SECTION 16000

SCHOOL OF MEDICINE
ELECTRICAL FACILITIES DESIGN GUIDE

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PART 1 - GENERAL

A. The Electrical Facility Design Guides are intended to be used as a general guideline for the electrical facility design for Stanford Hospital and School of Medicine.

B. The main objective for these Guides is to achieve consistent facility designs that will enable Stanford to optimize both performance and operating cost objectives. Any deviation from this Guide must be approved by the Owner.

C. The guides follow the CSI format, and in many cases can be used as the foundation for the formulation of Electrical Specifications.

D. It is the responsibility of the Design/Build Contractors and Consulting Engineers to provide Job specific design & specifications.

E. Any use of these SHC/SOM Facility Design Guides, for any project, is the sole responsibility of the design consultant and must be approved, confirmed, and shown on the Design Engineers/Consultants own project drawings and specifications. Verbatum copying of the SHC/SOM Electrical Facilities Design Guides, and issuing with Stanford logos will be disapproved.

PART 2 - BUILDING TYPES:

The design, manufacture and testing of electrical equipment and materials shall conform tor exceed latest applicable NEMA, IEEE, and ANSI standards.

PART 3 – CODE COMPLIANCE – ELECTRICAL CODES

A. All work and materials shall comply with the latest rules, codes and regulations, including, but not limited to the following:

1. Occupational Safety and Health Act (OSHA)

2. California Electrical Code (CEC). This is the National Electrical Code with significant amendments.

3. California Building Code for seismic bracing

4. California Fire Code (CFC)

5. California Administrative Code, Title 24 (Energy Conservation)

6. Americans with Disabilities Act (ADA) as applicable to equipment mounting heights and alarm systems.

7. NFPA Standards, as applicable, including Generator Installations, Fuel Storage, Hazardous Locations, and Fire Alarm Systems.

8. Applicable Federal, State, and Local laws, regulations, and ordinances.

B. Code compliance is mandatory. Nothing in these Design Standards implies acceptance of work not conforming to these codes. Items that exceed minimum code requirements shall comply with these Standards.

PART 4 – ELECTRICAL SPECIFICATIONS

All specifications provided by consultants shall follow the CSI format. In many cases, these SHC/SOM Facilities Design Standards can be used as the foundation for the formulation of Electrical Specifications. Any use of these SHC/SOM Facility Design Guides, for any project, is the sole responsibility of the design consultant and must be approved, confirmed, and shown on the Design Engineers/Consultants own project drawings and specifications. Verbatim copying of the SHC/SOM Facilities Design Guides, and issuing with Stanford logos will be disapproved.

PART 5 – UTILITY DISTRIBUTION SYSTEM

A. Stanford University receives power for most of the campus at 60KV and provides campus-wide distribution at 12,470 and 4,160 volts. Primary service will be provided to new buildings at one of these voltages (usually 12,470). Secondary services will be at 208Y/120 or 480Y/277.

B. The Hospital and Medical Center E.D. Stone Buildings are served by City of Palo Alto utilities at 12.5KV with site power distribution provided by the Medical Center. Site power to the E.D. Stone Buildings is at 4160V via a very old system.

C. Off campus buildings are served directly by PG&E or Palo Alto Utilities.

D. Where primary service is required, provide 4” with at least one spare to the manhole or other location designated by Stanford. The Stanford Campus Utilities Department will furnish, install and terminate the primary voltage cables.

E. Where secondary service is required, provide conduits and cable from the new building to the transformer and include termination of secondary cables to the transformer. The Stanford Campus Utilities Department has a standard connection detail. Provide the building system ground at the building service. Do no include an equipment grounding conductor or other ground path with the service connectors.

PART 6 – ELECTRICAL SERVICE AND POWER DISTRIBUTION:

Service Voltage:

A. New building services rated 300 KVA and above shall be served at 480Y/277 volts except as specifically approved by the Project Manager in consultation with the Campus Electrical Utilities Group. 480Y/277 volt services rated less than 300 KVA are acceptable.

B. Provide 208Y/120 volt utilization transformers as necessary to meet the program requirements for the project.

C. Secondary services rated up to and including 500 KVA shall be provided from outdoor padmount transformers. Exceptions must be justified and shall be only as specifically approved in writing by the Project Manager in consultation with the Campus Electrical Utilities Group.

D. Services larger than 500 KVA generally require unit substations and primary service. Reference Stanford Campus Facility Design Guidelines.

PART 7 – EMERGENCY POWER

A. **General:**

1. The School of Medicine Policy for new building emergency power systems is to provide diesel engine electrical generators specifically for each building. The selection of each generator shall be based on the requirements of the life safety issues and any, if required, program loads. Special and primary consideration shall be given to the life safety loads. If program loads are required, provide separate Automatic Transfer Switches (ATS) for both the Life Safety and Program Loads.

2. Where emergency power is required, provide an on-site diesel driven generator set with a sub base fuel tank. The Medical Center has a standard specification for these units that meet County Hazmat, noise, and other specific requirements. Sound attenuated enclosures may be required on a case by case basis.

3. The size and location needs to be coordinated with Stanford Campus Utilities, Stanford Planning Department, and Stanford Hospital / School of Medicine.

B. **Generators: (Section 16230)**

1. If a diesel unit is used, the fuel tank shall be a sub-base or free standing concrete type. Underground tanks are not permitted. The tanks shall be UL listed for

above ground storage and meet requirements of the County (or City) and the University Fire Marshal.

2. Natural gas fueled units are not acceptable

3. Where unit type battery backed emergency lighting is used, provide a central inverter system except where a small number of wall mounted units is adequate. Battery backed fluorescent ballasts and similar systems within the luminaires are not acceptable due to high maintenance costs.

C. Automatic Transfer Switches: (Section 16231)

1. The Medical Center has standardized on ASCO automatic transfer switches with bypass/isolation. Use only open transition type with in-phase monitor. The Medical Center has a Standard Specification.

2. Do not provide automatic engine exercise timers.

PART 8 – METERING (See Campus Facilities Guidelines, Section 16211)

A. All new services shall be provided with kilowatt hour meters. Meters shall be Square-D D/PML 7330 meters. These meters are interconnected with the campus SCADA system and substitutions are not acceptable. Contact the Stanford Campus Utilities Department for current meter requirements and for a standard wiring detail.

B. Provide a test switch to isolate the meter from voltage and current circuits.

C. Provide a current transformer on each phase with a 5-amp output proportional to 80% of the rating of the main circuit breaker. Provide a short-circuiting test switch to isolate the meter from the current transformers secondary. Shorting pin type terminal blocks are not acceptable.

D. Provide three, 2.4:l ratio, voltage transformers for metering on 480-volt systems. Provide fuses on the primary and secondary and provide a separate fuse for 120-volt control power to the digital meter. Provide fuse holders that allow the fuses to be safety removed without de-energizing the switchboard.

PART 9 – TRANSFORMERS (Section 16271)

A. Transformer losses represent a significant operating expense. Provide capacity for future load growth but do not grossly oversize transformers.

B. Transformers in office and electronic equipment areas shall be K-rated for non-linear loads and shall be provided with 200% rated neutral terminals. Do not use oversized transformers to accommodate non-linear loads.

PART 10 – PRIMARY VOLTAGE SWITCHGEAR

A. See Stanford Campus Facilities Electrical Guidelines.

PART 11 – SECONDARY PRIMARY VOLTAGE CABLE & CONNECTIONS

A. See Stanford Campus Facilities Electrical Guidelines.

PART 12 – SWITCHBOARDS AND PANELBOARDS

Generally follow NEMA standards except as follows:

A. Panelboards

1. Panelboards shall be of door-in-door construction with separate, all metal locks on each door in addition to screws securing the outer door.

2. Panelboard and switchboard bus bars shall be copper. Provide a full capacity ground bus in addition to insulated neutral bus.

3. Provide 200% rated neutral bus on 208Y/120 panelboards in office and electronic equipment areas.

4. Provide plug-in type breakers for 208 volts, and bolt-on type for 480 volts.

5. Provide at least 20% future breaker spaces. Spaces shall have complete buses and connecting hardware.

6. If fused distribution switchboards are used, provide spare fuses and fuse storage enclosure.

7. Do not use circuit breakers with integral remote control devices; use lighting relays in a separate enclosure.

B. Motor Control Centers (Section 16443)

1. All bus shall be copper

2. Use NEMA Size 1 starters, minimum

3. Provide a separate control transformer with primary and secondary fusing for each starter.

4. Provide Hand-Off-Auto selector switches and red "Motor Run" and green "Motor Ready" pilot lights. Use transformer type pilot lights.

5. Provide 20% bus spaces for future expansion.

PART 13 – PROTECTIVE DEVICE COORDINATION AND SETTINGS

A. Provide for a coordination study by either the Engineer or the equipment manufacturer to determine the appropriate fuse sizes and breaker settings for selective coordination.

B. For design and coordination purposes assume an available fault current of 10,000 amps on the 12,470 and 4,160 volt primary systems.

C. Stanford Campus High Voltage Engineering will provide the necessary available short circuit currents in the System applicable to the projects.

D. Provide and Arc Flash Hazard study and labels according to the SHC/SOM Standard

PART 14 – GROUND FAULT PROTECTION (Section 16060)

A. In addition to Code required service protection, provide one additional level of feeder ground fault protection in large buildings and important research facilities.

B. Main Ground Bus:

Terminate system grounding conductors (Transformer neutrals, U-fer, building steel, water piping, concrete encased electrod, etc.) at an accessible bus adjacent to the main service. This bus will be used for grounding of telecommunications and related systems. Supplementary grounding systems must be bonded to the Main Ground Bus. Ground rods that are not connected to the Main Ground Bus are not permitted.

PART 15 – BRANCH CIRCUITS AND FEEDERS (Section 16412)

A. Provide a code sized, green insulated, equipment grounding conductor within every branch circuit and feeder raceway. Bond the grounding conductor to grounding terminals and metallic enclosures.

B. Provide a separate or oversized neutral for each receptacle circuit in office and electronic equipment areas. Provide a 200% rated neutral with feeders to panelboards where non-linear loads are expected.

C. Multi-wire (common neutral) branch circuits with 3-pole circuit breakers are not allowed. Use a separate neutral for each branch circuit.

D. WIRES AND CABLES (Section 16123)

1. All wire shall be copper with THHN/THWN insulation.

2. All power and lighting conductors shall be stranded. FIRE ALARM CONDUCTORS SHALL BE SOLID.

3. WIRE COLOR CODE: Color code wires as follows:

Conductors		120/208V	277/480V
Phase A	Black	Brown
Phase B	Red	Purple
Phase C	Blue	Yellow
Neutral	White	White or Gray
Ground	Green	Green

PART 16 – CONDUIT SYSTEMS (Section 16130)

A. Plastic Conduit (PVC): Use Schedule 40 PVC, approved for use as non-metallic raceway for 90 degree C conductors for underground conduits. Do not use type DB or Schedule 20. Use wrapped, rigid steel conduit for exposed risers. PVC risers with endbells may be used within switchgear and transformer enclosures. Underground conduits for conductors over 600 volts shall be completely encased in red concrete, 3" all around. Surround conduits for <600 volts with 3" of smooth sand all around.

B. Use ¾" minimum for home runs and in areas where future expansion is likely.

PART 17 – ADJUSTABLE FREQUENCY DRIVES (Section 16265)

A. Specific requirements may be included in the Design Standards. Provide a maintenance by-pass that electrically isolates the drive.

PART 18 – STREET LIGHTING

A. See Stanford Campus Facilities Electrical Guidelines.

PART 19 – INTERIOR LIGHTING (Section 16500)

PART 20 – FIELD TESTING:

A. Provide for tests and inspections to determine that equipment is suitable for the intended purpose and safe to energize. The tests shall be performed by a recognized testing agency.

B. Provide testing of at least the following.

1. Primary Voltage Main Switchgear
2. Unit Substation Transformers
3. Main and Feeder Breakers including Ground Fault
4. Service Switchboards
5. Large or important transformers
6. Motor Control Centers
7. Final Settings: The testing agency shall make the final settings and adjustments on protective devices and set the transformer taps according to the Engineer's specified values.

PART 21 – SAFETY

A. Coordination of ALL utility shut downs will be done via a request form.

1. For scheduled utility shutdowns, occurring inside the Medical Center, contact SHC Engineering and Maintenance 723-5555, for blank forms (see attached).
2. For scheduled utility shutdowns occurring outside the Medical Center go to the Stanford Campus Utility web site: http://www-facilities.stanford.edu/shutdowns/shutdownreq.html

B. In case of emergency:

1. For emergency response within the Medical Center call 650-723-7222
2. For Campus utility emergency response call 650-723-2281

C. Open manholes, trenches, and other hazards shall be barricaded at all times by the Contractor.

PART 22 – EMERGENCY POWER

A. Provide / connect to E-Power the HVAC Equipment serving the following rooms: Teledata Closets, MDF, IDF, Server Rooms, and all other items required by the specific project's program requirements.

END OF SECTION

UTILITY SHUTDOWN REQUEST FORM

SHC/SOM Engineering & Maintenace Room HH003

Date of Request: _____ SHUTDOWN REQUEST DATE: _____

WORK ORDER NO: _____ Time: _____ / _____
Start Finish

Shutdown Type:

CHW _____ HHW _____ DCW _____ DHW _____ Steam _____

HVAC _____ Fire Alarm _____ Fire Sprklr _____ Electric _____ Other _____

BUILDING: _____ PROJECT NAME: _____

AREAS AFFECTED: _____

PROJECT MGR: _____ PAGER: _____

OFFICE PHONE NO: _____

HOME PHONE NO: _____

CONTRACTOR: _____ PHONE: _____

FOREMAN: _____ PAGER: _____

SUB-CONTRACTOR: _____ PHONE: _____

FOREMAN: _____ PAGER: _____

NOTES / COMMENTS: _____

FAX Confirmation to: _____ Date: _____ FAX #: _____

For Engineering & Maintenance use only

SYSTEM TYPE: _____

DEVICE NO's: _____

Shut Down Notice Required: Yes No Notify Security: Yes No

APPROVED BY: _____ Date: _____

Note: All Fire Alarm Shutdowns require signature approval by the Fire Alarm Shop