**PART 1 - GENERAL**

1. **SUMMARY**
2. Section Includes: Load center unit substations suitable for indoor and outdoor locations.
3. Related Requirements:
4. Division 01 – General Requirements.
5. Section 03 30 00: Cast-In-Place Concrete.
6. Section 26 05 00: Common Work Results for Electrical.
7. Section 26 05 13: Basic Electrical Materials and Methods.
8. Section 26 05 16: Medium-Voltage Cables, Splices and Terminations.
9. Section 26 05 26: Grounding and Bonding.
10. Section 26 05 19: Low-Voltage Wires (600 Volt AC).
11. Section 26 10 00: Service Entrance.
12. Section26 12 00: Medium-Voltage Transformers.
13. Section 26 13 16: Medium-Voltage Metal-Enclosed Load Interrupter.
14. Section 26 24 13: Switchboards.
15. Section 31 23 13 – Excavation, and Fill.
    1. **REFERENCES**
16. Publications listed below (including amendments, addenda, revisions, supplements, and errata), form a part of this specification to the extent referenced.
17. American Concrete Institute (ACI):
18. ACI 318-14 – Building Code Requirements for Structural Concrete.
19. American Society for Testing and Materials (ASTM):
20. ASTM D117-10 – Standard Guide for Sampling, Test Methods, and Specifications for Electrical Insulating Oils of Petroleum Origin.
21. ASTM D3487-09 – Standard Specification for Mineral Insulating Oil Used in Electrical Apparatus.
22. California Building Code.
23. Institute of Electrical and Electronic Engineers (IEEE):
24. C37.121-12 – Guide for Switchgear-Unit Substations Requirements.
25. C57.12.01-15 – General Requirements for Dry-Type Distribution and Power Transformers.
26. C62.11-12 – Metal Oxide Surge Arresters for AC Power Circuits (> 1kV)
27. C62.41-91 – Recommended Practice on Surge Voltage in Low Voltage AC Power Circuits.
28. IEEE 551 – Recommended Practice for Calculating AC Short-Circuit Currents in Industrial and Commercial Power Systems.
29. IEEE 1584 – Performing Arc-Flash Hazard Calculations.
30. IEEE 3002 – Recommended Practice for Conducting Short-Circuit Studies and Analysis of Industrial and Commercial Power Systems
31. National Electrical Manufacturers Association (NEMA): TR 1-13 – Transformers, Step Voltage Regulators and Reactors
32. United States Department of Energy: 10 CFR Part 431 –Energy Efficiency Program for Commercial and Industrial Equipment.
33. ACRONYMS

ANSI American National Standards Institute

AOR Architect of Record

CEC California Electrical Code

EOR Engineer of Record

IBC International Building Code

IEEE Institute of Electrical and Electronics Engineers

NEC National Electrical Code

NEMA National Electrical manufacturers Association

* 1. **SUBMITTALS**

1. Provide in accordance to Division 01.
2. List of Materials: Submit a complete list of proposed materials.
3. Shop Drawings: Provide detailed and dimensioned Shop Drawings indicating kind, weight and thickness of materials, method of fitting and fastening parts together, location and number of ancillary components fitting suspension and fastening section(s) in place. Provide wiring diagrams for power distribution and connections.
4. Include a front elevation indicating dimensions and locations of equipment, make, kind and size or capacity of equipment and bussing, barriers, nameplate inscriptions, finish, total weight and size, and locations and sizes of anchor bolts.
5. Submit Fault Current, Coordination, and Arc-Flash reports based on installed conditions and equipment.
6. Provide installation and seismic anchorage details.
7. Drawings shall contain enough information to assemble and install equipment at the Project site without further instructions.
8. Prior to start of construction; provide copies of required test reports, proof of UL listing and compliance with IEEE and other applicable industry standards.
9. Installation Instructions: Submit manufacturer's written installation instructions including recommendations for handling, protection, and storage of equipment.
   1. **SUBSTITUTIONS**
10. Load centers and unit substations that deviate from these requirements shall not be accepted without written approval from OWNER’S Design Standards Section and Maintenance and Operations Technical Unit. When deviating or substituting equipment, the following information shall be submitted:
11. Substitution request form with stating substantiating reasons for the request and benefits to OWNER.
12. Proposed substitutions requests shall provide proof of compliance with Load-Center Unit Substation characteristics indicated in these specifications.
13. Submittals must comply with contract general provisions.
    1. **QUALITY ASSURANCE**
14. Equipment design, accessories, supports, and method of installation shall comply with requirements for earthquake-resistant construction of the State of California.
15. Components shall be listed and approved for the intended application by Underwriter's Laboratories (UL), or other Nationally Recognized Testing Laboratory (NRTL), and in compliance with applicable industry standards and codes, including those mentioned under article 1.02 – References.
16. Equipment shall be new and high quality. Manufacturer shall have been continuously manufacturing distribution transformers for at least 10 years.
17. Factory tests: the load center-unit substation shall be thoroughly tested at the factory to assure there are no electrical or mechanical defects. Tests shall be conducted per UL and ANSI standards. Provide a copy of test certification. The following tests shall be performed:
18. Medium-Voltage Section: Refer to sections 26 26 100 – Service Entrance, 26 1200 – Medium Voltage Transformers, 26 1316 – Medium Voltage Metal Clad Enclosure Load Interrupter, 26 0516 – Medium Voltage Cables Splices Terminations.
19. Low Voltage Section: Refer to section 26 20 00 – Low Voltage Transformers, 26 2413 – Switchboards, 26 2600 – Power Distribution Units.
20. Transformer Section(s):
21. Perform insulation-resistance tests winding-to-winding and each winding-to-ground.
22. Perform turns-ratio tests at all tap positions.
23. Certification from the manufacturer that the substations have been seismically tested to California Building Code requirements. Certification shall be based upon simulated seismic forces on a shake table or by analytical methods, but not by experience data or other methods.
24. Two weeks prior to final inspection submit certified field test reports.
25. Certifications: Two weeks prior to final inspection, submit the following:
26. Certification by the manufacturer that substations conform to the requirements of the drawings and specifications.
27. Certification by the Contractor that substations have been properly installed, adjusted, and tested.
    1. **COMMISSIONING**
28. A Commissioning Services Provider (CxSP) retained by the OWNER will lead and provide Commissioning (Cx) of power distribution systems and assemblies, including submittal review, installation, testing, documentation, and training as indicated in section 26 08 00 – Electrical Systems Commissioning.
29. CONTRACTOR shall follow the commissioning responsibilities stated in Section 01 91 13, General Commissioning Requirements.
30. CONTRACTOR shall provide all tools and personnel, and perform start-up, prefunctional and functional performance testing in the presence of the OWNER’s Commissioning Services Provider.
    1. **WARRANTY**
31. Provide the following warranties:
32. Manufacturer shall provide a two-year material warranty.
33. Installer shall provide a two-year installation warranty.
34. Warranty period shall begin at substantial completion or at project acceptance for beneficial occupancy, whichever occurs first.
35. CONTRACTOR shall warranty equipment, meters and ancillary components via a single warranty source. Multiple warranty sources are not acceptable.

**PART 2 - PRODUCTS**

* 1. **DESIGN REQUIREMENTS**

1. Equipment shall be built and tested in accordance with ANSI, NEMA and IEEE standards.
2. Load center unit substations shall consist of a medium-voltage incoming line section, a transformer section and a low-voltage section each separated from others by steel barriers but electrically connected and physically joined to form a single, metal-enclosed structure. Enclosure frame and internal barriers shall be fabricated of code gage steel and finished with medium gray, ANSI No. 49, paint applied over a rust-inhibiting phosphate primer. Construction shall prevent entry of rodents into substation interior.
3. Equipment shall be totally adjusted and tested at factory and sectionalized for shipment. Installation and connection of unit substation shall not require removal or disassembly of factory-mounted, stationary high-voltage devices. Prominent nameplates bearing equipment ratings, tap changing information, manufacturer identification and reference serial numbers shall be installed on the front of unit substation.
   1. **EQUIPMENT**
4. Medium-Voltage Incoming Line Section: Incoming line section shall terminate incoming feeder. Incoming line section and components shall be designed and coordinated to provide a single short-circuit rating comprising switch fault closing rating, short time ratings and fuse interrupting rating. Basic function impulse level (BIL) of entire assembly shall be not less than 95 KV per NEMA testing procedure. Incoming line section shall consist of an air insulated steel enclosure separated from transformer section by steel barriers and containing load break load interrupter switch, three pole, two position, as specified in Section 26 13 16: Medium-Voltage Metal-Enclosed Load Interrupter.
5. Load Center Unit Substations shall be Siemens, Square D, General Electric, PowerSmiths, MGM, Eaton, or equal approved by OWNER.
6. Transformer Section:
7. Transformer shall be of dry-type, cast resin construction, installed in a suitable ventilated enclosure, as specified in Section 26 12 00: Medium-Voltage Transformers.
8. Transformer ratings shall be as indicated on Drawings.
9. Transformers rated 35KVA or smaller shall not exceed 40 decibels. Transformers larger than 35 KVA shall be listed for no more than five decibels below NEMA standards per unit.
10. Size and number of shock mounts for all transformers shall be in accordance with manufacturer's recommendations.
11. Secondary Section: Secondary section shall consist of low-voltage distribution switchboard as specified under Sections 26 24 13: Switchboards, and Section 26 2200: Low-Voltage Transformers.
12. Power Distribution System Reports: The required reports shall be performed using an industry standards software such as SKM System Analysis Inc., ETAP Powering Success, EasyPower, or District approved equal. The following information must be submitted:
13. CONTRACTOR shall provide a complete selective coordination report of the installed power distribution system breakers and disconnects in compliance with applicable codes and IEEE standard 242.
14. CONTRACTOR shall provide an Arc-Flash study report in accordance to code and IEEE 1584 standards. The report shall indicate trip times for protective device(s) settings, arcing fault current values, and incident energy and flash boundaries. Report shall indicate clothing requirements for each piece of equipment.
15. CONTRACTOR shall provide a Short Circuit Report of the installed power distribution system in compliance with codes and IEEE Standard 551.

**PART 3 - EXECUTION**

* 1. **INSTALLATION**

1. Equipment shall be installed on a concrete house keeping pad as specified in Section 03 30 00: Cast-In-Place Concrete, unless noted otherwise.
2. Utility meters shall be firmly installed on a switchboard door or exterior wall with weatherproof fittings.
3. Anchor bolts for freestanding equipment shall be designed to meet seismic requirements of CBC. Equipment shall be anchored to the concrete pad with 3/4-inch expansion bolts with bolts field tested to withstand 150 foot-pounds of torque.
4. Tightening of wire lugs or wire and cable connections shall be performed in presence of the Project Inspector. Torque values shall be as recommended by manufacturer.
5. Furnish one spare fuse for each fusible switch installed. Spare fuse shall be of the type and rating as those installed.
6. Do not install unit substations in corrosive environments such as swimming pool pumps and boiler rooms, or similar areas.
7. Follow manufacturer's instructions for receiving handling, storage, and installation of unit substation.
8. Provide project record drawing on 8 ½ by 11-inch paper sheet denoting finished mounting and electrical connections.
   1. **PROTECTION**
9. Protect the Work of this section until Substantial Completion.
   1. **CLEANUP**
10. Remove rubbish, debris and waste materials and legally dispose of off the Project site.
11. Repair scratched or marred surfaces affected during the execution of work. Repair surfaces shall match original finish.

END OF SECTION