

SECTION 26 11 16.11

SECONDARY UNIT SUBSTATIONS – SECONDARY LESS THAN 1000 V

PART 1 GENERAL

1.01 SCOPE

- A. The Contractor shall furnish and install the secondary unit substation(s) complete from the incoming line terminals to the outgoing line terminals as specified herein and as shown on the contract drawings.
- B. The secondary unit substation shall consist of primary equipment, transformer and secondary equipment as specified below. The manufacturer of the unit substation shall furnish and coordinate all major components of the substations, including incoming primary equipment section, transformer and low-voltage section, as well as circuit breakers, fusible switches, and metering components. Provide a single warranty covering all substation assemblies, transformers and components.
- C. Connections between the primary device and transformer shall be *[cable] [bus], and between the transformer and secondary shall be flexible bus braid.
- D. Outdoor primary and secondary equipment where specified shall be of weatherproof construction, rodent proof and shall contain 120-volt space heaters, receptacles and lighting as required.

1.02 RELATED SECTIONS

- A. Section 26 12 13 – Substation Transformers – Liquid-Filled
- B. Section 26 12 16 – Substation Transformers – Dry-Type
- C. Section 26 12 16.13 – Substation Transformers – Resibloc Cast Resin
- D. Section 26 12 16.15 – Substation Transformers – Vacuum Cast-Coil Design
- E. Section 26 13 13 – Metal-Clad Switchgear (Vac-Clad-W) – Medium Voltage
- F. Section 26 13 13.21 – Metal-Enclosed Breaker Switchgear – Medium Voltage Drawout Mounted (MEB)
- G. Section 26 13 13.23 – Metal-Enclosed Breaker Switchgear – Medium Voltage Fixed Mounted (MSB)
- H. Section 26 13 16.11 – Medium Voltage Switches – 5/15 kV – Single Switch
- I. Section 26 13 16.13 – Medium Voltage Switches – 5/15 kV – Line-up
- J. Section 26 23 00.11 – Metal-Enclosed Drawout Switchgear (Magnum DS) – Low Voltage
- K. Section 26 23 00.13 – Metal-Enclosed Drawout Switchgear (DSII) – Low Voltage
- L. Section 26 24 13.13 – Switchboards – Low Voltage (Compartmentalized Feeders – Pow-R-Line *l*)

* Note to Spec. Writer – Select one

M. Section 26 24 13.11 – LV Distribution Switchboards – Low Voltage (Group Mounted Feeders – Pow-R-Line C)

1.03 REFERENCES

- A. The secondary unit substation shall be designed, assembled, tested and installed in accordance with latest applicable standards of NEMA, IEEE and ANSI, applicable to its three major sections:
1. MV Metal-Clad Switchgear – NEMA SG4, SG5; ANSI C37
 2. MV Metal-Enclosed Switchgear – NEMA SG4, SG5; ANSI C37
 3. MV Load Interrupter Switchgear – NEMA SG4, SG5; ANSI C37
 4. MV Motor Controllers – ANSI/NEMA ICS-3-Part 2, UL347
 5. Secondary Substation Transformers – NEMA 210, IEEE 100, ANSI C57
 6. LV Metal-Enclosed Switchgear – ANSI C37, UL 1558
 7. LV Distribution Switchboards – NEMA PB-2, UL 891

1.04 SUBMITTALS – FOR REVIEW/APPROVAL

- A. The following information shall be submitted to the Engineer:
1. Master drawing index
 2. Front view elevation
 3. Floor plan
 4. Single line
 5. Schematic diagram
 6. Nameplate schedule
 7. Component list
 8. Conduit entry/exit locations
 9. Assembly ratings including:
 - a. Short-circuit rating
 - b. Voltage
 - c. Continuous current
 - d. Basic Impulse level for equipment over 600 volts
 - e. kVA
 10. Major component ratings including:
 - a. Voltage
 - b. Continuous current
 - c. Interrupting ratings
 11. Cable terminal sizes
 12. Connection details between close-coupled assemblies
 13. Composite front view and floor plan of close-coupled assemblies
 14. Impedance for transformers

15. Product data sheets

- B. Where applicable, the following additional information shall be submitted to the Engineer:
1. Busway connection
 2. Key interlock scheme drawing and sequence of operation

1.05 SUBMITTALS – FOR CONSTRUCTION

- A. The following information shall be submitted for record purposes:
1. Final as-built drawings and information for items listed Paragraph 1.04, and shall incorporate all changes made during the manufacturing process
 2. Wiring diagrams
 3. Certified production test reports
 4. Installation information
 5. Seismic certification as specified

1.06 QUALIFICATIONS

- A. The manufacturer of the assembly shall be the manufacturer of the major components within the assembly.
- B. For the equipment specified herein, the manufacturer shall be ISO 9001 or 9002 certified.
- C. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.
- D. [∃]Provide Seismic tested equipment as follows:
1. The equipment and major components shall be suitable for and certified to meet all applicable seismic requirements of the International Building Code (IBC) for zone 4 application. Guidelines for the installation consistent with these requirements shall be provided by the switchgear manufacturer and be based upon testing of representative equipment. The test response spectrum shall be based upon a 5% minimum damping factor, IBC: a peak of 2.45g's (3.2-11 Hz), and a ZPA of 0.98g's applied at the base of the equipment. The tests shall fully envelop this response spectrum for all equipment natural frequencies up to at least 35 Hz.

-- *OR --

1. The equipment and major components shall be suitable for and certified to meet all applicable seismic requirements of the California Building Code (CBC) through zone 4 application. Guidelines for the installation consistent with these requirements shall be provided by the switchgear manufacturer and be based upon testing of representative equipment. The test response spectrum shall be based upon a 5% minimum damping factor, CBC: a peak of 2.15g's, and a ZPA of 0.86g's applied at the base of the equipment. The tests shall fully envelop this response spectrum for all equipment natural frequencies up to at least 35 Hz.

[∃] Note to Spec. Writer – Optional

* Note to Spec. Writer – Select one

-- *OR --

1. The manufacturer may certify the equipment based on a detailed computer analysis of the entire assembly structure and its components. Guidelines for the installation consistent with these requirements shall be provided by the switchgear manufacturer and be based upon testing of representative equipment. The equipment manufacturer shall document the requirements necessary for proper seismic mounting of the equipment
2. The following minimum mounting and installation guidelines shall be met, unless specifically modified by the above referenced standards.
 - a. The Contractor shall provide equipment anchorage details, coordinated with the equipment mounting provision, prepared and stamped by a licensed civil engineer in the state. Mounting recommendations shall be provided by the manufacturer based upon approved shake table tests used to verify the seismic design of the equipment.
 - b. The equipment manufacturer shall certify that the equipment can withstand, that is, function following the seismic event, including both vertical and lateral required response spectra as specified in above codes.
 - c. The equipment manufacturer shall document the requirements necessary for proper seismic mounting of the equipment. Seismic qualification shall be considered achieved when the capability of the equipment, meets or exceeds the specified response spectra.

1.07 REGULATORY REQUIREMENTS

- A. [∩][Certified copies of production test reports shall be supplied demonstrating compliance with these standards when requested by the engineer.]

1.08 DELIVERY, STORAGE AND HANDLING

- A. Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of these instructions shall be included with the equipment at time of shipment.

1.09 OPERATION AND MAINTENANCE MANUALS

- A. Equipment operation and maintenance manuals shall be provided with each assembly shipped and shall include instruction leaflets, instruction bulletins, and renewal parts lists where applicable for the complete assembly and each major component.

[∩] Note to Spec. Writer – Optional

PART 2A PRODUCTS – PRIMARY EQUIPMENT

***Note to Spec. Writer:**

Select primary from one of the following:

| | |
|---|--|
| Metal-Clad Switchgear (Vac-Clad-W) – Medium Voltage | Section 26 13 13 – Part 2 |
| Metal-Enclosed Breaker Switchgear – Medium Voltage Drawout Mounted (MEB) | Section 26 13 13.21 – Part 2 |
| Metal-Enclosed Breaker Switchgear – Medium Voltage Fixed Mounted (MSB) | Section 26 13 13.23 – Part 2 |
| Medium Voltage Switches (MVS) | Section 26 13 16.11 or Section 26 13 16.13 – Part 2 |

PART 2B PRODUCTS – TRANSFORMERS

***Note to Spec. Writer:**

Select transformer from one of the following:

| | |
|-----------------------------------|------------------------------|
| Liquid Transformers | Section 26 12 13 – Part 2 |
| Dry-Type Transformers | Section 26 12 16 – Part 2 |
| RESIBLOC® Cast Resin Transformers | Section 26 12 16.13 – Part 2 |
| Cast-Coil Transformers | Section 26 12 16.15 – Part 2 |

PART 2C PRODUCTS – SECONDARY EQUIPMENT

***Note to Spec. Writer:**

Select secondary from one of the following:

| | |
|--|------------------------------|
| Metal-Enclosed Drawout Switchgear – (Magnum DS) Low Voltage | Section 26 23 00.11 – Part 2 |
| Metal-Enclosed Drawout Switchgear – (DSII) Low Voltage | Section 26 23 00.13 – Part 2 |
| Switchboards Low Voltage (Group Mounted Feeders – Pow-R-Line C) | Section 26 24 13.11 – Part 2 |
| (Compartmentalized Feeders – Pow-R-Line i) | Section 26 24 13.13 – Part 2 |

PART 3 EXECUTION

3.01 FACTORY TESTING

- A. Standard factory tests shall be performed on the primary equipment provided under this section. All tests shall be in accordance with the latest version of ANSI and NEMA standards.
- B. The following factory tests shall be made on all transformers. All tests shall be in accordance with the latest revision of ANSI and NEMA standards.
1. Resistance measurements of all windings on the rated voltage connection of each unit and at the tap extremes of one unit only of a given rating on this project
 2. Ratio tests on the rated voltage connection and on all tap connections
 3. Polarity and phase-relation tests on the rated voltage connections
 4. No-load loss at rated voltage on the rated voltage connection
 5. Exciting current at rated voltage on the rated voltage connection
 6. Impedance and load loss at rated current on the rated voltage connection of each unit and on the tap extremes of one unit only of a given rating on this project
 7. Applied potential test
 8. Induced potential tests
 9. [∃]Temperature test(s) shall be made on *[all units] [one unit only of a project covering one or more units of a given kVA rating]. Tests shall not be required when there is available a record of a temperature test on an essentially duplicate unit. When a transformer is supplied with auxiliary cooling equipment to provide more than one kVA rating, temperature tests as listed above shall be made on the lowest kVA OA or AA rating and the highest kVA FA rating
 10. [∃]ANSI impulse test on all primary windings
- C. The following standard factory tests shall be performed on the secondary equipment provided under this section. All tests shall be in accordance with the latest version of ANSI and NEMA standards.
1. The switchgear shall be completely assembled, wired, adjusted and tested at the factory. After assembly, the complete switchgear shall be tested to ensure the accuracy of the wiring and the functioning of all equipment. The main bus system shall be given a dielectric test of 2200 volts for one minute between live parts and ground and between opposite polarities
 2. The wiring and control circuits shall be given a dielectric test of 1500 volts for one minute or 1800 volts for one second between live parts and ground, in accordance with ANSI C37.20.1
- D. The manufacturer shall provide three (3) certified copies of factory test reports.
- E. [∃]Factory tests as outlined above shall be witnessed by the owner's representative.

[∃] Note to Spec. Writer – Optional

* Note to Spec. Writer – Select one

1. The manufacturer shall notify the owner two (2) weeks prior to the date the tests are to be performed
2. The manufacturer shall include the cost of transportation and lodging for up to three (3) owner's representatives. The cost of meals and incidental expenses shall be the owner's responsibility

3.02 FIELD QUALITY CONTROL

- A. Provide the services of a qualified factory-trained manufacturer's representative to assist the Contractor in installation and startup of the equipment specified under this section for a period of _____ working days. The manufacturer's representative shall provide technical direction and assistance to the contractor in general assembly of the equipment, connections and adjustments, and testing of the assembly and components contained herein.
- B. The Contractor shall provide three (3) copies of the manufacturer's field startup report.

3.03 MANUFACTURER'S CERTIFICATION

- A. A qualified factory-trained manufacturer's representative shall certify in writing that the equipment has been installed, adjusted and tested in accordance with the manufacturer's recommendations.
- B. The Contractor shall provide three (3) copies of the manufacturer's representative's certification.

3.04 TRAINING

- A. The Contractor shall provide a training session for up to five (5) owner's representatives for _____ normal workdays at a job site location determined by the owner.
- B. The training session shall be conducted by a manufacturer's qualified representative. The training program shall include instructions on the assembly including primary equipment, transformer, and secondary equipment. All circuit breakers, protective devices and other major components shall be included.

3.05 INSTALLATION

- A. The contractor shall install all equipment per the manufacturer's recommendation and the contract drawings.
- B. All necessary hardware to secure the assembly in place shall be provided by the contractor.

3.06 FIELD ADJUSTMENTS

3.07 FIELD TESTING

· Note to Spec. Writer – Insert data in blanks