**6. ENGINEERING SYSTEMS REQUIREMENTS**

**D50 ELECTRICAL**

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SYSTEMS REQUIREMENTS  
ELECTRICAL TEMPLATE 06/23  
  
Instructions for using this template: There are template files for each UNIFORMAT Level 2 Group Elements. This template is for Group Element D50-ELECTRICAL. Text such as this is hidden text that will not print when the hidden text box in "Print/Options" is un-checked.  
  
Edit this template for the requirements of the project and wherever brackets [ ] appear. Use UFC 3-501-01 when determining electrical system requirements.   
   
It is acceptable to place all required information in the main element (such as D5010) and delete the sub-elements provided in this template.  
  
The SYSTEMS REQUIREMENTS are intended to define items that are required throughout the facility or on a system wide basis that is common to several rooms. Room-specific requirements are defined in the ROOM REQUIREMENTS section. Coordinate with the lead programmer for ROOM REQUIREMENTS. Delete all building 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 D50 (Section D50) 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 D50 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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NOTE: Consider each electrical system component relative to Part 2 UFGS Section 01 33 29, *Sustainability Requirements and Reporting* and UFC 1-200-02 *High Performance and Sustainable Building Requirements* and minimize energy costs.  
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**SYSTEM DESCRIPTION**  
This project includes the construction of buildings and structures as listed below. Refer to site plans for building locations.

[ ]

Provide an interior electrical system consisting of Service Entrance Wiring and Equipment, Distribution and Lighting Panelboards, Dry Type Transformers as required, Conduits, Feeder and Branch Circuits, Motor Control Equipment, Lighting and Branch Wiring, Communications and Alarm Systems, Emergency Lighting, Grounding and Lightning Protection as required, including accessories and devices as necessary and required for a complete and usable system. This section covers installations out to the building 1.5 meter (5 foot) line.

Provide each building with a [single] [ ] utility service with radial power distribution.

Select electrical characteristics of the power system to provide a safe, efficient and economical distribution of power based upon the size and types of electrical loads to be served. Use distribution and utilization voltages of the highest level that is practical for the load to be served.

Provide a minimum of [20][ ] percent spare circuit and load capacity at all levels of the power distribution system including any stand-by power systems.

Provide an interior distribution system consisting of insulated conductors in conduit.

**GENERAL SYSTEM REQUIREMENTS**  
Provide an Electrical System complete in place, tested and approved, as specified throughout this RFP, as needed for a complete, usable and proper installation. Install all equipment in accordance with the criteria of PTS Section D50 and the manufacturer's recommendations. Where the word "should" is used in the manufacturer's recommendations, substitute the word "must".

This section of the RFP includes all electrical work on or within the building out to the five (5) foot line. Electrical site work outside the five (5) foot line is covered in section G40.

SUSTAINABILITY  
Provide electrical systems and components that support project sustainability and energy goals.

ANTITERRORISM  
Provide bracing of electrical equipment which is suspended and weighs more than 31 pounds.

SEISMIC BRACING  
Bracing of electrical equipment to resist seismic events [is] [is not] required based on site seismic design criteria and building importance factor.

ELECTRICAL TESTING  
Test new electrical equipment in accordance with NETA acceptance testing specifications. Test existing electrical equipment remaining in service in accordance with NETA maintenance testing specifications.

COMMISSIONING  
Commission all systems in accordance with RFP Part 3 Chapter 2; UFGS Section 01 33 29, *Sustainability Requirements and Reporting*, UFGS Section 01 91 00.15 *Building Commissioning*, and UFC 1-200-02 *High Performance and Sustainable Building Requirements*.

Refer to UFC 4-721-10, *Navy and Marine Corps Bachelor Housing* for additional Electrical Design criteria.

**D503006 INDUSTRIAL CONTROL SYSTEMS (ICS)**

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NOTE: Edit the following to meet the base and activity requirements.  
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[Provide an Industrial Control System (ICS) distribution system, and horizontal distribution system including, but not necessarily limited to, equipment racks, all [wiring,] [pathway systems,] [grounding,] [backboards,] [connector blocks,] [protectors for all copper service entrance pairs,] [patch panels,] [fiber optic distribution panels,] [terminators for all fiber optic cables,] [outlet boxes,] [data jacks] [cover plates] and [ ].

[The ICS Equipment Rack must be 84-inches (2100mm) [ ]high[, double compartment with two doors, separately keyed with vertical locking mechanism].]

Provide [Category 6 Unshielded Twisted Pair (UTP) copper cable] [[ ] strand single mode fiber optic cable] for horizontal ICS distribution system data cables.

Provide horizontal distribution system from the Telecommunications Room to the following facility control systems[, through the patch panel in the Mechanical Room]:

[HVAC Direct Digital Controls (DDC)]

[Lighting Control System]

[\_\_\_\_]

**D5010 ELECTRICAL SERVICE AND DISTRIBUTION**

**D501001 MAIN TRANSFORMERS**

Main transformer(s) are defined in Section G40, *Site Electrical Utilities*.

**D501002 SERVICE ENTRANCE EQUIPMENT**

Provide underground service into the facility.

Provide a main switchboard or main distribution panel as service equipment.

[Provide energy usage monitoring by using digital metering with current transformers on the incoming service equipment. Monitor the total power usage at the service entrance. Monitored output must report to and be compatible with the Direct Digital Controls (DDC) system.]

**D501003 INTERIOR DISTRIBUTION TRANSFORMERS**

Provide dry type transformers as required to step down secondary voltages for general purpose outlets and other low voltage equipment.

**D501004 PANELBOARDS**

Provide distribution and branch circuit panelboards to serve loads as required.

**D501005 ENCLOSED CIRCUIT BREAKERS**

[Provide enclosed circuit breakers for [ ]]

**D501006 MOTOR CONTROL CENTERS**

Provide individual motor starters with disconnect switches, variable speed drives and manual motor starters for motor controls as required by mechanical equipment.

**D501090 OTHER SERVICE AND DISTRIBUTION**

Provide surge protective devices (SPD) at the service entrance.

**D5020 LIGHTING AND BRANCH WIRING**

Provide electrical connections for all systems requiring electrical service.

Provide lighting and general purpose receptacles throughout all spaces as required.

Provide dedicated circuits and connections for the following special outlets: see Chapter 5, "Room Requirements"..

**D502001 BRANCH WIRING**

Provide branch wiring consisting of insulated conductors in conduit.

**D502002 LIGHTING EQUIPMENT**

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NOTE: Editor fill out room data sheets with lighting requirements for each area.  
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Provide a complete lighting system consisting of exit and emergency lighting and area lighting consisting of [LED][fluorescent] and high intensity discharge lighting including switches and automatic controls including occupancy sensors, [vacancy sensors,][daylighting controls,] automatic lighting shutoff systems and dimming systems.

**D5030 COMMUNICATIONS AND SECURITY**

The Room Requirements Section identifies locations for communications and security systems and equipment, unless noted otherwise in the following sub-elements.

**D503001 TELECOMMUNICATIONS SYSTEMS**

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NOTE: Edit the following to meet the base and or activity requirements. Include Category 6 cable requirement here. This coordinates with the latest guidance indicated in UFC 3-580-01 and will override the conflict in UFC 3-580-10 that required Category 5E cable.  
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Provide a complete building entrance facility, backbone distribution system, and horizontal distribution system including, but not necessarily limited to, all [wiring,] [pathway systems,] [grounding,] [backboards,] [connector blocks,] [protectors for all copper service entrance pairs,] [patch panels,] [fiber optic distribution panels,] [terminators for all fiber optic cables,] [outlet boxes,] [telephone jacks,] [data jacks] [cover plates] and [ ].

Provide Category 6 Unshielded Twisted Pair (UTP) copper cable for horizontal voice and data cables.

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NOTE: Secret Internet Protocol Router Network (SIPRNET) and other protocols are used to transmit unencrypted classified information. SIPRNET outlets can only be provided in controlled access areas (CAA) as defined by IA PUB-5239-22, Information Assurance Protected Distribution System (PDS) Guidebook, which is issued "For Official Use Only".  
  
Guidance for designing a Protected Distribution System (PDS) is described in UFC 3-580-10, Appendix E. The PDS is used to protect the media transporting the unencrypted classified information, and is required for any media transporting unencrypted classified information that leaves the perimeter of the CAA. Determine if a PDS is required for the project and indicate SIPRNET outlet requirements either in the Room Requirements section of the RFP or in the paragraph below, but not in both locations.  
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[Secret Internet Protocol Router Network (SIPRNET) is a project requirement. Provide a Protected Distribution System (PDS) as required. Provide outlets in accordance with [the Room Requirements.][in the following rooms:

[\_\_\_\_]

[\_\_\_\_].]

**D503004 TELEVISION SYSTEMS**

Provide a complete CATV system to be owned and maintained by the Government including all interior equipment required to provide high quality TV signals to all outlets with a return path for interactive television and cable modem access. System must include, but is not necessarily limited to, headend amplifier, amplifiers, splitters, combiners, line taps, cables, outlets, tilt compensators and all other parts, components, and equipment necessary to provide a complete and usable system.

Conduct CATV testing at each of the following points in the system:

Furthest outlet from each telecommunications closet.

**D503005 SECURITY SYSTEMS**

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NOTE: For Electronic Security Systems (ESS) on Marine Corps projects, provide infrastructure support only. Coordination with Commandant Marine Corps (CMC) is required.  
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[Provide empty raceways with pull strings, outlet boxes, cover plates, and associated power outlets to enable an Electronic Security Systems(ESS ) installation by the ESS supplier.]

**D503090 OTHER COMMUNICATIONS AND ALARM SYSTEMS**

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NOTE: Mass Notification Systems are included in D40, *Fire Protection*.  
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Provide an Individual Inhabited Facility/Building Subsystem type Mass Notification System (MNS).

**D5090 OTHER ELECTRICAL SERVICES**

**D509001 GENERAL CONSTRUCTION ITEMS (ELECTRICAL)**

Provide General Construction Items (Electrical) including, but not necessarily limited to, all connections, fittings, boxes and associated equipment needed by this and other sections of this RFP as required for a complete and usable system.

Provide firestopping for conduits and cable trays that penetrate fire-rated walls, fire-rated partitions, or fire-rated floors in accordance with Section C10, Interior Construction.

**D509002 EMERGENCY LIGHTING**

Provide power and wiring for emergency lights and exit lights throughout the facility.

**D509003 GROUNDING SYSTEMS**

Provide a complete grounding system for the facility electrical and telecommunications systems.

**D509004 LIGHTNING PROTECTION**

Perform lightning risk assessment per NFPA 780. If risk assessment indicates a lightning protection system must be installed, design and install a complete lightning protection system in accordance with UFC 3-575-01, *Lightning and Static Electricity Protection System*, with a UL Lightning Protection Inspection Certificate certified to NFPA 780, including, but not necessarily limited to, strike termination devices, conductors, ground terminals, interconnecting conductors, surge protective devices, and other connectors and fittings required for a complete and usable system.

Lightning Protection Systems must not void the roof warranty.

**D509005 ELECTRIC HEATING**

Provide power wiring and connections as required for all electric heating systems and equipment.

**D509006 ENERGY MANAGEMENT CONTROL SYSTEM**

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NOTE: Energy management typically is covered in detail in the mechanical sections. Coordinate with mechanical and ensure that all power requirements are accounted for.  
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[Provide power wiring and connections as required for all systems and equipment including [ ]. Coordinate connection requirements with service entrance energy monitoring equipment.]

**D509007 PHOTOVOLTAIC ENERGY SYSTEM**

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NOTE: Consider roof mounted crystalline panel Photovoltaic Energy Systems for all buildings with clearance from shading, appropriate roof orientation, and roof area availability. Roof availability must consider other roof mounted systems which could include Solar Domestic Hot Water System (SDHWS), HVAC equipment, personnel access paths, and standoffs from the roof edge. Roof availability may be less than 80 percent. Consider electrical room space for inverters, and other equipment.  
  
Verify building and roof structural capacity to support crystalline panels for existing buildings. Coordinate crystalline panel support with structural engineering for new construction. Coordinate with roofing requirements covered in Section B30 and UFC 3-110-03 Roofing.  
  
Verify that a life cycle cost analysis (LCCA) has been performed per UFC 1-200-02, by planning or otherwise perform a LCCA before design start. Perform an analysis for your project using "PVWatts" at** [**http://rredc.nrel.gov/solar/codes algs/PVWATTS/version2/**](http://rredc.nrel.gov/solar/codes%20algs/PVWATTS/version2/) **. Locally verify and apply for incentives, where applicable. Incentives may be found at** [**www.dsireusa.org**](http://www.dsireusa.org/) **. Purchased electrical utility rates may be found at** [**https://navyenergy.navfac.navy.mil/duers/index.html**](https://navyenergy.navfac.navy.mil/duers/index.html) **. EAR 16 Activity Detail Report contains the blended purchase price.   
  
Coordinate special requirements for metering with Activity and add appropriate information on existing and planned systems.  
  
Size Photovoltaic System, verify size specified will physically fit available space.  
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[Provide a roof mounted, grid connected, photovoltaic energy system including crystalline photovoltaic panels, inverters, combiner boxes, and support systems. System inverters must have an output of [480Y/277v] [208Y/120v] [240/120v] [ ] and a minimum aggregate capacity of [ ]kw.

Provide KWH meters that are compatible to [the existing base AMI system].