**6. ENGINEERING SYSTEMS REQUIREMENTS**

**A10 FOUNDATIONS**

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SYSTEMS REQUIREMENTS  
FOUNDATIONS TEMPLATE 02/18  
  
Instructions for using this template: There are template files for each UNIFORMAT Level 2 Group Elements. This template is for Group Element A10-FOUNDATIONS. Text such as this is hidden text that will not print when the hidden text box in "Print/Options" is un-checked.  
  
The Structural Team Member and the Geotechnical Team Member must edit this template for the requirements of the project and wherever brackets [ ] appear. The Designer must use UFC 3-301-01 when determining project requirements.  
  
The SYSTEMS REQUIREMENTS are intended to define items that are required throughout the facility. Room-specific requirements are defined in the Part 3 Chapter 5 ROOM REQUIREMENTS section. Coordinate with the lead programmer for ROOM REQUIREMENTS. Delete all elements that are not required for the project. If additional elements or sub-elements are required for the project that do not appear in the template, refer to the NIST UNIFORMAT II publication for additional building element numbers and descriptions. The Uniformat II Work Breakdown Structure can be found at** [**www.wbdg.org/ndbm/**](http://www.wbdg.org/ndbm/) **. Coordinate with the PERFORMANCE TECHNICAL SPECIFICATION SECTION A10 (Section A10) to ensure that performance requirements are provided for all of the Building Elements listed here and that paragraph numbering matches   
  
There may be rare occasions when prescriptive specifications may either be edited and included in Part 5 of the RFP or required in Section A10 to be edited by the Contractor's Designer of Record. In both cases, the Engineering Systems Requirements (ESR) must include references to these documents.  
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**SYSTEM DESCRIPTION**  
Provide the building foundation system in accordance with Unified Facilities Criteria (UFC) 3-301-01, *Structural Engineering*and UFC 3-220-01, *Geotechnical Engineering*. Design foundations to suit subsurface conditions, capable of transmitting all building loads to the ground.

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*   
NOTE: If Section B10 *Superstructure*, is not provided as part of this Request For Proposal, delete the following paragraph and provide any required structural design criteria in the subsequent paragraphs.  
\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

[See Engineering Systems Requirements (ESR) Section B10, *Superstructure*, for additional loading criteria.]

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*   
NOTE: Delete the following paragraphs if this information will be provided in ESR Section B10, *Superstructure*. Provide information for special live loads, concentrated loads, and extraordinary events (e.g., terrorism threats, accidental blast). Normally, special loads and extraordinary events are not required and the following paragraphs will be deleted.  
\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

[In addition, design the structure in accordance with the following loading criteria:

[Live Loads

[Provide for live loads for occupancies or uses not provided in UFC 3-301-01 as follows:

Occupancy or Use: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Uniform Live load: \_\_\_\_\_\_\_\_\_\_\_\_ psf.]

[Concentrated Live Load: \_\_\_\_\_\_\_\_\_\_\_\_\_\_lbs.]

[Provide for live loads that differ from the minimum live loads provided in UFC 3-301-01 as follows:

Occupancy or Use: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Uniform Live load: \_\_\_\_\_\_\_\_\_\_\_\_ psf.]

[Concentrated Live Load: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_lbs.]

][Extraordinary Events

Design the structure to withstand the effects of the following extraordinary (i.e. low probability event: [\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_].

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*   
NOTE: Delete the following paragraphs if this information will be provided in ESR Section B10, *Superstructure*. Provide wind exposure and Importance Factor information if the contractor cannot be expected to be able to obtain this information from other sources.  
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][Importance Factors

Use Risk Category [I] [II] [III] [IV] [V] in Table 2-2 of UFC 3-301-01 for determining Importance Factors for seismic and snow design.]

][Wind Exposure

Base wind design on Exposure [A] [B] [C] [D] [E] [F].]

**A10 GENERAL**

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*   
NOTE: Modify the paragraphs below to correspond with the subsurface soils information that is being provided. Assure that the information is included in Part 6 of the RFP.  
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GOVERNMENT PROVIDED GEOTECHNICAL INFORMATION

Subsurface soil information [, including a geotechnical report ][and pile driving analysis] [from projects immediately adjacent to the project site] are included in other portions of this RFP.

[The included subsurface information is only for the Contractor's information and is not guaranteed to fully represent all subsurface conditions. The Government will not be responsible for any interpretation or conclusion by the Contractor drawn from the data or information.]

[The included geotechnical report accompanying the subsurface information is provided only to better convey data (boring logs, testing, and other data) or to document observed site conditions. The assumptions, analysis, and recommendations of any accompanying report were developed for preliminary planning purposes only and may not reflect present project requirements. The Contractor is required to retain a Geotechnical Engineer experienced and licensed in the geographic region of the project to interpret the Government provided information as related to the design concept and develop geotechnical requirements to support design and construction.]

Anticipate minor variations in subsurface conditions between borings. The Contractor is responsible for costs associated with the site preparation, ground improvement and foundations except as allowed by Contract Clause Federal Acquisition Regulation (FAR) 52.236-2, "Differing Site Conditions". The Contractor's Geotechnical Engineer must perform additional subsurface investigation/testing as required to adequately determine all applicable geotechnical factors including the type and capacity of the project foundations. The Contractor's Geotechnical Engineer is required to evaluate the provided information and any additional information obtained and prepare a report as described in other portions of this RFP. The minimum requirements for the subsurface investigation and report are as required by Facilities Criteria (FC) 1-300-09N with associated references.

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NOTE: If additional subsurface investigation is known to be required to supplement the Government provided data, include the following paragraph to ensure the scope of the additional investigation is minimally acceptable.  
\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

[Perform the soils investigation at the site for use in the design and construction of the new facilities. Perform, at Contractor's expense, subsurface exploration, investigation, testing, and analysis for the design and construction of features such as the building foundations, pavement section(s), stormwater management facility(ies), and utility structure foundations. Prepare a report including laboratory analysis of samples and recommendations for foundation and pavement design by a Professional Engineer as specified and in accordance with UFC 3-201-01, *Civil Engineering.*]

[As a minimum, the successful bidder's Geotechnical Engineer must perform additional subsurface exploration and supplementary laboratory testing as necessary to support the design concept.]

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NOTE: If there are any unusual conditions existing on the site or anticipated during construction, identify them below. Choose the following bracketed paragraph example, if applicable to the project and describe the project specific unusual conditions using similar detail as used in the example. \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

[[Observed site conditions which may present a challenge during design/construction include - The soils that will be exposed after completion of stripping will be soft and at or near the groundwater elevation. Anticipate these marginal subgrade support conditions and incorporate measures into the design and construction procedures to obtain required soil support while maintaining progress for completion on schedule.][\_\_\_\_]]

[Provide personnel under the supervision of a registered Professional Engineer to inspect excavations and soil/groundwater conditions throughout construction. The Engineer is required to perform pre-construction and periodic site visits throughout construction to assess site conditions. The Engineer, with the concurrence of the Contractor and the Contracting Officer, is required to update the excavation, sheeting, shoring and dewatering plans as construction progresses to reflect actual site conditions and is required to submit the updated plan and a written report (with professional stamp) at least monthly informing the Contractor and Contracting Officer of the status of the plan and an accounting of Contractor adherence to the plan; specifically addressing any present or potential problems. The Engineer must be available to meet with the Contracting Officer at any time throughout the Contract duration. Provide the services of the Engineer at no additional cost to the Government.] [It is important to note that the presence of loose or compressible soils may result in excessive settlement that could impact the performance of surface bearing structures and supporting facilities such as foundations, slabs, pavements, sidewalks, and utilities. The magnitude and duration of consolidation settlement will be dependent on the composition, depth, and thickness of the compressible soils as well as the successful bidder's design concept. The Contractor's Geotechnical Engineer is responsible for evaluating potential global settlement due to designed grade increases and final structural loads. The Contractor's Geotechnical Engineer must develop any settlement mitigation procedures (such as preloading, surcharging, fill monitoring programs, and ground improvement systems) needed to maintain global settlements within tolerable limits. Surcharge material, if required, must remain in place for a minimum of 90 days.]

SEISMIC DESIGN

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*   
NOTE: For most projects, a site-specific seismic ground motion study is not required, since UFC 3-301-01 provides ground motion accelerations for most CONUS and OCONUS locations. See IBC Section 1615 for further information. Include one of following 3 paragraphs, either instructing them how to select the seismic site classification or specifying the seismic site classification.  
\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

[A site-specific seismic ground motion study is [not] required.] [Determine the Seismic Site Classification in accordance with UFC 3-301-01, *Structural Engineering*.]

[Use the seismic site classification \_\_\_\_.]

[Perform a liquefaction assessment in accordance with American Society of Civil Engineers (ASCE) 7 and be based on the Summary Report and supporting documentation contained in National Center for Earthquake Engineering Research - *NCEER-97-0022, Proceedings of the NCEER Workshop on Evaluation of Liquefaction Resistance of Soils*. Liquefaction assessment must utilize the Maximum Considered Earthquake (MCE) Peak Ground Acceleration (PGA) adjusted for site class effects.]

**A1010 STANDARD FOUNDATIONS**

As determined by the Designer of Record to be applicable, provide a Standard foundation. "Standard Foundations" are shallow or deep foundations as specifically addressed in International Building Code (IBC) Chapter 18. Do not use masonry unit footings, steel grillage footings, timber footings or wood foundations. Treated timber piles may be used if determined acceptable by the Designer of Record.

**A1020 SPECIAL FOUNDATIONS**

As determined by the Designer of Record to be applicable, provide a Special foundation. "Special Foundations" are any foundations that are not specifically "Standard Foundations", or a combination of Standard Foundations and a site improvement/ground modification system. Examples of site improvement/ground modification systems include surcharging, stone columns, rammed aggregate piers, impact densification, compaction grouting, vibroflotation, and other similar systems. As "Special Foundation" techniques or systems typically require the use of specialty contractors, a Professional Engineer must establish installation and acceptance criteria and supervise the installation. The Designer of Record must submit justification for use, including acceptable evidence of previous successful installation in similar conditions, methods and equipment used in their installation, proposed testing and inspection to be used, supporting test data, calculations and any other information related to the structural properties and load capacity of such system. The allowable stresses for piles/piers must not exceed those limitations specified in UFC 1-200-01.

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NOTE: Identify any project specific foundation design requirements below.  
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[Support the entire project structure on a deep foundation][A shallow foundation is allowed provided surcharging is performed.][A crawl space is not permitted.][\_\_\_\_].

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NOTE: Delete the following paragraphs if there are no sheet piles for this project.  
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For steel sheet piles used in salt or brackish water, provide [cathodic protection of the sheet piles.] [heavy-gage hot-rolled sheet piling conforming to American Society for Testing and Materials (ASTM) A 690/ A 690M.] Apply a protective coating conforming to Society for Protective Coatings (SSPC) [PS 10.01] [PS 10.02] [PS 11.01][on the exterior face][on both faces] of sheet piles in the in the splash zone]. [Allow [1/16][1/8] inch of additional wall thickness for sacrificial corrosion.]".

**A1030 GROUND FLOOR SLABS**

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 NOTE: Select the appropriate ground floor slab system. If ground floor system to be determined by the Contractor, based on available geotechnical information, leave both options.  
 \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

[As determined by the Designer of Record, provide soil supported concrete slab on ground. Where slab on ground is below the existing adjacent exterior grade, provide water/dampproofing and a perimeter drainage system to remove ground water from the area immediately adjacent to the buildings. Provide perimeter and under slab insulation in accordance with UFC 3-101-01, *Architecture*.]

[As determined by the Designer of Record to be applicable, provide a structurally supported slab. Provide for support of all utilities that may be adversely affected by soil consolidation or expansive soils. Provide stainless steel supports sized adequately to support the in-service utility. Where the structurally supported slab is below the existing adjacent exterior grade, provide water/dampproofing and a perimeter drainage system to remove ground water from the area immediately adjacent to the buildings. Provide perimeter and under slab insulation in accordance with UFC 3-101-01, *Architecture*.]

**A1040 STRUCTURALLY SUPPORTED SLAB**

As determined by the Designer of Record to be applicable, provide a structurally supported slab. Provide for support of all utilities that may be adversely affected by soil consolidation or expansive soils. Provide stainless steel supports sized adequately to support the in-service utility. Where the structurally supported slab is below the existing adjacent exterior grade, provide water/dampproofing and a perimeter drainage system to remove ground water from the area immediately adjacent to the buildings. Provide under slab insulation in accordance with ASHRAE 189.1, Normative Appendix A.

--End of Section--