**6. ENGINEERING SYSTEMS REQUIREMENTS**

**G40 SITE ELECTRICAL UTILITIES**

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SYSTEMS REQUIREMENTS  
SITE ELECTRICAL UTILITIES TEMPLATE 09/22  
  
Instructions for using this template: There are template files for each UNIFORMAT Level 2 Group Elements. This template is for Group Element G40-SITE ELECTRICAL UTILITIES. Text such as this is hidden text that will not print when the hidden text box in "Print/Options" is unchecked.  
  
The Electrical Designer must 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 G4010) 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. 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 G40 (Section G40) 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 G40 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 site electrical utilities relative to Part 2 UFGS Section 01 33 29, *Sustainability Requirements and Reporting* and UFC 1-200-02, *High Performance and Sustainable Building Requirements*.  
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**SYSTEM DESCRIPTION**  
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NOTE: This specification is generally written around projects that will tap into existing telecommunications and medium voltage power systems. These systems may be overhead or underground. Generally the taps will be radial in nature but may require some switching and tie networks based on the existing system. It is not the intent of this ESR to provide extensive modifications, switching and circuiting to overhead and underground electrical systems. Provisions are included for simple networking but if major changes to the existing systems are required, this ESR and Section G40 will require extensive modifications.  
  
This specification assumes a project will utilize installation-owned utility systems. Should the utilities be owned by a non-installation entity, RFP Editor will need to coordinate with the utility owner for system requirements and make necessary modifications to this ESR and corresponding PTS G40.  
  
Address scope and ensure the system description clearly describes the existing system, designated connection points, and any other information needed for the Contractor to understand the existing system and how the new project will connect to it.   
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[Demolish the existing [ ] system [and provide a new [ ].]

The site electrical utility system consists of all power and telecommunications and fiber optic cabling from the existing distribution system point of connection including all connections, accessories and devices as necessary and required for a complete and usable system. This section covers installations up to within 5 feet (1.5 meters) of new (or existing) building location.

**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 PTS Section G40 and the manufacturer's recommendations. Where the word "should" is used in the manufacturer's recommendations, substitute the word "must".

Provide site electrical utilities systems and components that support project sustainability goals of Part 2 UFGS Section 01 33 29, *Sustainability Requirements and Reporting*.

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NOTE: Requirements for Government Furnished Equipment (GFE) are provided in ESR E10, *Equipment*.  
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**G4010 ELECTRICAL DISTRIBUTION**

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NOTE: Edit voltage characteristics to match voltages for the project.  
   
Coordinate with local activity utility branch to determine the closest point of connection for the electrical distribution. Preliminary load calculations will be required by the RFP writer for the activity to assure that the existing system will not be overloaded. A site plan and simple one line diagram will generally be required to direct the design builder and coordinate properly with the existing electrical power system if switching and or tie networks are involved.  
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Connect to the existing [ kV], three phase, [four] [three] wire, 60 Hertz electrical power system. The connection point must be [overhead] [underground] at [Pole xxx] [Manhole xxx] [ ] and extended to the project site underground in ductbank to a Pad Mounted Transformer.

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NOTE: Provide available fault current when it is known. Use second option below for all other cases. Assuming an infinite bus will assure a conservative design but may result in connections of medium voltage equipment being oversized or inadequate for the conditions. Consult with the activity. When accurate data is not available, choose infinite bus.  
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The available fault current at the point of connection [is [ ]] [must be assumed to be an infinite bus.]

**G401002 TRANSFORMERS**

Provide a three phase pad mounted transformer to feed the facility.

Provide the following features:

• Dead-Front Design with ANSI specific front plate spacing

• Radial feed switch

• Three surge arresters for radial feed circuits.

• Biodegradable less-flammable liquid-insulated

**G401004 OVERHEAD ELECTRIC CONDUCTORS**

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NOTE: Overhead systems will generally be simple radial taps from existing distribution. Existing poles should be utilized to the extent possible.  
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[Provide a [three] [single] phase overhead pole line from [ ] to [the facility site] [ ] .]

**G401005 TOWERS, POLES, CROSSARMS AND INSULATORS**

Provide wood poles for overhead power distribution.

**G401006 UNDERGROUND ELECTRIC CONDUCTORS**

Provide a medium voltage and a 600 volt secondary underground electrical power distribution systems to meet the connection requirements as indicated in paragraph G4010 "Electrical Distribution". Provide fused cut-outs on connections to overhead distribution systems.

**G401007 DUCTBANKS, MANHOLES, HANDHOLES AND RACEWAYS**

Provide a system of concrete encased ductbanks, handholes and manholes for all underground power wiring.

**G401008 GROUNDING SYSTEMS**

Provide a complete grounding system for the electrical power distribution system.

**G401009 METERING**

Provide a separate Kilowatt Demand Meter for each Pad Mounted Transformer [and Unit Substation].

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NOTE: Coordinate with local activity for any specific energy management requirements. Coordinate this section with interior metering requirements in ESR D50.  
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[Provide each secondary switchgear with a separate digital circuit monitor/analyzer. Provide equipment with capabilities to connect to the existing [ ] monitoring system.]

**G401011 EQUIPMENT REQUIREMENTS FOR COASTAL AND HIGH HUMIDITY AREAS**

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NOTE: Determine if the location will require unique design features related to minimizing equipment degradation associated with premature rusting caused by exposure salt spray in coastal areas or high humidity. UFC 3-501-01 establishes design requirements. \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

[Provide exterior equipment designed for coastal and high humidity areas.]

**G4020 SITE LIGHTING**

Provide site lighting for exterior including underground distribution, handholes, grounding, poles, fixtures and controls as required for a complete and usable system.

**G402001 EXTERIOR LIGHTING FIXTURES AND CONTROLS**

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NOTE: Fill in bracket with description of areas or spaces requiring lighting. Utilize SSL lighting sources (e.g., LED) for exterior lighting, except where lighting is required to match an existing source.  
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[Highway Lighting] for [ ]  
[Secondary Street Lighting] for [ ]  
[Residential Streets] for [ ]  
[Area and Parking Lighting] for [ ]

[Provide [LED][induction][fluorescent] [metal halide] type lighting fixtures, complete with lamps.]

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NOTE: Include one of the following options based on owner preference. When first option is used, include times and dates for ON/OFF operation. Include contactor, time switch, photocell switch requirements as applicable.  
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[Provide an automatic lighting control system for exterior lighting fixtures utilizing lighting contactors, time switches, and photocell switches such that lighting will automatically turn "ON" at [ ] and turn "OFF" at [ ].]

[Provide lighting control for exterior lighting fixtures with individual photocell switches on each luminaire.]

**G402003 OTHER AREA LIGHTING**

Provide other area lighting for equipment washdown and drying areas and recreational areas.

**G402004 LIGHTING POLES**

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NOTE: Coordinate selection of poles and installation method with the Base Exterior Architectural Plan (BEAP) or Installation Appearance Plan (IAP). RFP writer shall coordinate with local activity to determine desired site lighting requirements.  
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Provide [concrete poles] [fiberglass poles] [aluminum] [steel] [direct set] [complete with foundations] for site lighting.

**G402005 UNDERGROUND ELECTRIC CONDUCTORS**

Provide a complete underground distribution system for all site lighting systems.

**G402006 DUCTBANKS, MANHOLES AND HANDHOLES**

Provide a direct buried underground system including conduits and handholes to meet the connection requirements indicated in paragraph G4020 "Site Lighting".

**G402007 GROUNDING SYSTEMS**

Provide a complete grounding system for all site lighting systems.

**G4030 SITE COMMUNICATION AND SECURITY**

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NOTE: This section is written around tapping into an existing site communications infrastructure and extending service to a new or renovated facility. It is not intended to be used as a tool to build or modify a telecommunications infrastructure system. If project scope includes such, this spec will require extensive modifications. Include only the bracketed items relevant to the project. Delete all others.  
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Provide a site communication system including, but not necessarily limited to, Voice and Data Telecommunications Systems and Cable Television (CATV) Systems including all conduit and wiring, underground structures, termination equipment, poles and structures, and grounding systems as required for a complete and usable system.

**G403001 TELECOMMUNICATIONS SYSTEMS**

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NOTE: Coordinate with local activity Base Communication Officer to determine if exterior telecommunications is the responsibility of the Contractor or Government provided and edit the following accordingly. Connection point may be on an overhead pole but should typically be underground. Copper pairs and fiber counts will typically be determined by the RFP writer working with the BCO. The ICS Infrastructure fiber optic cable will be terminated in the ICS equipment rack located in the Telecommunications Equipment Room.  
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[The connection point for the site telecommunications systems must be [overhead] [underground] at [Pole xxx] [Manhole xxx] and extended to the project site [overhead] [underground in a system of manholes and ductbank] [underground in direct buried in conduit] to the [telecommunications equipment room] [ ].]

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NOTE: ICS Infrastructure is typically 4-strand single-mode fiber optic cable. Only use multimode mode fiber optic cable if the existing fiber plant is multimode. Otherwise use single mode fiber optic cable. Use the first paragraph if the fiber optic cable is Contractor provided. Use the second paragraph if the fiber optic cable is Government provided.**

**If the ICS Infrastructure is provided separate from the Telecommunications System, identify the requirements for the ICS Infrastructure in G403010.  
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[Provide [ ] pair copper and [ ] strand [single] [multi] mode fiber optic cable between the connection point and building entrance facilities.]

[Provide [ ] empty [ ] inch ([ ] mm) conduits with pull strings for Government provided cable. [ ] will provide [ ] pair copper and [ ] strand [single] [multi] mode fiber optic cable into the building entrance facilities.]

**G403002 CABLE TV SYSTEMS (CATV)**

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NOTE: Coordinate with local activity Base Communication Officer to determine if exterior CATV is the responsibility of the Contractor or provided by local CATV provider and edit the following accordingly. Typically CATV cable should be provided by the local CATV company via customer provided conduits. Connection point may be on an overhead pole but should typically be underground.  
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The connection point for the site CATV must be [overhead] [underground] at [Pole xxx] [Manhole xxx] and extended to the project site underground in ductbank to the telecommunications equipment room.

Provide 1 empty 103 mm (4 inch) conduits with pull strings between the exterior connection point and equipment room.

**G403003 CABLES AND WIRING**

Cables and wiring for site telecommunications systems are required as stated in their respective categories.

**G403004 DUCTBANKS, MANHOLES AND HANDHOLES**

Provide a system of ductbanks, manholes, and handholes for site telecommunications.

**G403009 GROUNDING SYSTEMS**

Provide a complete grounding system for all site communications and security systems.

**G403010 INDUSTRIAL CONTROL SYSTEMS (ICS)**

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*   
NOTE: Only use this section if the ICS Infrastructure is separate from the base Telecommunications System. Coordinate with local activity Base Communication Officer and Public Works ICS Manager to determine if exterior telecommunications is the responsibility of the Contractor or Government provided and edit the following accordingly. Connection point will typically be underground. Fiber counts will typically be determined by the RFP writer working with the BCO. The ICS Infrastructure fiber optic cable will be terminated in the ICS equipment rack located in the Telecommunications Equipment Room.  
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[The connection point for the site ICS Infrastructure must be underground at [Manhole xxx][Pedestal xxx] and extended to the project site [underground in a system of manholes and ductbank] [underground in direct buried in conduit] to the telecommunications equipment room.

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NOTE: ICS Infrastructure is typically 4-strand single-mode fiber optic cable. Only use multimode mode fiber optic cable if the existing fiber plant is multimode. Otherwise use single mode fiber optic cable. Use the first paragraph if the fiber optic cable is Contractor provided. Use the second paragraph if the fiber optic cable is Government provided.  
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[Provide [ ] strand [single][multi] mode fiber optic cable between the connection point and the telecommunications equipment room.]

[Provide [ ] empty [ ] inch ([ ] mm) conduits with pull strings for Government provided cable. [ ] will provide [ ] strand [single][multi] mode fiber optic cable into the telecommunications equipment room.] ]

**G409007 PHOTOVOLTAIC ENERGY SYSTEM**

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NOTE: Consider ground mounted crystalline panel Photovoltaic Energy Systems for all buildings with clearance from shading, and site area availability.  
  
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://pvwatts.nrel.gov/. 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.mil/duers/index.html**](https://navyenergy.navfac.navy.mil/duers/index.htm) **. 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 [ground][pole][canopy] 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.

Design the system to achieve an estimated minimum average annual energy production of [ ] kilowatt-hours per year for the first 5 years of operation.

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

-- End of Section --