Facility Planning & Control

**7. GUIDELINES FOR ELECTRICAL DESIGNERS**

 The Electrical Designer shall comply with all requirements applicable to this Project. Applicability of requirements shall be addressed during the Pre-Design Conference: Electrical Design shall comply with the applicable articles in the current State adopted codes and laws for electrical systems in/on State owned or leased facilities.

 The minimum services required, at each Phase Submittal of the Electrical Design are listed in the General Instructions to Designers. For the purposes of this document, special systems are any systems not required by codes, but which the Owner approves. Examples of special systems are: CATV/CCTV, fire alarm (when not required by code), intercom/paging, lightning protection, nurse call, PA, security, telecommunications distribution, TVSS, etc. All Design Phase and Construction Documents submitted must be project specific. Submittals with insufficient information or information not applying to the Project will be rejected and returned. Requirements that shall be included, at the appropriate phase of the project, shall include, **but not be limited to,** the following:

**NOTE: *It is the responsibility of the Prime Designer, Sub-Designer(s), and/or Lessor to ensure that all electrical and communications systems and associated space quantities, sizes and environments are coordinated to meet all requirements herein. In the event of ambiguities, the more stringent shall prevail.***

**Electrical Equipment Rooms**

1. The rooms shall be designed for electrical lighting and power control equipment only. This space shall not be shared with communications, fire alarm, mechanical, and/or security systems equipment.

2. The locations of the rooms shall be as close to the load center as feasible so as to minimize the lengths of sub-feeders and branch circuits. The room elevation shall be above any potential floodwater.

3. The room shall be provided with the proper architectural, HVAC, and lighting environment for electrical equipment. Ensure that inter-disciplinary coordination is accomplished.

4. Unless otherwise required, one (1) 120 VAC, 20 A branch circuit terminated with two (2) duplex receptacles, minimum, shall be provided in the room. The location/spacing of the receptacles shall accommodate the room/equipment layout such that they will be conveniently accessible to maintenance personnel.

5. Lighting shall be provided in the room at an illumination level of approximately 50 footcandles.

**Raceways**

1. Conduit

a. EMT shall be used for indoor applications unless code or User requirements mandate other types of raceway systems. All EMT couplings, outlet bodies, and terminations shall be compression type.

b. IMC may be substituted for RMC applications as permitted by the National Electrical Code. All couplings, outlet bodies, and terminations shall be threaded type.

c. RMC shall be used outdoors above ground and in transitions from underground to above ground. All couplings, outlet bodies, and terminations shall be threaded type.

d. RNC, schedule 40, minimum, shall be used underground encased in concrete. The concrete shall be 1500 psi, minimum, poured and formed to give a three (3) inch cover around the conduit(s), minimum. The entire encasement shall be dyed red. The depth of earth cover shall depend on the application in accordance with the NEC and NESC, as a minimum.

e. Appropriate type pull lines shall be provided in all empty conduit. Pull lines shall be metallic/tracer type when placed in underground RNC. End caps shall be provided on all empty conduit terminations.

f. Bushings shall be provided on all conduit terminations.

g. The Construction Documents shall ensure that all penetrations (i.e. conduit, thimbles, etc.) in rated vertical and horizontal partitions are properly protected in accordance with referenced codes.

h. All underground stub conduit shall be sealed with a waterproof compound. Foam type compounds are not acceptable.

2. Road crossings shall be constructed as required by the User Agency and the appropriate government authority, if applicable. Some roads such as city, parish, or state streets and highways require permits and special methods of crossing (cut & patch, bore, steel casing, etc.).

**Wiring Outlets and Devices**

1. Appliance, Lighting, and Receptacle Outlets and Switch Boxes

a. Outlets shall be provided in types, quantities, and mounting locations as required by the User Agency and applicable codes and laws referenced in these documents.

b. Outlets shall be equipped with any combination of different wiring devices as required by the User Agency. Locations of the outlets shall be obtained from the specific requirements of the User Agency.

2. Devices

a. All 120 VAC, duplex receptacles shall be rated for 20 A capacity. Wiring terminations shall be made with screw type terminals.

b. All 120 and 277 VAC lighting switches shall be toggle type rated for 20 A capacity. Wiring terminations shall be made with screw type terminals.

c. Device and cover plate colors will be User Agency choice, coordinated through the Designer. Cover plate material shall be polycarbonate unless application justifies other such as finished aluminum and stainless steels. Phenolic will not be acceptable.

3. Lighting

a. All lighting shall be LED unless there is sufficient justification to use an alternate type. Any other lighting types shall require FP&C written approval.

4. Transformers

a. Indoor transformers shall be dry type.

b. Outdoor transformers, 225KVA and larger, shall be pad mount, oil filled. Smaller transformers with primary voltage at or below 480 VAC, used outdoors may be dry type with Class 155 insulation and designed with a weatherproof enclosure, unless oil type is specified by the owner.

c. K-rated transformers shall be used to serve nonlinear, initial loads only. Provide characteristics and calculations with design development submittal for the applications intended, based on ANSI/IEEE C57.110-1986 (R1993) or equivalent.

d. All transformers shall be designed in accordance with the NEC, NESC, IEEE applicable colored books, and good engineering and construction standards.

 1. Some requirements are:

 a. Copper windings

 b. 150 degree F temperature rises, unless otherwise required.

5. Cable and Wire

a. All medium/high voltage cable shall be designed in accordance with the NEC, NESC, IEEE applicable colored books, and good engineering and construction practices.

b. Some requirements are:

 1. EPR insulated (XLPE types are not acceptable)

 2. Copper conductors

 3. Tape type shields

 4. Extended manufacturer warranties

b. Specify medium/high voltage splices to be performed by qualified, experienced cable splicers.

c. Aluminum feeders No. 2 AWG and larger will be considered only by written request to the FPC Project Manager and as long as conduit is sized appropriately, and splices/terminations are made-up to prevent dissimilar metal galvanic action, oxidation, and different rates of contraction/expansion. Electrical Designer shall specify materials and methods.

d. Low voltage branch circuits shall be copper with the proper insulation for the voltage class and application. Aluminum alloy (AA-8000 series) may be used under certain conditions, such as conductor size (No.2 AWG and larger), application (Panelboard and motor feeders), etc. Obtain approval from the FPC Project Manager prior to selection if aluminum is proposed.

6. Services

a. A statement defining electric service(s) shall be included in the Schematic Design Phase Submittal Documents.

b. The Electrical Designer shall coordinate each service with the User Agency, and shall design appropriate service or services with respect to voltage, type of service, location, metering, disconnects, poles, transformers, pads, conduits and conductor type, pull points, etc. Where pad mounted transformers are used, the supporting concrete pad shall be detailed on the drawings, and where applicable shall be in accordance with the serving public utility company’s requirements.

 Where an electric service or group of services must be obtained from a utility company, the Electrical Designer shall obtain a written proposal, from the utility company, detailing the utility company’s requirements, portion of the service or services, including projected cost and time schedule and provide this information in the Schematic Design Documents, and each subsequent Design Phase. The Designer, User Agency, and FP&C (Owner) shall discuss the best way to address these issues including responsibility of these services.

c. Where a User Agency has its own distribution system, coordinate each required service with the User Agency and design a complete service, which extends back to a mutually agreed point. Coordinate type of system and equipment so as to integrate with existing distribution system. Verify that the existing electrical system has adequate capacity to accommodate all modifications and additions required by the new project. The Electrical Designer's responsibility shall extend to the location of the source of power for the project. Metering, required by the User, shall be provided for in the system design. Considerations for metering shall be for EMS interface, allocation of energy costs. The Electrical Designer shall coordinate any site temporary power requirements with the Designer. If temporary power is not provided for in the Designer’s plans and specifications, as a responsibility of the General Contractor, temporary power provisions shall be included in CSI Division 26 - Electrical. If temporary power provisions are required in CSI Division 1 of the specification, these provisions shall not be duplicated in CSI Division 26 - Electrical.

d. References to Utility Company and/or User Agency drawings and specifications alone, in defining service provisions, will not be acceptable.

7. Grounding

 Grounding of services, electrodes, steel columns, cold water pipes, and equipment shall be in accordance with the NEC, NESC, IEEE Green Book, and good design & construction practices.

 a. Some requirements are:

 1. Copper clad electrodes 3/4” x 10’ minimum

 2. Bonding to cold water pipes “only” is not acceptable.

 3. Connections made underground and other inaccessible locations shall be exothermally welded.

 4. Conductors shall be stranded copper installed with the least number of bends as possible.

 5. Conduit shall be nonmagnetic.

**Definitions of Terms Used in this Section**

A Amperes or Amps

ADAAG Americans with Disabilities Act Accessibility Guidelines

ASHRAE/IES American Society of Heating, Refrigeration, and Air Conditioning Engineers / Illuminating Engineering Society

AWG American Wire Gauge

CCTV Closed Circuit TeleVision

CSI Construction Specification Institute

EMS Energy Management System

EMT Electrical Metallic Tubing

FPC Facility Planning & Control

HVAC Heating, Ventilation, and Air

Conditioning

IMC Intermediate Metallic Conduit

NEC National Electrical Code

NESC National Electrical Safety Code

PA Public Address

RMC Rigid Metallic Conduit

RNC Rigid Nonmetallic Conduit

TVSS Transient Voltage Surge Suppression

VAC Volts Alternating Current

**NOTES**