

# **MEDIUM VOLTAGE METERING AND SERVICE EQUIPMENT**

## **Table of Contents - Section 1000**

<b>PARAGRAPH</b>		<b>PAGE</b>
<b>1000.0</b>	<b>MEDIUM VOLTAGE METERING AND SERVICE EQUIPMENT</b> .....	<b>1</b>
1000.1	GENERAL.....	1
<b>1000.2</b>	<b>ENGINEERING SPECIFICATIONS</b> .....	<b>1</b>
<b>1000.2-1</b>	<b>CUSTOMER TO SUPPLY THE FOLLOWING INFORMATION</b> .....	<b>2</b>
1000.2-2	APS DIVISION ENGINEERING WILL THEN SUPPLY THE FOLLOWING INFORMATION.....	2
1000.2-3	CUSTOMER TO SUPPLY INFORMATION TO APS DIVISION ENGINEERING FOR APPROVAL ..	2
<b>1000.3</b>	<b>MANUFACTURER'S DRAWINGS FOR APPROVAL</b> .....	<b>3</b>
<b>1000.4</b>	<b>SPACE REQUIREMENTS FOR INSTALLATION OF SWITCHBOARDS (WORKING SPACE)</b> .....	<b>3</b>
1000.5	ENCLOSURE AND SEALING OF METERING AND PULL SECTIONS .....	3
<b>1000.6</b>	<b>MAIN SERVICE SWITCH OR BREAKER</b> .....	<b>3</b>
1000.7	OVERHEAD BUSWAY (2400 AND 4160 VOLTS).....	3
1000.8	UNDERGROUND SERVICE .....	3
<b>1000.9</b>	<b>SERVICE CABLE TERMINATING SECTION</b> .....	<b>3</b>
1000.10	METER PANEL DETAILS .....	4
<b>1000.11</b>	<b>LIFTING HANDLES ON REMOVABLE PANELS</b> .....	<b>4</b>
1000.12	CUSTOMER'S LOAD CONDUCTORS .....	4
1000.13	UNACCEPTABLE METER LOCATIONS .....	4
1000.14	WEATHER-PROOF ENCLOSURES .....	4
1000.15	EUSERC - ELECTRIC UTILITY SERVICE EQUIPMENT REQUIREMENTS COMMITTEE .....	4
1000.16	CONDUCTORS PASSING THROUGH COMPARTMENT WALLS .....	4
1000.17	INSULATED NEUTRAL TERMINATION .....	4
1000.18	GROUND/BOND BUS .....	4
1000.19	METER HEIGHT .....	4



## 1000.0

## **MEDIUM** VOLTAGE METERING AND SERVICE EQUIPMENT

The following requirements apply to switchboards and services between 601 volts and 25 kV. For higher voltages, contact APS Division Customer Service. Requirements in other sections of this manual also apply to high voltage services.

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### 1000.1

#### GENERAL

APS may furnish primary service of a voltage and phase listed in Section 200, Paragraph 201.0 where available.

**The Customer shall provide fault interrupting means that will interrupt the maximum fault current supplied by APS at the time a new service entrance section is installed and at any future time. Because fault duties generally trend upward, the Customer is encouraged to provide equipment that has interrupting capability to meet future needs. APS will provide the fault current figures.**

#### A. SINGLE PHASE INSTALLATIONS

Single phase primary metered load (no transformation by APS) will be limited by the size of the APS protective device on the source side of meter. **All loads over 150 KVA must receive APS Engineering approval.**

If transformation by APS is required, load will be limited to a 167 KVA transformer.

#### B. THREE PHASE INSTALLATIONS

Three phase 2400 or 4160 V will normally be limited to 5000 KVA. (See paragraph 1000.2) For loads above 5000 KVA, Customer will be required to accept the APS primary distribution or transmission voltage (12.5 kV or higher.) Subject to availability of transformer(s) and APS Engineering approval, the 5000 KVA limit can be exceeded.

If transformation is required and APS elects to use transformer(s) with exposed terminals which must be located at ground level, the Customer will provide fenced in area and transformer pad per APS specifications.

#### C. COORDINATION GUIDELINES

The type and setting of the Customer's protective device must be approved by APS Engineering and a witnessed test or certified copy of the test results (including verification of relay settings) will be required. Testing shall be done at 4 year intervals or less by certified personnel and a copy of the test results shall be supplied to APS.

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### 1000.2

#### ENGINEERING SPECIFICATIONS

Each switchboard and service exceeding 600 volts will be considered "specially engineered." To properly coordinate the provisions of these requirements, the consulting engineer, manufacturer or contractor (Customer) must contact APS Division Customer Service as early in the design stage as possible. Specifications for all equipment (e.g., service entrance section, pull section, breakers, etc.) must be submitted to APS for approval prior to fabrication of the equipment. See paragraph 1000.3. APS Division Engineering will prepare and issue engineering specifications and drawings for each **medium** voltage service installation. These specifications will be based on the following.



## 1000.2-1 CUSTOMER TO SUPPLY THE FOLLOWING INFORMATION

1. Location (address) of the property to be served.
2. Type of structure or facilities to be served. (See Section 200 - Application for Service)
3. Voltage and phase desired. (See Section 200, Paragraph 201.0)
4. Size (ampacity) of the proposed service entrance section (normally 12470/7200 or 20780/12000.) Service entrance sections of 100 amps or greater **may** require a breaker for Customer's main disconnect. **Any application requesting service needing a protection study will be required to pay in advance a study fee determined by APS.**

**NOTE: Services below 100 amps may also require a breaker for main disconnect. Consult Division Engineering.**

5. Size of main disconnect/breaker.
6. Anticipated peak load. (Electrical load calculations)

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## 1000.2-2 APS DIVISION ENGINEERING WILL THEN SUPPLY THE FOLLOWING INFORMATION

1. Recommend the type of protective device (breaker or fused disconnect) to be installed by the Customer on his equipment.
2. Type of protective device that is used by APS on the line that will serve Customer.
3. Time current characteristic of APS relays or fusing with which customer equipment must coordinate. (Typical relays used by APS for 12470/7200 circuit protection are G.E. "IAC 53" with a phase minimum operating current (MOC) of 600 amps and a ground MOC of 180 amps. APS phase and ground relays have both instantaneous and timed (time dial of 4) trip capabilities. **However, in some areas, relay settings may be less than above.**

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## 1000.2-3 CUSTOMER THEN TO SUPPLY THE FOLLOWING INFORMATION TO APS DIVISION ENGINEERING FOR APPROVAL

1. When a breaker is necessary to coordinate with APS facilities, phase and ground relays are required. Relays shall have timed and instantaneous trip capabilities. Characteristics of the timed trip shall be "very inverse." Customer relay information needed:
  - a. Manufacturer of relay.
  - b. Current transformer ratio.
  - c. Setting ranges of relay.
  - d. Proposed settings of relay.
  - e. Time current characteristics.
2. If a fused disconnect is acceptable to Division Engineering, the following information is needed:
  - a. Name of fuse manufacturer.
  - b. Fuse type.
  - c. Continuous current rating of fuse.
  - d. Total clearing time-current characteristic of the fuse.

**NOTE: Customer's equipment (relays/fuses) must be designed to isolate the APS system from faults in the Customer's distribution lines, equipment and transformers. Coordination time of customer protective devices must be 1/4 second faster than APS protective devices at the maximum available fault current. The installation shall comply with all applicable codes and ordinances.**



### 1000.3 MANUFACTURER'S DRAWINGS FOR APPROVAL

The designer or manufacturer of the **medium** voltage switchgear for the customer's service shall submit two(2) copies of drawings of the service cable terminating section, metering isolation, bus isolation switch and main breaker to the APS Electric Meter Section prior to fabrication of the switchboard. To review drawings or obtain approvals call 602-371-7368 to set-up an appointment. **Also, one copy of above mentioned drawings shall be submitted to APS Division Engineering.**

Information needed on drawings: Switchgear manufacturer (name), EUSERC drawings that are applicable, ampacity of switchgear, physical dimensions, voltage, phase, bus bracing (AIC rating), protective devices to be used and their interrupting rating, accurate address (street and number), etc. (See Paragraph 302.9, Section 300)

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### 1000.4 SPACE REQUIREMENTS FOR INSTALLATION OF SWITCHBOARDS (WORKING SPACE)

**Medium** voltage switchboards should in every case be installed with at least 6 feet of clear space on all sides. A level standing and working space of at least 6 feet (measured from face of panel) shall be provided in front of any part of the side or end of a switchboard where such panel supports or provides access to metering, test equipment, underground service terminating pull section or switches. (These are minimum dimensions. Working space clearances may need to be increased. NEC/ Check with AHJ.)

Where access is required to both the front and rear of the switchboard in order to provide maintenance, servicing, operation and testing, walkways at least 24 inches wide shall be provided around the ends of the **medium** voltage switchboard. (See Paragraph 301.9, Section 300 for meter room requirements. Rooms containing equipment that exceeds 600 volts must have a sign on all doors stating "Warning - **Medium** Voltage - Keep Out".)

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### 1000.5 ENCLOSURE AND SEALING OF METERING AND PULL SECTIONS

Service terminating pull sections and metering sections shall be fully enclosed. All removable parts that will give access to these sections or to any secondary wiring shall be sealable.

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### 1000.6 MAIN SERVICE SWITCH OR BREAKER

The manufacturer or contractor shall furnish and install a single main service switch or breaker for each **medium** voltage service. The service switch or breaker shall be installed on the load side of the metering equipment. **Consult Division Engineering if requesting an alternate feed/spot network service for location of service switch/breaker in respect to metering equipment.**

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### 1000.7 OVERHEAD BUSWAY (2400 AND 4160 VOLTS)

In cases where the top feed connection employing busway is desired, the contractor shall furnish and install such busway. The busway shall extend from the meter section of the switchboard to a location designated by APS as being suitable for connection to its supply facilities and shall be equipped with a suitable service head.

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### 1000.8 UNDERGROUND SERVICE

The Delivery Point will be at the connection of the pull section located at ground level. The customer shall furnish and install the appropriate pull section and metering cubicle in accordance with this section. Any exceptions to the above must be approved by APS Division Engineering.

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### 1000.9 SERVICE CABLE TERMINATING SECTION

**Medium** voltage switchboards to which underground service is to be supplied by APS shall be equipped with a fully enclosed service terminating pull section by the manufacturer. The pull section shall be part of the switchboard that houses the metering section and disconnecting device. Bus bars with provisions for terminating lugs (See Section 1100, Dwg #347) are required from the



pull section into the metering cubicle. One landing position per phase and neutral shall be provided for each 400 amps of section size.



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## ELECTRIC SERVICE REQUIREMENTS

**1000.3**

REVISION  
06/02/10

**MEDIUM** VOLTAGE METERING AND SERVICE EQUIPMENT

PAGE  
4

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**1000.10 METER PANEL DETAILS**

Two 15" meter panels as shown in Section 1100, EUSERC Dwg. 332 (1-panel cutout and 1-panel blank) or one 30" panel are acceptable to APS. (See Paragraph 302.2 of Section 300 for meter height requirements.) A #4 AWG flexible braided bond wire shall be installed across at least one hinge per door.

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**1000.11 LIFTING HANDLES ON REMOVABLE PANELS**

Each removable panel giving access to an instrument transformer or **medium** voltage termination compartment shall be equipped with two lifting handles. The area of any single panel shall not exceed 9 square feet. Where hinged doors are used, their size is not limited. Both panels and doors used for meter compartments or termination compartments shall be sealable and lockable.

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**1000.12 CUSTOMER'S LOAD CONDUCTORS**

Customer's load conductors may not run through any meter or termination area.

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**1000.13 UNACCEPTABLE METER LOCATIONS**

See Paragraph 301.6 of Section 300 for unacceptable meter locations.

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**1000.14 WEATHER-PROOF ENCLOSURES**

See Section 300 for outdoor switchgear requirements.

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**1000.15 EUSERC - ELECTRIC UTILITY SERVICE EQUIPMENT REQUIREMENTS COMMITTEE**

Switchboard service sections approved for use in the area served by APS are built to the standards developed by the Electric Utility Service Equipment Requirements Committee, and are available to the Customer through switchboard manufacturers. (See Manufacturing Requirements, Section 1100 - EUSERC DWGS #401 through 408)

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**1000.16 CONDUCTORS PASSING THROUGH COMPARTMENT WALLS**

When cable or bus pass through compartment walls, through-the-wall bushings must be used, or bare bus clearance must be maintained.

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**1000.17 INSULATED NEUTRAL TERMINATION**

The neutral termination shall be located in the service termination area. The insulated neutral bus shall extend from the service termination in the pull section through the metering voltage transformer (V.T.) area into the Customer's disconnect compartment (non-sealed area), where it shall have a disconnect link, if necessary and provisions for a bond tie on the line side of said link. The insulated neutral bus is to be separate from the ground/bond bus. (See Bonding and Grounding, Section 700, Paragraph 705.6)

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**1000.18 GROUND/BOND BUS**

A ground/bond bus shall extend from the pull section, through the metering section into the Customer's disconnect compartment (non-sealed area). The ground/bond bus shall be tied to the Customer's neutral in the Customer's disconnect compartment (non-sealed area) with a properly sized main bond jumper. (See Section 700, Paragraph 705.6)

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**1000.19 METER HEIGHT**

See Section 300, Paragraph 302.2 for meter heights

