facility or high security zones.
 - a) The facility CCTV system should include fixed cameras.
 - b) The facility CCTV system should be capable of monitoring facility entry points, and high secure zones including but not limited to weapons vaults, and secure communications rooms.
4. The CCTV system performance requirements includes:
 - a) The installed CCTV system should consist of closed circuit video cameras and a digital video recorder, connected by a high speed electronic data transmission network to the owners existing security management system.
 - b) The installed cameras should have zoom and picture quality capabilities of providing face recognition of persons in a vehicle at all locations monitored by the CCTV system.
 - c) The installed CCTV system should be capable of meeting performance requirements in both day and nighttime conditions.
 - d) The installed CCTV system should be capable of meeting performance requirements in all seasons and extreme weather conditions consistent with this geographical location.

B. Amenity and Comfort:

1. Monitoring stations.
 - a) Primary Station - Provide a primary monitoring station located in the new facility with four 13 inch color monitors. The monitoring station should include the capability to view all cameras as well as operate/control the PTZ cameras.
 - b) Statewide System - The CCTV system needs to be compatible with the current statewide CCTV system, including remote operation.

C. Operations & Maintenance:

1. Provide training in operation, maintenance, and programming of the CCTV system for the Owner’s Designated Personnel. Training shall conform to, and include, the following:
 - a) Provide 16 hours of training for Owner’s designated operating personnel.
 - b) Students shall be provided with binder containing product and system specific training modules for system installed. Minimum of one copy per student plus one extra copy.
2. The CCTV system must be fully capable during emergency conditions including but not limited to power outages.

D. Reliability:

1. CCTV system shall be designed, installed, commissioned and serviced by factory trained employees of the CCTV system manufacturer.
2. Materials and equipment shall be catalogued products of manufacturers regularly engaged in production and installation of automatic temperature control systems. Materials and equipment used shall be standard components, regularly manufactured for this or other systems and not custom designed specially for this Project. Systems and components shall have been thoroughly tested, proven in actual use for at least two years, and shall be manufacturer's latest standard design that complies with specification requirements.
3. CCTV devices and installation shall be warranted to be free from defects in workmanship and material for a period of one year from date of job acceptance by Owner. Any equipment, software, or installation found to be defective during this period shall be repaired or replaced without additional expense to Owner. Factory authorized warranty service shall be available on site within 60 minutes of a call for service.

END OF SECTION – ELECTRONIC SURVEILLANCE SYSTEM

Security Control System

PERFORMANCE

A. Basic Function:

1. Provide a security control system capable of monitoring, detecting and controlling access to the Site, new facility and high secure zones.
2. Provide an access control system capable of providing the following access control systems:
 - a) Provide keyless entry (Card Reader) system to control entry to the main entrance, and exterior entry doors. System needs to include badging station; computer, badging printer, supply of cards, etc..
 - b) Provide a remote access control system operated by a receptionist to remotely unlock entry doors to allow public access the facility.
 - c) Provided keyed access to all other areas, Medco Key system compatible with the system that OMD has at all of it's facilities.
3. Provide a mass notification capable of providing voice communication as well as an ADA compliant visual alerting system.
4. Provide an intrusion detection system for all areas deemed as high secure zones listed in Section 0600 Project Program.
 - a) The intrusion detection system should be compatible with the Moon Security system currently in use by OMD.
5. Provide point to point voice communication systems located building entry and building service entries.
6. The access control system shall be a fully distributed processing system so that information, including time, date, valid codes, access levels, and similar data, is downloaded to intelligent system controllers.

B. Amenity and Comfort:

1. Provide a PC central station with software designated as the main controlling PC of the security access system.

C. Operations & Maintenance:

1. Provide training in operation, maintenance, and programming of the security control system for the Owner's Designated Personnel. Training shall conform to, and include, the following:
 - a) Provide 16 hours of training for Owner's designated operating personnel.
 - b) Students shall be provided with binder containing product and system specific training modules for system installed. Minimum of one copy per student plus one extra copy.
2. The security control system must be fully capable of operating during emergency conditions including but not limited to power outages.

D. Reliability:

1. Security control system shall be designed, installed, commissioned and serviced by factory trained employees of the security control system manufacturer.
2. Materials and equipment shall be catalogued products of manufacturers regularly engaged in production and installation of automatic temperature control systems. Materials and equipment used shall be standard components, regularly manufactured for this and/or other systems and not custom designed especially for this Project. Systems and components shall have been thoroughly

tested, proven in actual use for at least two years, and shall be manufacturer's latest standard design that complies with specification requirements.

3. Security control devices and installation shall be warranted to be free from defects in workmanship and material for a period of one year from date of job acceptance by Owner. Any equipment, software, or installation found to be defective during this period shall be repaired or replaced without additional expense to Owner. Factory authorized warranty service shall be available on site within 60 minutes of a call for service.

PRODUCTS

1. MANUFACTURER - Security control system components and architecture shall be manufactured by Lenel. (See Attachment for more information on system DB is to provide.)

Oregon Military Department Enterprise Lenel OnGuard Pro System

Badging Computer System Requirements, (latest edition of the items):

1. One Dell Optiplex 7040 Work Station
2. One Dell 21.5 Monitor P2214H
3. One Dell Smartcard Reader USB keyboard
4. One Basic USB Optical Mouse for Business - Black
5. One Magicard Rio Pro Duo ID Card Printer
6. One AmazonBaxics 60-inch Tripod
7. One Sony CX240 Mini CamCorder 27x2 7 LCD
8. One Startech USB 2.0 Video Capture Cable converter
9. One Transcend Memory 2GB Micro SD card
10. One Startech USB A/A M/M 6ft White
11. One Belkin 3' USB A/A M/F Ext Cable
12. One HP LaserJet Pro 400 M401N Printer
13. One Lenel Badging License
14. Printable Badge Cards quantity 500.
 - a. Manufacture: HID
 - b. Part Number: 1386LGGMN
 - c. Starting badge number: -----
 - d. Format Number: H103
 - e. Facility Code: 214

Note: No suitable substitutions. All equipment must come with a warranty that equal or exceeds the State of Oregon Purchasing contracts for equipment above. Submit your proposed list for approval, prior to ordering. This equipment will need delivered to the AGI-IT office to be inventoried, configured, and deployed to operate with our Lenel OnGuard system.

END OF SECTION – SECURITY CONTROL SYSTEM

Equipment And Furnishings

PERFORMANCE

A. Basic Function:

1. Design the facility to accommodate the equipment and furnishings required by the Owner, which are specified in the Project program.
2. Equipment and furnishings comprise the following elements:
 - a) Equipment: Mechanized, plumbed, and electrical devices, other than equipment that is part of a service system (HVAC, electrical, etc.), and permanently installed fixtures not covered by another Section.
 - b) Furnishings: Movable (loose) furniture and fittings, without electrical or plumbing connections.
3. All specified equipment and furnishings are to be provided by the Design-Builder unless otherwise indicated in the Project Program.
4. Where equipment or furnishings elements also must function as elements defined within another element group, meet requirements of both element groups.
5. In addition to the requirements of this section, comply with all applicable requirements of Facility Performance Section.

B. Amenity and Comfort:

1. Appearance:
 - a) Services Connections to Equipment: Concealed behind or under items or their housings.
 - b) [RESERVED]

C. Health and Safety:

1. Accident Prevention:
 - a) Comply with the requirements of 29 CFR 1910, regulations of Occupational Safety and Health Administration.
 - b) Prevent accidental pinching, crushing, and cutting of operator limbs, fingers, and toes in or by moving parts of equipment by using intelligent design or guards or other protection, without reliance on self-protective operation by operator.
 - 1) Exception: Equipment specifically designed for cutting, such as food preparation equipment, may have exposed cutting edges.
 - 2) [RESERVED]

D. Durability:

1. Weather Resistance: Items located outdoors must comply with requirements of Shell.
2. Vandal Resistance: Parts not easily removed without the use of tools.

E. Operation and Maintenance:

1. Ease of Maintenance: Not requiring any routine measures to maintain operation or finishes, other than washing with soap and water.
2. Ease of Repair: Serviceable parts and access panels easily removable with common tools.
3. Ease of Equipment Service: As specified in the Facility Performance and the following:
 - a) Rooftop Equipment: Of type that is serviceable by relatively quick replacement of parts, minimizing time required on roof, and eliminating need to perform repair work in the weather.
 - b) Parts Having Service Life Less Than That Specified for Element: Easily replaceable, without de-installation or de-mounting of the entire element, component, or equipment item.
 - c) Valves: Easily replaceable internal parts, eliminating necessity of removal of entire valve for repair.

END OF SECTION - EQUIPMENT AND FURNISHINGS

Site work

PERFORMANCE

A. Basic Function:

1. Provide all modifications to the Site and Site improvements and utilities required for proper functioning of the Project and as indicated in the Project program.
2. Site work comprises the following elements:
 - a) Site Preparation: All modifications to the Site and grades required for construction of new work and for proper functioning of the Project.
 - b) Site Improvements: All elements required to provide finished and durable Site surfaces, indoor plantings, and outdoor improvements described in the Project program.
 - c) Site Services: All outdoor and underground elements required to complete the design of services defined in Services.
 - d) Other Site Construction: Miscellaneous Site elements.
3. Where Site elements also must function as elements defined within another element group, meet the requirements of both element groups.
4. In addition to the requirements of this section, comply with all applicable requirements of Facility Performance.

B. Amenity and Comfort:

1. Weather:
 - a) Provide shelter from weather for:
 - 1) Persons waiting for entrances to open, minimum of 20 people standing.
2. Wind: Design to shield entrances from wind in all seasons.
3. Comfort:
 - a) Provide outdoor seating as described in the Project program and as follows:
 - 1) Quantity:
 - (a) 2 bench seats at each exterior door.
 - (b) 6 fixed tables with fixed seating at outdoor courtyard areas.
4. Appearance:
 - a) Fit the new activities on Site to the topography, soils, and existing vegetation as much as possible.
 - b) Finished Surfaces:
 - 1) Make finished surfaces smooth and uniform in appearance, without depressions that collect water.
 - 2) Do not leave soil surfaces exposed in finished work; minimize the amount of time soil surfaces are left exposed.
 - 3) If, after consideration of other performance requirements, options remain as to methods of finishing soil surfaces, the Owner prefers:
 - (a) Landscaping, rather than paving.
 - (b) Perennial shrubbery and ground covers, rather than lawns.
 - (c) Water-pervious paving, such as unit pavers on pervious bed, rather than monolithic pavement.
 - c) Conceal unsightly Site elements from view from the street.
 - d) Conceal the following from view from the remainder of the Site:
 - 1) Trash collection and storage areas.
 - 2) Utility yards.
 - 3) Vehicle Maintenance areas.
 - e) Substantiation:
 - 1) Design Development: Site plans showing methods of achieving appearance requirements; renderings or sketches showing principal views described in requirements.
 - 2) [RESERVED]

C. Health and Safety:

1. Safety:
 - a) Inhibit:
 - 1) The intentional driving of vehicles from roadways and parking areas onto pedestrian walkways and planted areas.
 - 2) [RESERVED]
 - b) Prevent:
 - 1) Access by unauthorized persons to outdoor areas containing electrical equipment that has exposed powered components.
 2. Maximum Slopes:
 - a) Slopes with Smooth Pavement: 1:10, unless restricted to vehicular use.
 - b) Slopes Covered with Grass: 1:5, unless less than 1 m (3 feet) in height.
 - c) Slopes with Pedestrian-Inhibiting Vegetation: 1:1, unless less than 1.5 m (5 feet) in height.
 - d) Slopes With No Access From Top: Limited only by structural stability and resistance to erosion.
 3. Fire Sources: Design to minimize the danger of wildfires spreading to the Site, by complying with NFPA 1144-2011.
 4. Vermin/Animal Control:
 - a) Prevent and eliminate standing water that could become stagnant.
 - b) [RESERVED]
 5. Vehicular Safety: Comply with the Code.
 - a) Provide visual barriers at extreme changes in elevation near roadways.
 - b) Provide tactile warnings where pedestrian walkways cross or run adjacent to roadways.
- D. Structure:
1. Earthwork: Provide structural design in accordance with ASCE 7 if not otherwise required by the Code.
 - a) Bearing Capacity: Under substructure, paving, and Site structural elements, maintain natural bearing capacity or achieve or correct compaction as required to prevent uncontrolled subsidence or other movement.
 - b) Substantiation:
 - 1) Design Development: Engineering design of any structural fills required.
 2. Site Fixtures, Equipment, and Services:
 - a) Provide foundations or other mountings as required to support the completed and operational element permanently and safely and without uncontrolled subsidence or other movement.
 - b) [RESERVED]
- E. Durability:
1. Weather Resistance of Plants and Turf: Use plants that will withstand extremes of weather likely to occur in any 5 years without supplementary irrigation and without seasonal protection other than mulch.
 - a) Owner agrees that maintenance to the level specified by the Design-Builder will be necessary to assure survival of the plants.
 - b) Exception: Supplementary irrigation is expected during new plant establishment period.
 - c) Substantiation:
 - 1) Design Development: Documentation of the historical extremes and duration of extremes in temperature, rainfall, and drought periods; proven-in-use documentation on major plant groups to be used, under similar Site conditions in the same climatic region; length of time required for full establishment.
 - 2) [RESERVED]
 2. Soil Erosion Resistance: Comply with the Code.
 - a) Maintain the existing Site features that contribute to erosion resistance to the greatest extent possible.
 - b) The present natural resistance to erosion is insufficient; take measures to improve the resistance to erosion.
 - c) Design to minimize soil erosion.

- d) If erosion occurs during construction and within one year after completion, relocation or replacement of eroded soil and repair of eroded areas shall be performed by the Design-Builder at no cost to the Owner.
 - e) If erosion occurs within one year after completion, provide improved erosion control measures within one week after notification by Owner.
3. Traffic Resistance: Provide finished Site surfaces that are permanently resistant to the type of traffic to be expected, under all weather conditions.
- a) Where vegetated surfaces will not withstand the anticipated traffic, provide pavement or other surfacing.
 - b) If vegetated surfaces are damaged due to traffic within one year after completion, replacement of vegetation with more durable materials shall be performed by the Design-Builder at no cost to the Owner.
 - c) Vegetation and fencing may be used to discourage pedestrian traffic, if other functional requirements can be met.
 - d) Substantiation, Paving and Hard Surfacing:
 - 1) Preliminary Design: Identification of types and thicknesses of paving and surfacing for various functions.
 - 2) Construction Documents: Engineering calculations, based on anticipated weights and intensity of traffic.
4. Flooding:
- a) Control storm water runoff as required to prevent damage to Project elements, including vegetation, and to prevent damage to neighboring properties, including vegetation.
 - b) Prevent storm water runoff into public utilities in excess of actual capacity or amount allowed by public agencies, whichever is less, under conditions of the most extreme rainfall that might occur in 100 years.
 - c) Minimize increase in storm water runoff into rivers, streams, lakes, and other waterways and drainage ways as required by authorities having jurisdiction.
 - d) Substantiation:
 - 1) Design Development: Engineering design of Site drainage, including drainage volume calculations.
 - 2) [RESERVED]
5. Vehicular Collision: Design to minimize the probability of vehicular impact on Site fixtures and accidental driving on lawns and landscaped areas.
- F. Operation and Maintenance:
- 1. Ease of Maintenance:
 - a) Snow Removal: Design to facilitate removal of snow from vehicular and pedestrian traffic ways using mechanized equipment or automatic means wherever possible; where not possible, design to minimize the effort required to use manual snow removal methods.
 - b) [RESERVED]
 - 2. [RESERVED]

END OF SECTION – SITE WORK

Demolition

PERFORMANCE

A. Basic Function:

1. Provide all Site and structure demolition required for proper functioning of the Project and as indicated in the Project program.
2. Site demolition work comprises the following elements:
 - a) Vegetation and Plantings: All demolition and debris removal to the existing vegetation and plantings required for construction of new work and for proper functioning of the Project.
 - b) Existing Fencing: All demolition and debris removal to the existing security fencing required for construction of new work and for proper functioning of the Project.
 - c) Site Improvements: All demolition and debris removal to the existing Site improvements required for construction of new work and for proper functioning of the Project.
 - d) Site Utilities: All demolition, abandonment, and debris removal to the existing subsurface and above ground utilities required for construction of new work and for proper functioning of the Project.
 - e) Other Site Demolition: Miscellaneous Site elements not listed but require demolition for construction of new work and for proper functioning of the Project.
3. Building demolition work comprises the following elements:
 - a) Existing Structures: All demolition and debris removal to the existing buildings required for construction of new work and for proper functioning of the Project.
 - b) [RESERVED]
4. In addition to the requirements of this section, comply with all applicable requirements of Facility Performance.

END OF SECTION – DEMOLITION

END OF SECTION 0700