

## SECTION 8 METERING CONTENTS

### ELECTRIC METERING GENERAL - GM0001M

INDEX .....	SHEET 8.2.3
SCOPE .....	SHEET 8.2.3
GENERAL REQUIREMENTS .....	SHEET 8.2.3
EQUIPMENT .....	SHEET 8.2.4
METER REQUIREMENTS .....	SHEET 8.2.4
METER FACILITIES .....	SHEET 8.2.8
ELECTRICAL CONNECTIONS .....	SHEET 8.2.9

### ELECTRIC METERING COMMERCIAL & INDUSTRIAL - CM0001M

INDEX .....	SHEET 8.3.11
SCOPE .....	SHEET 8.3.11
GENERAL REQUIREMENTS .....	SHEET 8.3.11
METER LOCATIONS .....	SHEET 8.3.12
UNDERGROUND TERMINATIONS .....	SHEET 8.3.12
METERING TRANSFORMER ENCLOSURES .....	SHEET 8.3.14
SINGLE CUSTOMER METER INSTALLATIONS .....	SHEET 8.3.14
TEST BYPASS BLOCK DETAIL .....	SHEET 8.3.17
CT CABINET 201-400 AMP .....	SHEET 8.3.19
CT BRACKET (2 CT'S) 201-400 AMP .....	SHEET 8.3.20
CT BRACKET (3 CT'S) 201-400 AMP .....	SHEET 8.3.21
SERVICE TERMINATION CABINET .....	SHEET 8.3.22
TWO CT CABINET 401-800 AMP .....	SHEET 8.3.24
THREE CT CABINET 401-800 AMP .....	SHEET 8.3.25
SAFETY SOCKET METER BOX .....	SHEET 8.3.26
MULTIPLE METER INSTALLATIONS, 2-6 METERS, 7+ METERS .....	SHEET 8.3.30
100/200 AMP C AND I SERVICE PEDESTALS .....	SHEET 8.3.34

### LOCKED METERING FACILITY KEY BOX - GI0004M

PURPOSE .....	SHEET 8.4.37
RESPONSIBILITY .....	SHEET 8.4.37
INSTALLATION .....	SHEET 8.4.37

### ELECTRIC METERING RESIDENTIAL - RM0001M

INDEX .....	SHEET 8.5.38
SCOPE .....	SHEET 8.5.38
GENERAL REQUIREMENTS .....	SHEET 8.5.38
REMOTE SITE METER READING (OMR/ERT) .....	SHEET 8.5.39
OVERHEAD / UNDERGROUND FED METER	
SOCKET (0-225 AMPS) .....	SHEET 8.5.39
UNDERGROUND FED METER SOCKET (226-400 AMPS) .....	SHEET 8.5.40
METER SOCKET (0-225 AMPERES 120/208 VOLTS) .....	SHEET 8.5.41
UNDERGROUND SERVICE W/CURRENT TRANSFORMER .....	SHEET 8.5.42
CONNECTION OF AUXILIARY AND STANDBY POWER SOURCES.....	SHEET 8.5.43



**Liberty Utilities®**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

ENGINEERING & CONSTRUCTION STANDARD

## ELECTRIC INSTALLATION GUIDE SECTION 8 INDEX

8.1.1 OF 91

SUBSTRUCTURE

DRAWING NUMBER  
**INDEX**

## ELECTRIC PRIMARY METERING - PM0001M

INDEX .....	SHEET 8.6.44
PURPOSE .....	SHEET 8.6.44
TYPE OF ELECTRICAL SERVICE .....	SHEET 8.6.44
REQUIRED METER EQUIPMENT APPROVALS .....	SHEET 8.6.44
ELECTRIC METER LOCATIONS .....	SHEET 8.6.44
UNDERGROUND TERMINATIONS .....	SHEET 8.6.45
PRIMARY METERING OF OVERHEAD CUSTOMERS .....	SHEET 8.6.46
REFERENCES .....	SHEET 8.6.46
CONSTRUCTION DRAWINGS .....	SHEET 8.6.47
OVERHEAD: 3 PHASE 4 WIRE SYSTEM .....	SHEET 8.6.47
OVERHEAD: 3 PHASE 3 WIRE SYSTEM .....	SHEET 8.6.48
HIGH VOLTAGE METERING ENCLOSURE .....	SHEET 8.6.50

## ELECTRIC SWITCHBOARDS 0-600 VOLTS - SB0001M

INDEX .....	SHEET 8.7.57
SCOPE .....	SHEET 8.7.57
GENERAL METERING REQUIREMENTS .....	SHEET 8.7.57
SWITCHBOARDS - GENERAL .....	SHEET 8.7.57
SWITCHBOARD SERVICE SECTION .....	SHEET 8.7.59
SERVICE ENTRANCE LOCATION .....	SHEET 8.7.62
UNDERGROUND SERVICE PULL SECTION .....	SHEET 8.7.62
METER SWITCH SEQUENCE .....	SHEET 8.7.62
SERVICE TERMINATIONS .....	SHEET 8.7.63
METER PANELS .....	SHEET 8.7.63
UNDERGROUND SERVICE TERMINATION .....	SHEET 8.7.63
SERVICE TERMINATION IN PULL SECTION WHICH IS ABOVE GROUND.....	SHEET 8.7.65
OVERHEAD SERVICE TERMINATION .....	SHEET 8.7.66
UNDERGROUND SERVICE TERMINATING FACILITIES IN PULL	
BOXES OR PULL SECTIONS 0-600 VOLTS .....	SHEET 8.7.67
INSTRUMENT TRANSFORMER COMPARTMENT .....	SHEET 8.7.71
RAIN TIGHT SWITCHBOARDS WITH ENCLOSED	
METER PANELS .....	SHEET 8.7.72
3 PHASE 3 WIRE 0-1000 AMPERES .....	SHEET 8.7.74
3 PHASE 4 WIRE 0-1000 AMPERES .....	SHEET 8.7.76
3 PHASE 3 WIRE 1001-3000 AMPERES .....	SHEET 8.7.78
3 PHASE 4 WIRE 1001 TO 3000 AMPERES .....	SHEET 8.7.80
3 PHASE 3 WIRE 3001 AMPERES AND LARGER .....	SHEET 8.7.82
3 PHASE 4 WIRE 3001 AMPERES AND LARGER .....	SHEET 8.7.84
REMOVABLE LINK & CT SUPPORT 4" BUS	
3001 AMPS AND LARGER .....	SHEET 8.7.86
REMOVABLE LINK & CT SUPPORT 5" BUS	
1001 TO 3000 AMPS .....	SHEET 8.7.87
SOCKET METER PANEL .....	SHEET 8.7.88
SOCKET METER & RECORDER PANEL .....	SHEET 8.7.89
SELF CONTAINED METERS (0-200 AMP) .....	SHEET 8.7.90
METER SOCKETS .....	SHEET 8.7.91



**Liberty Utilities®**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

ENGINEERING & CONSTRUCTION STANDARD

### ELECTRIC INSTALLATION GUIDE SECTION 8 INDEX

8.1.2 OF 91

SUBSTRUCTURE

DRAWING NUMBER  
**INDEX**

# ELECTRIC METERING GENERAL

## 1.0 INDEX

- 1.0 INDEX
- 2.0 SCOPE
- 3.0 GENERAL REQUIREMENTS
- 4.0 EQUIPMENT
- 5.0 METER REQUIREMENTS
- 6.0 METER FACILITIES
- 7.0 ELECTRICAL CONNECTIONS

## 2.0 SCOPE

This guide covers general requirements and codes for all electrical metering. For detailed information refer to the appropriate standard.

## 3.0 GENERAL REQUIREMENTS

### 3.1 **Establishment of Service**

Electric service will not be established until the service entrance facilities are completed by the customer. In areas where local ordinances require permits and final inspection, the utility will not install the service conductors or metering until the installation has passed all local inspections.

### 3.2 **Customer Responsibilities**

The customer shall furnish, install and maintain the conductors and equipment beyond the point of attachment. The customer shall provide approved meter enclosures, as well as meter sockets and sealing rings. It is the customers responsibility to consult the utility for fault duty information.

### 3.3 **The Utility Consultation**

The customer must consult the utility before purchasing service entrance equipment. The type of service and voltage available will vary with location. The Utility will provide the fault duty information.

### 3.4 **The Utility Responsibilities**

All meters, metering transformers, secondary test switches and normal metering transformer secondary wiring will be provided and installed by the utility.



**Liberty Utilities®**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

ENGINEERING & CONSTRUCTION STANDARD

## **ELECTRIC METERING GENERAL**

8.2.3 OF 91

SUBSTRUCTURE

DRAWING NUMBER  
**GM0001M**

- 3.5 All meter sockets and enclosures shall have Underwriter's Laboratory approval. All installations and Equipment shall comply with the latest requirements of the Electric Utility Service Equipment Requirements Committee (EUSERC).
- 3.6 In general a building will be supplied through only one set of service conductors of the same voltage.

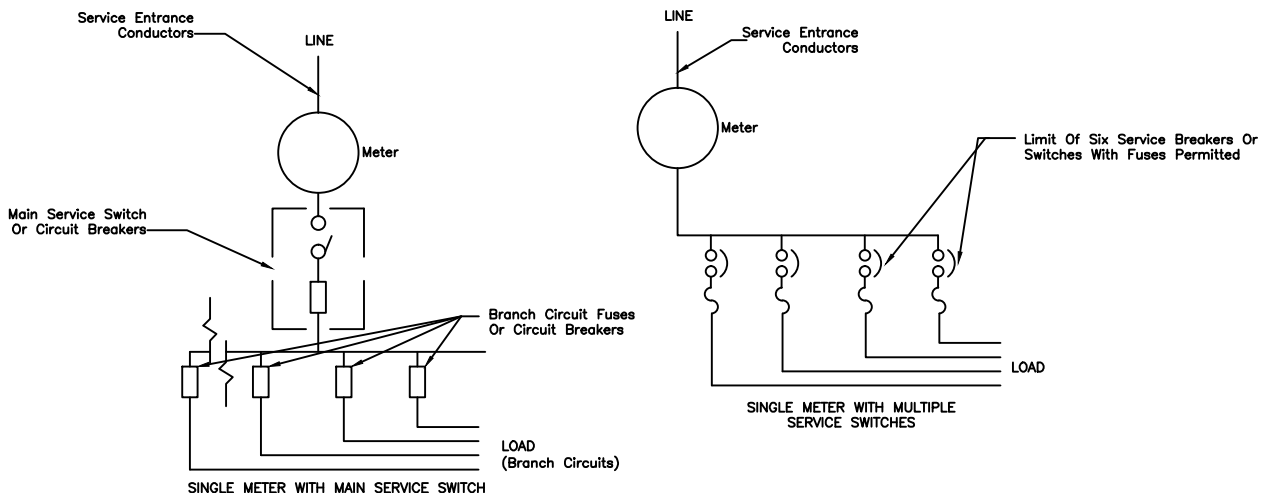
## 4.0 EQUIPMENT

- 4.1 The type and size of overhead service entrance conductors (weatherhead to panel) shall conform to the ordinances and codes of the GO 128 and the local inspection authority. In no case shall the service entrance conductors be smaller than #8 AWG. **The Utility will size and provide underground service conductors.**
- 4.2 **Equipment / TFR Ratings:**  
The capacity of the service switch may be used as the basis for determining the size of other related equipment (transformer). In those cases where a main service switch is not used, the rating of the service equipment shall be considered as that required to serve the total diversified load.
- 4.3 Refer to GO 128, Appendix D, Article 3 for service entrance requirements.

## 5.0 METER REQUIREMENTS

### 5.1 Meter Sequence

The metering arrangement provides for the line cables to enter first, followed by the disconnect, followed by the protection devices. (Meter-Switch-Fuse Sequence)  
Refer to local codes for multiple meter installation



**Liberty Utilities®**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

ENGINEERING & CONSTRUCTION STANDARD

**ELECTRIC  
METERING  
GENERAL**

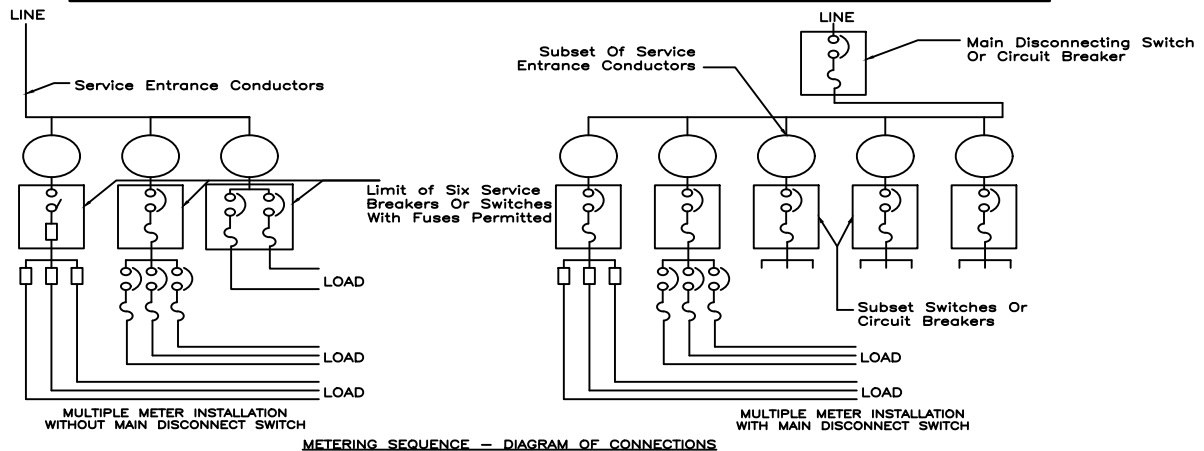
8.2.4 OF 91

**SUBSTRUCTURE**

**DRAWING NUMBER  
GM0001M**

The meter switch may be located inside or outside the building being served in accordance with applicable electrical codes. Inside mounted disconnects will require the installation of a shunt trip device outside the premises.

When a single set of service entrance conductors supply a multi-meter installation (2-6 meters), a meter switch for each meter shall be located on the load side of each meter.



For larger multi-meter installations (7+ meters) electrical codes require the installation of a main service switch or breaker located on the supply side of the meters. In these instances, an individual meter switch must also be installed on the load side of each meter.

## 5.2 Meter Cabinet

Cabinets for meters and service switches shall be designed to provide the required clearances between the meter socket sealing flange and the inside cabinet door.

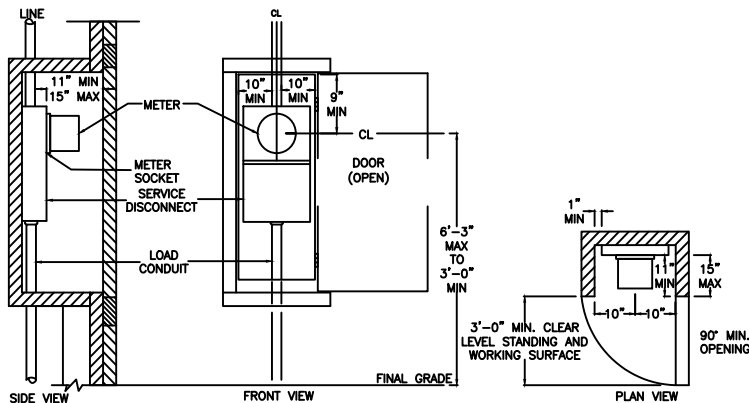
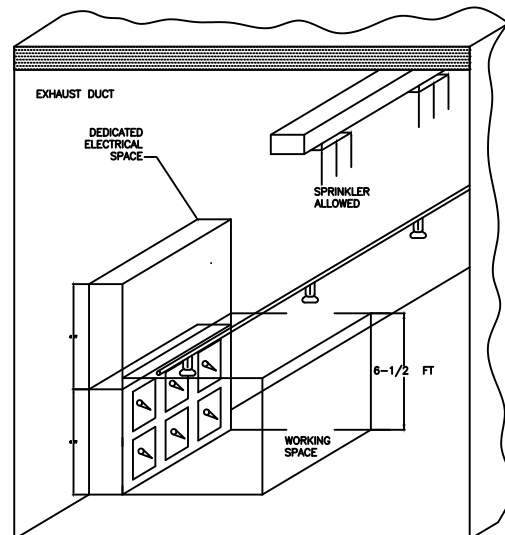



FIGURE 1

See GO 95 RULE 34 for required working spaces and headroom about electrical equipment.

FIGURE 2



	DRAWN	LL	<b>ENGINEERING &amp; CONSTRUCTION STANDARD</b>  <b>ELECTRIC METERING GENERAL</b>	8.2.5 OF 91
	DESIGN	MG		SUBSTRUCTURE
	SUPR	AL		DRAWING NUMBER
	DATE	04/23		<b>GM0001M</b>
	REV	05		

### 5.3 Meter Markings

Each meter position and each service switch or breaker shall be clearly and permanently marked to indicate the particular location supplied by it. The relation of the meter socket, breaker, and location served must be easily discernible. Meters will not be installed until the marking is complete.

Permanent marking shall include a stamped or engraved metal or plastic identification plate attached by screws or rivets. Clear identification means a legible apartment or street number. The store name or number may be included, but does not constitute a clear designation in itself.

### 5.4 Meter Locking and Sealing

All service switches or breakers shall have provisions for locking in the open position. Sealable latches, studs, or screws shall be used for sealing covers or sections. When a latch is also used, it shall be designed to permit positive locking and made of a durable corrosion resistant material.

Enclosure and meter *seals* shall be **provided by the utility**. Removal of the seal is unlawful without prior authorization.

When a stud and wing nut assembly is used for sealing, the stud shall be 1/4" - 20UNC minimum. The stud and wing nut shall be drilled 3/32".

### 5.5 Transformer Compartments

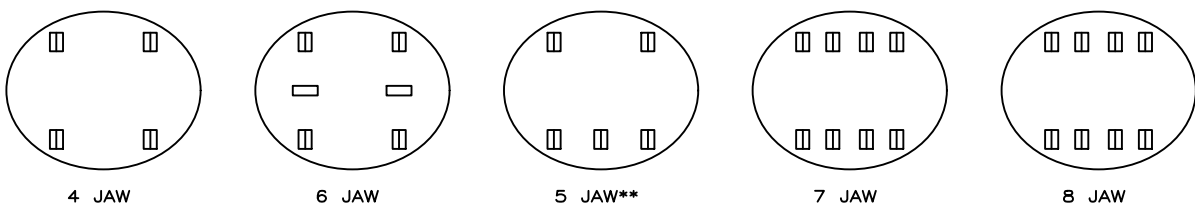
Current transformer compartments are normally required if the capacity of the service switch exceeds 200 amps.

### 5.6 Cover Panel Attachments

Cover panels shall be rigidly attached to stationary components of switchboards and enclosures independent of any removable socket mounting device, test device, or other nonrigid section.

### 5.7 Meter Sockets - The type of socket required is shown below:

REQUIRED SOCKET JAW CONFIGURATION



\*\* The fifth jaw for self-contained 5 JAW meter sockets may be located in either the nine or six o'clock position.



**Liberty Utilities®**

ENGINEERING & CONSTRUCTION STANDARD

8.2.6 OF 91

**ELECTRIC  
METERING  
GENERAL**

**SUBSTRUCTURE**

**DRAWING NUMBER  
GM0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

METER	SOCKET	JAWS	0-200 Amp Self-Contained			201 Amps and Above Rated Meter Socket Jaws
Voltage	Phases	Types	Wires	Meter Socket Jaws	Socket By-Pass Device	
120/240	1	Residential	3	4	Optional	6
120/208	1	Residential	3	5	Optional	-
120/240	1	C & I	3	4	Yes	6
120/208	1	C & I	3	5	Yes	-
120	3 - Delta	C & I	3	5	Yes	8
240	3 - Delta	C & I	3	5	Yes	8
480	3 - Delta	C & I	3	5	Yes	8
208/120	3 - Wye	C & I	4	7	Yes	13
120/240	3 - Delta	C & I	4	7	Yes	13
480/277	3 - Wye	C & I	4	7	Yes	13

Sealing rings shall be provided with socket. When sockets are installed on hinged panels, they shall be designed for back connection. All self-contained meter sockets shall be rigidly connected to the back wall of the socket enclosure or to a stationary support within the meter panel. Additionally when meter panels with sealing ring flanges are used, all meter sockets shall be attached with screws to the meter panel.

#### 5.8 Bus Bar

Ampacities of busbar conductors shall conform to UL-891 "Deadfront Switchboard Standards." Maximum widths and number of busbars shall conform to LU standards. Ampacity of instrument transformer compartment bus shall conform to NEMA Standards publication PB2, part 6.04, Paragraph A, for section bus. Aluminum busbars shall be plated to prevent corrosion.

#### 5.9 Ventilation Openings

Ventilation openings shall be louvered, screened and be guarded with internal barriers to prevent access to energized parts.

#### 5.10 Lifting Handles

When lifting handles are required on panels or enclosures, each handle shall be designed for full grasp, secure attachment, and minimum strength of 75 pounds.

**Note: Chest type handles with a folding grasp are not acceptable.**



**Liberty Utilities®**

ENGINEERING & CONSTRUCTION STANDARD

8.2.7 OF 91

**ELECTRIC  
METERING  
GENERAL**

**SUBSTRUCTURE**

**DRAWING NUMBER  
GM0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

## 6.0 METER FACILITIES

### 6.1 Meter Access

All metering facilities shall be installed in locations which provide ready access for meter reading, inspection, and testing. Ready access is defined as capable of being reached quickly without climbing over objects or removing obstacles.

### 6.2 Meter Rooms

A meter room (*adjacent to a building's outer wall is approved construction*), is an accessible illuminated room provided by the customer for locating the service and metering equipment. The meter room may also be used for communication equipment. **Internal / isolated electrical rooms without direct access from the outside of the building, are prohibited unless approved in writing by LU,** see GI0011U, Section 4.0. **Gas meters shall not be installed in this room nor shall the room be used for storage.** Meter rooms shall be provided with a doorway opening to the outside. Meter rooms will be locked and provided with a LU keybox at customer expense. Keyboxes are available, contact the local LU office (stock 8800-950400, See GI0004U, Sheet 8.4.37, for details).

### 6.3 Meter Heights

Meter height, which is measured between the centerline of the meter and the standing surface shall be as follows:

1. Meter rooms, enclosed cabinets, recessed cabinets 48" - 75"
2. Surface mount 48" - 75"
3. The 48" height may be reduced to 36" upon LU approval.

### 6.4 Meter Locations (see CM0001M, Section 4)

Electric meter installations shall be accessible for reading, testing, and inspection.

- a. **Outdoor switchgear / meter locations are preferred.**
- b. **An internal electrical room adjacent to the building's outer wall (with the switchgear adjacent to the outer wall) is allowed with written approval from LU.**
- c. **All locations for meters are subject to prior LU approval. All meter installations in non-preferred locations require written approval from LU.**
- d. Accessibility to the meter shall be maintained during landscaping, fencing, and construction.
- e. Locations in elevated areas or depressed area shall have access by means of a ramp or stairway.



**Liberty Utilities®**

ENGINEERING & CONSTRUCTION STANDARD

8.2.8 OF 91

**ELECTRIC  
METERING  
GENERAL**

**SUBSTRUCTURE**

**DRAWING NUMBER  
GM0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04



- f. Meters installed on or recessed in the surface of a building shall have a clear working and standing space (36"x36"x78" high) entirely on the property of the customer. Exceptions must be approved by LU.
- g. Locations on any walkway, alley, or driveway giving access to commercial or industrial property are not allowed.

6.5 **Unacceptable Locations:**

- a. Hazardous locations such as elevator shafts, doorways, driveways, alleys, hatchways, over stairways, ramps, or steps. Areas where personnel may contact high voltage conductors or moving equipment.
- b. In places where vibration, moisture, excessive temperature, fumes or dust may damage the meter or interfere with its operation.
- c. Within or requiring access through any restroom or powder room. Areas accessible only by trapdoor, hatchway or ladder.
- d. For single family residences, meter shall not be installed within any single family garage or residence.
- e. Within any enclosed areas which contain gas meters.
- f. It is recommended that locations of meters on exterior walls of bedrooms or closets should be avoided.

## 7.0 ELECTRICAL CONNECTIONS

7.1 Unmetered Conductors

Only LU service conductors as defined by the GO 95/128 shall be permitted in LU "sealed" compartments. **Customer-owned conductors, including ground rods and associated ground wire are prohibited in the sealed compartments.**

7.2 **Contact the LU Meter Dept for Fire Pump connections and requirements.**


7.3 Grounding / Bonding

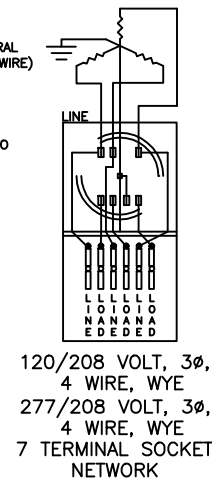
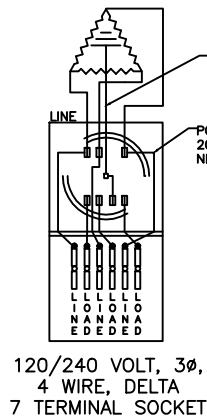
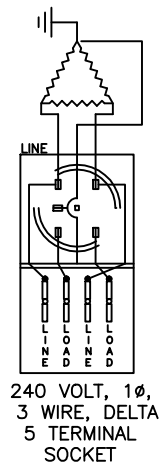
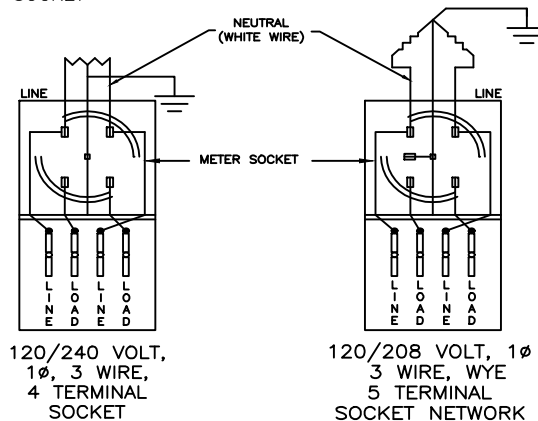
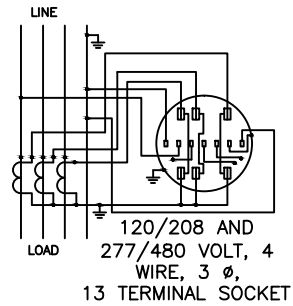
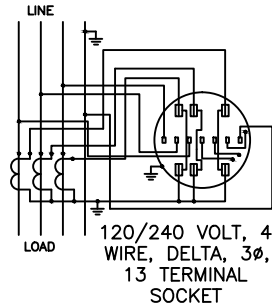
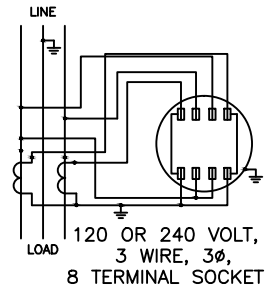
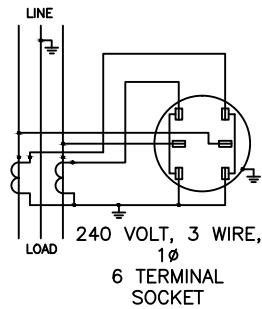
Lugs for terminating the panels "ground/bonding" conductors shall be located outside the LU "sealable" section and shall be designed to readily permit the user's neutral system to be isolated from LU's neutral. **Grounding electrode conductor(s) shall not be routed through any LU "sealed" compartment.**

7.4 Panel / Socket Wiring:

**Automatic and lever type by-passes are not approved.**

The electrical connections for approved sockets are shown for reference only on the following page.

 <b>Liberty Utilities®</b>					ENGINEERING & CONSTRUCTION STANDARD		8.2.9 OF 91
					<b>ELECTRIC METERING GENERAL</b>		SUBSTRUCTURE
DRAWN	DESIGN	SUPR	DATE	REV			DRAWING NUMBER
LL	ET	JM	08/17	04			<b>GM0001M</b>



**Liberty Utilities®**

ENGINEERING & CONSTRUCTION STANDARD

8.2.10 OF 91

# **ELECTRIC METERING GENERAL**

**SUBSTRUCTURE**

**DRAWING NUMBER  
GM0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

# ELECTRIC METERING COMMERCIAL & INDUSTRIAL

## 1.0 INDEX

- 1.0 INDEX
- 2.0 SCOPE
- 3.0 GENERAL REQUIREMENTS
- 4.0 METER LOCATIONS
- 5.0 UNDERGROUND TERMINATIONS
- 6.0 METERING TRANSFORMER ENCLOSURES
- 7.0 SINGLE CUSTOMER METER INSTALLATIONS
- 8.0 MULTIPLE METER INSTALLATIONS, 2-6 METERS, 7+ METERS
- 9.0 C/I, 100 & 200 AMP SERVICE PEDESTALS

## 2.0 SCOPE

This standard provides detailed information for installation of electrical metering (0-600 volts) in Commercial and Industrial (C/I) applications.

## 3.0 GENERAL REQUIREMENTS

### 3.1 Type of Service

Electric service to C/I customers depends upon the load, applicable rate schedule, and area voltages.

### 3.2 LU Consultation

It is important the customer consult LU prior to the purchase of equipment for fault duty requirement of equipment. *All C/I metering installations above 200 Amps must be approved in writing by LU, prior to installation by submitting two (2) sets of drawings to: LU Electric Metering Dept. (R90EM), 933 Eloise Avenue, South Lake Tahoe, CA. 96150.*

### 3.3 General Codes

All meter sockets and enclosures shall be Underwriter's Laboratory listed. All installations and equipment shall comply with the latest requirements of the Electric Utility Service Equipment Requirements Committee (EUSERC), as adopted by LU.



**Liberty Utilities®**

ENGINEERING & CONSTRUCTION STANDARD

8.3.11 OF 91

**ELECTRIC  
METERING**

SUBSTRUCTURE

**COMMERCIAL & INDUSTRIAL**

DRAWING NUMBER

**CM0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

## 4.0 METER LOCATIONS

### 4.1 Basic Location Requirements

See LU Standard, GM0001M, Electric Metering-General, for details.

### 4.2 Typical Location

*Meter locations are preferred on an exterior 'ground-level' floor wall or other permanent structure nearest LU's distribution facilities. See GM0001M, Section 6.0 for options and details.*

### 4.3 Multiple meter Installations

Multiple occupancy buildings will have the meters grouped at one location.  
**One** LU underground service will generally be run to a building.

### 4.4 Service Disconnect Locations

Meters may be located at a point other than adjacent to the service disconnecting means. In accordance with applicable codes, the disconnect should be located outside the building being served.

### 4.5 Metering Transformers

Transformer rated meters and associated metering transformers are installed adjacent to each other. LU may approve installations with a maximum separation of 50 circuit feet to assure accessibility or prevent inaccurate meter measurements. When separation of the meter and metering transformers is allowed, the customer shall provide clearances and working space for both the meter and metering transformer assembly. The customer shall supply and install conduit for the meter wiring and the metering transformers. The conduit, minimum diameter of 1-1/2", shall be limited to two 90° bends. Condulets, junction boxes or similar fittings are not allowed.

## 5.0 UNDERGROUND TERMINATIONS

### 5.1 Service Termination Facilities

Service termination facilities shall be specifically designed to receive LU's underground service lateral conductors as a single cable entry. Enclosures designed for a combination of overhead and underground entry are acceptable as long as they meet LU requirement for underground feed.

### 5.2 Cable Termination Lugs

Line cable termination lugs (crimp to flat) will be provided by LU. Panels 400A and under may utilize 'set-screw' type terminations. One NEMA 2 hole spade will be provided for each 400 amps of panel capacity

 <b>Liberty Utilities®</b>					ENGINEERING & CONSTRUCTION STANDARD		8.3.12 OF 91
					<b>ELECTRIC METERING COMMERCIAL &amp; INDUSTRIAL</b>		SUBSTRUCTURE
DRAWN	DESIGN	SUPR	DATE	REV			DRAWING NUMBER
LL	ET	JM	08/17	04			<b>CM0001M</b>

Socket enclosures designed for service up to 200 amps shall have separate service termination lugs independently mounted from the socket jaw support. Service termination space in enclosures with ratings over 200 amps with multiple meter sockets shall accommodate compression type lugs. All bussing or cable conductors beyond the terminating lugs shall be provided by the customer. Bus stubs or bussing in the service terminating space used for terminating the utility service shall have mounting bolts/spades in accordance with NEMA standards. The service cable termination lugs shall be compatible with the size and type of service being installed. The termination lugs for the neutral and each of the phase conductors shall be rigidly and permanently affixed in the service termination space and all properly grouped at one location. If the neutral is insulated from the enclosure, a bonding screw or jumper shall be provided. Terminating lugs shall be mounted with a minimum of 1-1/2" clear work space between two adjacent uninsulated line lugs of different voltage, any in-between uninsulated line lugs and grounded metal. For equipment above 400 amps, the horizontal spacing may be reduced if insulated barriers are used or if a 1-1/2" radial separation is maintained.

### 5.3 Service Terminations Enclosures

Wireways in the service termination space designed for terminating the utility service lateral shall be clearly identified for such use. Termination shall be made in the service termination enclosure or in a specifically designed space of a removable and sealable access plate.

### 5.4 Cable Layout

The layout or design of the service termination enclosure must allow adequate space for service cable bending. Knockouts in the cable wireways should be positioned to minimize service cable bending. Minimum bend radius of secondary service cables = 8 X "outside diameter" and primary cables = 12X "outside diameter".

### 5.5 Sealing

The termination enclosure, socket enclosure, and test bypass block section shall be sealable and isolated from other enclosure sections which are accessible to the customer.

### 5.6 Labeling

The manufacturer's rating label shall show (a) whether the socket enclosure is designed for overhead service entry, underground service entry, or both, (b) termination lugs are designed for both copper and aluminum conductors, and (c) the wire size range of the lugs.



**Liberty Utilities®**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

ENGINEERING & CONSTRUCTION STANDARD

**ELECTRIC  
METERING  
COMMERCIAL & INDUSTRIAL**

8.3.13 OF 91

SUBSTRUCTURE

DRAWING NUMBER  
**CM0001M**

### 5.7 Clearance

The minimum distance between the point of entry of the underground service conductors into the socket enclosure and the bottom of the hot bus terminating lugs shall be 8" for sockets up to 125 amps, and 11" for sockets rated 126 to 200 amps.

## 6.0 METERING TRANSFORMER ENCLOSURES

### 6.1 Definition

A metering transformer installation consists of current transformers and potential transformers mounted in a metal cabinet with a watt-hour meter and its accompanying manual "test-bypass" facilities. Automatic and lever style by-pass facilities are not approved. A separate mounting device may be provided for the meter.

### 6.2 Customer Responsibility

The customer shall furnish and install a metal cabinet for enclosure of the metering transformers. The enclosures short circuit duty rating will match or exceed the given fault duty.

### 6.3 Enclosure Covers

All covers which must be lifted into place shall be equipped with two handles or similar lifting devices rated for lifting 75#. All covers shall have a caution sign with the label "DO NOT BREAK SEALS - NO FUSES INSIDE".

### 6.4 Locations

Metering transformer cabinets may be mounted either indoor or outdoors provided outdoor installations are rain tight. Cabinets may be mounted vertically provided that the cables shall enter and leave the cabinet in such a manner that LU can conveniently install and connect the current transformers.

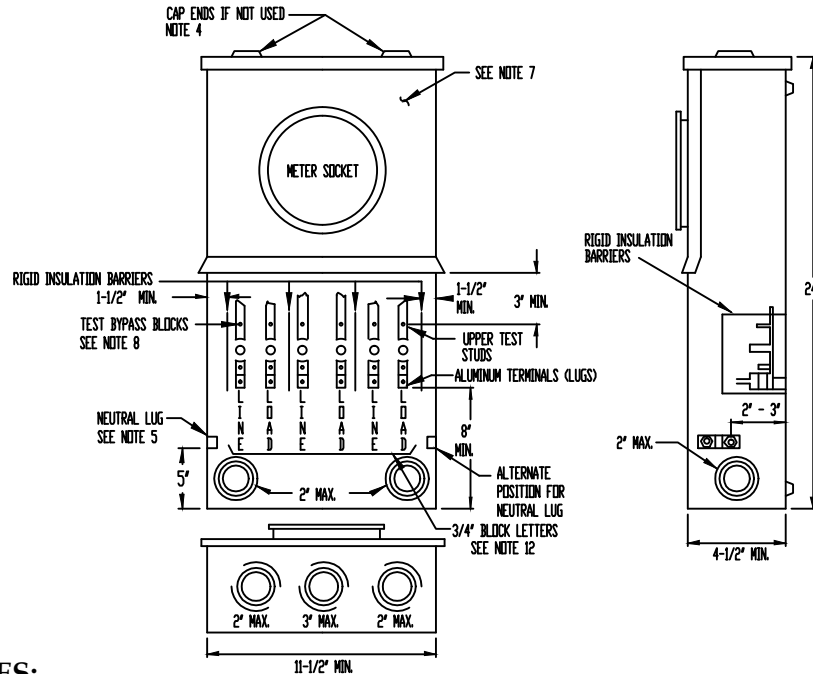
## 7.0 SINGLE CUSTOMER METER INSTALLATIONS

### 7.1 Single Customer, 0 - 200 Amp, Overhead and Underground

The customer shall furnish, install and maintain an approved meter socket with a LU approved "manual test-bypass" facilities (only exception is a 100 amp panel that is exclusively for night time lighting load) to permit LU to bypass and de-energize the meter socket for all commercial three phase and single phase services.

 <b>Liberty Utilities®</b>					ENGINEERING & CONSTRUCTION STANDARD		8.3.14 OF 91
					<b>ELECTRIC METERING COMMERCIAL &amp; INDUSTRIAL</b>		SUBSTRUCTURE
DRAWN	DESIGN	SUPR	DATE	REV			DRAWING NUMBER
LL	ET	JM	08/17	04			<b>CM0001M</b>

## 7.2 0 - 125 Amp, Panel details.



### NOTES:

1. This device shall be used for commercial / industrial, and may be used for multifamily residential (not separately metered) and other types of occupancies.
2. This device may be used as a combination terminating, pull, and meter socket box for an underground service.
3. Aluminum bodied lugs for #6 through 1/0 wire.
4. Hubs capped off if used for underground feed.
5. Insulated bondable vertical lay-in, double neutral lug with 1/0 wire capacity, mounted on either sidewall.
6. Test-bypass blocks shall be bussed or wired to socket jaws or terminals which permit LU to bypass and de-energize the meter socket.
7. All section panels shall be independently removable. Upper panel shall be non-removable when meter is in place. Meter socket shall be mounted on support and attached to upper panel. Lower panel shall be sealable and permanently labeled:  
**"DO NOT BREAK SEALS - NO FUSES INSIDE"**.
8. Test-bypass block detail on drawing sheet 8.3.17.
9. For 3 phase 4 wire, connect 7th jaw to body of neutral lug with #8 copper wire.
10. For 3 phase 4 wire delta, identify right hand test-bypass block (2 poles) as power leg.
11. For 3 phase 3 wire, install bus to connect line and load poles together at the top of center test-bypass block and connect 5th jaw to this bus, using #8 copper wire.
12. Decals on inside back of enclosure in 3/4" minimum block letter labeling.



**Liberty Utilities®**

ENGINEERING & CONSTRUCTION STANDARD

8.3.15 OF 91

**ELECTRIC  
METERING**

**SUBSTRUCTURE**

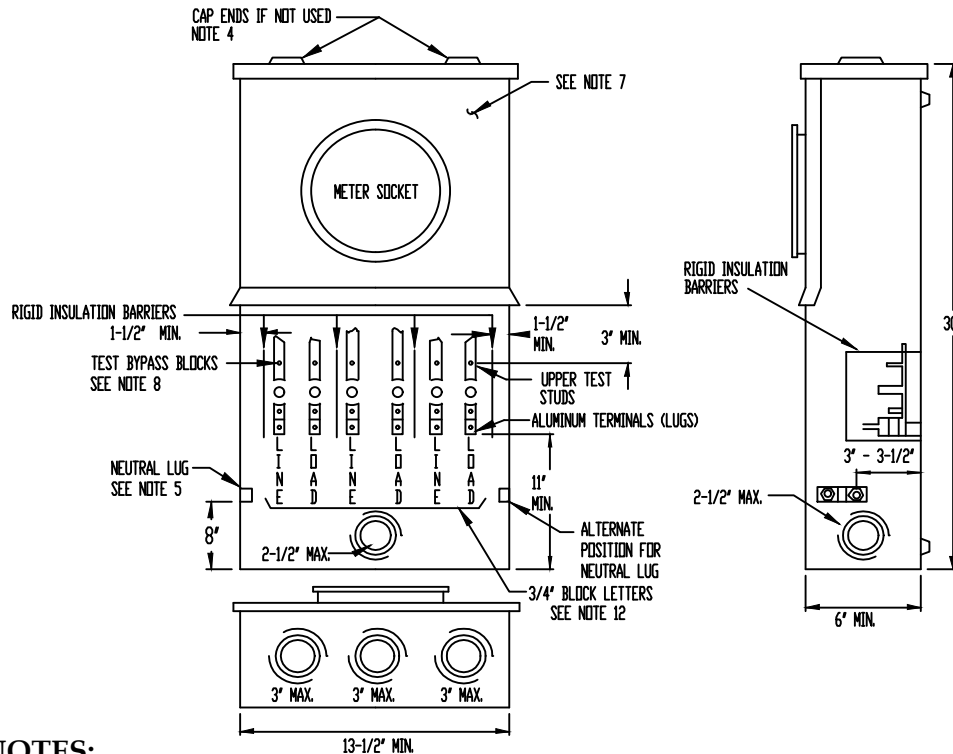
**COMMERCIAL & INDUSTRIAL**

DRAWING NUMBER

**CM0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

### 7.3 126 - 200 Amp, Panel details.



#### NOTES:

1. This device shall be used for commercial / industrial, and may be used for multi-family residential (not separately metered) and other types of occupancies.
2. This device may be used as a combination terminating, pull, and meter socket box for an underground service.
3. Aluminum bodied lugs for 1/0 through 250 kcm wire.
4. Hubs capped off if used for underground feed.
5. Insulated bondable vertical lay-in, double neutral lug with 250 kcm wire capacity, mounted on either sidewall.
6. Test-bypass blocks shall be bussed or wired to socket jaws or terminals which permit LU to bypass and de-energize the meter socket.
7. All section panels shall be independently removable. Upper panel shall be non-removable when meter is in place. Meter socket shall be mounted on support and attached to upper panel. Lower panel shall be sealable and permanently labeled: "DO NOT BREAK SEALS - NO FUSES INSIDE".
8. Test-bypass block detail on drawing sheet 8.3.17.
9. For 3 phase 4 wire, connect 7th jaw to body of neutral lug with #8 copper wire.
10. For 3 phase 4 wire delta, identify right hand test-bypass block (2 poles) as power leg.
11. For 3 phase 3 wire, install bus to connect line and load poles together at the top of center test-bypass block and connect 5th jaw to this bus, using #8 copper wire.
12. Decals on inside back of enclosure in 3/4" minimum block letter labeling.



**Liberty Utilities®**

ENGINEERING & CONSTRUCTION STANDARD

8.3.16 OF 91

**ELECTRIC  
METERING**

**SUBSTRUCTURE**

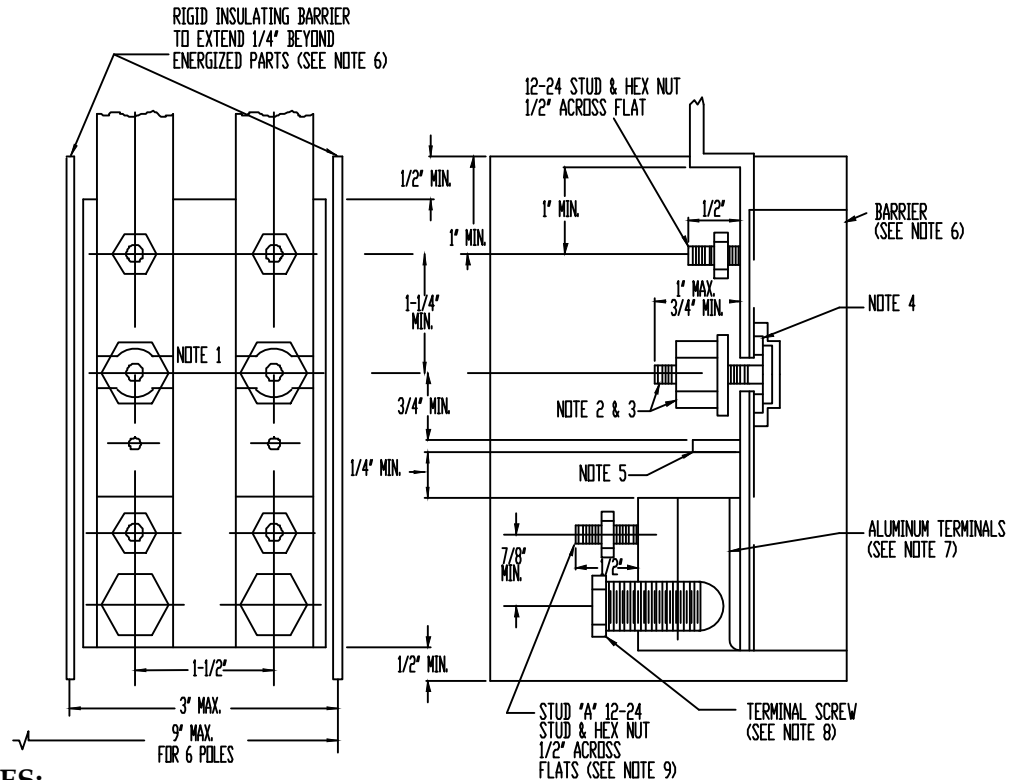
**COMMERCIAL & INDUSTRIAL**

**DRAWING NUMBER  
CM0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04



## TEST BYPASS BLOCK DETAIL



### NOTES:

1. Strike distance between upper and lower bus sections shall not be less than 1/4" when circuit-closing nut is backed off.
2. Circuit-closing nut shall be a hex nut 5/8" across flats with plated copper washer attached and have threads counter-bored at bottom to facilitate reinstallation. Bolt head shall be secured in place to prevent turning and backout.
3. The circuit-closing nut and bolt assembly shall maintain the applied contact pressure between the plated copper washer and the bus members of the test-bypass block.
4. Insulating washer shall be made from dimensionally stable, non-tracking material and shall provide a minimum 1/8" creep distance between the bolt and the bus sections. Bus sections shall be plated.
5. Wire stops shall extend to center of terminal opening or beyond.
6. Rigid insulating barriers shall project at least 1/4" beyond any energized parts when the maximum wire size is installed.
7. Lugs shall be aluminum, and sized for the panel Amp rating. The opening shall extend through the terminal body and, if wire hole is round, shall be chamfered as necessary to facilitate installation of the largest size wire.
8. The terminal screw may be of the Allen type (3/16" across flats for 100 amp, 5/16" across flats for 200 amp). If stud "A" is a part of the terminal screw, the terminal screw shall be 5/8" hex across flats.



**Liberty Utilities®**

ENGINEERING & CONSTRUCTION STANDARD

8.3.17 OF 91

**ELECTRIC  
METERING**

**SUBSTRUCTURE**

**COMMERCIAL & INDUSTRIAL**

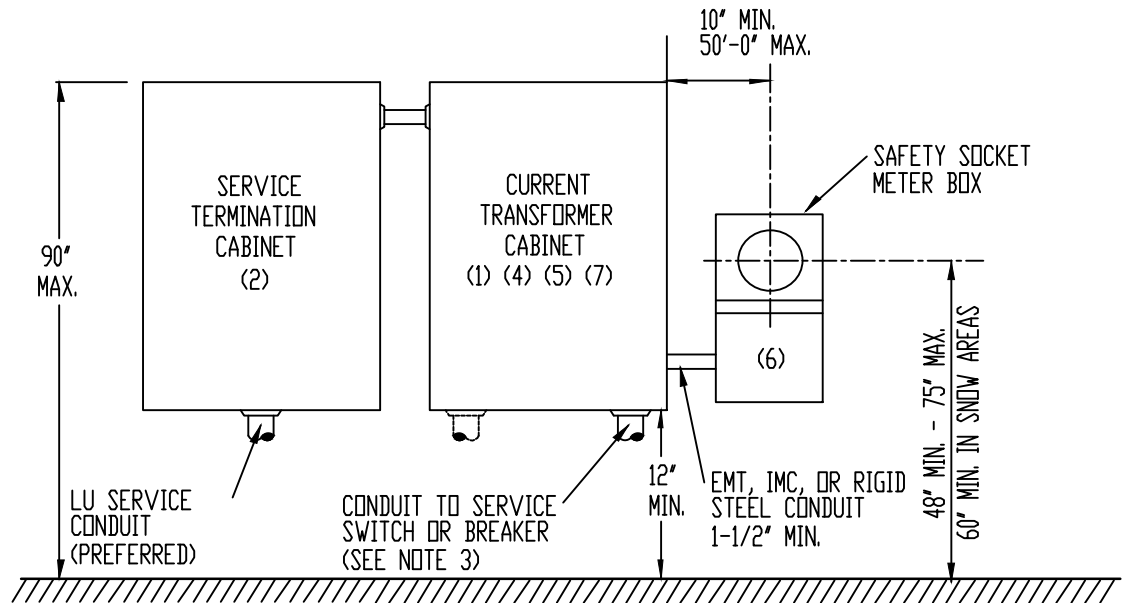
**DRAWING NUMBER  
CM0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

9. Stud "A" shall be located in the clear area between the terminating lug and the circuit-closing nut, and may be positioned on the terminal body, on the terminal screw, on the bus member, or incorporated as part of the wire stop.
10. All designs must receive approval of the EUSERC Standards Committees prior to production.

#### 7.4 Underground Service, 201 - 400 Amperes, Current Transformer Metering.

For a single underground C/I service which is to be metered using current transformers the customer shall furnish, install and maintain a separate termination cabinet, current transformer cabinet and safety socket meter box as shown below. For overhead service see Section 7.6.



#### NOTES:

1. Fault duty must match or exceed panel rating.
2. **LU will pull and terminate its service conductors directly to the bottom termination facilities in the service termination cabinet.**
3. The customer's service conductors shall normally exit the current transformer cabinet at and within two inches of the bottom corner.
4. The customer shall furnish lugs and connect his service entrance conductors to the load side of the current transformer mounting base.
5. For dimensions of **current transformer cabinet**, see sheet 8.3.19.
6. For dimensions of **safety socket meter box**, see sheet 8.3.26.
7. For three-phase four wire service, a mounting bracket for three CT's is required. For three wire three phase service, two CT's are required.



**Liberty Utilities®**

ENGINEERING & CONSTRUCTION STANDARD

8.3.18 OF 91

**ELECTRIC  
METERING**

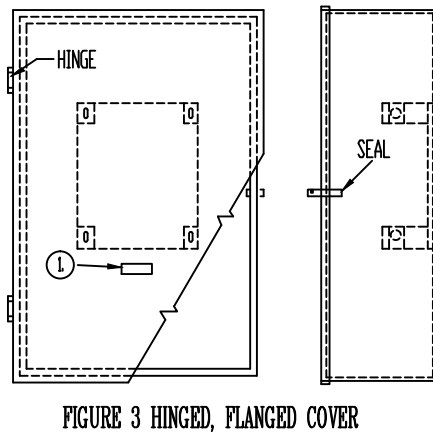
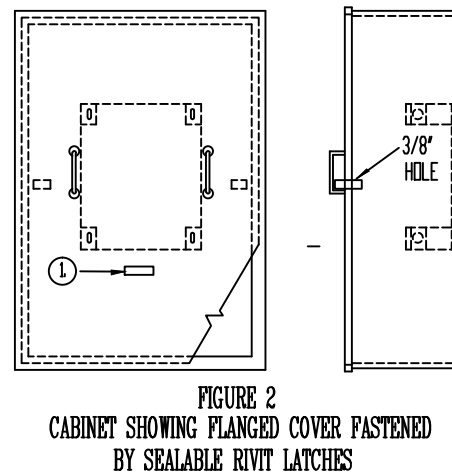
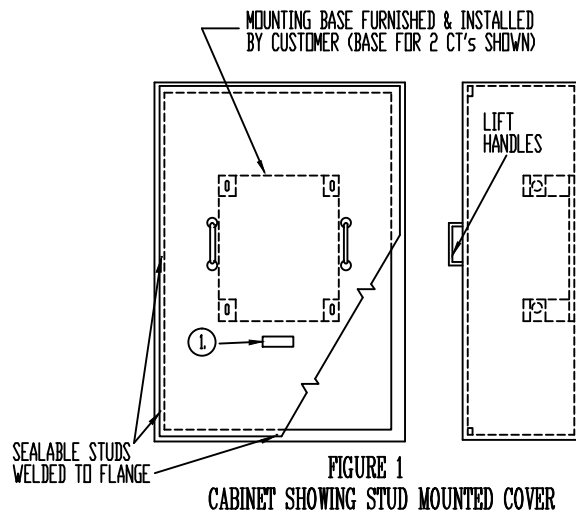
**SUBSTRUCTURE**

**COMMERCIAL & INDUSTRIAL**

**DRAWING NUMBER  
CM0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

## CURRENT TRANSFORMER (CT) CABINET 201 - 400 AMP



① CAUTION SIGN DO NOT BREAK SEAL  
NO FUSES INSIDE

TYPE OF SERVICE	MIN. CABINET SIZE	MOUNTING BASE
3 WIRE	20" W x 36" H x 11"D	2 CT BASE
4 WIRE	30" W x 36" H x 11"D	3 CT BASE

### NOTES:

1. Cover shall be sealable.
2. Customer shall furnish lugs and connect cable to current transformer mounting base for load side only.
3. Current transformer cabinet shall not be used as a splicing chamber.
4. When exposed to weather, cabinet shall be rain tight.
5. Grounding lug shall be provided and secured to CT cabinet.
6. See sheets 8.3.20 and 8.3.21 for CT mounting bracket.



**Liberty Utilities®**

ENGINEERING & CONSTRUCTION STANDARD

8.3.19 OF 91

**ELECTRIC  
METERING**

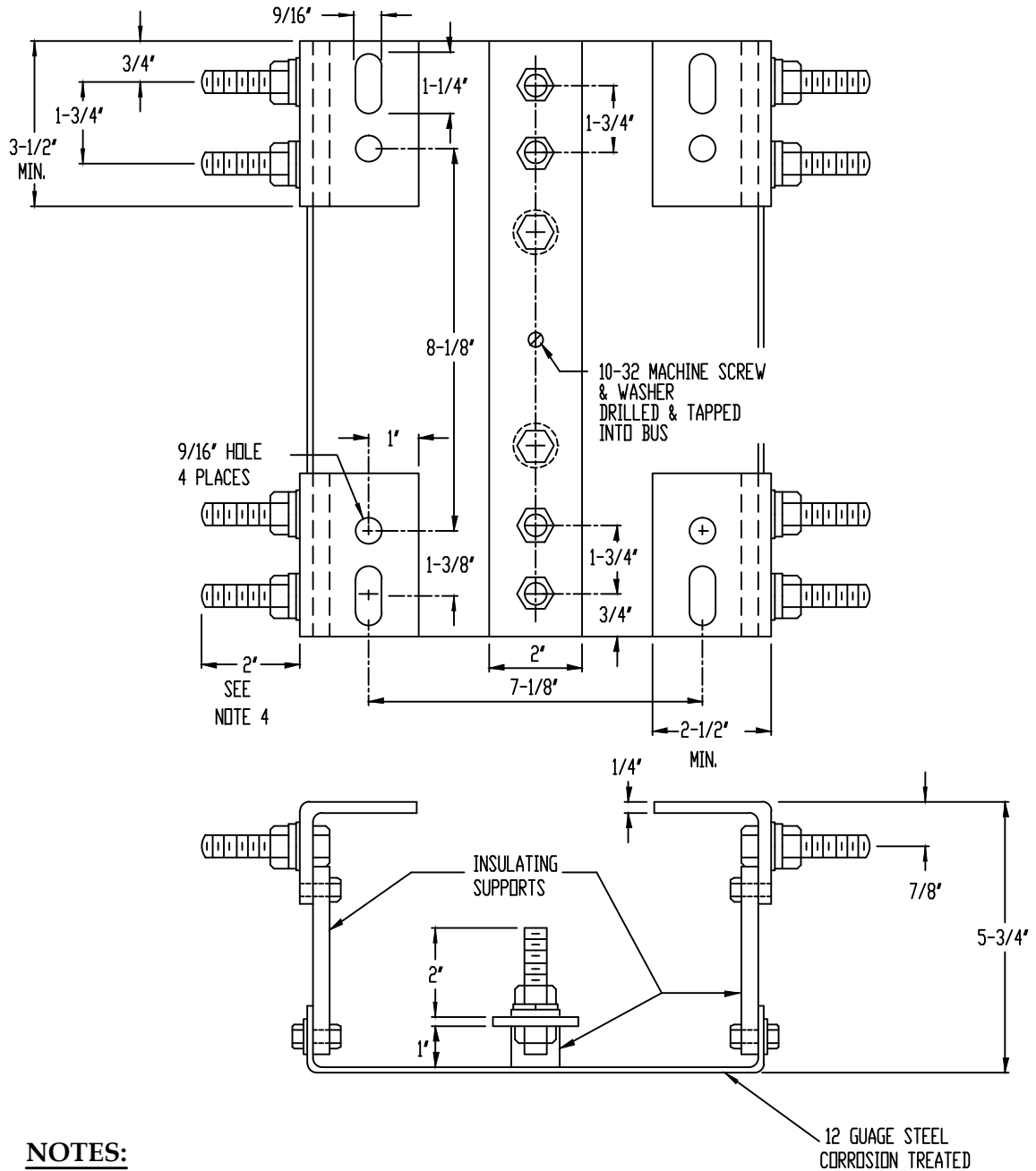
**SUBSTRUCTURE**

**COMMERCIAL & INDUSTRIAL**

**DRAWING NUMBER  
CM0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

## CURRENT TRANSFORMER BRACKET (2 CT'S) 201 - 400 AMP



### NOTES:

1. Fault duty rating must match or exceed panel rating.
2. For application see drawing sheet 8.3.19.
3. Details shown on end view for left leg and bus assembly apply to all four leg assemblies.
4. 1/2" - 13 UNC x 2", 8 typical, hex nuts, lock washer and flat washer.



**Liberty Utilities®**

ENGINEERING & CONSTRUCTION STANDARD

8.3.20 OF 91

**ELECTRIC  
METERING**

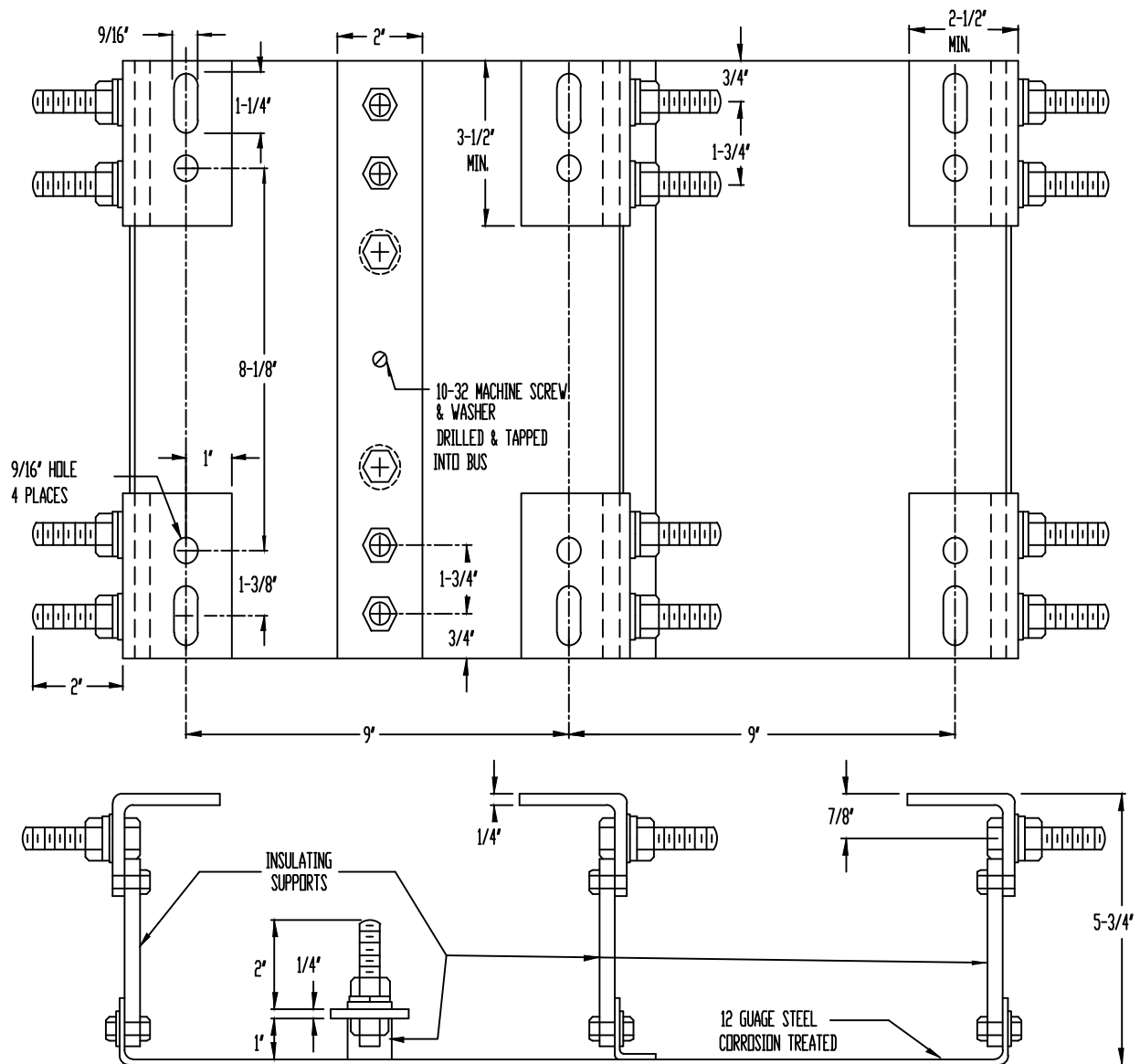
**SUBSTRUCTURE**

**COMMERCIAL & INDUSTRIAL**

**DRAWING NUMBER  
CM0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

## CURRENT TRANSFORMER BRACKET (3 CT'S) 201 - 400 AMP



### NOTES:

1. Fault duty rating must match or exceed panel rating.
2. For application see drawing sheet 8.3.19.
3. Details shown on end view for left leg and bus assembly apply to all four leg assemblies.
4. 1/2" - 13 UNC x 2", 8 typical, hex nuts, lock washer and flat washer.



**Liberty Utilities®**

ENGINEERING & CONSTRUCTION STANDARD

8.3.21 OF 91

**ELECTRIC  
METERING**

**SUBSTRUCTURE**

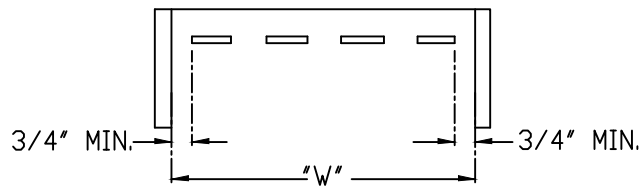
**COMMERCIAL & INDUSTRIAL**

DRAWING NUMBER

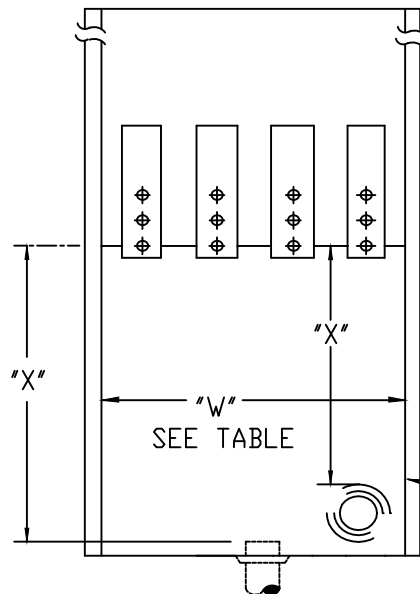
**CM0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

## SERVICE TERMINATION CABINET

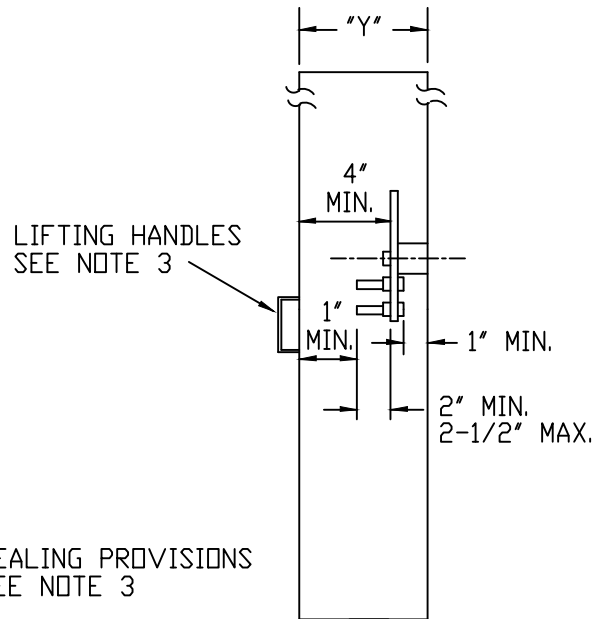


TOP VIEW



FRONT VIEW

TABLE 1: (MINIMUM PULLBOX DIMENSIONS)				
SERVICE AMPACITY	"W"		"Y"	"X"
	3 - WIRE	4 - WIRE	-----	
0 - 200	10-1/2"	14"	6"	11"
201 - 400	10-1/2"	14"	6"	22"
401 - 800	16-1/2"	22"	11"	26"
801 - 1200	22-1/2"	30"	11"	26"



SIDE VIEW

### NOTES:

1. Fault duty rating must match or exceed panel rating.
2. The above minimum dimensions in Table 1, are for the case where the conduit enters the bottom of the pull box and all load conductors exit above the terminals. Where the service conduit enters from the side/back (bottom conduit entrance preferred) of the pull box the "X" dimension shall be taken from the closest portion of the conduit to the nearest termination bolt.
3. Pull box covers shall be removable, sealable, provided with two lifting handles, and limited to a maximum size of 9 square feet in area. Sealing provisions shall consist of two drilled stud and wingnut assemblies on opposite sides on the panel. All securing screws shall be captive.



**Liberty Utilities®**

ENGINEERING AND CONSTRUCTION STANDARD

8.3.22 OF 91

**ELECTRIC  
METERING**

**SUBSTRUCTURE**

**COMMERCIAL & INDUSTRIAL**

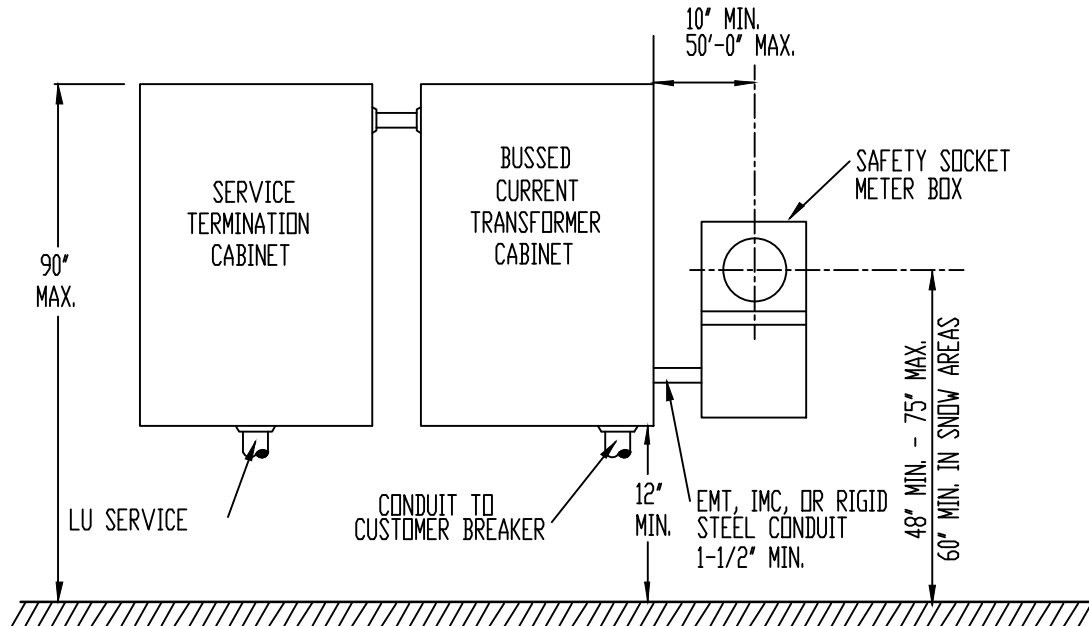
**DRAWING NUMBER  
CM0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

### 7.5 Underground service, 401-800 Amperes, Current Transformer Metering.

For a single underground commercial or industrial service which is to be metered using current transformers, the customer will furnish, install and maintain a service termination cabinet, current transformer cabinet and safety socket meter box as shown below. For overhead service see Section 7.6.

For compactness of equipment and aesthetics, it may be desirable to consider the installation of a switchboard service section.



#### NOTES:

1. Fault duty rating must match or exceed the panel rating.
2. **LU will pull and terminate its service conductors directly to the bottom of the termination facilities in the service termination cabinet. It shall be the customers responsibility to provide the tie between the termination cabinet and the CT cabinet and the load side of the termination cabinet.**
3. The customer's service entrance conductors shall normally enter the service termination cabinet at or within two inches of the bottom and leave the cabinet at or within two inches of the opposite end.
4. The customer shall furnish lugs and connect his service entrance conductors to the load side of the service termination cabinet.
5. For dimensions of **current transformer cabinet**, see sheets 8.3.24 and 8.3.25. For **dimensions of the service termination cabinet**, see sheet 8.3.22.
6. For dimensions of **safety socket box**, see sheet 8.3.26.
7. For three phase four wire service, bussing for three CT's is required, for three phase three wire service bussing two CT's is required.



**Liberty Utilities®**

ENGINEERING AND CONSTRUCTION STANDARD

8.3.23 OF 91

**ELECTRIC  
METERING**

**SUBSTRUCTURE**

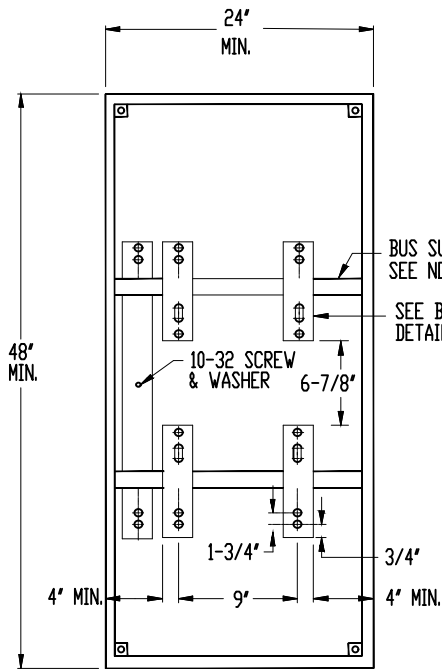
**COMMERCIAL & INDUSTRIAL**

**DRAWING NUMBER**

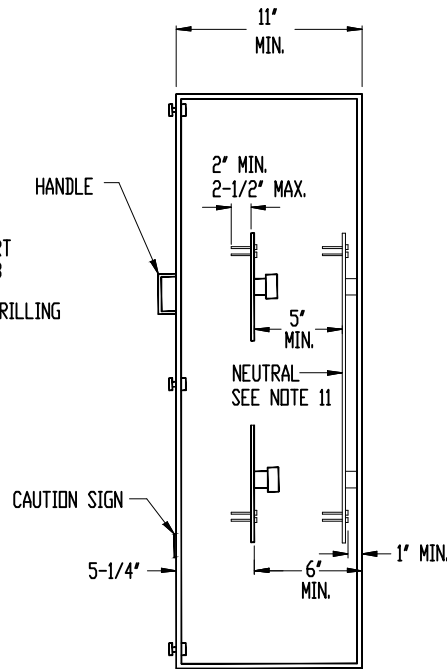
**CM0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

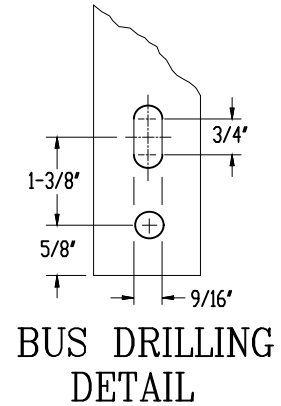
## TWO CURRENT TRANSFORMER CABINET 401 - 800 AMP



FRONT DETAIL



SIDE DETAIL



### NOTES:

1. When the service switch exceeds 800 amps, consult LU.
2. **This cabinet may be used when the service switch or breaker is 800 amps or less.**
3. The Fault duty rating must match or exceed the panel rating.
4. The use of a standard switchboard service section in lieu of metering arrangements using this cabinet may prove to be more economical for the customer and should be investigated.
5. A hinged cover may be used provided there is proper clearance to open the cover when the cabinet is installed.
6. Cover shall be sealable.
7. When exposed to weather, cabinet shall be rain tight.
8. A grounding lug shall be provided and secured to cabinet.
9. When available space precludes the use of above minimum dimensions, consult LU.
10. **No bus bar may be more than 4 inches wide.**
11. Neutral may be cable or bus bar and may be located on either side of the cabinet.
12. Current transformer cabinet shall not be used as a splicing chamber.
13. Customer shall furnish lugs and connect cable to load sides of bus stubs. LU will terminate on lugs for underground service.



Liberty Utilities®

ENGINEERING AND CONSTRUCTION STANDARD

8.3.24 OF 91

ELECTRIC  
METERING

SUBSTRUCTURE

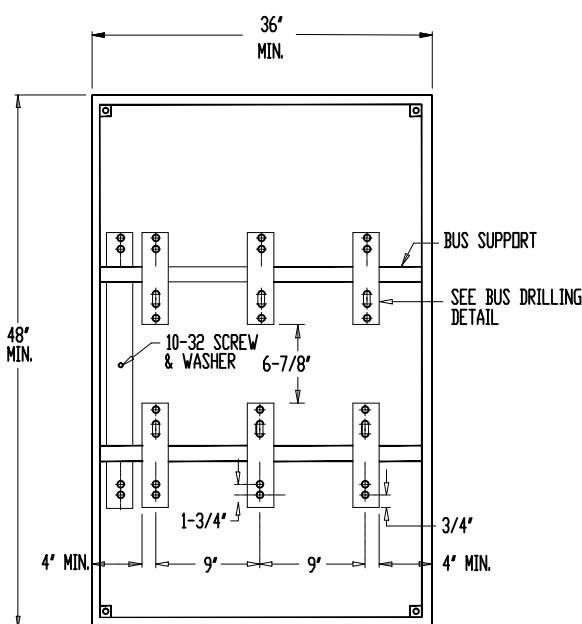
COMMERCIAL & INDUSTRIAL

DRAWING NUMBER  
*CM0001M*

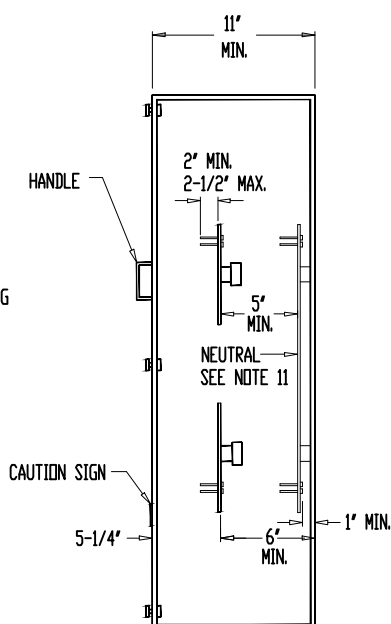
DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04



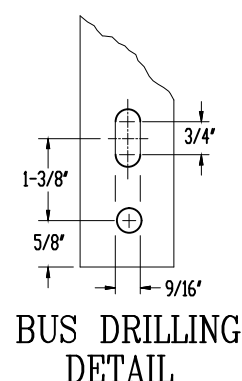
### THREE CURRENT TRANSFORMER CABINET 401 - 800 AMP



FRONT DETAIL



### SIDE DETAIL



**NOTES:**

1. When the service switch exceeds 800 amps, consult LU.
2. **This cabinet may be used when the service switch or breaker is 800 amps or less.**
3. The Fault duty rating must match or exceed the panel rating.
4. The use of a standard switchboard service section in lieu of metering arrangements using this cabinet may prove to be more economical for the customer and should be investigated.
5. A hinged cover may be used provided there is proper clearance to open the cover when the cabinet is installed.
6. Cover shall be sealable.
7. When exposed to weather, cabinet shall be rain tight.
8. A grounding lug shall be provided, and secured to cabinet.
9. When available space precludes the use of above minimum dimensions, consult LU.
10. **No bus bar may be more than 4 inches wide.**
11. Neutral may be cable or bus bar and may be located on either side of the cabinet.
12. Current transformer cabinet shall not be used as a splicing chamber.
13. Customer shall furnish lugs and connect cable to load sides of bus stubs. LU will terminate on lugs for underground service.



Liberty Utilities®

ENGINEERING AND CONSTRUCTION STANDARD

8.3.25 OF 91

## ELECTRIC METERING

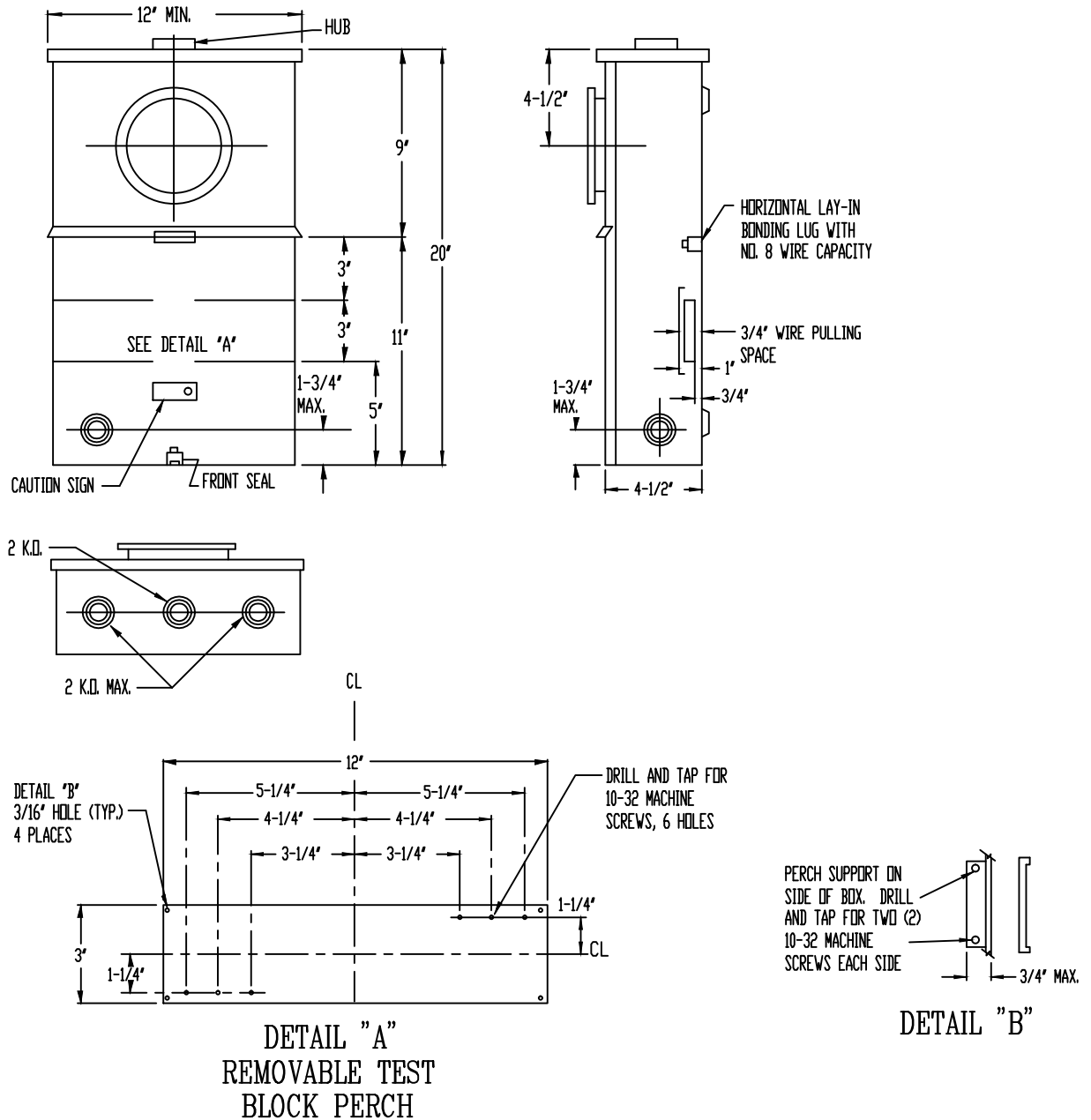
## SUBSTRUCTURE

DRAWING NUMBER  
**CM0001M**

## COMMERCIAL & INDUSTRIAL

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

## SAFETY SOCKET METER BOX



### NOTES:

1. All section covers shall be independently removable. Upper cover shall be non-removable when meter is in place. Lower cover shall be sealable and permanently labeled: **"DO NOT BREAK SEALS - NO FUSES INSIDE"**



**Liberty Utilities®**

ENGINEERING AND CONSTRUCTION STANDARD

8.3.26 OF 91

**ELECTRIC  
METERING**

**SUBSTRUCTURE**

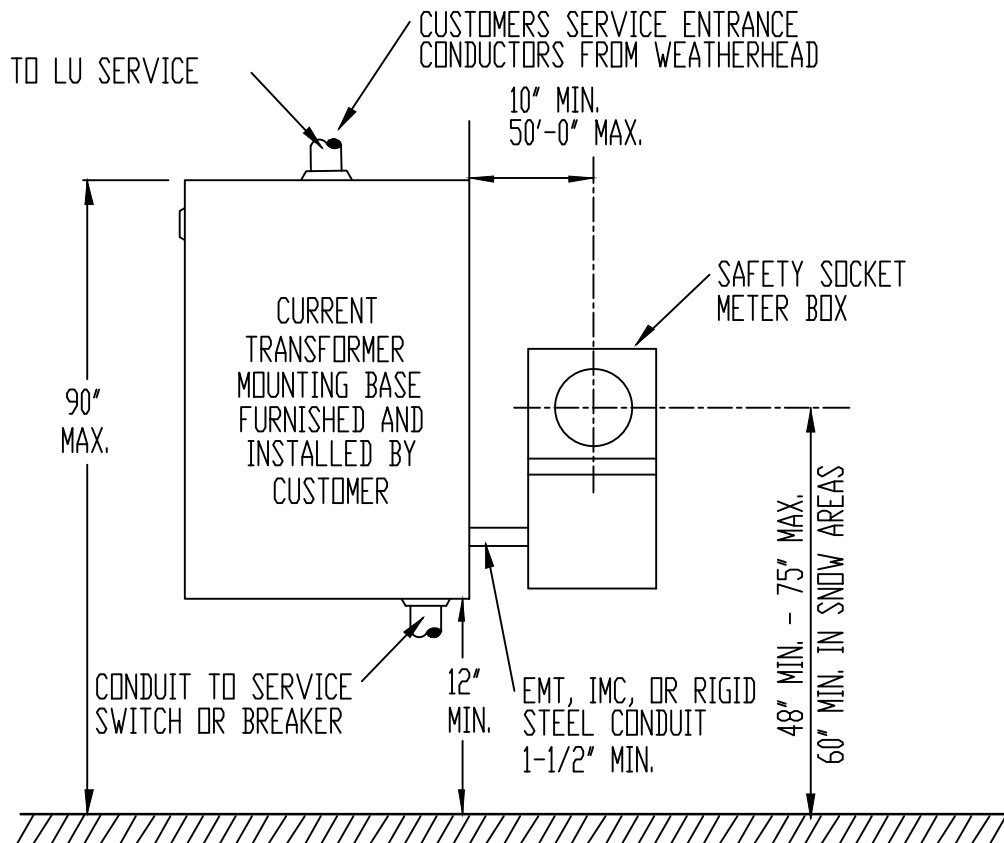
**COMMERCIAL & INDUSTRIAL**

**DRAWING NUMBER  
CM0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

## 7.6 Overhead service, 201 - 600 Amp, Current Transformer Metering.

For single overhead commercial or industrial service which is to be metered using current transformers, the customer shall furnish, install, own and maintain a separate current transformer cabinet and safety socket meter box and required service entrance conductors, conduit, and weatherhead to the point of attachment of LU's overhead service.



### NOTES:

1. Fault duty rating must match or exceed panel rating.
2. The customer's service entrance conductors shall enter the current transformer cabinet at the top and leave the cabinet at or within two inches of the bottom.
3. The customer shall furnish riser conduit, weatherhead, lugs and connect his service entrance conductors to the line and load sides of the current transformer mounting base.
4. **The customer's neutral conductor shall be continuous without splice through the current transformer cabinet.**
5. For dimension of the **current transformer cabinet**, see sheets 8.3.24 and 8.3.25.
6. For dimension of **safety socket box**, see sheet 8.3.26.
7. For three phase four wire service a mounting bracket for three CT's is required. For three phase three wire service two CT's are required.



**Liberty Utilities®**

ENGINEERING AND CONSTRUCTION STANDARD

8.3.27 OF 91

**ELECTRIC  
METERING**

**SUBSTRUCTURE**

**COMMERCIAL & INDUSTRIAL**

**DRAWING NUMBER  
CM0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

## 7.7 Underground service, 201 Amps and above, Current Transformer Metering in Switchboard Service Sections.

For a single underground C/I service which is terminated in a multi-section manufactured freestanding, self-supporting switchboard, the customer will furnish, install and maintain a switchboard service section with accompanying provisions for the underground service termination. See Section 7.8 for overhead switchboard service.

A switchboard service section is designed and manufactured specifically for terminating the service entrance conductors and housing the metering transformers, meters and associated test equipment, and may include the customer's service switch or breaker.

Typical arrangements of switchboard service sections with provision for a pull box for underground service conductor termination are illustrated below. **For switchboard details, see SB0001M.**

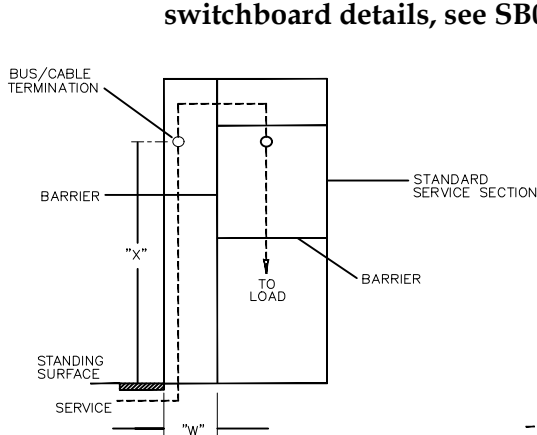


FIGURE 1  
SWITCHBOARD  
PULL SECTION

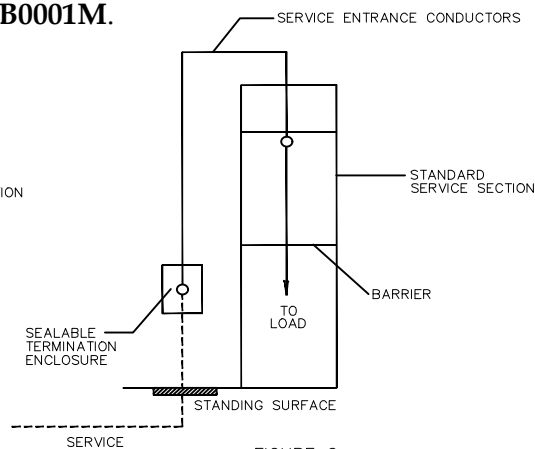


FIGURE 2  
SEPARATE TERMINATION ENCLOSURE  
1200 AMP MAXIMUM

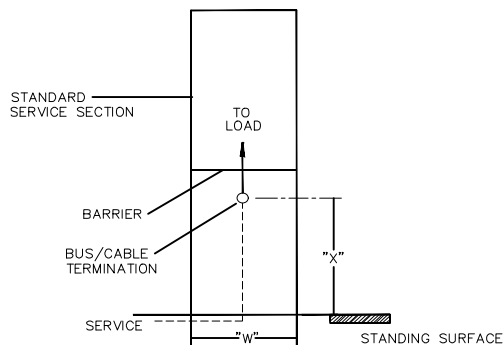


FIGURE 3  
BOTTOM FEED PULL SECTION  
2000 AMP MAXIMUM

TABLE 2 - MINIMUM PULL SECTION DIMENSIONS			
SWITCHBOARD RATING (AMPERES)	MINIMUM ACCESS OPENING DIMENSION "W"		TERMINATION HEIGHT "X"
	3-WIRE	4-WIRE	
BELOW 400	12"	12"	-----
400 - 800	24"	24"	42" MIN. - 72" MAX.
801 - 1200	24"	30"	
1201 - 2000	30"	35"	
2001 - 3000	-----	42"	60" MIN. - 72" MAX.
3001 - 4000	-----	44"	60" MIN. - 72" MAX.



**Liberty Utilities®**

ENGINEERING AND CONSTRUCTION STANDARD

8.3.28 OF 91

**ELECTRIC  
METERING**

**SUBSTRUCTURE**

**COMMERCIAL & INDUSTRIAL**

**DRAWING NUMBER  
CM0001M**

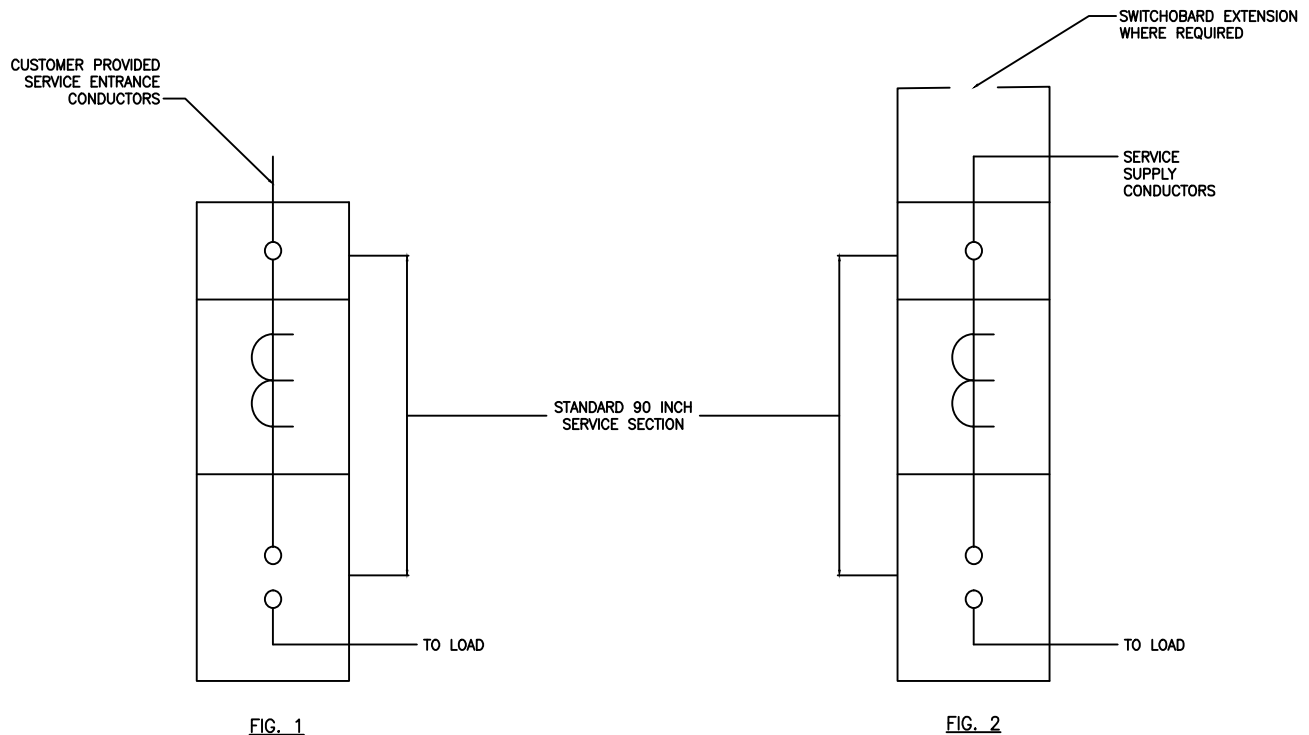
DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

## 7.8 Overhead service, 201 Amps and above, Current Transformer Metering in Switchboard Service Sections.

For a single overhead C/I service which is terminated in a multi-section manufactured freestanding, self-supporting switchboard, the customer will furnish, install and maintain a switchboard service section with accompanying provisions for the above grade (overhead) service termination. See Section 7.7 for underground switchboard service.

A switchboard service section is designed and manufactured specifically for terminating the service entrance conductors and housing the metering transformers, meters and associated test equipment, and may include the customer's service switch or breaker.

Typical arrangements of switchboard service sections with provisions for overhead service conductor terminations are illustrated. **For switchboard details, see SB0001M. See SB0001M, Section 10, Table 2 for dimensions.**



**Liberty Utilities®**

ENGINEERING AND CONSTRUCTION STANDARD

8.3.29 OF 91

**ELECTRIC  
METERING  
COMMERCIAL & INDUSTRIAL**


**SUBSTRUCTURE**

**DRAWING NUMBER  
CM0001M**

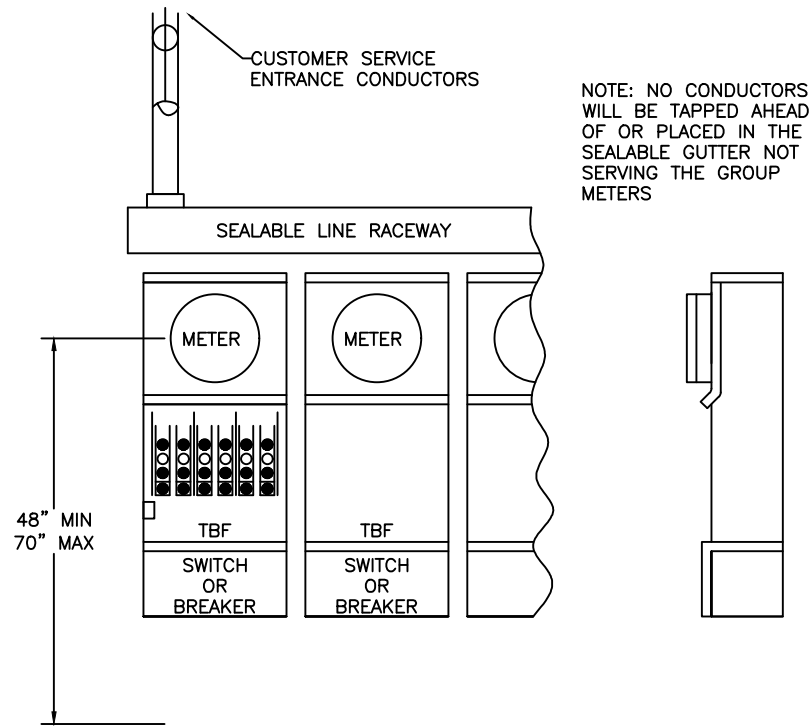
DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

## 8.0 MULTIPLE METER INSTALLATIONS, 2-6 METERS, 7+ METERS

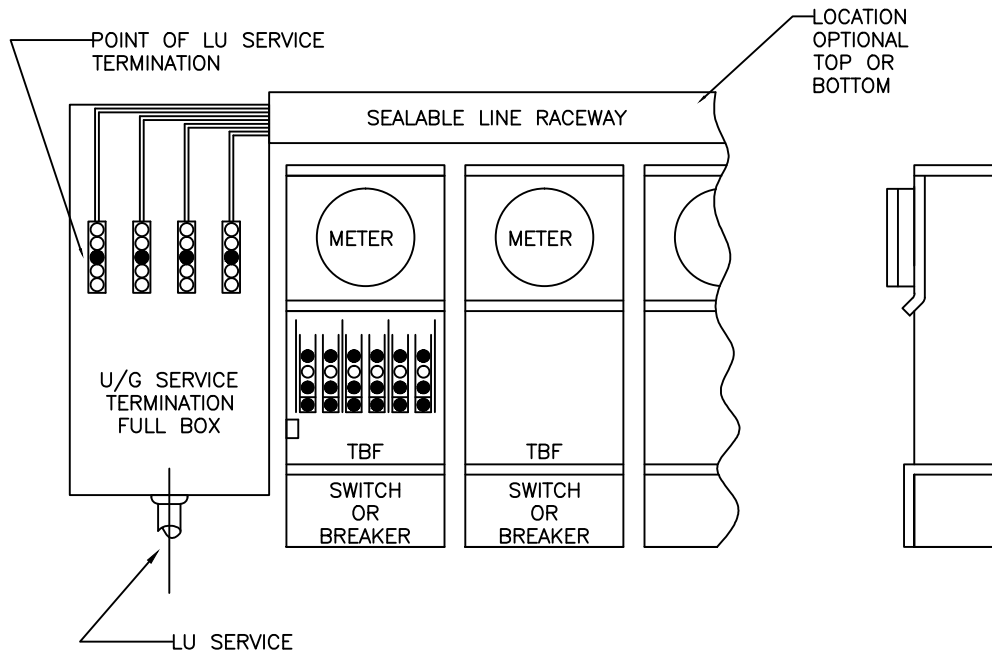
- 8.1 Group meter installations are required for multi-customer buildings where each occupant has an individual meter. Each individual meter shall be considered as single customer. Submittal of "shop drawings" is required for all commercial multi-metered installations.
- 8.2 **Refer to GO 95 58**  
Maximum number of disconnects: SIX: **GO 95 rule 58**, Each disconnect (not fuses) shall simultaneously open all poles: GO 95 rule 58.
- 8.3 **Meter Identification**  
Each meter and its service disconnect shall clearly identify the location served. Identification is a unit or street number and will be marked by a stamped/engraved metal /plastic identification plate.
- 8.4 **Customer Service Entrance Conductors** shall extend from Liberty Utilities' service termination point to the line side of each meter socket jaw. LU is not responsible for the wiring in the customer owned raceway/gutter.
- 8.5 **Ampacity Rating** of the installation is given by:  
2 - 6 Meters Ampacity of service termination facility  
7 + Meters Main service disconnect rating  
Fault duty rating (Amps) must be obtained from LU.
- 8.6 **Center line spacing** between meter sockets shall be (minimum):  
7-1/2" Horizontal  
8-1/2" Vertical
- 8.7 LU will provide blank covers for empty sockets.

 <b>Liberty Utilities®</b>					ENGINEERING AND CONSTRUCTION STANDARD		8.3.30 OF 91
					<b>ELECTRIC METERING COMMERCIAL &amp; INDUSTRIAL</b>		SUBSTRUCTURE
							DRAWING NUMBER <b>CM0001M</b>
DRAWN	DESIGN	SUPR	DATE	REV			
LL	ET	JM	08/17	04			

**8.8 OVERHEAD SERVICE, GROUPED METER INSTALLATION, WITHOUT A MAIN SWITCH (6 METERS MAX.)**



**8.9 UNDERGROUND SERVICE, GROUPED METER INSTALLATION, WITHOUT A MAIN SWITCH (6 meters max).**



ENGINEERING AND CONSTRUCTION STANDARD

8.3.31 OF 91

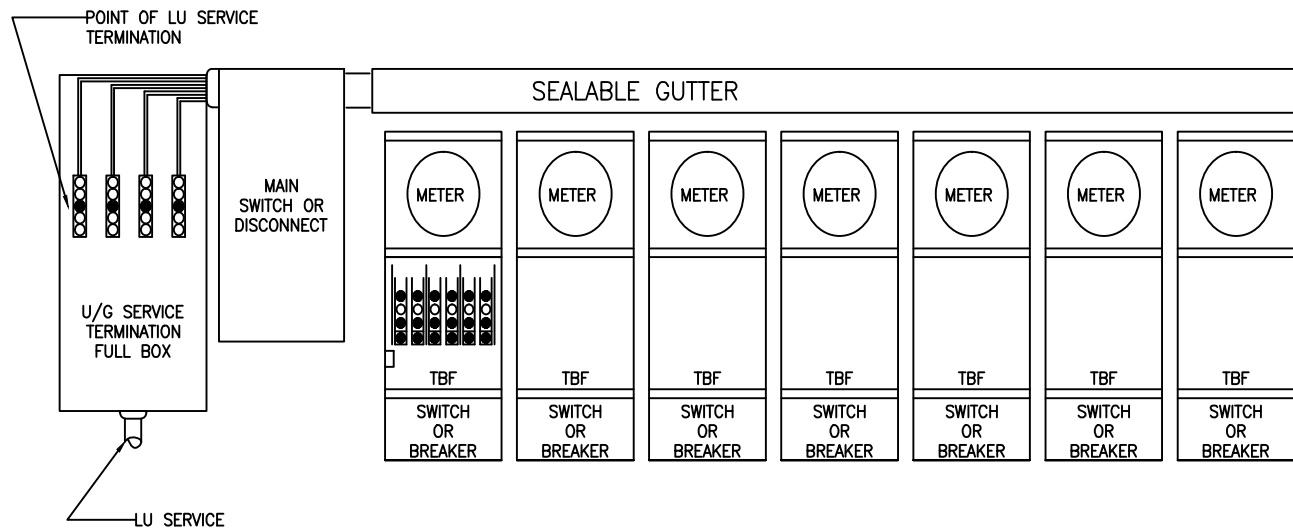
**ELECTRIC  
METERING  
COMMERCIAL & INDUSTRIAL**

SUBSTRUCTURE

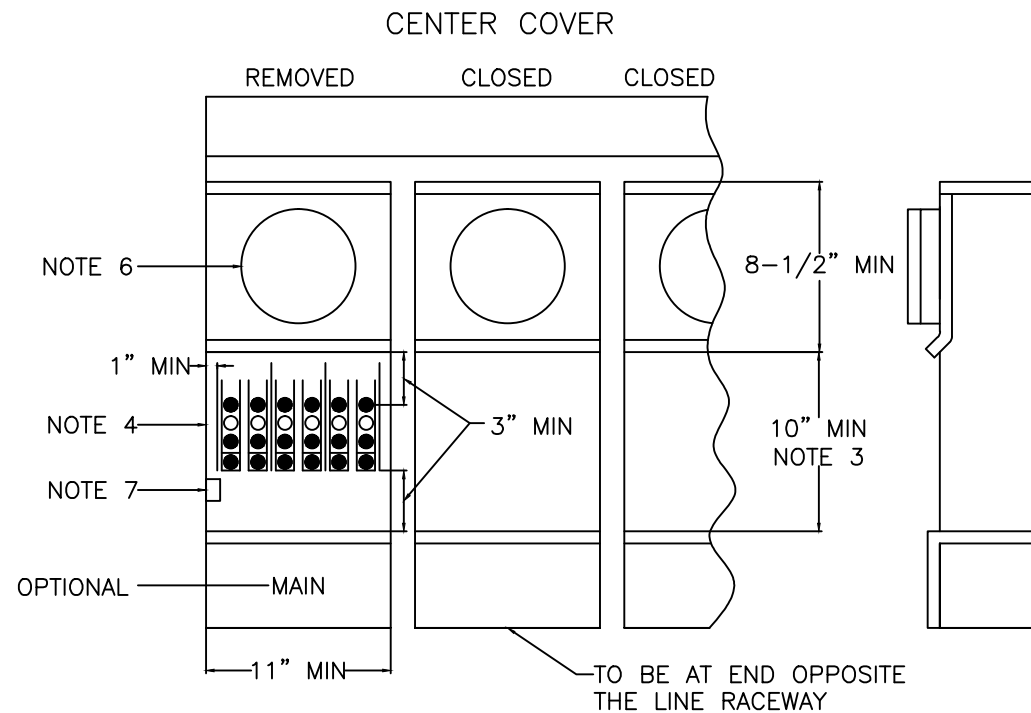
DRAWING NUMBER  
**CM0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

**8.10 GROUPED METER INSTALLATION WITH A MAIN SWITCH**



**8.11 SAFETY SOCKET BOX WITH TEST BY-PASS FACILITIES FOR MULTIPLE SELF CONTAINED METER INSTALLATION**



ENGINEERING AND CONSTRUCTION STANDARD

8.3.32 OF 91

**ELECTRIC  
METERING  
COMMERCIAL & INDUSTRIAL**

SUBSTRUCTURE


DRAWING NUMBER  
**CM0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04



## NOTES:

1. This device will be used for multiple commercial and industrial meter installations mounted in a ganged array.
2. Manual "test-bypass" blocks with rigid insulating barriers shall be installed and wired or bussed to a line raceway and also wired or bussed to the meter socket then to the main switch by the manufacturer. Blocks and barriers shall conform to sheet 8.3.17 requirements with physical arrangement conforming to sheets 8.3.15 & 8.3.16. Connection sequence is line-load, line-load, line-load from left to right.
3. Minimum access opening to test bypass blocks shall be 11" x 10".
4. Upper test connector stud shall be a minimum of 3" below upper panel.
5. See Metering - General section for meter socket clip requirements.
6. All section covers shall be independently removable. Upper cover shall be non-removable when meter is installed. Meter socket shall be mounted on support and attached to panel. Test bypass cover panel shall be sealable and permanently labeled: **"DO NOT BREAK SEAL - NO FUSES INSIDE"**.
7. When a neutral is required for metering or testing, an insulated neutral terminal, mounted on either side, shall be provided behind each test bypass cover panel. The terminal shall be readily accessible when the cover is removed and shall be individually connected to the neutral bus with a minimum of #8 copper wire.
8. For 3 phase, 4 wire, connect 7th jaw to body of neutral lug with #8 copper wire.
9. For 3 phase, 4 wire delta , identify right hand test bypass block (2-poles) as power leg.
10. For 3 phase, 3 wire, install bus to connect line and load poles together at top of center test bypass block and connect 5th jaw to this bus, using #8 copper wire.
11. For 1 phase, 3 wire, omit center test bypass block.
12. For 1 phase, 3 wire, 120/208 volts, omit center test bypass block. Connect 5th jaw to body of neutral lug with #8 copper wire.
13. Permanent line-load labels on inside back of enclosure in 3/4" (Min.) high block letters.
14. Minimum depth shall be 4-1/2" for 1 - 100 amps and 6" for 101 - 200 amps.

 <b>Liberty Utilities®</b>					ENGINEERING AND CONSTRUCTION STANDARD		8.3.33 OF 91
					<b>ELECTRIC METERING COMMERCIAL &amp; INDUSTRIAL</b>		<b>SUBSTRUCTURE</b>
DRAWN	DESIGN	SUPR	DATE	REV			DRAWING NUMBER
LL	ET	JM	08/17	04			<b>CM0001M</b>

## 9.0 C/I, 100 & 200 AMP SERVICE PEDESTALS

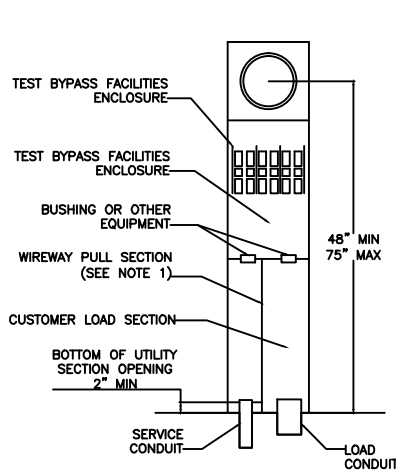


FIG. 1. SERVICE PEDESTAL EXPOSED METER TYPE

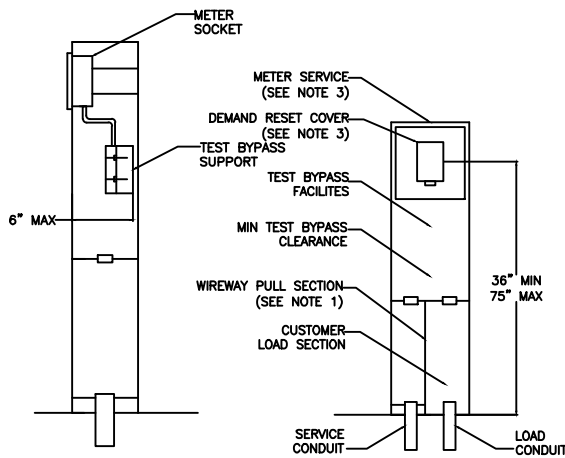


FIG. 2A-SERVICE PEDESTAL ENCLOSED METER TYPE

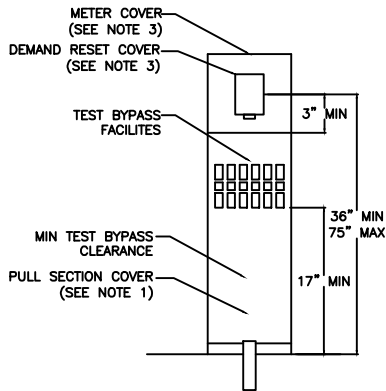
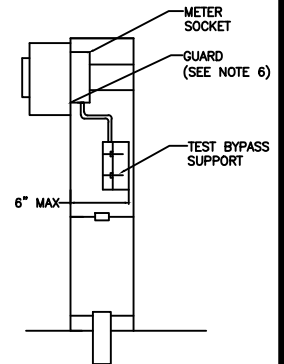


FIG. 2B-SERVICE PEDESTAL ENCLOSED METER TYPE

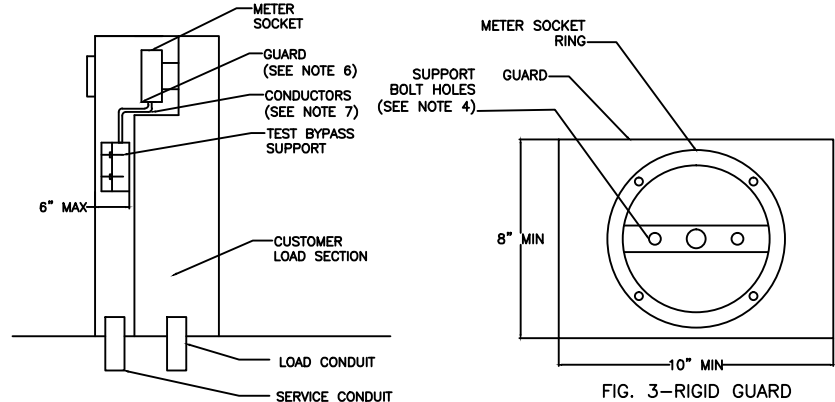


FIG. 3-RIGID GUARD

### NOTES:

1. Meter sockets shall be securely attached to the meter socket support by more than one bolt.
2. Meter socket configuration requirements are listed in Electric Metering, General - Standard GM0001M.
3. Wireways shall have minimum dimensions of 5-1/2" wide opening, 18" high and 2-3/4" deep and shall be accessible from the front, side or rear through a removable, sealable, full-length cover. The bottom of all wireways shall have provisions for accepting a minimum 2" conduit. A suitable alternate construction for wireway is a conduit which permits pull and termination of the service conductors directly into the "test-bypass" facilities.
4. Service conductors are to be terminated on the test bypass facilities in all cases.



**Liberty Utilities®**

ENGINEERING AND CONSTRUCTION STANDARD

8.3.34 OF 91

**ELECTRIC  
METERING  
COMMERCIAL & INDUSTRIAL**

**SUBSTRUCTURE**

**DRAWING NUMBER  
CM0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04



## NOTES:

1. Meter sockets shall be securely attached to the meter socket support by more than one bolt.
2. Meter socket configuration requirements are listed in Electric Metering, General - Standard GM0001M.
3. Wireways shall have minimum dimensions of 5-1/2" wide opening, (9" if containing termination facilities) 18" high and 2-3/4" deep and shall be accessible from the front, side or rear through a removable sealable full-length cover. The bottom of all wireways shall have provisions for accepting a minimum 2" conduit.
4. Service conductors are to be terminated on the test bypass facilities (or landing lugs when provided).
5. If landing lugs are provided, insulated cable or bus shall be installed between the landing lugs and the test bypass facilities (see fig 1).
6. If meter is enclosed, the enclosing cover (top and front) shall be removable for test and inspection of the meters by LU. The metering cover shall have a demand reset cover which shall be hinged, lockable and constructed of steel with minimum dimensions of 4-1/2" wide by 6" high.
7. The meter socket shall be provided with a full socket rim for securing the meter in place.
8. When a meter socket panel is not used, a rigid nonconductive or rounded metallic guard shall be mounted behind and attached to the meter socket rim to prevent accidental contact with energized parts.
9. Insulated cable or buss conductors shall be installed between the "test-bypass" facilities and the meter socket.
10. Internal equipment shall be secured in place without screws or nuts on the outer surface of the enclosure that may be loosened from the outside.
11. Pedestals shall be bolted securely to the pad.
12. Pedestals shall have openings at their base to permit (2)- 3" conduits.
13. Maximum radial distance from the edge of the pull section that is closest to the furthest line terminal shall not be greater than 2-1/2". See detail ZZ.
14. Refer to sheet 8.3.35 and table 1 for figure 2 "test-bypass" facilities enclosure clearances.



**Liberty Utilities®**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

ENGINEERING AND CONSTRUCTION STANDARD

**ELECTRIC  
METERING  
COMMERCIAL & INDUSTRIAL**

8.3.36 OF 91

**SUBSTRUCTURE**

**DRAWING NUMBER  
CM0001M**

# LOCKED METERING FACILITY KEY BOX

## 1.0 PURPOSE

The purpose of installing a key box is to alleviate the problem of supplying and handling large numbers of keys for access to locked metering facilities in customer buildings. The key box will enable authorized company personnel to enter locked facilities by means of a LU key.

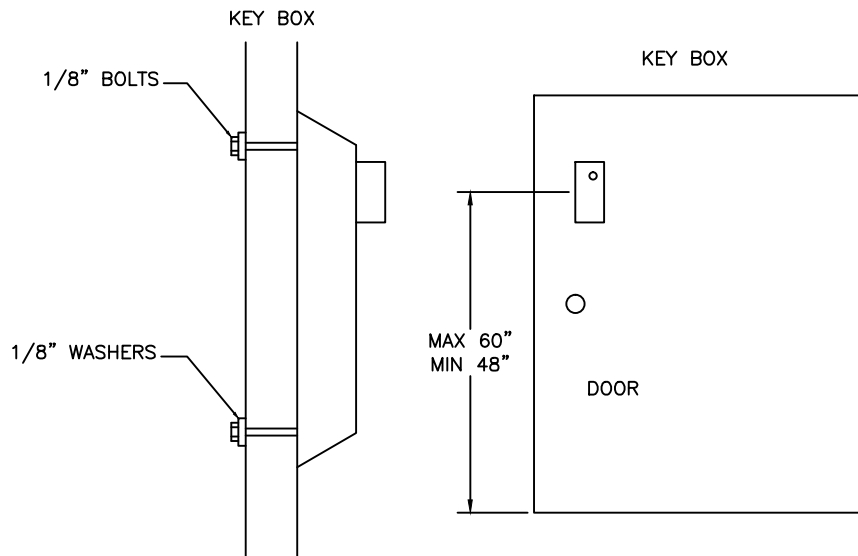
## 2.0 RESPONSIBILITY

It will be the responsibility of the developer / owner to supply, maintain, and install a key box on each locked door and supply a key to the access door for each box. It will also be the responsibility of the developer / owner to supply a new key for each box in the event locks on the doors are changed.


Key boxes (LU Stock #8800-950400) should be called for on any work order where metering access is a problem.

## 3.0 INSTALLATION

Key boxes are to be installed on every locked door to LU metering facilities (electric, and gas). Boxes are to be bolted through door (no screws) with (4)-1/8" bolts. See installation details below.



INSTALLATION DETAIL

 <b>Liberty Utilities®</b>	ENGINEERING AND CONSTRUCTION STANDARD		8.4.37 OF 91	
	<b>LOCKED METERING FACILITY KEY BOX</b>		SUBSTRUCTURE	
DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04
			DRAWING NUMBER <b><i>G10004M</i></b>	

# ELECTRICAL METERING RESIDENTIAL

## 1.0 INDEX


- 1.0 INDEX
- 2.0 SCOPE
- 3.0 GENERAL REQUIREMENTS
- 4.0 REMOTE METER READING (OMR/ERT)
- 5.0 OVERHEAD/UNDERGROUND FED METER SOCKET (0-225 AMPS)
- 6.0 UNDERGROUND FED METER SOCKET (226-400 AMPS)
- 7.0 METER SOCKET (0-225 AMPS, 120/208V)
- 8.0 UNDERGROUND SERVICE W/CURRENT TRANSFORMER METERING (401-800 AMPS)
- 9.0 CONNECTION OF AUXILIARY AND STANDBY POWER SOURCES

## 2.0 SCOPE

This standard provides specific information for construction of metering facilities for residential customers.

## 3.0 GENERAL REQUIREMENTS

- 3.1 The type of service available will normally be three wire single phase 120/240 volt. Three wire single phase 120/208 volt will be available in certain areas. Custom built homes requiring three phase service will be considered under LU standard CM0001M, Electric Metering Commercial & Industrial.
- 3.2 LU should be contacted prior to purchase of equipment and wiring.
- 3.3 All meters and sockets shall be Underwriter's Laboratory listed. All installations and equipment shall comply with the latest requirements of Electrical Utility Service Equipment Requirements Committee, (EUSERC), as adopted by LU.
- 3.4 Customer is responsible for installation and maintenance of all equipment beyond the attachment point with the exception of the meter and metering equipment.

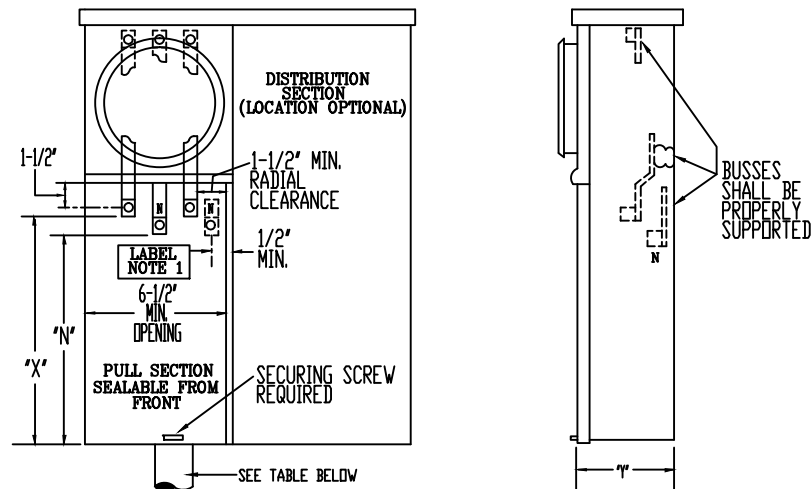
 <b>Liberty Utilities®</b>					ENGINEERING AND CONSTRUCTION STANDARD		8.5.38 OF 91
					<b>ELECTRIC METERING RESIDENTIAL</b>		SUBSTRUCTURE
							DRAWING NUMBER <b>RM0001M</b>
DRAWN	DESIGN	SUPR	DATE	REV			
LL	ET	JM	08/17	04			

## 4.0 REMOTE METER READING (OMR/ERT)

- 4.1 OMR/ERT meters allow LU to read the meter from a remote location. The OMR/ERT meter must be available for testing and verification on a bi-annual basis.
- 4.2 OMR/ERT meters are available from LU for single phase 120/240 volt services.
- 4.3 The customer may be charged for this installation.

## 5.0 OVERHEAD/UNDERGROUND FED METER SOCKET (0-225 AMPS)

The customer shall furnish, install, and maintain a self-contained four terminal socket for 120/240 service or a five terminal socket for 120/208 service (see 7.0 for 120/208V details). Lugs are to be provided by the customer. Combination overhead/underground service entrance panels are not authorized, unless cable landing lugs are provided at top and bottom, and the "X" dimension for underground fed applications is met.



MAXIMUM AMPACITY	"X" MIN. DIM	"N" MIN. DIM	"Y" MIN. DIM	CONDUIT RANGE
125	8"	6"	4"	1-1/4" - 2-1/2"
225	11"	8-1/2"	5-1/2"	1-1/2" - 3"

### NOTES:

1. A yellow caution label (2" x 3" minimum) shall be installed below the terminations in the pull section reading **"CAUTION: BUS ENERGIZED AT ALL TIMES"**.
2. Terminals shall be aluminum lugs with a range of #6-1/0 AWG for the 0-125 amp panel and #4 AWG-250 kcm for the 225 amp panel.



**Liberty Utilities®**

ENGINEERING AND CONSTRUCTION STANDARD

8.5.39 OF 91

**ELECTRIC  
METERING  
RESIDENTIAL**

**SUBSTRUCTURE**

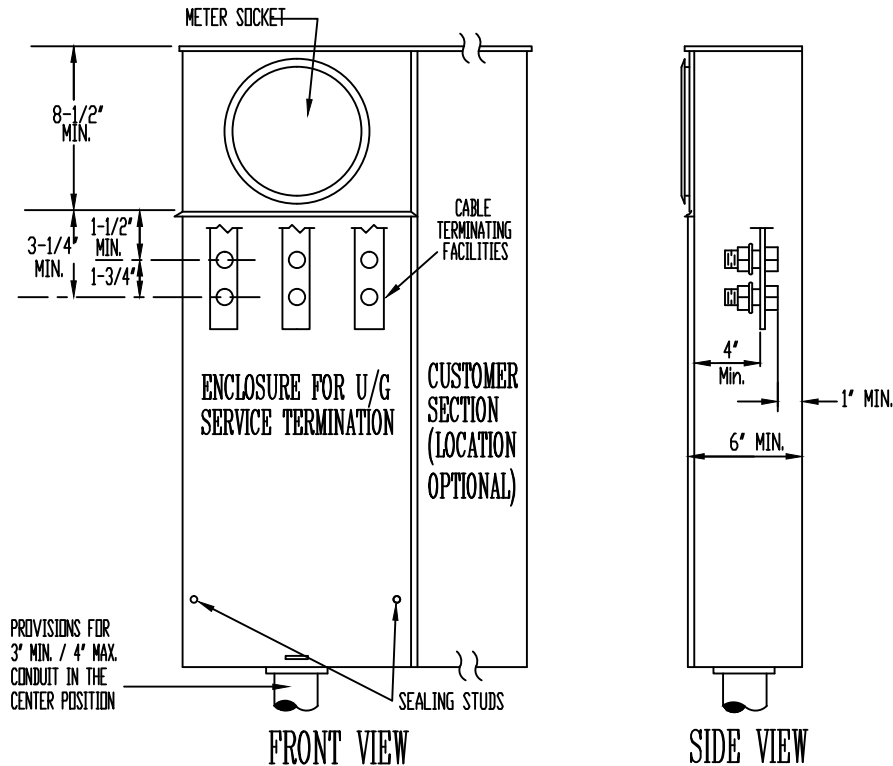
**DRAWING NUMBER  
RM0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

3. Provide a bonding screw or jumper if the neutral terminal is insulated from the enclosure.
4. A minimum radial clearance of 1-1/2" shall be provided between terminal surfaces and ground surfaces.

## 6.0 UNDERGROUND FED METER SOCKET (226-400 AMPS)

For a single phase underground service the customer shall furnish, install, and maintain a service termination and meter mounting device designed for that purpose.



### NOTES:

1. This equipment shall be marked with either a rating of "320 amperes continuous" or "400 amperes maximum (320 amperes continuous)".
2. **Bolt-in socket meters are no longer approved as of 01/01/02.**
3. Ring sockets are required.
4. Sockets may include manual bypass facilities which maintain service continuity when the meter is removed for testing and inspection.
5. Underground Only - The meter socket may be located above, left, or right of the pull section.
6. Underground Only - Pull section cover panels shall be removable, sealable, equipped with two lifting handles (rated for lifting 75#), and not exceed nine square feet in size. Sealing provisions are to be provided on both sides of the panel.



ENGINEERING AND CONSTRUCTION STANDARD

8.5.40 OF 91

**ELECTRIC  
METERING  
RESIDENTIAL**

SUBSTRUCTURE

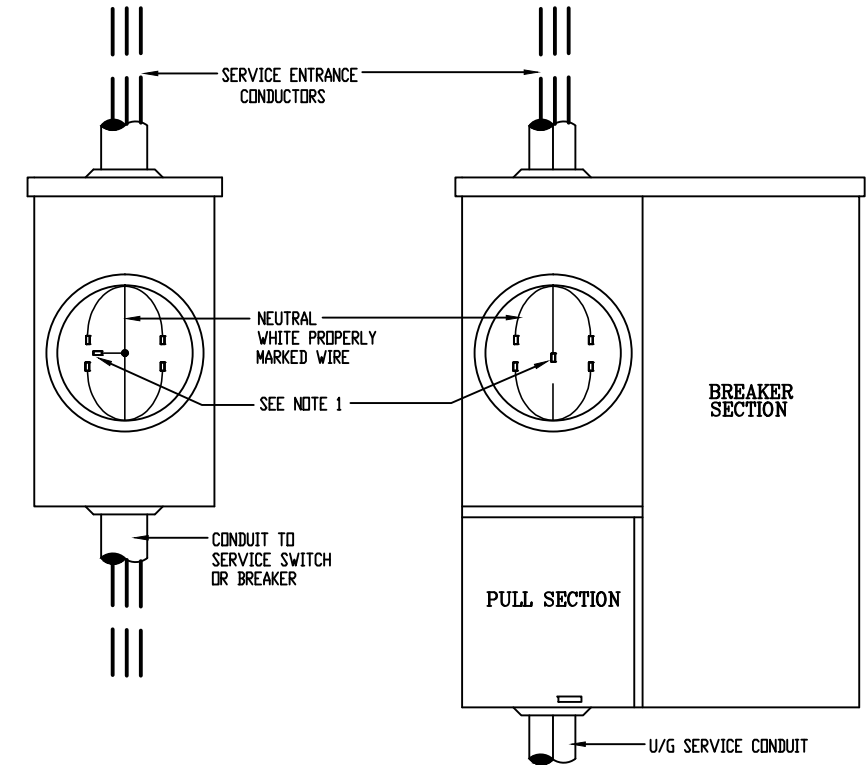
DRAWING NUMBER  
**RM0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04



# 7.0 METER SOCKET (0 - 225 AMPERES 120/208 VOLTS)

When this service is available from LU to a separately metered residence or other domestic unit, the customer shall furnish and completely wire a five-terminal socket for 120/208 volt service, similar to that shown below. If the service is overhead, the customer shall provide, install and maintain the required overhead entrance conductors, conduit, and service head to the point of attachment of LU's overhead service conductors. (See Section 5.0 for 120/240V details)



INDIVIDUAL  
METER SOCKET  
SEE NOTE 2

COMBINATION METER  
SOCKET LOAD CENTER  
SEE NOTE 3

**NOTES:**

- Sockets for 120/208 volt service shall be supplied with a fifth terminal which may be located in either the nine or six o'clock position.
- Overhead service only.
- Overhead or underground service.



DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

ENGINEERING AND CONSTRUCTION STANDARD

**ELECTRIC  
METERING  
RESIDENTIAL**

8.5.41 OF 91

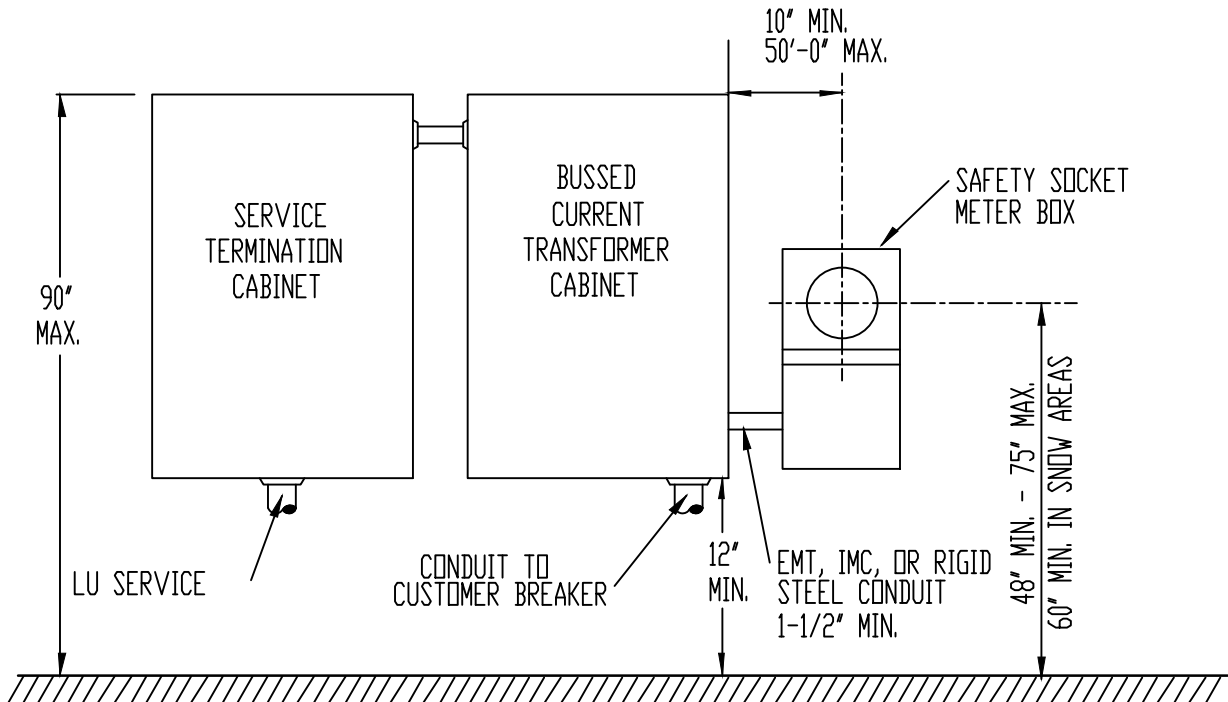
SUBSTRUCTURE

DRAWING NUMBER  
**RM0001M**

## 8.0 UNDERGROUND SERVICE W/CURRENT TRANSFORMER METERING (401 - 1000 AMPS)

For a service which is to be metered using current transformers, the customer hall furnish, install and maintain a separate termination cabinet, current transformer cabinet and safety socket meter box.

MINIMUM CABINET SIZE	MOUNTING BASE
24" x 48" x 11"	1 C.T. BASE



### NOTES:

1. Fault duty rating will match or exceed panel rating.
2. **The neutral conductor shall be continuous without a splice through the current transformer cabinet.**
3. Cover shall be sealable and include the caution sign "No Fuses Inside"
4. A 24" x 48" min. CT cabinet with a two-CT mounting base shall be furnished and installed by the customer.
5. A 16-1/2" x 26" x 11" min. service termination cabinet will be furnished and installed.
6. A 12" x 20" x 4-1/2" safety socket meter box will be furnished and installed.



**Liberty Utilities®**

ENGINEERING AND CONSTRUCTION STANDARD

8.5.42 OF 91

**ELECTRIC  
METERING  
RESIDENTIAL**

SUBSTRUCTURE

DRAWING NUMBER  
**RM0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

## 9.0 CONNECTION OF AUXILIARY AND STANDBY POWER SOURCES


**NOTE:** REFER TO NEC, ARTICLE 700, and LU STANDARDS, UNDERGROUND, ENG 04U, for details.

*All auxiliary/standby power sources must be installed in compliance with all GO 95/128 and local/state/federal ordinances.*

*Any portable electric generator which is capable of being temporarily connected to a customer's electrical system, which is normally supplied by LU, shall be connected only after opening the customer's main service switch so as to isolate the customer's electrical system from LU's system. Also, the generator must be disconnected before reclosing the main service switch to restore normal electric service.*

Any electrical generator, other than one authorized by LU to run in parallel with LU, or standby power source capable of being permanently or temporarily connected to a customer's electrical system shall be connected only by means of a visibly open double throw-switch, to isolate the customer's electrical system from LU's system. Failure to isolate the customer's electrical system from LU's system can cause electrical feedback and endanger both life and property.

*Any person who possesses and intends to use any such auxiliary generator or standby power source on an electrical system normally supplied by LU must notify the appropriate LU District Engineer (530-546-1763) of the units' installation location and how it is intended to be used and operated.*

 <b>Liberty Utilities®</b>					ENGINEERING AND CONSTRUCTION STANDARD		8.5.43 OF 91
					<b>ELECTRIC METERING RESIDENTIAL</b>		SUBSTRUCTURE
DRAWN	DESIGN	SUPR	DATE	REV			DRAWING NUMBER
LL	ET	JM	08/17	04			<b>RM0001M</b>

# ELECTRIC PRIMARY METERING

## 1.0 INDEX

- 1.0 INDEX
- 2.0 PURPOSE
- 3.0 TYPE OF ELECTRICAL SERVICE
- 4.0 REQUIRED METER EQUIPMENT APPROVALS
- 5.0 ELECTRIC METER LOCATIONS
- 6.0 UNDERGROUND TERMINATIONS
- 7.0 PRIMARY METERING OF OVERHEAD CUSTOMERS
- 8.0 REFERENCES
- 9.0 CONSTRUCTION DRAWINGS

## 2.0 PURPOSE

This standard provides information on the construction of metering for customers who receive primary voltages ( 2.4kV to 24.9kV ).

## 3.0 TYPE OF ELECTRICAL SERVICE


Electric service to primary metered customers will be 60 hertz alternating current. The customer shall consult LU prior to the purchase of equipment and the installation of wiring. The type and voltage of service that will be supplied depends upon the load, the applicable rate schedule and the type of electric service available in the local area.

## 4.0 REQUIRED METER EQUIPMENT APPROVALS

All metering enclosures shall meet the latest Electric Utility Service Equipment Requirements Committee (EUSERC) Specifications, as adopted by LU.

## 5.0 ELECTRIC METER LOCATIONS

- 5.1 In order that the most satisfactory meter location may be determined and that adequate space will be provided, LU must be consulted in the preliminary planning stage. Installation of additional facilities or future relocations at the customer's expense may be prevented by early consultation with LU.
- 5.2 Meters and metering equipment may be located in a meter room that is provided by the customer. Meter rooms must be illuminated and must be provided with a doorway


 <b>Liberty Utilities®</b>					ENGINEERING AND CONSTRUCTION STANDARD		8.6.44 OF 91
					<b>ELECTRIC PRIMARY METERING</b>		SUBSTRUCTURE
							DRAWING NUMBER <b>PM0001M</b>
DRAWN	DESIGN	SUPR	DATE	REV			
LL	ET	JM	08/17	04			

opening to the outside of the building. The customer will furnish and install, a standard lockbox with doorway key to provide access where it is necessary to keep the meter room locked (LU Standard, GI0004U). Meter room shall meet the requirements of GO 128 Appendix D Article 3.

## 6.0 UNDERGROUND TERMINATIONS

- 6.1 For each primary metering installation two sets of drawings must be submitted to LU. These drawings must detail the interface between LU and the customer. The lead time to obtain the necessary hardware has been up to 12-14 weeks; therefore the drawings should be submitted in advance of construction by 14 weeks minimum. This will assure that the proper metering equipment is available upon construction.
- 6.2 Two types of primary metering terminations are approved: 1) Preassembled High Voltage Switchboard Metering and 2) vault-mounted metal enclosures. The vault to mount the enclosure will be provided by the customer. Refer to LU's Volume 5 , section PPM for details. For the switchboard type metering, the potential transformer disconnect shall be of the gang-operated type operated by a swing handle. This enclosure must meet the latest version of the "Electric Utility Service Equipment Requirements Committee" (EUSERC) requirements. The metering components, PTs, CTs, etc. will be furnished by LU.
- 6.3 Wireways in the high voltage switchboard service termination space designed for terminating the utility service shall be clearly identified for such use. Service termination shall be made in the service termination enclosure or in specially designated space of a meter panel which has a separate removable and sealable access plate.

The layout or design of the service termination enclosure, which requires bending the utility service conductors, should provide space to permit a minimum cable bending radius equal to 10-12 times the overall outside diameter of the cable. The following table is a list of conductors found in LU distribution system and their associated minimum bending radius:

 <b>Liberty Utilities®</b>					ENGINEERING AND CONSTRUCTION STANDARD		8.6.45 OF 91
					<b>ELECTRIC PRIMARY METERING</b>		SUBSTRUCTURE
							DRAWING NUMBER <b>PM0001M</b>
DRAWN	DESIGN	SUPR	DATE	REV			
LL	ET	JM	08/17	04			

- 6.4 Knockouts in cable wireways should be positioned to minimize service cable bending.
- 6.5 The service termination enclosure, socket enclosure, and test by-pass block section shall be sealable and isolated or have barriers provided from other integral enclosure sections which are accessible to the customer in order to effectively prevent the attachment of unauthorized connections to unmetered conductors or terminals.
- 6.6 The manufacturer's rating label, or other markings used in lieu of a label, shall show among other things: A) Whether the socket and socket enclosure is designed for overhead service entry, underground service entry, or both; B) That the terminating lugs are designed for both aluminum and copper conductors; and C) The wire size range of the termination lugs.


## **7.0 PRIMARY METERING OF OVERHEAD CUSTOMERS**

LU will place pole top metering one pole from the point of interface with the customer's lines. That is, LU will own and operate the lines including the metering equipment to the customers pole. The customer will provide a means of disconnecting his facilities from LU's. Each installation will require coordination with LU Metering Operations and Customer Service Engineering to assure each customer is provided safe and economically engineered service.

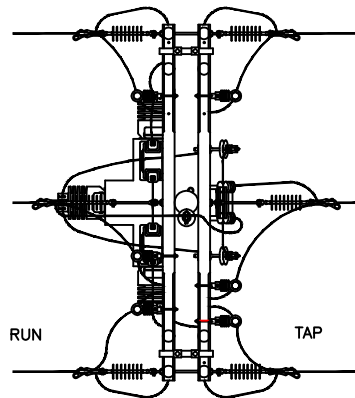
For each primary metering installation, two sets of drawings must be submitted to LU. These drawings must detail the interface between LU and the Customer. The lead time to obtain the necessary hardware has been up to 8-10 weeks; therefore, the drawings should be submitted in advance of construction by 10 weeks minimum. This will assure that the proper metering equipment is available upon construction.

## **8.0 REFERENCES**

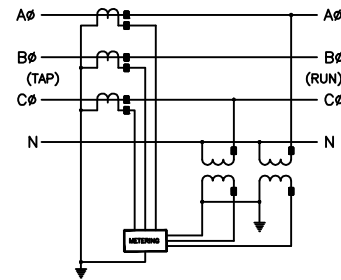
EUSERC: Electric Utility Service Equipment Requirements Committee Specifications.  
 GO 128 Appendix D Article 3: Entrance and Access to Work Space  
 NEC Article 490, Systems over 600 Volts.  
 LU: Specification UCD01X, "Cross-Linked Polyethylene Primary Cable", Volume 21.  
 LU: Section PPM, Underground Vol.

 <b>Liberty Utilities®</b>					ENGINEERING AND CONSTRUCTION STANDARD		8.6.46 OF 91
					<b>ELECTRIC PRIMARY METERING</b>		SUBSTRUCTURE
DRAWN	DESIGN	SUPR	DATE	REV			DRAWING NUMBER
LL	ET	JM	08/17	04			<b><i>PM0001M</i></b>

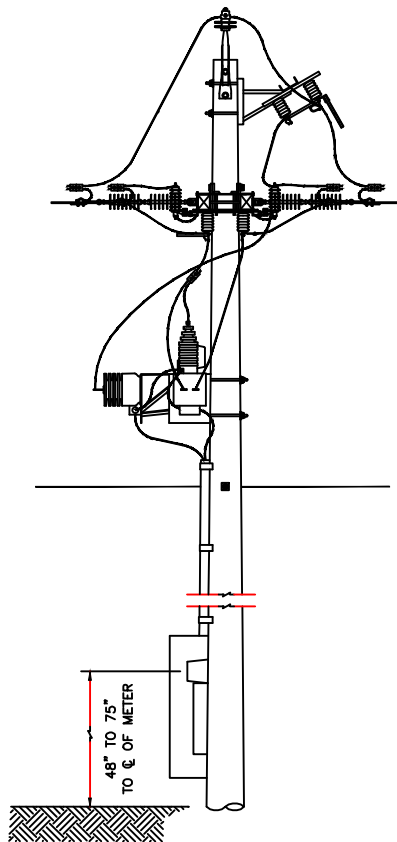
## 9.0 CONSTRUCTION OVERHEAD: 3 PHASE 4-WIRE SYSTEM DRAWINGS



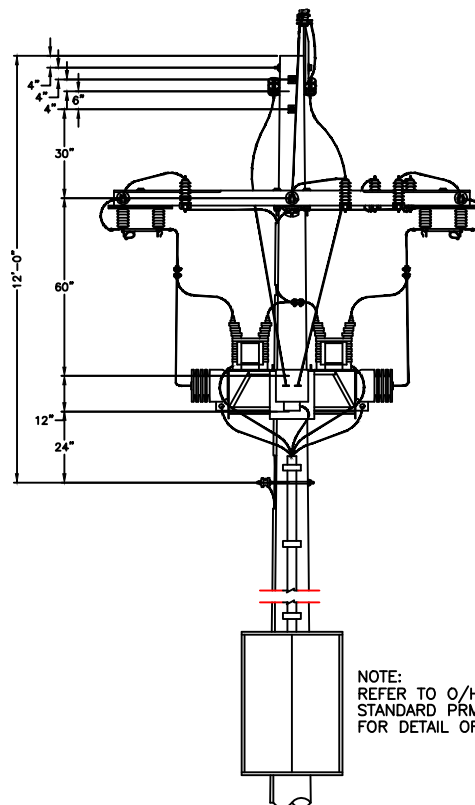
TOP VIEW



3-LINE DIAGRAM



SIDE VIEW



ELEVATION

NOTE:  
REFER TO O/H CONSTRUCTION  
STANDARD PRM02H, VOLUME 3  
FOR DETAIL OF THIS STRUCTURE

### OVERHEAD: 3 PHASE 4-WIRE SYSTEM



**Liberty Utilities®**

ENGINEERING AND CONSTRUCTION STANDARD

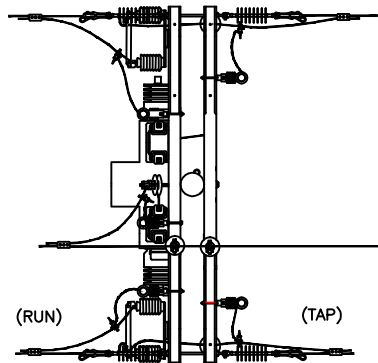
8.6.47 OF 91

**ELECTRIC  
PRIMARY  
METERING**

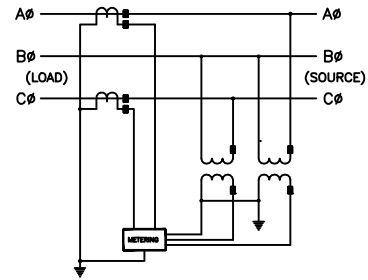
SUBSTRUCTURE

DRAWING NUMBER  
**PM0001M**

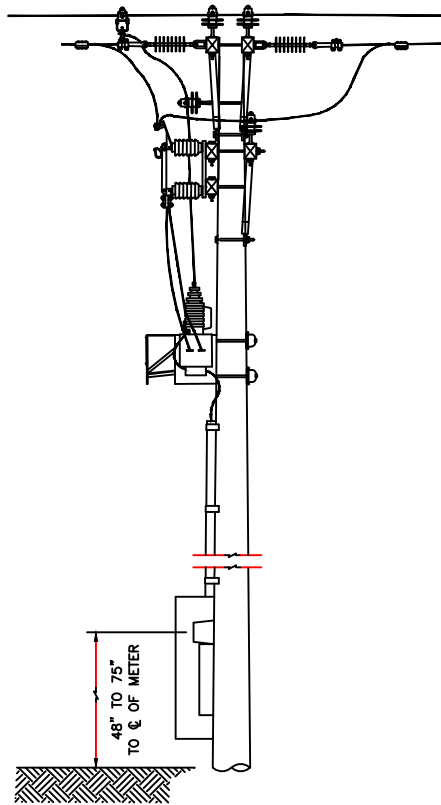
DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04



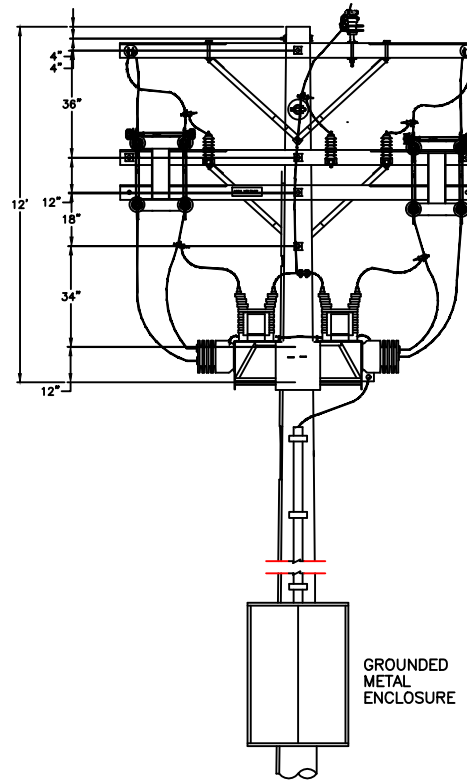
TOP VIEW



3-LINE DIAGRAM



SIDE VIEW



ELEVATION

## OVERHEAD: 3 PHASE 3-WIRE SYSTEM



**Liberty Utilities®**

ENGINEERING AND CONSTRUCTION STANDARD

8.6.48 OF 91

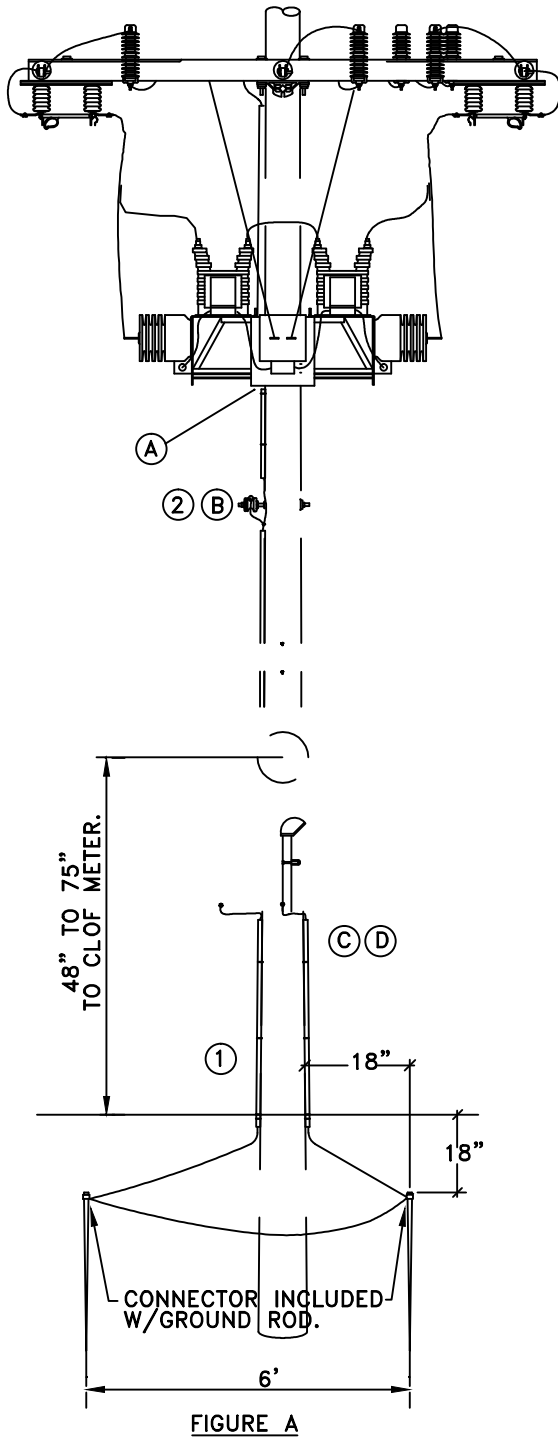
**ELECTRIC  
PRIMARY  
METERING**

SUBSTRUCTURE

DRAWING NUMBER  
**PM0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04



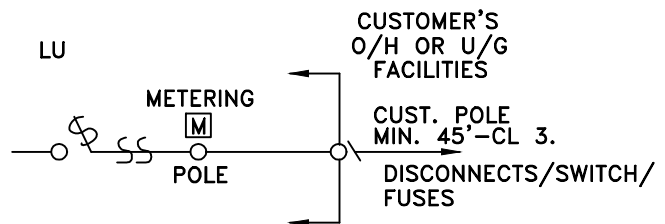


### CONSTRUCTION NOTES:

- (A) THE EQUIPMENT RACK SHALL BE GROUNDED.
- (B) NEUTRAL GROUNDING IS APPLICABLE FOR 4 WIRE SYSTEMS ONLY.
- (C) METERING CABINET SHALL BE PROVIDED WITH TWO (2) SEPERATE GROUND SOURCES. AN ADDITIONAL GROUNDING LUG IS REQUIRED. GROUNDING LEADS WILL BE #4 CU OR LARGER.
- (D) HIGH VOLTAGE GLOVES SHALL BE USED WHEN CONNECTING GROUND ROD ADDITIONS TO EXISTING METERING GROUNDING SYSTEMS.

### ENGINEERING NOTES:

- (1) GROUNDING SHALL BE MEASURED. RESISTIVITY OF THE GROUNDS SHALL BE LESS THAN 25 OHMS.
- (2) BEFORE TESTING THE GROUNDS ON A 4 WIRE SYSTEM THE POLE GROUND WILL BE DISCONNECTED FROM THE NEUTRAL.



CIRCUIT CONFIGURATION  
FIGURE B

- NOTES - LU. TO PROVIDE:
- (1) XARM FOR CUSTOMER POLE, FOR DEADEND LU. CONDUCTOR.
  - (2) GUYING, IF REQUIRED.



**Liberty Utilities®**

ENGINEERING AND CONSTRUCTION STANDARD

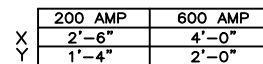
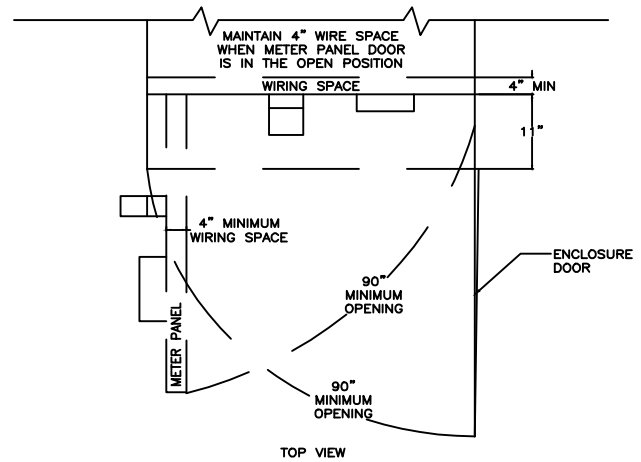
8.6.49 OF 91

**ELECTRIC  
PRIMARY  
METERING**

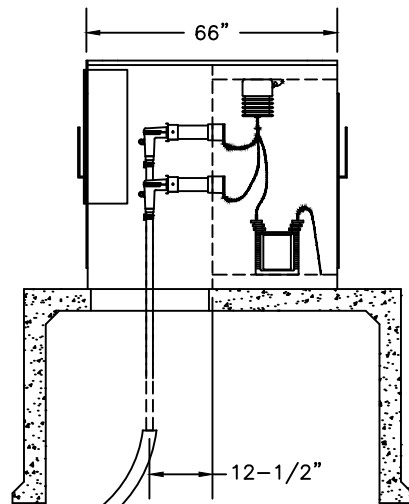
**SUBSTRUCTURE**

**DRAWING NUMBER  
PM0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

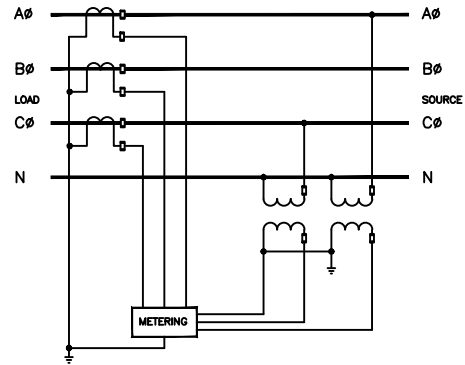


OUTDOOR METERING ENCLOSURE				
NOMINAL SERVICE VOLTAGE	APPROXIMATE SIZE			
	HEIGHT	WIDTH	DEPTH	DEPTH
5KV	97"	48"	71.5"	2400#
15KV	97"	48"	71.5"	2400#
25KV	120"	60"	90"	4800#



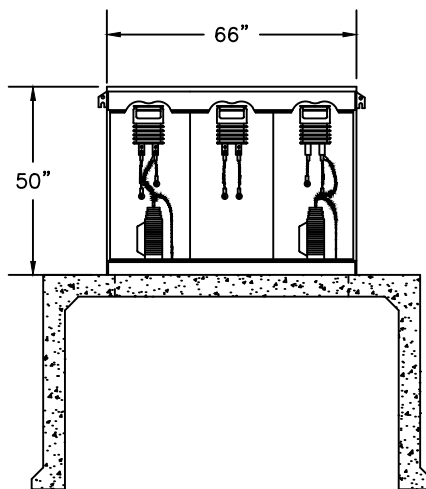
SIDE VIEW

NOTE: PRIMARY METERING  
TO BE ORDERED BY  
METERING DEPARTMENT

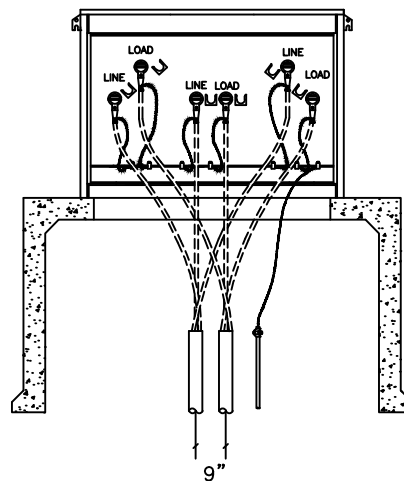


WIRING DIAGRAM 4-WIRE

Refer to PE0023U, Substructures,  
Section 6, for pad details.



REAR VIEW



FRONT VIEW

## UNDERGROUND: 3 PHASE 4-WIRE SYSTEM, 200 AMP



**Liberty Utilities®**

ENGINEERING AND CONSTRUCTION STANDARD

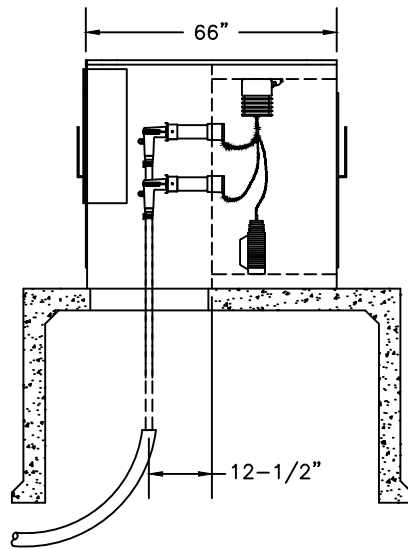
8.6.51 OF 91

**ELECTRIC  
PRIMARY  
METERING**

SUBSTRUCTURE

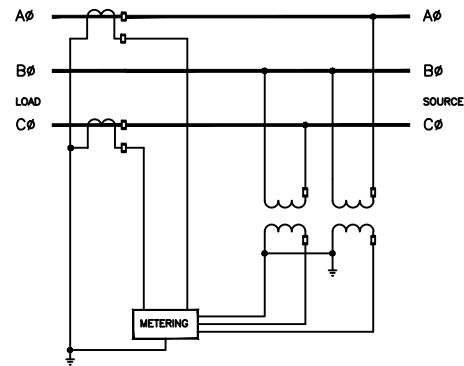
DRAWING NUMBER  
**PM0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04



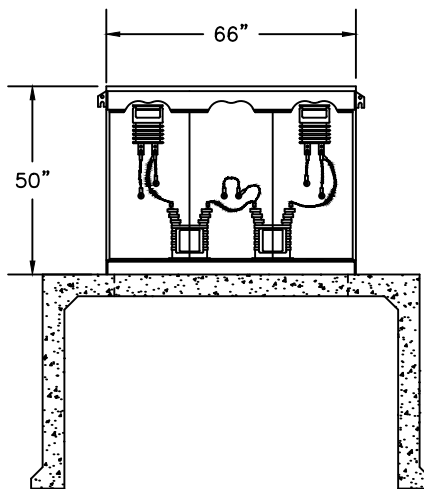
SIDE VIEW

NOTE: PRIMARY METERING  
TO BE ORDERED BY  
METERING DEPARTMENT

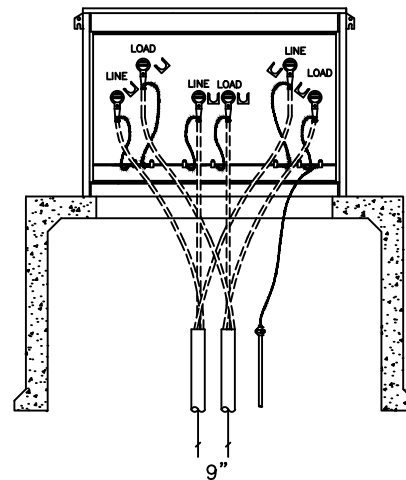


WIRING DIAGRAM 3-WIRE

Refer to PE0023U, Substructures,  
Section 6, for pad details.



REAR VIEW



FRONT VIEW

## UNDERGROUND: 3 PHASE 3-WIRE SYSTEM, 200 AMP



**Liberty Utilities®**

ENGINEERING AND CONSTRUCTION STANDARD

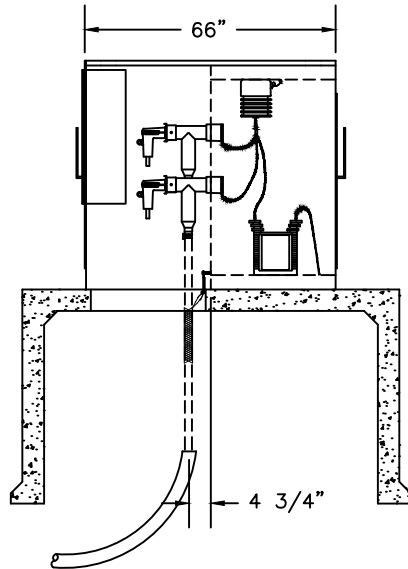
8.6.52 OF 91

**ELECTRIC  
PRIMARY  
METERING**

SUBSTRUCTURE

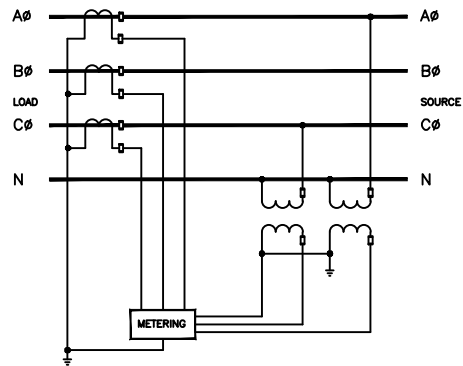
DRAWING NUMBER  
**PM0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04



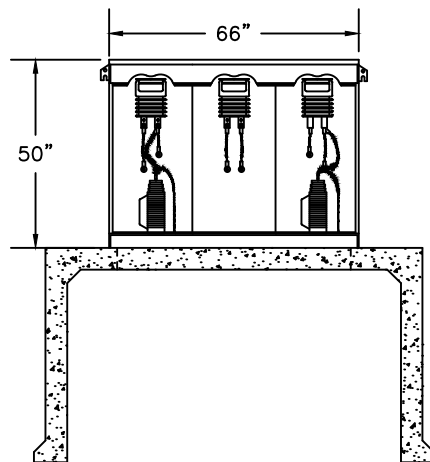
SIDE VIEW

NOTE: PRIMARY METERING  
TO BE ORDERED BY  
METERING DEPARTMENT

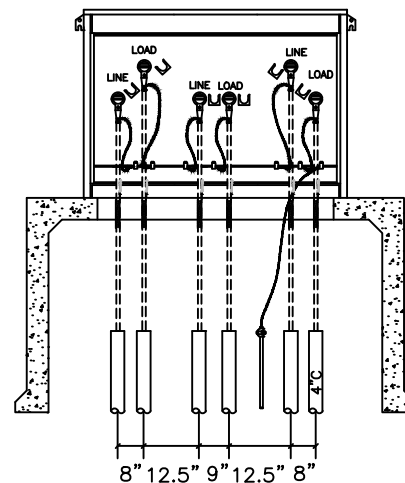


WIRING DIAGRAM 4-WIRE

Refer to PE0023U, Substructures,  
Section 6, for pad details.



REAR VIEW



FRONT VIEW

## UNDERGROUND: 3 PHASE 4-WIRE SYSTEM, 600 AMP



**Liberty Utilities®**

ENGINEERING AND CONSTRUCTION STANDARD

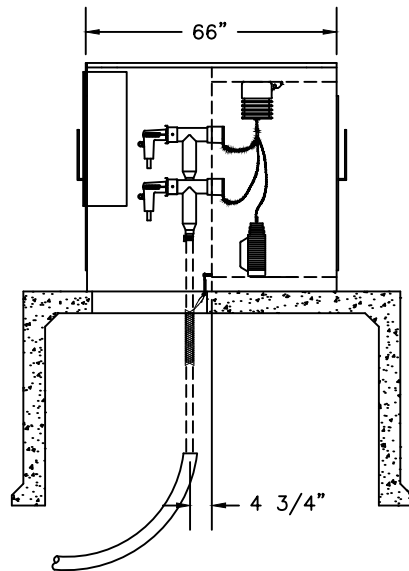
8.6.53 OF 91

**ELECTRIC  
PRIMARY  
METERING**

**SUBSTRUCTURE**

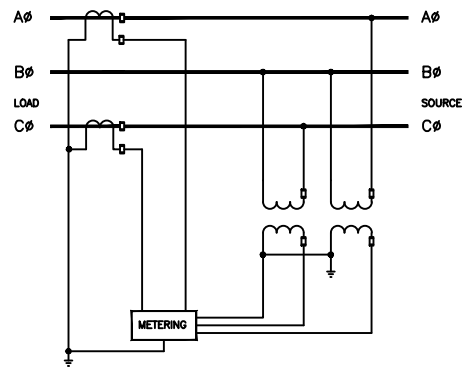
**DRAWING NUMBER  
PM0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04



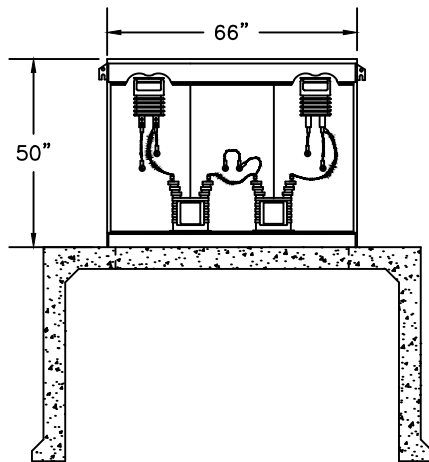
SIDE VIEW

NOTE: PRIMARY METERING  
TO BE ORDERED BY  
METERING DEPARTMENT

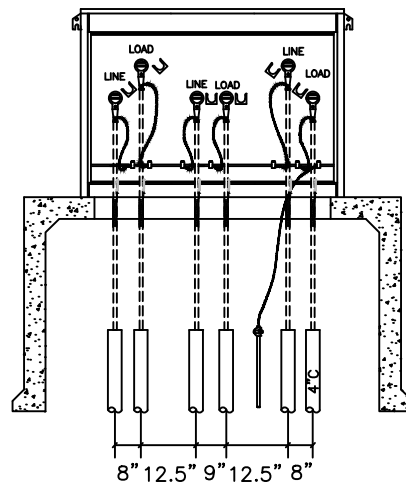


WIRING DIAGRAM 3-WIRE

Refer to PE0023U, Substructures,  
Section 6, for pad details.



REAR VIEW



FRONT VIEW

## UNDERGROUND: 3 PHASE 3-WIRE SYSTEM, 600 AMP



**Liberty Utilities®**

ENGINEERING AND CONSTRUCTION STANDARD

8.6.54 OF 91

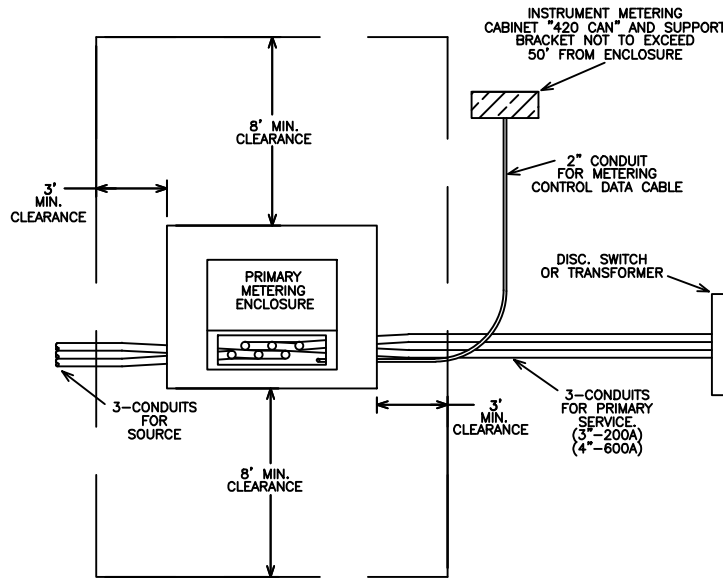
**ELECTRIC  
PRIMARY  
METERING**

SUBSTRUCTURE

DRAWING NUMBER  
**PM0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

# CLEARANCE AND GROUNDING DETAILS

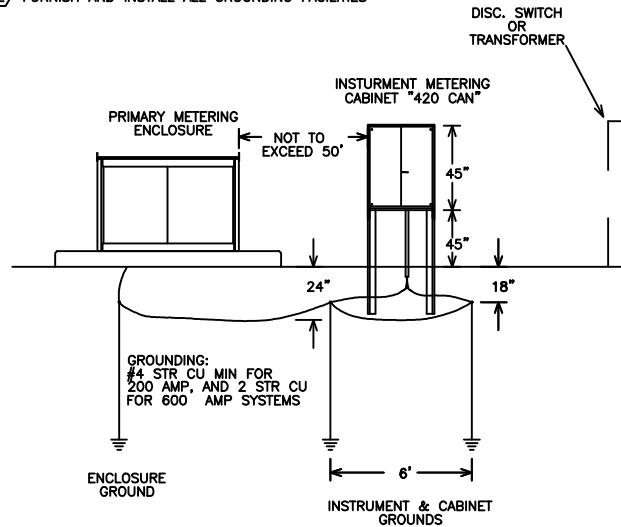


## LU RESPONSIBILITY

- ① FURNISH AND INSTALL PRIMARY METERING ENCLOSURE.
- ② FURNISH INSTRUMENT METERING CABINET (420 CAN) AND SUPPORT BRACKET.
- ③ FURNISH AND INSTALL SERVICE AND METERING CONTROL DATA CABLE.
- ④ FURNISH AND INSTALL ALL PRIMARY CONDUIT.

## CUSTOMER RESPONSIBILITY

- Ⓐ INSTALLATION OF METERING CABINET AND SUPPORT BRACKET PER LU SPECS.
- Ⓑ FURNISH AND INSTALL ENCLOSURE SUBSTRUCTURE PER LU SPECS.
- Ⓒ FURNISH AND INSTALL ALL SERVICE CONDUIT PER LU SPEC.CD0004U & C1000IM.
- Ⓓ FURNISH AND INSTALL ALL PRIMARY CONDUIT
- Ⓔ FURNISH AND INSTALL ALL GROUNDING FACILITIES



**Liberty Utilities®**

ENGINEERING AND CONSTRUCTION STANDARD

8.6.55 OF 91

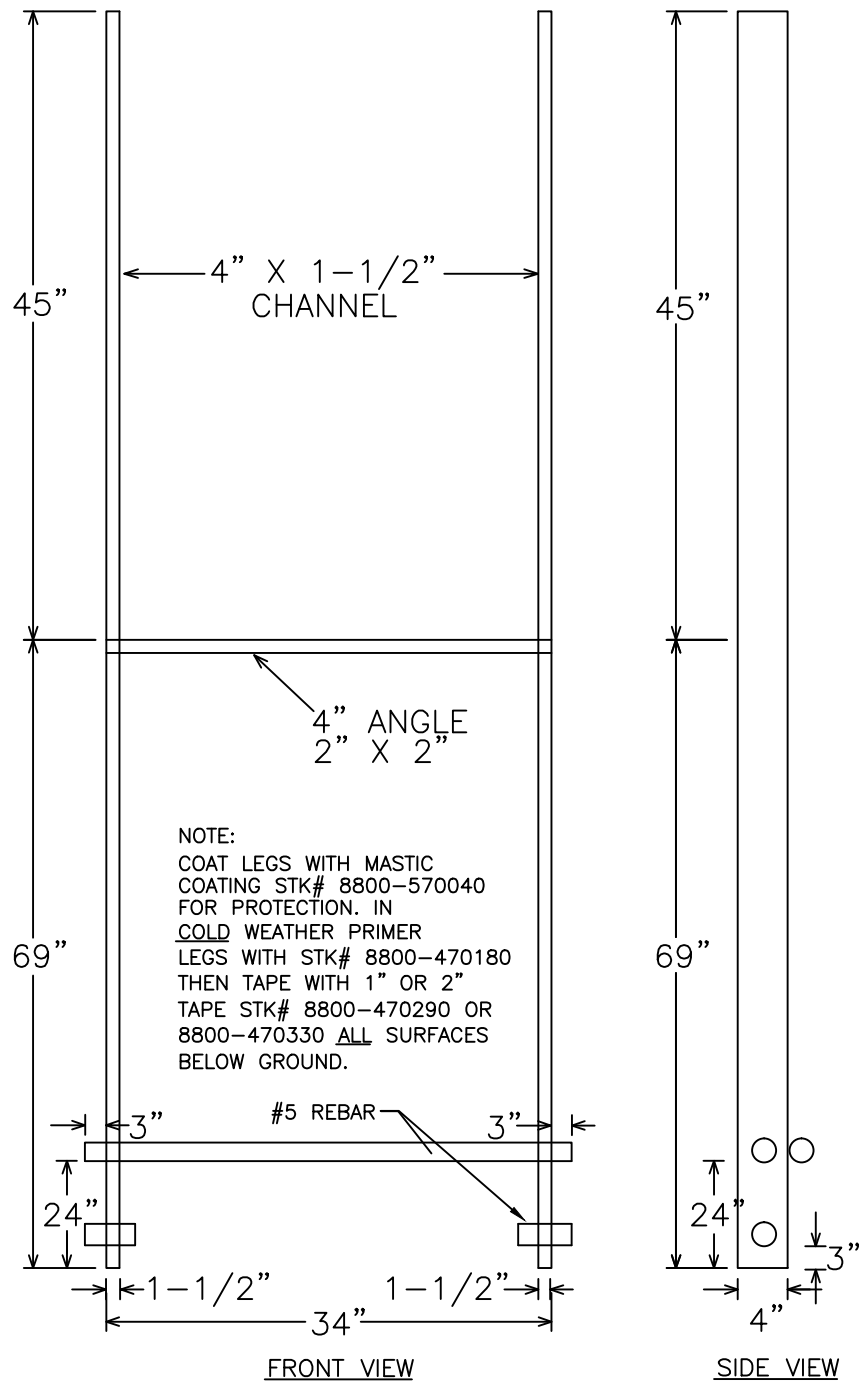
**ELECTRIC  
PRIMARY  
METERING**

**SUBSTRUCTURE**

**DRAWING NUMBER  
PM0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

# SUPPORT BRACKET DETAIL



**Liberty Utilities®**

ENGINEERING AND CONSTRUCTION STANDARD

8.6.56 OF 91

**ELECTRIC  
PRIMARY  
METERING**

**SUBSTRUCTURE**

**DRAWING NUMBER  
PM0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04



# ELECTRIC SWITCHBOARDS 0-600 VOLTS

## 1.0 INDEX

1.0	INDEX
2.0	SCOPE
3.0	GENERAL METERING REQUIREMENTS
4.0	SWITCHBOARD - GENERAL
5.0	SWITCHBOARD SERVICE SECTION
6.0	SERVICE ENTRANCE LOCATION
7.0	UNDERGROUND SERVICE PULL SECTION
8.0	METER SWITCH SEQUENCE
9.0	SERVICE TERMINATIONS
10.0	METER PANELS
11.0	METER SOCKETS

## 2.0 SCOPE


This Standard provides specific dimensions and details of service and meter equipment which is assembled by the manufacturer in free-standing, self-supporting switchboard construction, and which is **not covered** by the **basic requirements** in the "Electric Metering General" Section, LU Standard GM0001M.

## 3.0 GENERAL METERING REQUIREMENTS

Important information pertaining to all metering installations is contained in GM0001M. *This section should be reviewed before proceeding with the purchase of equipment or installation of wiring.*

## 4.0 SWITCHBOARDS - GENERAL

Prior to manufacturer, the customer shall submit 2 copies of the drawings of the proposed switchboard, its location, and pad design to LU.

 <b>Liberty Utilities®</b>					ENGINEERING AND CONSTRUCTION STANDARD		8.7.57 OF 91
					<b>ELECTRIC SWITCHBOARDS 0-600 VOLTS</b>		SUBSTRUCTURE
DRAWN	DESIGN	SUPR	DATE	REV			DRAWING NUMBER
LL	ET	JM	08/17	04			<b><i>SB0001M</i></b>

Additionally, the customer shall consult LU for specific information on the following:

- a. Service voltage, current rating, and fault duty.
- b. Meter panel requirements for applicable rate schedule
- c. Service termination location
- d. Switchboard and/or meter location(s)
- e. Size and number of service conductors and conduits per phase.
- f. The rating of the metering current transformers will not necessarily be the same as the current rating of the service switch. Fault duty rating will exceed given fault duty.

All compartments containing unmetered conductors shall be sealable. When a raceway or conduit for meter secondary wiring is necessary, such raceway or conduit shall be sealable.


Service entrance conductors must enter the metering transformer compartment from one end and exit from the opposite end.

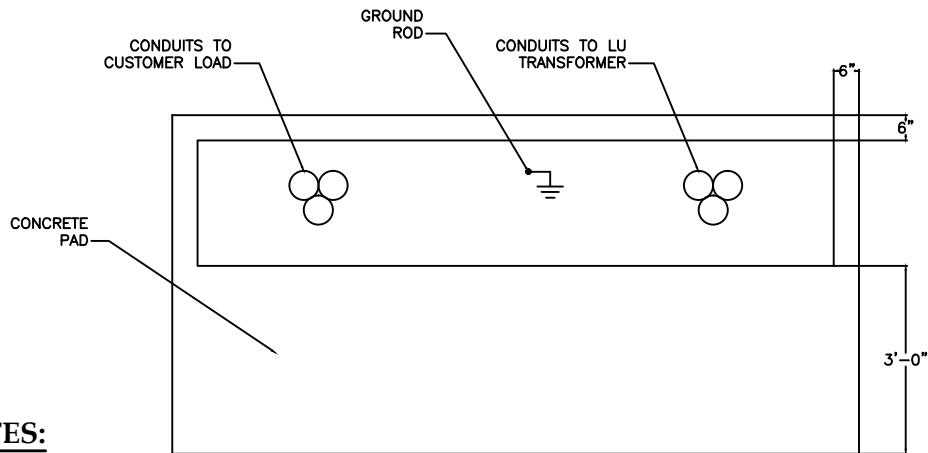
Service entrance transformers, and test switches will be furnished and installed by LU. Secondary wiring from metering transformers to meters will be installed by LU. Any required conduits or raceways shall be furnished and installed by the customer.

Where meters remote from the switchboard location are required, meter secondary wiring from current transformers to meter sockets will **not** exceed 50 feet. Conduit for secondary wiring will be supplied by the customer. Minimum size of the conduit will be 1-1/2". There will be **no more than two (2) sweeping 90° elbows** in one run. **L.B.'s or similar fittings will not be allowed.** Contractor shall contact LU before installing secondary wire conduit. Provisions for safety sockets for these remote meters should be as described on LU Standards Drawing, CM0001M.

When self-contained meter sockets are installed in switchboards, they are to be wired by the switchboard manufacturer.

**Manufactured freestanding outdoor switchboards** shall be installed in accordance with NEC, **Article 408**. Freestanding switchboards shall be securely fastened to a concrete pad to prevent possible movement of the switchboard. The concrete pad provided shall be of sufficient size to extend 6" beyond the sides and back of the switchboard with a 36" working space extended in front. The 6" thick pad shall be 6" x 6" wide mesh reinforced and have a 5/8" x 8' ground rod conveniently provided to facilitate equipment grounding. The following example provides typical pad dimensions:

 <b>Liberty Utilities®</b>					ENGINEERING AND CONSTRUCTION STANDARD		8.7.58 OF 91
					<b>ELECTRIC SWITCHBOARDS 0-600 VOLTS</b>		<b>SUBSTRUCTURE</b>
DRAWN	DESIGN	SUPR	DATE	REV			DRAWING NUMBER
LL	ET	JM	08/17	04			<b>SB0001M</b>



#### NOTES:

1. 45° chamfer all corners.
2. 8" subbase compacted to 90% of the relative density at optimum moisture content and graded level to finish grade.
3. Refer to PE0009U for clearances and protection requirements.
4. Refer to CB0003U for cable and conduit selection.

## 5.0 SWITCHBOARD SERVICE SECTION

### 5.1 Standard Switchboard Service Section - General

A service section is defined as the section of a customer's switchboard provided specifically for terminating the service, and housing the metering transformers (if required), revenue meters, test facilities, and service switch or breaker.

Taps may be taken from main service entrance conductors where more than one meter installation is necessary:

- a. When required on an overhead service, taps shall be made in a sealable compartment above and separate from the current transformer compartment.
- b. When required on an underground service, taps shall be made in the underground service termination pull section or pull box, provided suitable approved terminations are made on bus conductors and positioned so that incoming service entrance conductors and their connections shall not encroach into LU's pulling area nor interfere with LU's pull and termination of its service conductors.

In cases where more than one meter is to be installed, there will ordinarily be a separate service section for each meter installation and its associated service switch.

For services with self-contained meters (not using current transformers) it may be practicable to put two or more meters and switches in the same service section.



**Liberty Utilities®**

ENGINEERING AND CONSTRUCTION STANDARD

8.7.59 OF 91

**ELECTRIC  
SWITCHBOARDS  
0-600 VOLTS**

**SUBSTRUCTURE**

**DRAWING NUMBER  
SB0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

When two or more switchboard service sections are supplied from one set of service conductors, the supply conductors serving these switchboards shall be terminated ahead of and outside of the metering transformer compartments in a separate sealable enclosure. The supply conductors are to be arranged so they are readily accessible and may be worked upon without disturbing the metering transformers and associated secondary wiring.

The general arrangement of a standard switchboard service section is shown on Sheet 8.7.66. The standard section utilizes a hinged meter panel located in front of the metering transformer compartment. Hinged meter panels must be sealable and easily removable with the hinges readily interchangeable from the right or left side on the job site. Hinged panels approved for socket meters are shown on Sheet 8.7.71. **Hinged meter panels must have handles and open a minimum of 90° with meters and test switches mounted to permit safe and ready access to the instrument transformers.** When hinged panels are recessed, the section shall have additional width to meet this requirement. A recessed panel requires utility approval as a specially engineered section.

Switchboards to be used outdoors shall be of weatherproof construction in accordance with NEC, Article 408. Indoor switchboards used outdoors shall be enclosed in a permanent rain tight enclosure. Plywood or wood enclosures are unacceptable.

## 5.2 Specially Engineered Service Section


Switchboard design which does not conform to the standard switchboard is considered specially engineered, and includes installations:

- a. Over 4,000 amperes
- b. When the service breaker is too large for the standard service section
- c. When multiple metering sections are used
- d. When recessed meter panels are used


When a specially engineered service section is necessary, two drawings of the proposed section shall be submitted to LU (See Section 4.0 for address) for approval prior to manufacturer and bidding. Such drawings shall indicate the contractor's and the customer's name and address.

The general arrangement of specially engineered switchboard service sections should follow, as nearly as practicable, that of the Standard Section, and the following general requirements shall be observed:

- a. Socket meters used with current transformers shall normally be mounted on hinged panels. Self-contained meters shall be mounted on hinged panels.

 <b>Liberty Utilities®</b>					ENGINEERING AND CONSTRUCTION STANDARD		8.7.60 OF 91
					<b>ELECTRIC SWITCHBOARDS 0-600 VOLTS</b>		SUBSTRUCTURE
DRAWN	DESIGN	SUPR	DATE	REV			DRAWING NUMBER
LL	ET	JM	08/17	04			<b>SB0001M</b>

- b. When a hinged meter panel is located behind a door, a clear space of at least 11 inches between the meter panel and the door is required as well as 90° opening with meter and test switches in place. If needed, additional section width shall be provided to meet the requirements.
- c. A clear space in back of a meter panel shall be provided for the secondary wiring. For hinged meter panels, the minimum dimensions between the meter panel and the nearest bus as shown on Sheets 8.7.76 through 8.7.87 are adequate to provide this clearance. For non-hinged meter panels, a clear space of at least four inches to any barrier or obstruction shall be provided.
- d. Minimum clearance between meters shall also be maintained as shown on Sheet 8.7.89.
- e. A minimum of four inches of clear space is required directly below the bottom slot of the meter test switch to permit safe connection of test leads.
- f. Sockets installed on switchboards shall be as specified in LU Standard GM0001M.
- g. Not more than two meters shall be mounted on any removable meter panel.
- h. Panels which provide access to instrument transformers or a service terminating pull section shall not be larger than required for good accessibility. Removable panels shall be equipped with lifting handles (rated for lifting 75#) mounted slightly above the panel center and shall not be heavier than can be conveniently lifted by one man.
- i. The front edge of the current transformer bus bars shall all be located in the same vertical plane.
- j. A removable bus section and suitable transformer support shall be provided to permit installation of window-type current transformers for installations over 1,000 amperes.
- k. Busses shall be adequately supported in the metering transformer compartment to withstand the mechanical stresses of short circuit. The bus supports shall not interfere with installation or removal of current transformers. Current transformers shall not be used to support the busses; the busses shall be entirely self-supporting.
- l. The busses and current transformer mountings shall be designed so that each of the current transformers may be withdrawn from its mounting position directly through the access panel without disturbing any other current transformer. When multi-leaf busses are used, the busses shall be oriented so that they appear "edge wise" when viewed from the access panel.
- m. The general arrangement and spacing of current transformers and the methods of mounting current transformers shall conform in so far as practicable to the illustrations on Sheets 8.7.74 through 8.7.77 (single leaf bus) and Sheets 8.7.78 through 8.7.85 (multi-leaf bus).
- n. For underground connection of specially engineered service sections, See Sheet 8.7.67.

 <b>Liberty Utilities®</b>					ENGINEERING AND CONSTRUCTION STANDARD		8.7.61 OF 91
					<b>ELECTRIC SWITCHBOARDS 0-600 VOLTS</b>		SUBSTRUCTURE
							DRAWING NUMBER <b>SB0001M</b>
DRAWN	DESIGN	SUPR	DATE	REV			
LL	ET	JM	08/17	04			

- o. Switchboard to be used outdoors shall be of weatherproof construction. Indoor switchboards used outdoors shall be enclosed in a permanent rain tight enclosure. *Plywood or wood enclosures are unacceptable.*

## 6.0 SERVICE ENTRANCE LOCATION

In the standard and specially engineered switchboard service section, all service or supply conductors shall enter the service sections through one end and exit through the opposite end of the metering transformer compartment. This stipulation applies to either overhead or underground service or if two or more adjoining service sections are connected together. Direction of feed shall be vertical through the metering compartment as shown on Sheet 8.7.66.

## 7.0 UNDERGROUND SERVICE PULL SECTION

When an underground service is to be installed by LU, provisions for service termination shall be as shown on Sheets 8.7.64, 8.7.65, and 8.7.67.

Details of metering transformer compartments are shown on Sheets 8.7.74 through 8.7.85.

Covers for metering transformer compartments shall be made of code gauge metal; if non-hinged panels are used as covers, they shall be provided with lifting handles and be attached with sealable studs and wing nuts or by other approved means.


Copper or EUSERC approved plated aluminum bus bar shall be used on both the line and load sides of all current transformers. When aluminum bus is used, it must be stamped with approved plating process designation at service termination and transformer mounting points.

When LU requests links and supports for through-type current transformers, the bus and removable links must be a compatible material.

The current transformers supplied by LU for metering shall not be utilized for any other purpose.

The ends of the current transformers bus stubs shall be located so the current transformers can be connected without removing adjacent panels.

The current transformer bus stub supports in the metering transformer compartment shall be sufficiently rigid to maintain alignment of the bus.

 <b>Liberty Utilities®</b>					ENGINEERING AND CONSTRUCTION STANDARD		8.7.62 OF 91
					<b>ELECTRIC SWITCHBOARDS 0-600 VOLTS</b>		SUBSTRUCTURE
DRAWN	DESIGN	SUPR	DATE	REV			DRAWING NUMBER
LL	ET	JM	08/17	04			<b>SB0001M</b>

## 8.0 METER SWITCH SEQUENCE

Meters and metering equipment shall normally be located ahead, or on the supply side of the customer's main switch fuse or circuit breaker. Exception to this normal sequence is permissible only when required by electrical codes.

## 9.0 SERVICE TERMINATIONS

For overhead services, the customer shall furnish lugs and connect the cable to line and load sides of the bus stubs in the current transformer compartment.

For underground services, LU will terminate its service conductors on lug landings at the current transformer bus stubs only when the service is a single-meter installation and the switchboard is rated 400 amperes or less.

LU will terminate its service conductors on lug landings in the pull section, as shown in Figure 1 on Sheet 8.7.64, when the service is multiple metering or the switchboard is rated above 400 amperes.

- a. On switchboards rated 401-800 amperes, the customer shall install conductors from the service termination lug landings to the line side of the current transformer compartment.
- b. On switchboards rated above 800 amperes or with multiple meters, bus bars shall extend from the service termination lug landing into the current transformer compartment.


## 10.0 METER PANELS

The hinged meter panels shown on Sheet 8.7.72 are designed to accommodate only transformer-rated socket meters.

The non-hinged meter panels shall not be used in front of a current transformer section.

Sheet 8.7.90 shows spacings for various combinations of multiple meters. Self-contained meters shall not be mounted on hinged panels.

See Sheet 8.7.72 for dimensions of Service Section where only a Watthour meter is required. See Sheet 8.7.89 for dimensions of Service Section where multiple meters and separate recorder are required.

 <b>Liberty Utilities®</b>					ENGINEERING AND CONSTRUCTION STANDARD		8.7.63 OF 91
					<b>ELECTRIC SWITCHBOARDS 0-600 VOLTS</b>		<b>SUBSTRUCTURE</b>
DRAWN	DESIGN	SUPR	DATE	REV			DRAWING NUMBER
LL	ET	JM	08/17	04			<b><i>SB0001M</i></b>



## 10.1 UNDERGROUND SERVICE TERMINATION

Not more than two meters shall be mounted on any removable meter panel. Meter panels and filler panels shall be equipped with stops to prevent inward swinging beyond the front surface of the switchboard.

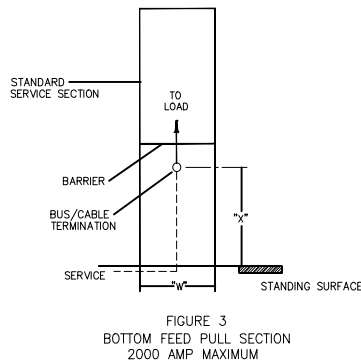
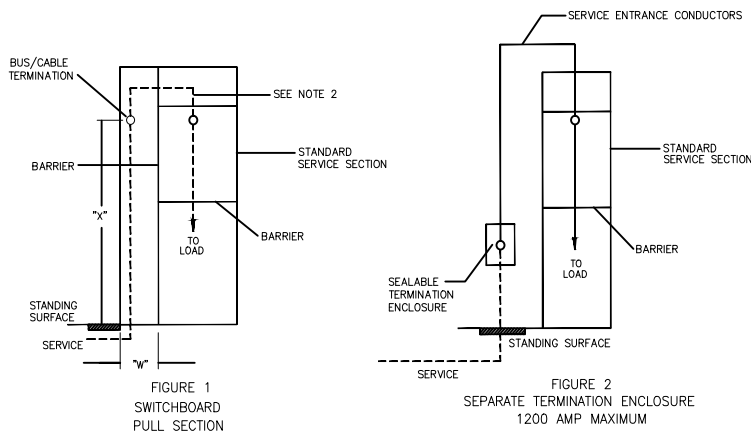


TABLE 2 - MINIMUM PULL SECTION DIMENSIONS			
SWITCHBOARD RATING (AMPERES)	MINIMUM ACCESS OPENING DIMENSION "W"		TERMINATION HEIGHT "X"
	3-WIRE	4-WIRE	
BELOW 400	12"	12"	42" MIN. - 72" MAX.
400 - 800	24"	24"	
801 - 1200	24"	30"	
1201 - 2000	30"	35"	60" MIN. - 72" MAX.
2001 - 3000	35"	42"	
3001 - 4000	-----	44"	60" MIN. - 72" MAX.
ABOVE 4000	CONSULT LU		

### NOTES:

1. A switchboard pull section (Fig. 1), a separate pull box (Fig. 2), or a bottom feed service section shall be provided for underground service.
2. When the service section is served from a pull section, the bus or cable conductors shall enter through the side or back in the sealable section above the current transformer compartment as shown in Fig. 1, or shall enter by means of horizontal cross bussing in back of metering compartment.
3. Bus bars, with provisions for termination lugs as shown on sheet 8.7.68 are required from the pull section into the service section, when the main switch is rated above 800 amperes, or when multiple metering is to be supplied.
4. Bus bars or cables may extend from the pull section landing lugs into the service section for 401 to 800 ampere installations.
5. The minimum width of the pull section shall be as specified in Table 1.
6. Side or rear entry of the service cable into the pull section may require a greater dimension than that shown in Table 1. Consult LU.



**Liberty Utilities®**

ENGINEERING AND CONSTRUCTION STANDARD

8.7.64 OF 91

**ELECTRIC  
SWITCHBOARDS  
0-600 VOLTS**

**SUBSTRUCTURE**

**DRAWING NUMBER  
SB0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04



7. LU will provide the terminating lugs.
8. All pull and terminating sections shall have full front access. Cover panels shall be removable, sealable, provided with two lifting handles, and limited to a maximum size of 9 square feet in area.

## 10.2 SERVICE TERMINATION IN A PULL SECTION WHICH IS ABOVE GROUND

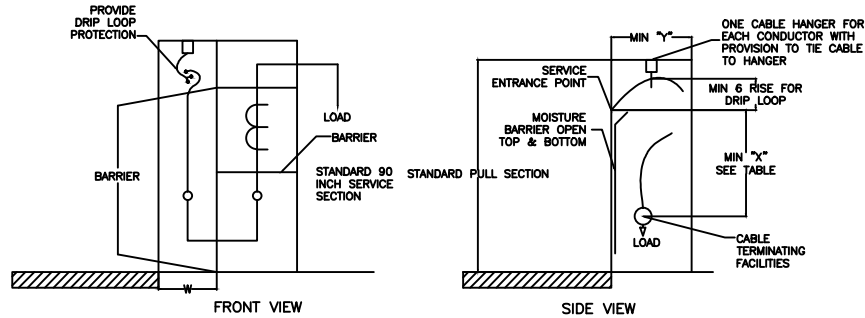


FIGURE 1 PULL SECTION WITH A HIGH BACK SERVICE ENTRY

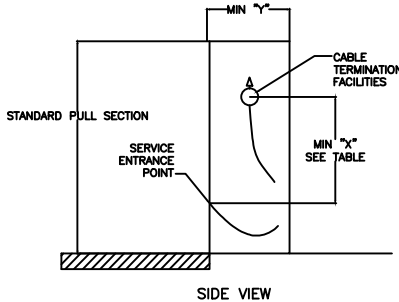


FIGURE 2 PULL SECTION LOW BACK SERVICE ENTRY

TABLE 2 - MINIMUM PULL SECTION DIMENSIONS				
SWITCHBOARD RATING (AMPERES)	MINIMUM ACCESS OPENING DIMENSION "W"		"Y" DEPTH	PULL SPACE "X"
	3-WIRE	4-WIRE		
BELOW 400	12"	12"	25"	30"
400 - 800	24"	24"	25"	42"
801 - 1200	24"	30"	25"	
1201 - 2000	30"	35"	30"	
2001 - 3000	35"	42"	36"	48"
3001 - 4000	----	44"	36"	48"
ABOVE 4000	CONSULT LU			

### NOTES:

1. Consult LU for the service entrance point.
2. An underground service may enter the back of a switchboard pull section as illustrated when the pull space has the required "X" dimension above or below the cable terminating facilities, and the pull section has the required "Y" depth. See Table 2.
3. For side entry, the "W" dimension of the pull section shall not be less than the "Y" dimension shown in Table 2.



**Liberty Utilities®**

ENGINEERING AND CONSTRUCTION STANDARD

8.7.65 OF 91

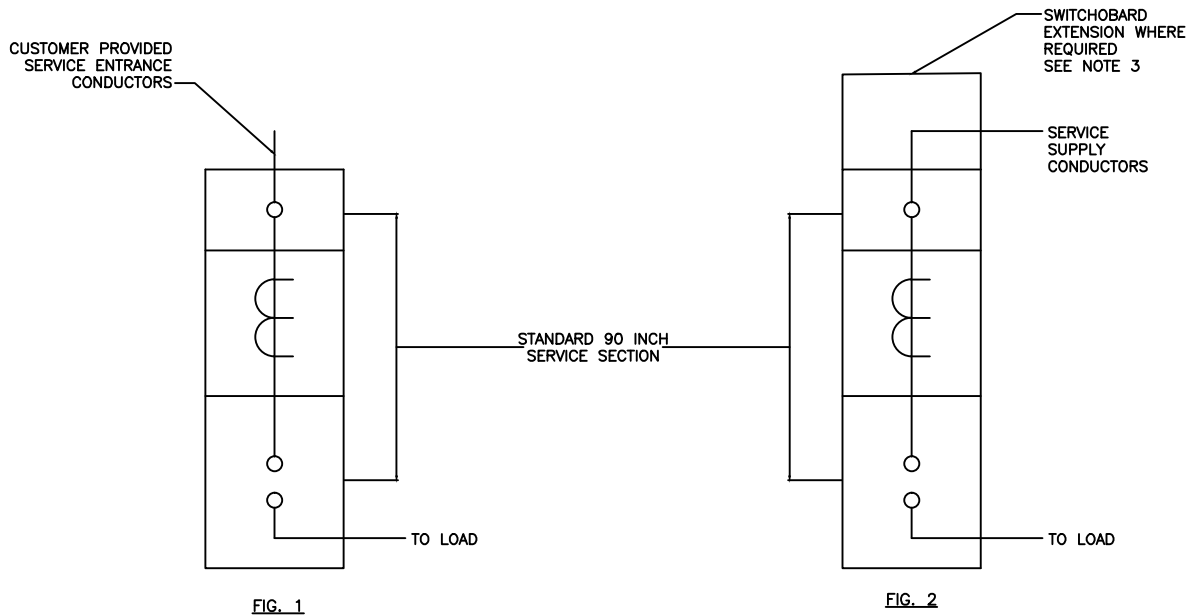
**ELECTRIC  
SWITCHBOARDS  
0-600 VOLTS**

**SUBSTRUCTURE**

**DRAWING NUMBER  
SB0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

### 10.3 OVERHEAD SERVICE TERMINATION



#### NOTES:

1. Must meet NEC, Article 384 requirements.
2. The service entrance conductors, Fig. 1, either cable or bus bar are furnished and installed by the customer in the following manner:
  - a. When switchboards are served through bus bar, the bus bars shall enter through the top, or at the side or back in the upper 10" section.
  - b. When switchboards are served with cable, the cables shall enter through the top of the board only as shown in Fig. 1.
3. When LU or customer requires incoming conduits from the side or rear for the service conductors, an extension as shown in Fig. 2, or other special designed termination may be required.
4. The direction of feed is from top to bottom. Load conductors shall leave below the metering compartment barrier, and may not be routed back through the current transformer compartment in order to exit the service section.
5. Service entrance conductors shall be connected to the bussing in the service section with lugs approved for the type conductors used.



**Liberty Utilities®**

ENGINEERING AND CONSTRUCTION STANDARD

8.7.66 OF 91

**ELECTRIC  
SWITCHBOARDS  
0-600 VOLTS**

**SUBSTRUCTURE**

**DRAWING NUMBER  
SB0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

## 10.4 SERVICE TERMINATING FACILITIES IN PULL SECTIONS 0-600 VOLTS

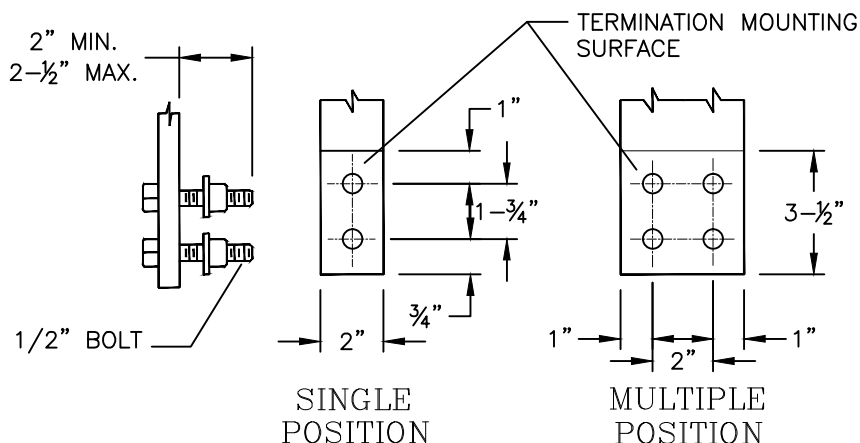


FIG. 1  
TERMINATING BOLT AND DRILLING DETAIL  
OF TERMINATING FACILITIES

### NOTES:

- One landing position is required for each 400 amperes of service ampacity up to 4000 amperes. Each landing position shall consist of two 1/2-inch steel bolts spaced on 1-3/4 inches vertical centers and extending from 2 inches to 2-1/2 inches from the mounting surface. When multiple positions are required, provide a minimum of 2 inches of horizontal spacing between positions.  
**Exception:** Edgewise terminating facilities may consist of 9/16" holes having the same spacing as specified for the 1/2-inch bolts as specified above and in figure 1. The unobstructed working space shall be provided on both sides of the termination bus, See Figure 3, page 8.7.69.
- Terminating bolts shall be provided with nuts, flat washers and a pressure maintaining spring washer, and all parts must be plated to prevent corrosion. Terminating bolts shall not be used for the dual purpose of service termination and of securing the terminating facilities in place.
- Terminating bolts must be secured in place. "Secured in place" shall mean that the stud will not turn, back out or loosen in any manner when tightening or loosening terminal nuts (including cross threaded situations).
- In the terminal mounting area, which is defined as the area of the terminating facilities as shown in Fig. 1, a clear space "barrel of proximity" of 1-1/2" minimum is required around any terminating facility including its bolts and bolt heads, any other bus, any other terminating facility or any grounded surface, except:
  - (1) the minimum clearance to the back of the pull section or to the front pull section cover may be 1".



**Liberty Utilities®**

ENGINEERING AND CONSTRUCTION STANDARD

8.7.67 OF 91

**ELECTRIC  
SWITCHBOARDS  
0-600 VOLTS**

**SUBSTRUCTURE**

**DRAWING NUMBER  
SB0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

- (2) the minimum clearance to any fully insulated horizontal bus behind the terminating facility may be 1".
- (3) the neutral terminating facility may have a minimum clearance of 1" from any grounded surface.
5. Each terminating facility must have at least 8" of unobstructed space in front of the entire mounting surface. This space must be accessible from the front of the pull section as viewed through the access panel opening.
6. Minimum distance from the lowest bolt of the terminating facility (where service cable enters bottom of pull section) is 28" for services not exceeding 800 amperes and 36" for services not exceeding 1200 amperes. Consult LU Metering Department for services exceeding 1200 amperes.
7. Terminating facilities shall be secured to prevent bus misalignment when cables are installed.

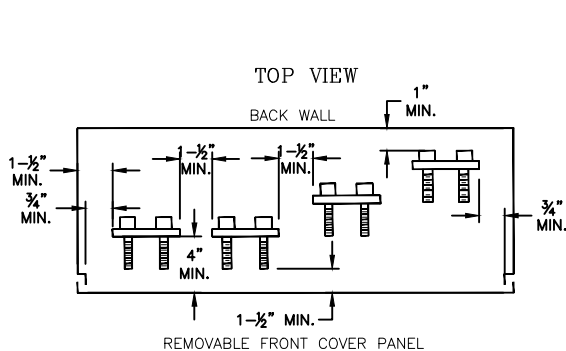


FIG. 2  
SPACING REQUIREMENTS FOR TERMINATING FACILITIES  
(SIDE BY SIDE OR STAGGERED)

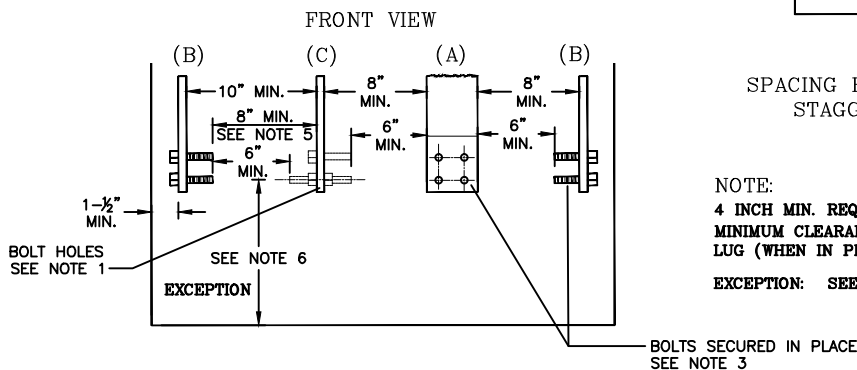


FIG. 3  
SPACING REQUIREMENTS FOR TERMINATING FACILITIES  
ACCESSIBLE FROM (A) FRONT ONLY, (B) ONE SIDE ONLY,  
OR (C) FROM EITHER SIDE. (SEE NOTES 3 AND 4)

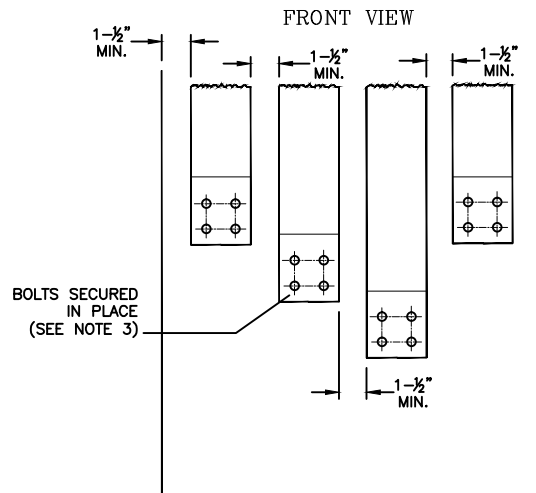


FIG. 4  
SPACING REQUIREMENTS FOR TOP TO BOTTOM  
STAGGER OF TERMINATING FACILITIES

NOTE:  
4 INCH MIN. REQUIRED [ASSURE 1 INCH  
MINIMUM CLEARANCE FROM BODY OF TERMINATING  
LUG (WHEN IN PLACE) TO FRONT PANEL]

EXCEPTION: SEE NOTES 4 AND 5



DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

ENGINEERING AND CONSTRUCTION STANDARD

## ELECTRIC SWITCHBOARDS 0-600 VOLTS

8.7.68 OF 91

SUBSTRUCTURE

DRAWING NUMBER  
**SB0001M**

## 10.5 3 WIRE - NOT FOR NEW CONSTRUCTION REFERENCE ONLY

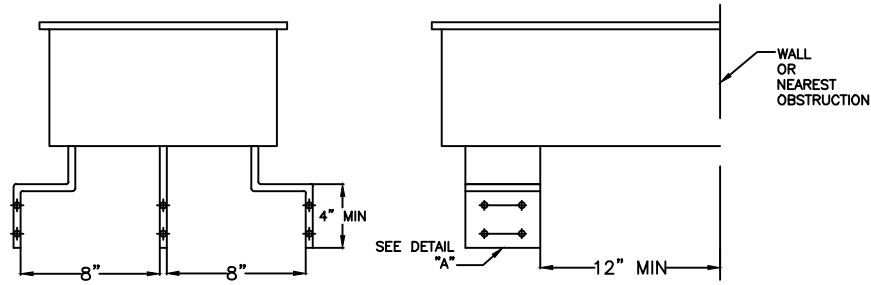


FIG. 1 - STUBS IN SAME PLANE

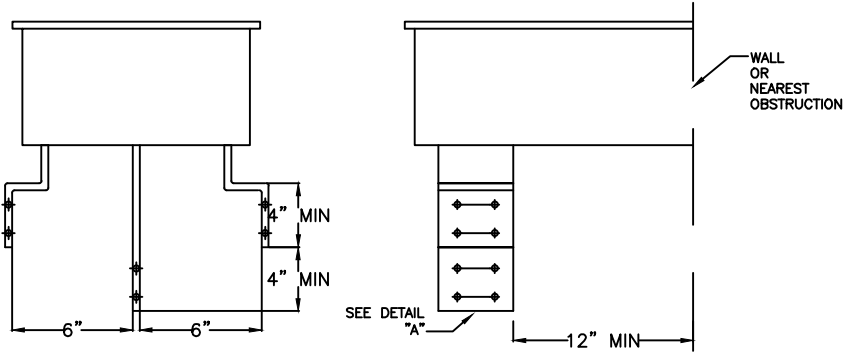


FIG. 2 - STUBS STAGGERED VERTICALLY

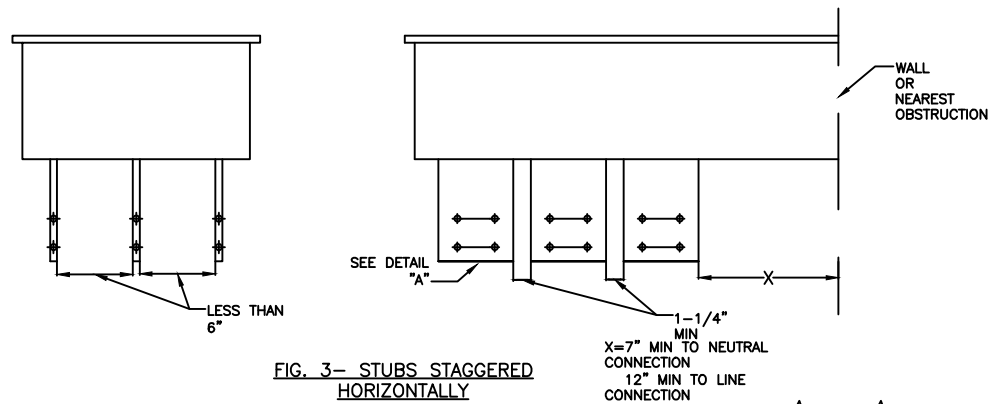
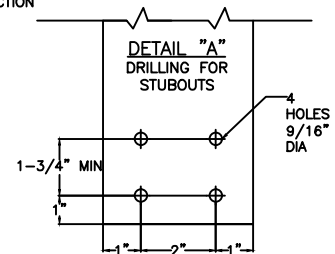


FIG. 3 - STUBS STAGGERED HORIZONTALLY



### NOTES:

1. LU will utilize 1200 Amp flex braids for connection between bus and transformer.
2. One Nema 2 hole landing spade for each 400 amps of buss capacity.



**Liberty Utilities®**

ENGINEERING AND CONSTRUCTION STANDARD

8.7.69 OF 91

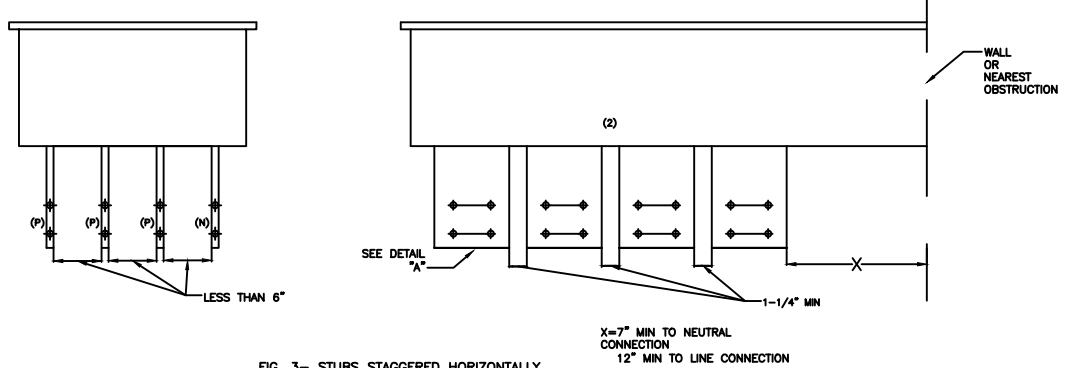
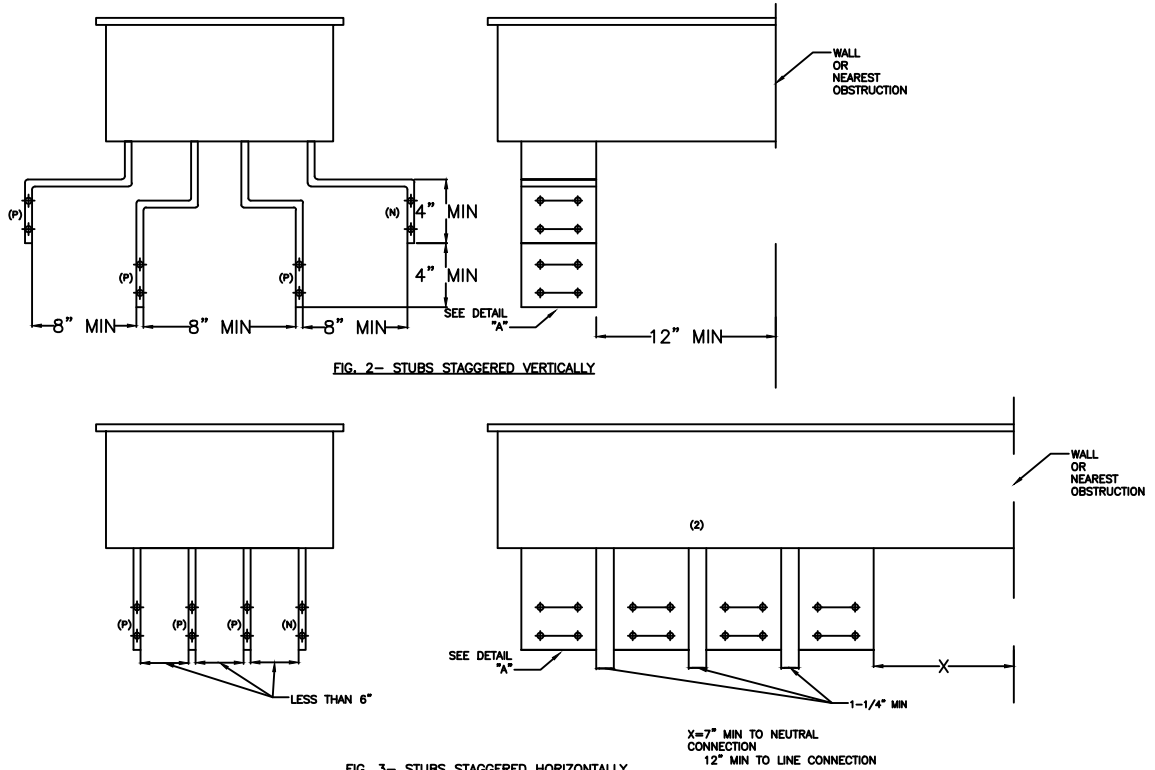
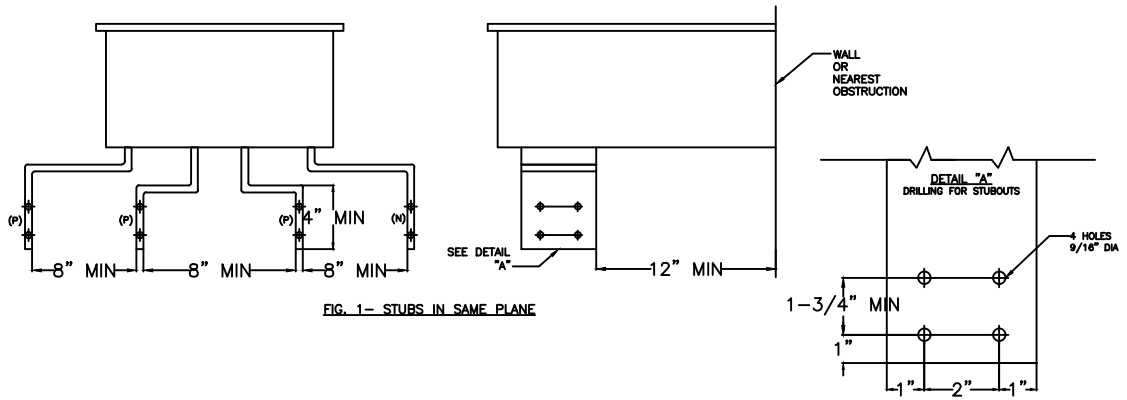
**ELECTRIC  
SWITCHBOARDS  
0-600 VOLTS**

**SUBSTRUCTURE**

**DRAWING NUMBER  
SB0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

## 10.6 4 WIRE -NEW CONSTRUCTION



### NOTES:

1. LU will utilize 1200 Amp flex braid for connections between bus and transformer.
2. One Nema 2 hole landing spade for each 400 amps of buss capacity.
3. Neutral shall be permanently marked by the manufacturer.
4. Contact LU Planning Representative prior to ordering bus duct for exact location of neutral position.
5. See LU Standard, VB0100U.



**Liberty Utilities®**

ENGINEERING AND CONSTRUCTION STANDARD

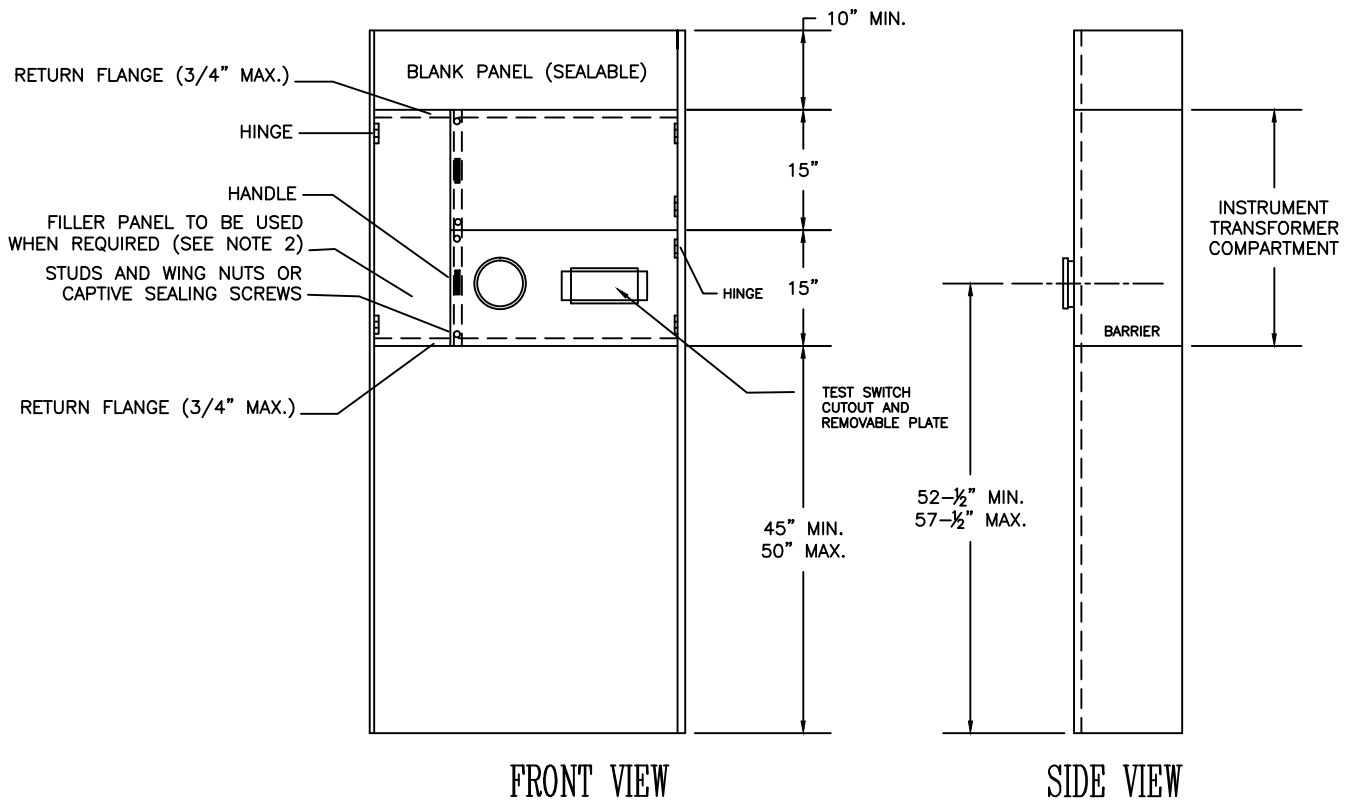
8.7.70 OF 91

**ELECTRIC  
SWITCHBOARDS  
0-600 VOLTS**

**SUBSTRUCTURE**

**DRAWING NUMBER  
SB0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04



### INSTRUMENT TRANSFORMER COMPARTMENT

#### NOTES:

1. Instrument transformer compartments shall be bussed with rectangular bus bar.
2. Filler panels shall be used where switchboard width exceeds meter panel width.
3. The grounding connection shall be made in the main switch or breaker compartment.
4. Meter panels shall be constructed of 12 gauge steel (minimum) and shall be reversible, sealable, hinged, and interchangeable.
5. When only one meter panel is furnished, it shall be mounted in the lower position.
6. Hinges shall be readily interchangeable, right or left, on the job site.
7. Width of meter panels may in some cases require the service section to be wider than the minimum allowable width of transformer compartment.
8. Meter panels and filler panels shall be equipped with stops to prevent inward swinging beyond the front surface of the switchboard.
9. A non-metallic barrier should be secured to the front and the back of the switchboard between the sealed and unsealed sections.



**Liberty Utilities®**

ENGINEERING AND CONSTRUCTION STANDARD

8.7.71 OF 91

**ELECTRIC  
SWITCHBOARDS  
0-600 VOLTS**

**SUBSTRUCTURE**

**DRAWING NUMBER  
SB0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

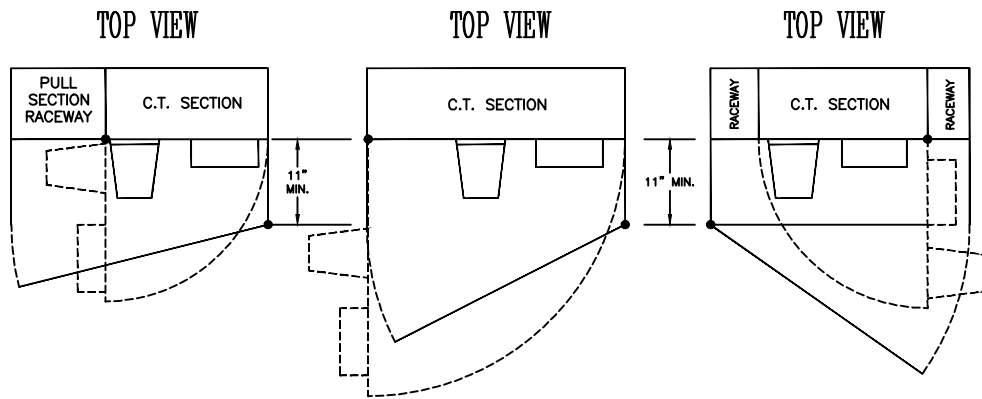
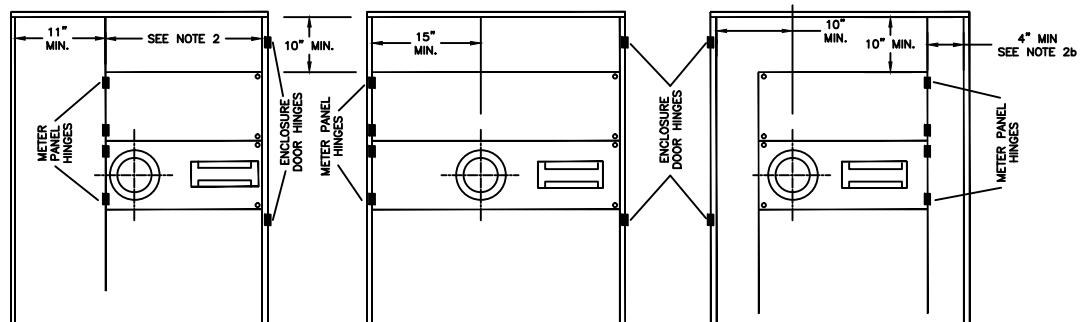


FIG. 1

FIG. 2

FIG. 3



FRONT VIEW

FRONT VIEW

FRONT VIEW

### RAIN TIGHT SWITCHBOARDS WITH ENCLOSED METER PANELS

#### NOTES:

1. Hinged meter panels shall be capable of being opened 90° with meter and test facilities in place.
2. For hinged meter panel design see Sheets 8.7.89 and 8.7.90.
  - a. For sheet 8.7.88 use Figures 1, 2, or 3 designs as illustrated.
  - b. For sheet 8.7.89, use Figure 1 design as illustrated on Figure 3, design with the 4 inch min., raceway dimension increased to 11 inch min.
3. The edge of the meter socket or test switch slots shall be 1 inch plus the depth of the recess from the hinged side.
4. For enclosure locking provisions, see LU Standard, GM0001M.



**Liberty Utilities®**

ENGINEERING AND CONSTRUCTION STANDARD

8.7.72 OF 91

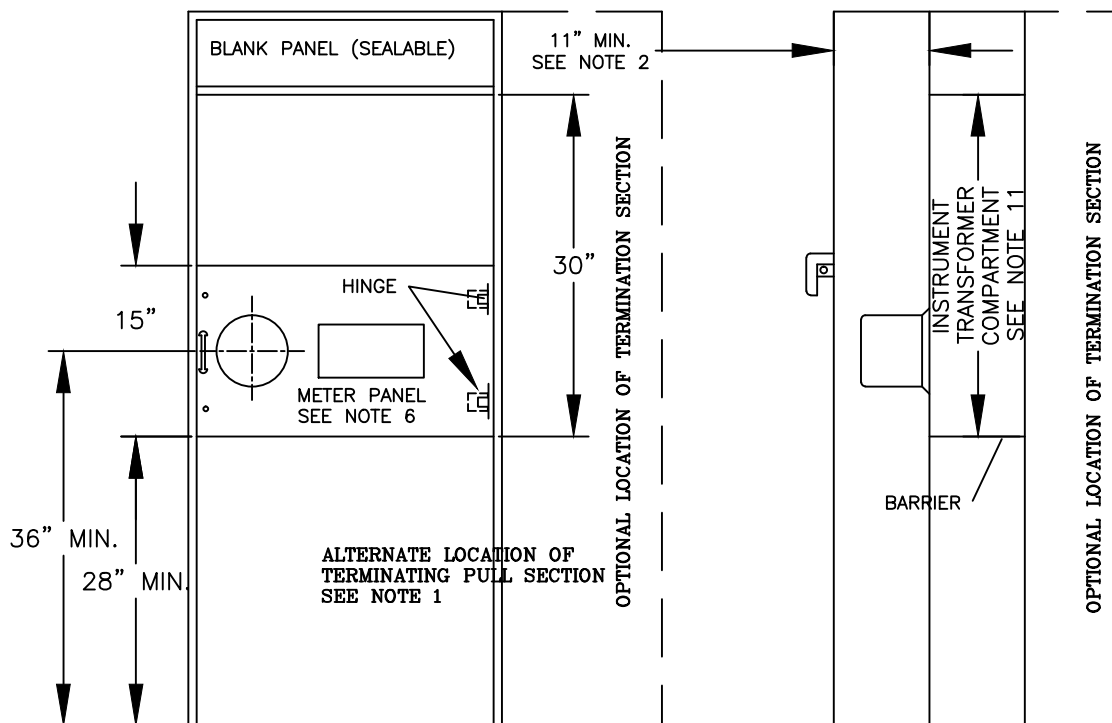
**ELECTRIC  
SWITCHBOARDS  
0-600 VOLTS**

**SUBSTRUCTURE**

**DRAWING NUMBER  
SB0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04





#### NOTES:

1. Terminating Pull Section shall be located beside or behind the instrument transformer compartment.
2. Refer to Sheet 8.7.74 for door and hinge details on meter panel enclosure.
3. Instrument transformer compartments shall be bussed with rectangular bus bar.
4. Filler panels shall be used where switchboard width exceeds maximum allowable meter panel width. See Sheet 8.7.71.
5. The grounding connection shall be made in the main switch or breaker compartment.
6. Meter panels shall be constructed of 12 gauge steel (minimum) and shall be reversible, sealable, hinged and interchangeable.
7. When only one meter panel is required, it shall be mounted in the lower position.
8. Hinges shall be readily interchangeable, right or left, on the job site.
9. Width of meter panels may in some cases require the service section to be wider than the minimum allowable width of instrument transformer compartment.
10. Meter panels and filler panels shall be equipped with stops to prevent inward swinging beyond the front surface of the switchboard.
11. For instrument transformer compartment requirements and minimum dimensions, refer to the following pages:  
 0 to 1000 amperes, see Sheets 8.7.74 - 8.7.77.  
 1001 to 3000 amperes, see Sheets 8.7.78 - 8.7.81.  
 3001 amperes and above, see Sheets 8.7.82 - 8.7.85.  
 Any questions, consult LU - Electric Metering.



**Liberty Utilities®**

ENGINEERING AND CONSTRUCTION STANDARD

8.7.73 OF 91

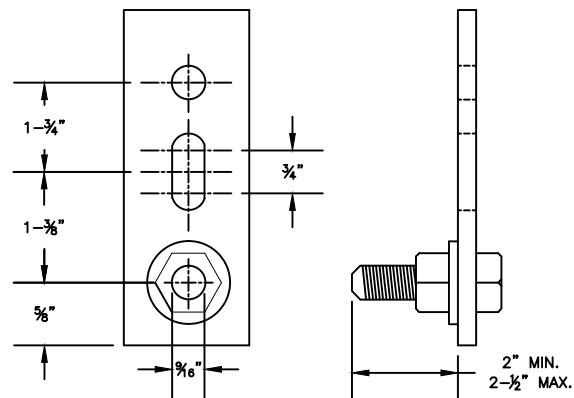
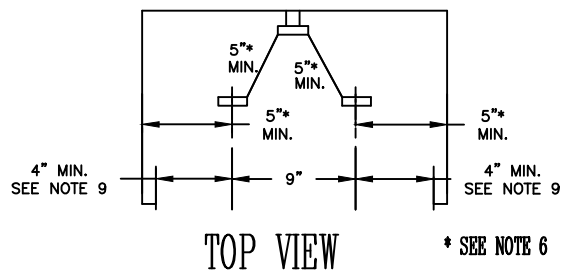
## **ELECTRIC SWITCHBOARDS 0-600 VOLTS**

**SUBSTRUCTURE**

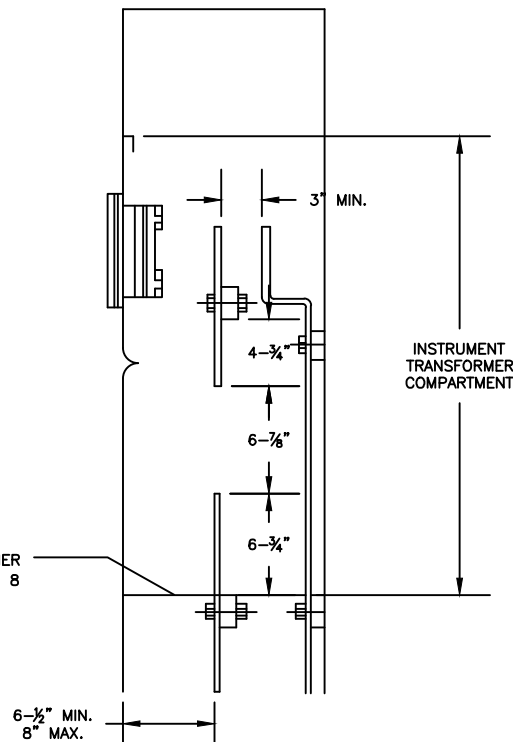
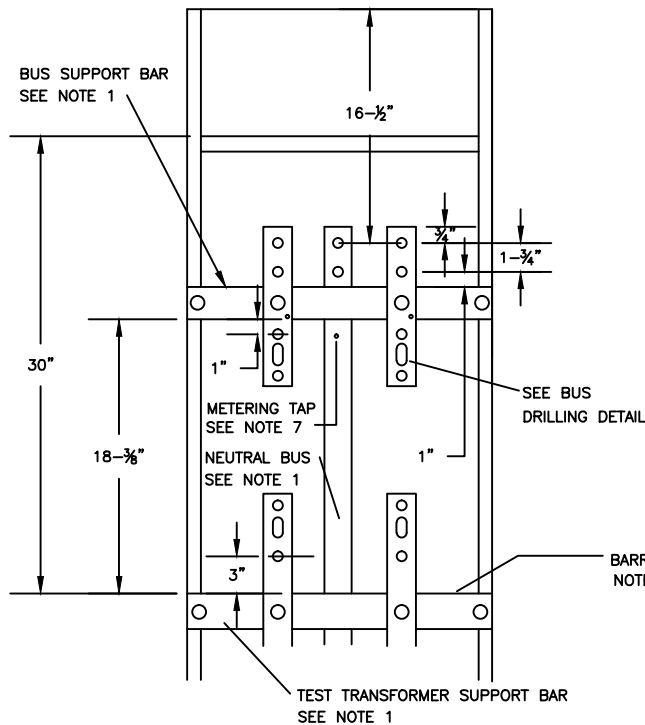
**DRAWING NUMBER  
SB0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

# **THREE PHASE THREE WIRE** **0 TO 1000 AMPERES**



TYPICAL 4 LOCATIONS, SEE NOTE 3



**FRONT VIEW**

**SIDE VIEW**



**Liberty Utilities®**

ENGINEERING AND CONSTRUCTION STANDARD

8.7.74 OF 91

**ELECTRIC  
SWITCHBOARDS  
0-600 VOLTS**


**SUBSTRUCTURE**

**DRAWING NUMBER  
SB0001M**

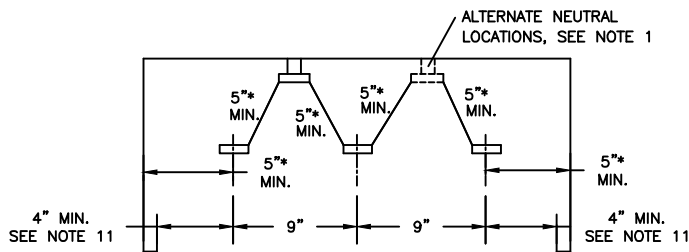
DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

## NOTES:

1. Bus arrangements and supports shall be provided as shown, except the neutral bus may be located at either side or on either side wall. Bus supports shall be constructed of a continuous bar of insulating material and shall be rigid to prevent misalignment of the bus units with cables in place.
2. The bus units may be supplied from the top or bottom and shall be anchored to prevent turning. Bus units shall be constructed of rectangular bus and when laminated shall have no space between laminations. Bus dimensions shall be provided as follows:  
Minimum: 1/4" x 2"; Maximum: 3/4" x 2".
3. Bus unit shall be provided with a fixed stud as shown for mounting CT's. Each shall:
  - a. Consist of a 1/2" steel bolt and shall be provided with a spring washer and nut.
  - b. Be secured in place. "Secured in place" shall mean that the stud will not turn, back-out, or loosen in any manner when tightening or loosening the associated nuts.
4. When the compartment is supplied from horizontal cross-bussing, the bussing shall pass through the compartment or in the sealed area above the compartment.
5. Except for conductors supplying the instrument-transformer compartment, no other conductors or devices shall be installed in, or routed through, the compartment or the sealed area above the compartment.
6. A clear unobstructed work space shall be provided around the current-transformer bus units from the barrier to the upper support bar.
7. Taps for attachment of meter wiring shall be provided as follows:
  - a. One tap on each upper and lower phase bus unit with a #10-32 UNC screw and washer provided for each phase bus in either the upper or lower position.
  - b. One tap on the neutral bus as shown.
8. The barrier shall be constructed of a rigid insulating material resistant to electrical "ARC" tracking, and shall be secured in place with a maximum deflection of 1/2" from an applied force of 25 pounds downward.
9. Dimension measured to inside edge of the compartment access opening.
10. The power leg bus for a four-wire delta service shall be identified by an outer finish that is orange in color or by tagging or other effective means.
11. Each bus shall have a connector that will accept stranded conductors having the ampere capacity of the main switch or breaker. When main switch is over 400 amperes and for all underground services, see Sheet 8.7.87.

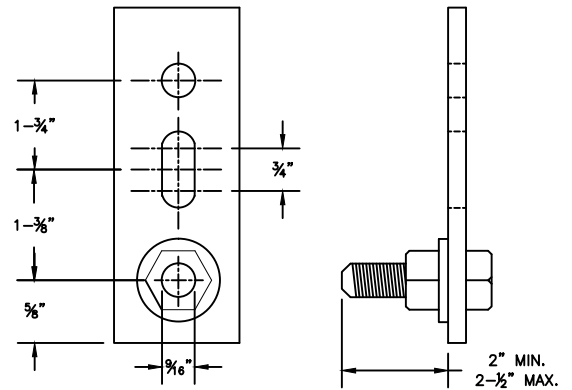
<div><div>Liberty Utilities®</div></div> <table><tr><td>DRAWN</td><td>DESIGN</td><td>SUPR</td><td>DATE</td><td>REV</td></tr><tr><td>LL</td><td>ET</td><td>JM</td><td>08/17</td><td>04</td></tr></table>					DRAWN	DESIGN	SUPR	DATE	REV	LL	ET	JM	08/17	04	ENGINEERING AND CONSTRUCTION STANDARD	8.7.75 OF 91
					DRAWN	DESIGN	SUPR	DATE	REV							
					LL	ET	JM	08/17	04							
<div>ELECTRIC SWITCHBOARDS 0-600 VOLTS</div>		SUBSTRUCTURE														
		DRAWING NUMBER <b><i>SB0001M</i></b>														

# **THREE PHASE FOUR WIRE** **0 TO 1000 AMPERES**

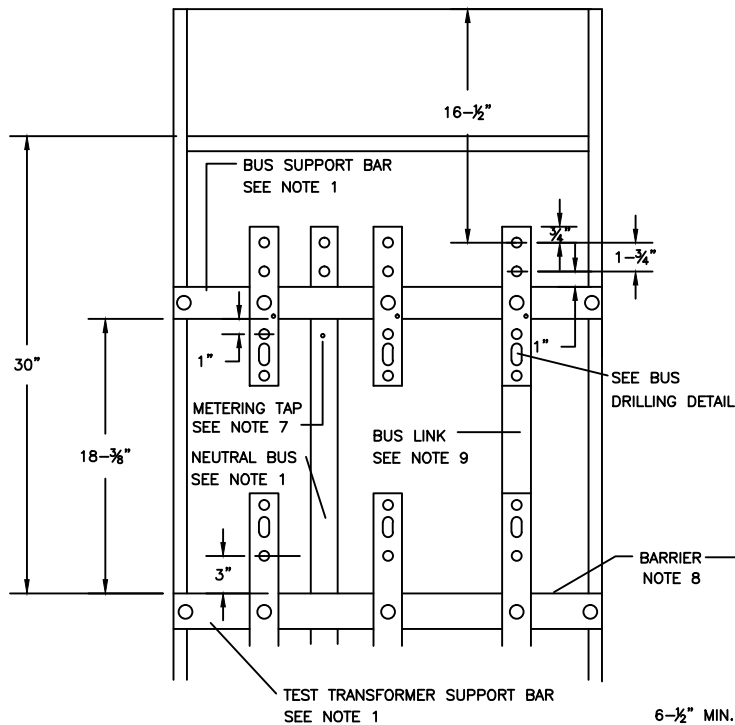


**TOP VIEW**

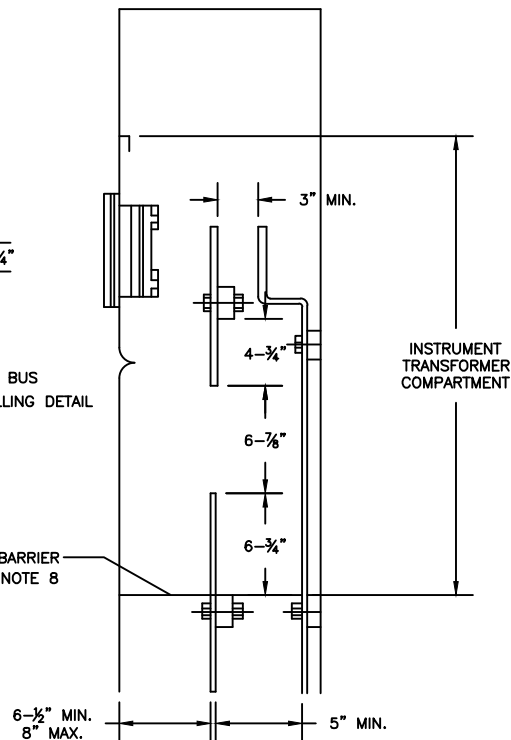
\* SEE NOTE 6



**BUS DRILLING DETAIL**  
 TYPICAL 6 LOCATIONS, SEE NOTE 3



**FRONT VIEW**



**SIDE VIEW**



**Liberty Utilities®**

ENGINEERING AND CONSTRUCTION STANDARD

8.7.76 OF 91

**ELECTRIC**  
**SWITCHBOARDS**  
**0-600 VOLTS**


**SUBSTRUCTURE**

**DRAWING NUMBER**  
**SB0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

## NOTES:

1. Bus arrangements and supports shall be provided as shown, except the neutral bus may be located at either side or on either side wall. Bus supports shall be constructed of a continuous bar of insulating material and shall be rigid to prevent misalignment of the bus units with cables in place.
2. The bus units may be supplied from the top or bottom and shall be anchored to prevent turning. Bus units shall be constructed of rectangular bus and when laminated shall have no space between laminations. Bus dimensions shall be provided as follows:  
Minimum: 1/4" x 2"; Maximum: 3/4" x 2".
3. Bus unit shall be provided with a fixed stud as shown for mounting CT's. Each shall:
  - a. Consist of a 1/2" steel bolt and shall be provided with a spring washer and nut.
  - b. Be secured in place. "Secured in place" shall mean that the stud will not turn, back-out, or loosen in any manner when tightening or loosening the associated nuts.
4. When the compartment is supplied from horizontal cross-bussing, the bussing shall pass through the compartment or in the sealed area above the compartment.
5. Except for conductors supplying the instrument-transformer compartment, no other conductors or devices shall be installed in, or routed through, the compartment or the sealed area above the compartment.
6. A clear unobstructed work space shall be provided around the current-transformer bus units from the barrier to the upper support bar.
7. Taps for attachment of meter wiring shall be provided as follows:
  - a. One tap on each upper and lower phase bus unit with a #10-32 UNC screw and washer provided for each phase bus in either the upper or lower position.
  - b. One tap on the neutral bus as shown.
8. The barrier shall be constructed of a rigid insulating material resistant to electrical "ARC" tracking, and shall be secured in place with a maximum deflection of 1/2" from an applied force of 25 pounds downward.
9. A removable link shall be installed in the right side phase bus when the service is to be used for three phase three wire service.
10. The power leg bus for a four-wire delta service shall be identified by an outer finish that is orange in color or by tagging or other effective means.
11. Dimension measured to inside edge of the compartment access opening.
12. Each bus shall have a connector that will accept stranded conductors having the ampere capacity of the main switch or breaker. When main switch is over 400 amperes and for all underground services, see Sheet 8.7.87.

<div><div>Liberty Utilities®</div></div>					ENGINEERING AND CONSTRUCTION STANDARD		8.7.77 OF 91
					<div>ELECTRIC SWITCHBOARDS 0-600 VOLTS</div>		SUBSTRUCTURE
							DRAWING NUMBER <i>SB0001M</i>
DRAWN	DESIGN	SUPR	DATE	REV			
LL	ET	JM	08/17	04			

# THREE PHASE THREE WIRE 1001 TO 3000 AMPERES

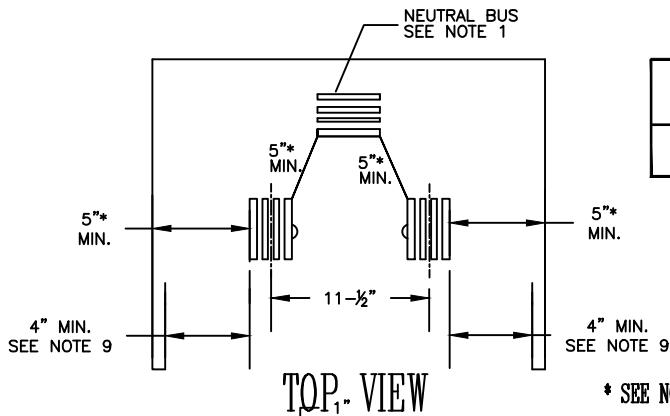
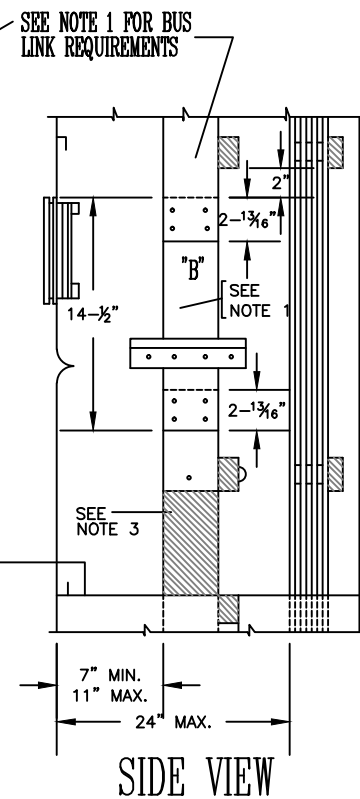
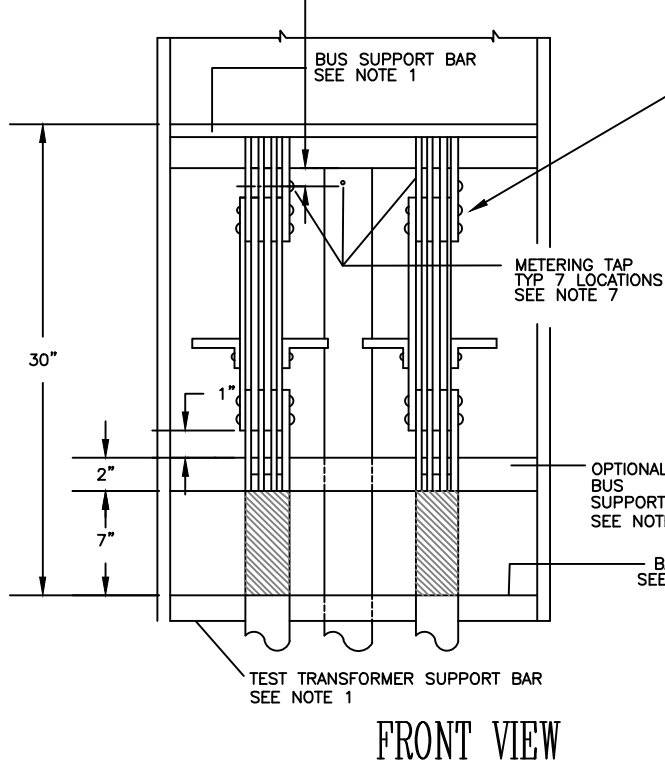


TABLE 1 MAXIMUM ALLOWABLE BUS SIZES
(4) 1/4" x 4" SPACED 1/4"



**Liberty Utilities®**

ENGINEERING AND CONSTRUCTION STANDARD

8.7.78 OF 91

**ELECTRIC  
SWITCHBOARDS  
0-600 VOLTS**


**SUBSTRUCTURE**

**DRAWING NUMBER  
SB0001M**

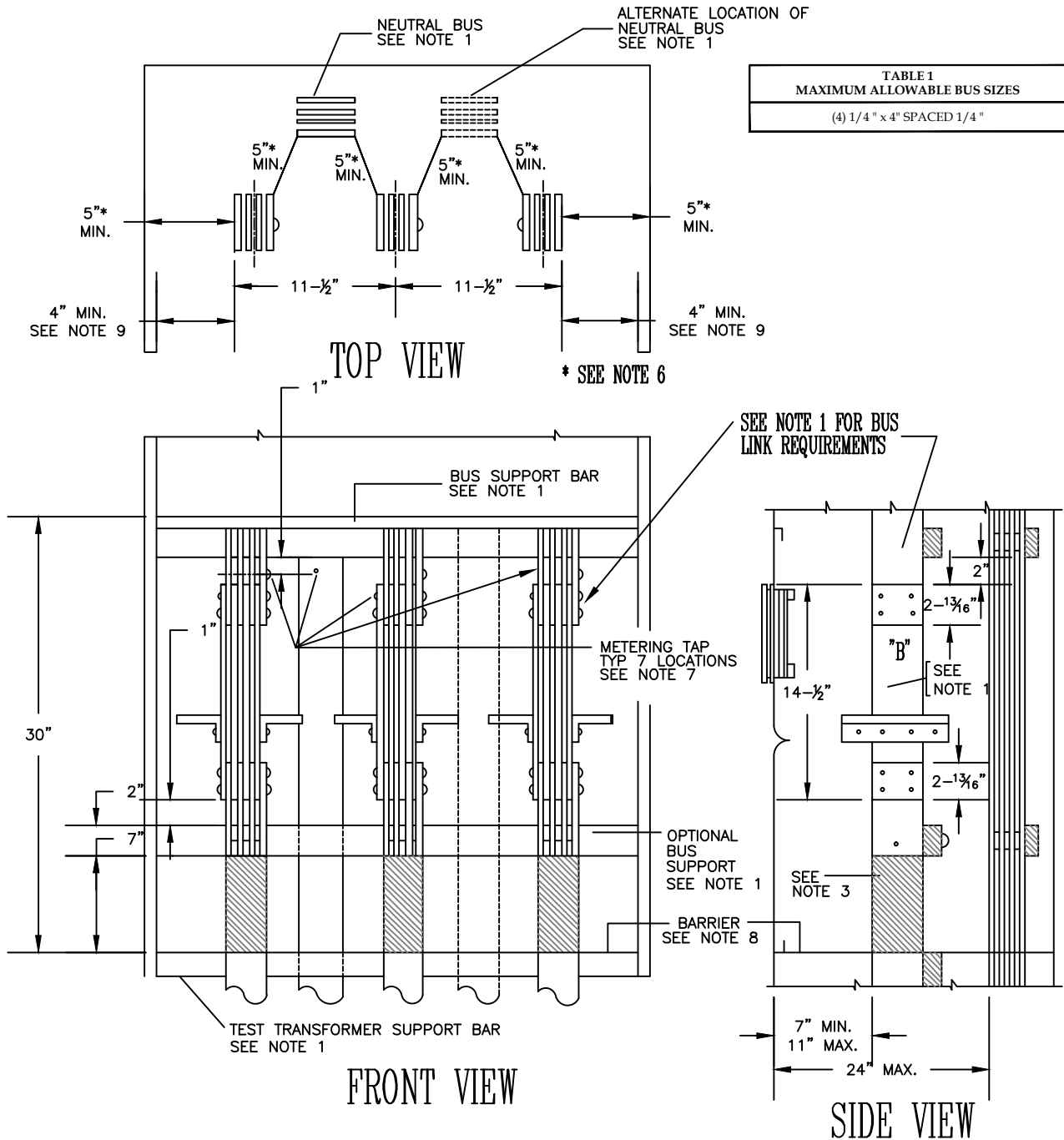
DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

## NOTES:

1. Bus arrangements and supports shall be provided as shown, except the neutral bus may be located at either side or on the side wall. Bus units shall be anchored so that busses will remain in position when section "B" is removed. For details of removable section "B" and the insulated CT support for 4" bus, see Sheet 8.7.88.
2. Direction of feed shall be vertical and no other conductors shall pass through this compartment. A neutral bus bar extension shall be provided in the instrument transformer compartment above the lower current transformer bus support when the service section phase busses are supplied from horizontal cross bussing.
3. Bus units shall be insulated as shown and the insulating material shall be rated for the serving voltage. Round bus corners as necessary to prevent damage to insulation.
4. Transformer compartment shall be on the supply side of the main switch or breaker.
5. For underground service installed by LU, the busses shall extend into the pull section as per Sheet 8.7.64.
6. The maximum permissible bus unit shall be as noted in Table 1.
7. Taps for attachment of meter wiring shall be provided as follows:
  - a. One tap on each upper and lower phase bus unit with a #10-32 UNC screw and washer provided for each phase bus in either the upper or lower position.
  - b. One tap on the neutral bus as shown.
8. Clearance to the side of the compartment shall be increased by the amount by which the corner angle exceeds one inch.
9. Dimension measured to inside edge of the compartment access opening.
10. Barrier shall be insulating non-tracking material and have a minimum of 24 vent holes of 3/8" diameter.
11. The barrier should not be less than 45" and shall not be more than 50" above the standing surface.

 <b>Liberty Utilities®</b>					ENGINEERING AND CONSTRUCTION STANDARD		8.7.79 OF 91
					<b>ELECTRIC SWITCHBOARDS 0-600 VOLTS</b>		SUBSTRUCTURE
DRAWN	DESIGN	SUPR	DATE	REV			DRAWING NUMBER
LL	ET	JM	08/17	04			<b><i>SB0001M</i></b>

# THREE PHASE FOUR WIRE 1001 TO 3000 AMPERES



**Liberty Utilities®**

ENGINEERING AND CONSTRUCTION STANDARD

8.7.80 OF 91

**ELECTRIC  
SWITCHBOARDS  
0-600 VOLTS**

**SUBSTRUCTURE**

**DRAWING NUMBER  
SB0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04



## NOTES:

1. Bus arrangements and supports shall be provided as shown, except the neutral bus may be located at either side or on the side wall. Bus units shall be anchored so that busses will remain in position when section "B" is removed. For details of removable section "B" and the insulated CT support for 4" bus, see Sheet 8.7.86.
2. Direction of feed shall be vertical and no other conductors shall pass through this compartment. A neutral bus bar extension shall be provided in the instrument transformer compartment above the lower current transformer bus support when the service section phase busses are supplied from horizontal cross bussing.
3. Bus units shall be insulated as shown and the insulating material shall be rated for the serving voltage. Round bus corners as necessary to prevent damage to insulation.
4. Transformer compartment shall be on the supply side of the main switch or breaker.
5. For underground service installed by LU, the busses shall extend into the pull section as per sheet 8.7.65.
6. The maximum permissible bus unit shall be as noted in Table 1.
7. Taps for attachment of meter wiring shall be provided as follows:
  - a. One tap on each upper and lower phase bus unit with a #10-32 UNC screw and washer provided for each phase bus in either the upper or lower position.
  - b. One tap on the neutral bus as shown.
8. Clearance to the side of the compartment shall be increased by the amount by which the corner angle exceeds one inch.
9. Dimension measured to inside edge of the compartment access opening.
10. Barrier shall be insulating non-tracking material and have a minimum of 24 vent holes of 3/8" diameter.
11. The barrier should not be less than 45" and shall not be more than 50" above the standing surface.



**Liberty Utilities®**

ENGINEERING AND CONSTRUCTION STANDARD

8.7.81 OF 91

**ELECTRIC  
SWITCHBOARDS  
0-600 VOLTS**

**SUBSTRUCTURE**

**DRAWING NUMBER  
SB0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

# **THREE PHASE THREE WIRE 3001 AMPERES AND LARGER**

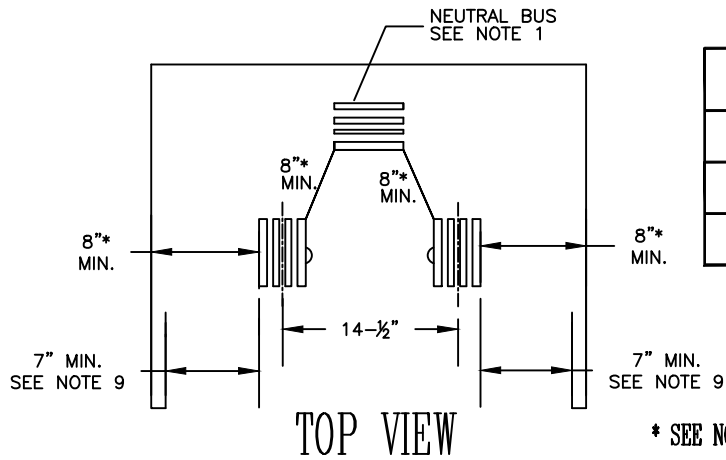
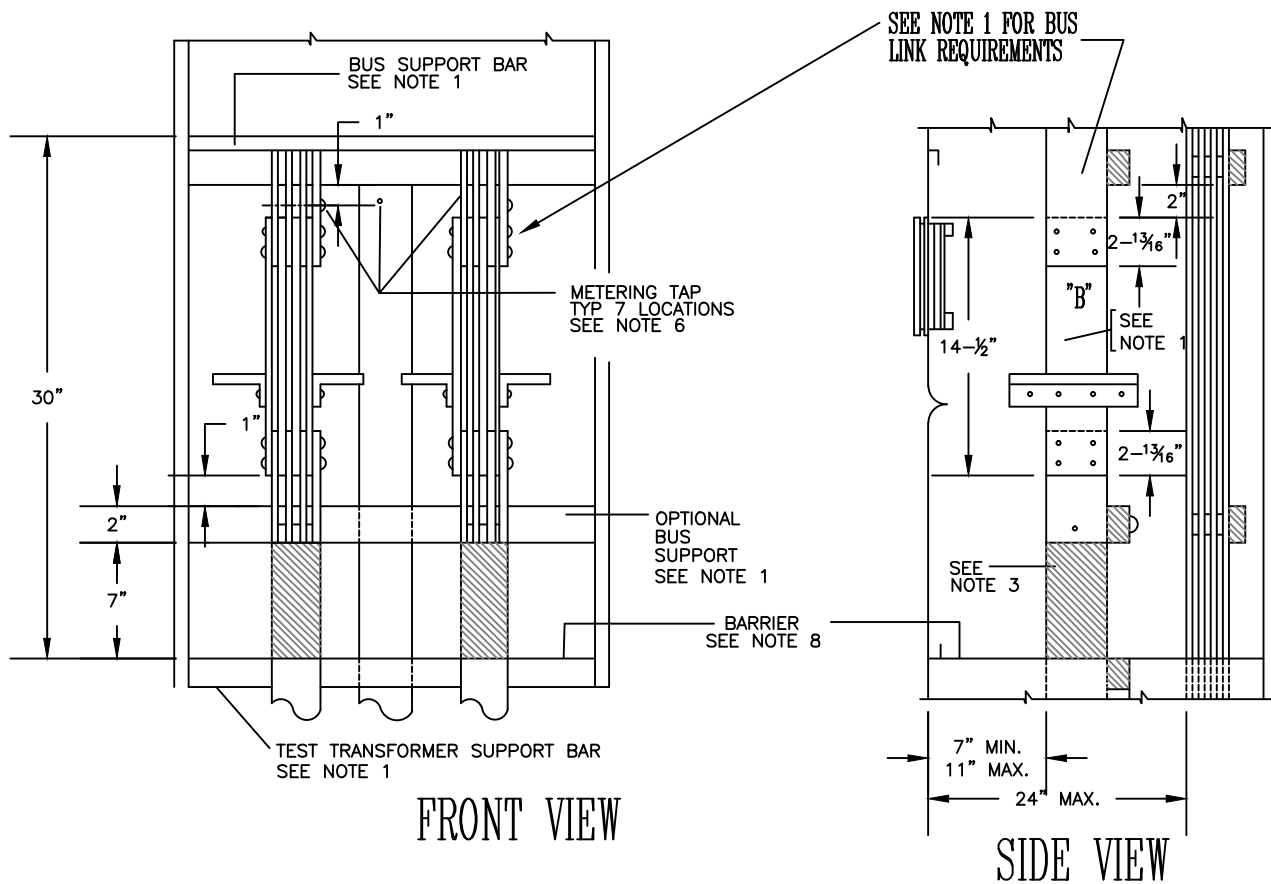


TABLE 1 MAXIMUM ALLOWABLE BUS SIZES
(4) 1/4 " x 4" SPACED 1/4 "
(6) 1/4 " x 5" SPACED 1/4 "
(5) 3/8 " x 5" SPACED 3/8 "



**Liberty Utilities®**

ENGINEERING AND CONSTRUCTION STANDARD

8.7.82 OF 91

**ELECTRIC  
SWITCHBOARDS  
0-600 VOLTS**


**SUBSTRUCTURE**

**DRAWING NUMBER  
SB0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

## NOTES:

1. Bus arrangements and supports shall be provided as shown, except the neutral bus may be located at either side or on the side wall. Bus units shall be anchored so that busses will remain in position when section "B" is removed. For details of removable section "B" and the insulated CT support for 4" bus, see Sheet 8.7.86. For 5" bus, see Sheet 8.7.87. Consult LU for use of bus larger than 5".
2. Direction of feed shall be vertical and no other conductors shall pass through this compartment. A neutral bus bar extension shall be provided in the instrument transformer compartment above the lower current transformer bus support when the service section phase busses are supplied from horizontal cross bussing.
3. Bus units shall be insulated as shown and the insulating material shall be rated for the serving voltage. Round bus corners as necessary to prevent damage to insulation.
4. Transformer compartment shall be on the supply side of the main switch or breaker.
5. For underground service installed by LU, the busses shall extend into the pull section as per Sheet 8.7.64.
6. The maximum permissible bus unit shall be as noted in Table 1.
7. Taps for attachment of meter wiring shall be provided as follows:
  - a. One tap on each upper and lower phase bus unit with a #10-32 UNC screw and washer provided for each phase bus in either the upper or lower position.
  - b. One tap on the neutral bus as shown.
8. Clearance to the side of the compartment shall be increased by the amount by which the corner angle exceeds one inch.
9. Dimension measured to inside edge of the compartment access opening.
10. Barrier shall be insulating non-tracking material and have a minimum of 24 vent holes of 3/8" diameter.
11. The barrier should not be less than 45" and shall not be more than 50" above the standing surface.

 <b>Liberty Utilities®</b>	ENGINEERING AND CONSTRUCTION STANDARD		8.7.83 OF 91	
	<b>ELECTRIC SWITCHBOARDS 0-600 VOLTS</b>		SUBSTRUCTURE	
DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04
			DRAWING NUMBER <b><i>SB0001M</i></b>	

# **THREE PHASE FOUR WIRE 3001 AMPERES AND LARGER**

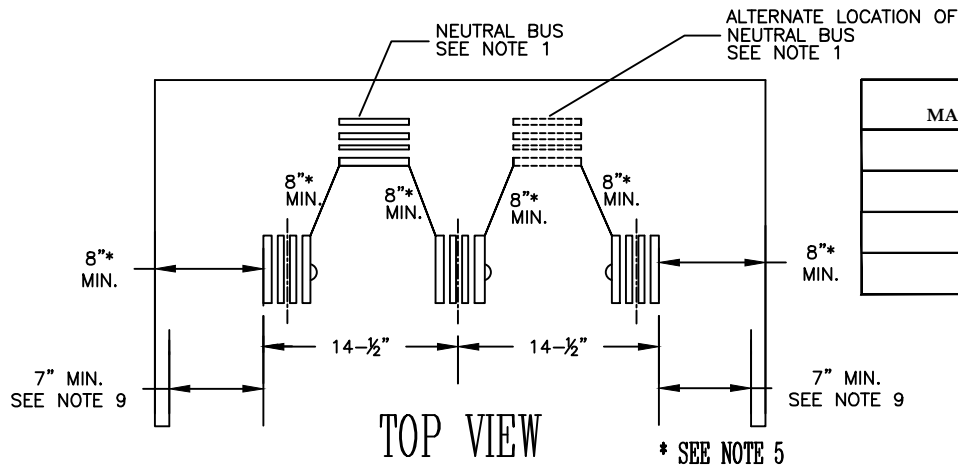
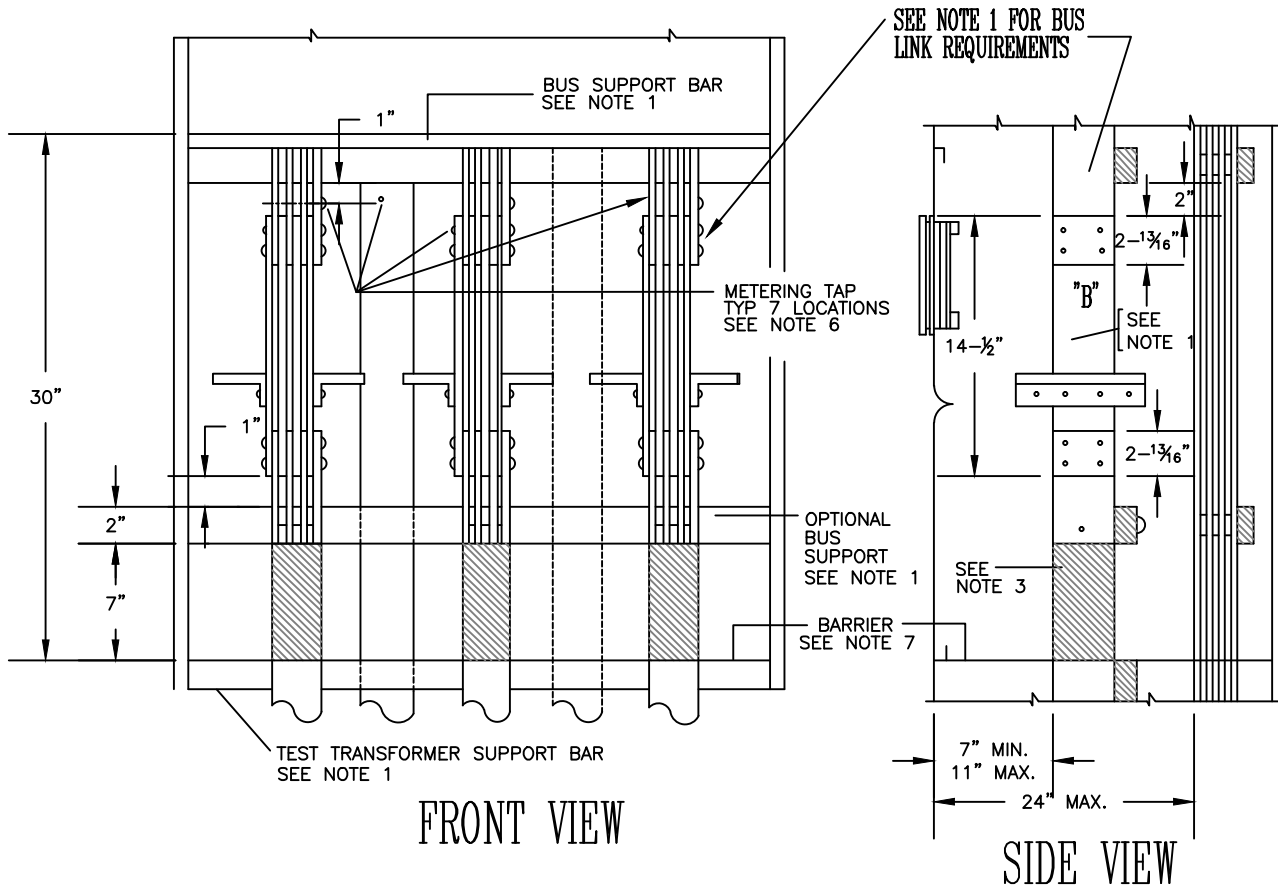


TABLE 1 MAXIMUM ALLOWABLE BUS SIZES
(4) 1/4" x 4" SPACED 1/4"
(6) 1/4" x 5" SPACED 3/8"
(4) 3/8" x 5" SPACED 3/8"
(5) 3/8" x 5" SPACED 3/8"



**Liberty Utilities®**

ENGINEERING AND CONSTRUCTION STANDARD

8.7.84 OF 91

**ELECTRIC  
SWITCHBOARDS  
0-600 VOLTS**

**SUBSTRUCTURE**

**DRAWING NUMBER  
SB0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

## NOTES:

1. Bus arrangements and supports shall be provided as shown, except the neutral bus may be located at either side or on the side wall. Bus units shall be anchored so that busses will remain in position when section "B" is removed. For details of removable section "B" and the insulated CT support for 4" bus, see Sheet 8.7.86. For 5" bus, see Sheet 8.7.87. Consult LU for use of bus larger than 5".
2. Direction of feed shall be vertical and no other conductors shall pass through this compartment. A neutral bus bar extension shall be provided in the instrument transformer compartment above the lower current transformer bus support when the service section phase busses are supplied from horizontal cross bussing.
3. Bus units shall be insulated as shown and the insulating material shall be rated for the serving voltage. Round bus corners as necessary to prevent damage to insulation.
4. Transformer compartment shall be on the supply side of the main switch or breaker.
5. For underground service installed by LU, the busses shall extend into the pull section as per Sheet 8.7.65.
6. The maximum permissible bus unit shall be as noted in Table 1.
7. Taps for attachment of meter wiring shall be provided as follows:
  - a. One tap on each upper and lower phase bus unit with a #10-32 UNC screw and washer provided for each phase bus in either the upper or lower position.
  - b. One tap on the neutral bus as shown.
8. Clearance to the side of the compartment shall be increased by the amount by which the corner angle exceeds one inch.
9. Dimension measured to inside edge of the compartment access opening.
10. Barrier shall be insulating non-tracking material and have a minimum of 24 vent holes of 3/8" diameter.
11. The barrier should not be less than 45" and shall not be more than 50" above the standing surface.
12. Return flanges for lower and upper meter panel support shall not project more than 3/4" up or down from adjacent switchboard panels.



**Liberty Utilities®**

ENGINEERING AND CONSTRUCTION STANDARD

8.7.85 OF 91

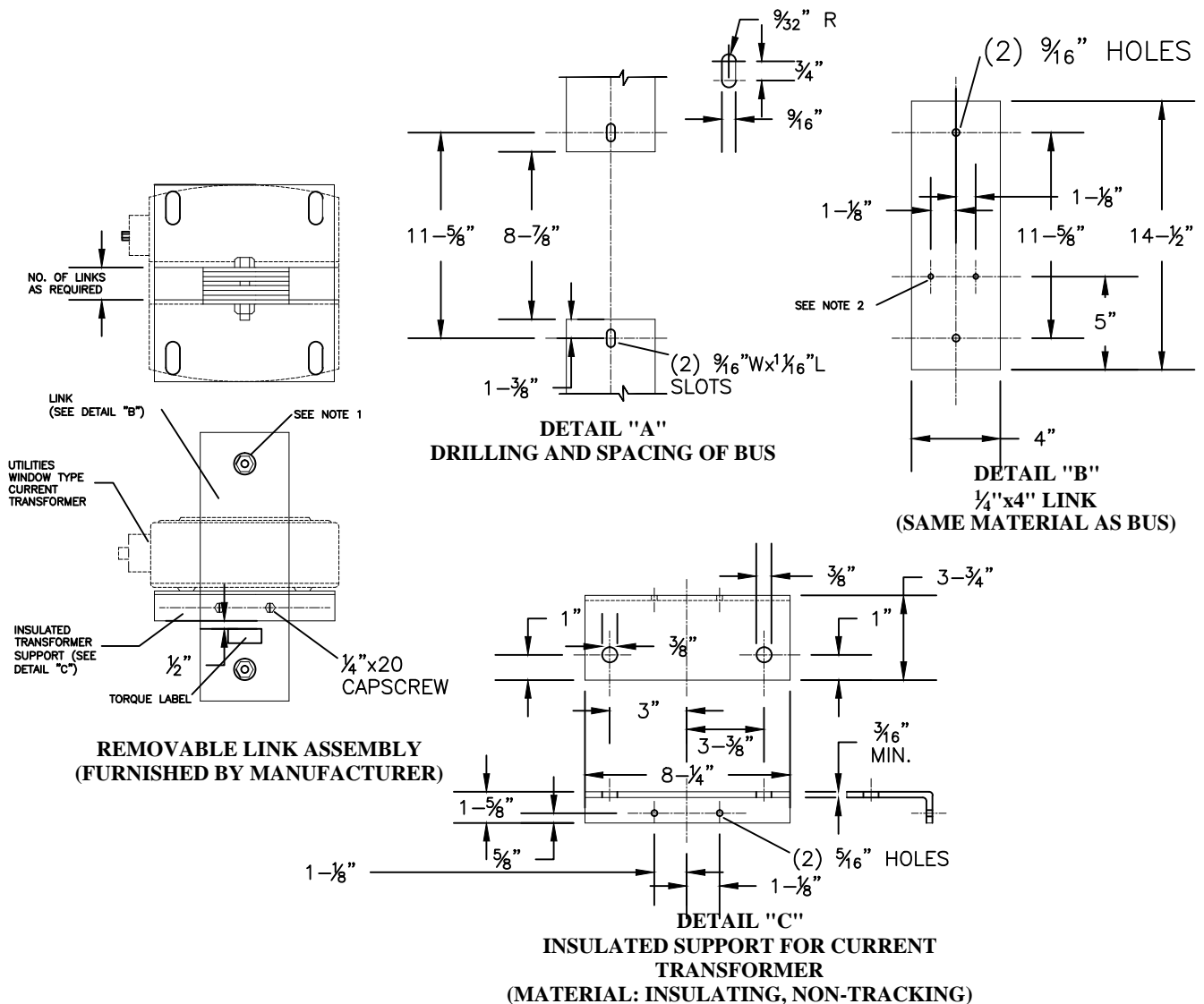
**ELECTRIC  
SWITCHBOARDS  
0-600 VOLTS**

**SUBSTRUCTURE**

**DRAWING NUMBER  
SB0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

# **REMOVABLE LINK & CT SUPPORT** **4" BUS - 3001 AMPS AND LARGER**



## **NOTES:**

1. Manufacturer to secure the removable bus link to the upper and lower CT bus units using 1/2-inch hex-head bolts, nuts (as shown) with a spring washer and a nut.
2. Drill and tap two holes as shown on the outer bus units for 1/4-inch x 20 UNC cap-screws.



**Liberty Utilities®**

ENGINEERING AND CONSTRUCTION STANDARD

8.7.86 OF 91

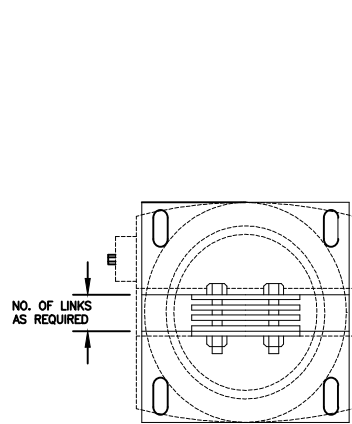
**ELECTRIC**  
**SWITCHBOARDS**  
**0-600 VOLTS**

**SUBSTRUCTURE**

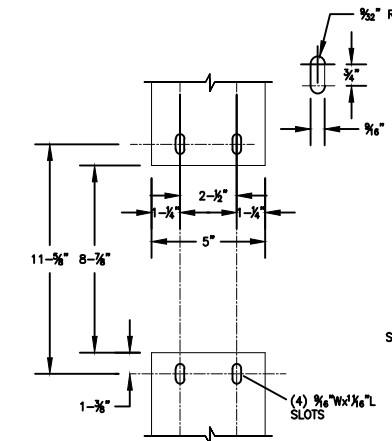
**DRAWING NUMBER**  
**SB0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

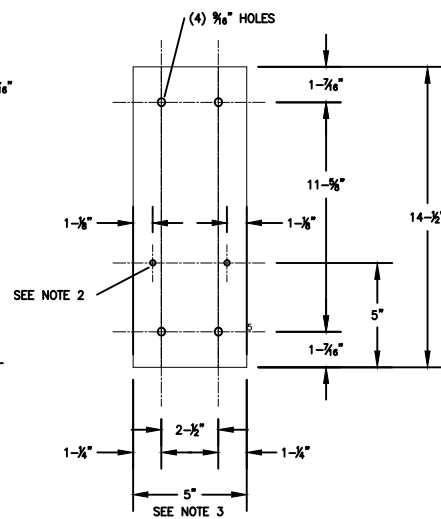
# **REMOVABLE LINK & CT SUPPORT** **5" BUS 1001 - 3000 AMPS**



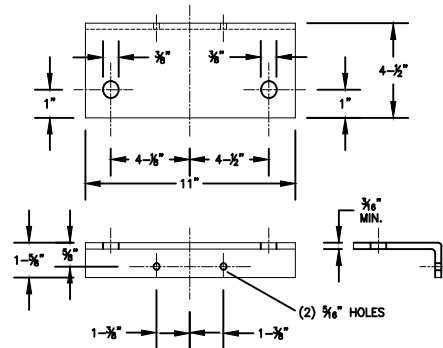
**REMOVABLE LINK ASSEMBLY**  
**(FURNISHED BY MANUFACTURER)**



**DETAIL "A"**  
**DRILLING AND SPACING OF BUS**



**DETAIL "B"**  
**1/4" x 5" LINK**  
**(SAME MATERIAL AS BUS)**



**DETAIL "C"**  
**INSULATED SUPPORT FOR CURRENT**  
**TRANSFORMER**  
**(MATERIAL: INSULATING, NON-TRACKING)**

## **NOTES:**

1. Manufacturer to secure the removable bus link to the upper and lower CT bus units using 1/2-inch hex-head bolts, nuts (as shown) with a spring washer and a nut.
2. Drill and tap two holes as shown on the outer bus units for 1/4-inch x 20 UNC cap-screws.
3. Consult LU for use of bus bars larger than 5 inches.



**Liberty Utilities®**

ENGINEERING AND CONSTRUCTION STANDARD

8.7.87 OF 91

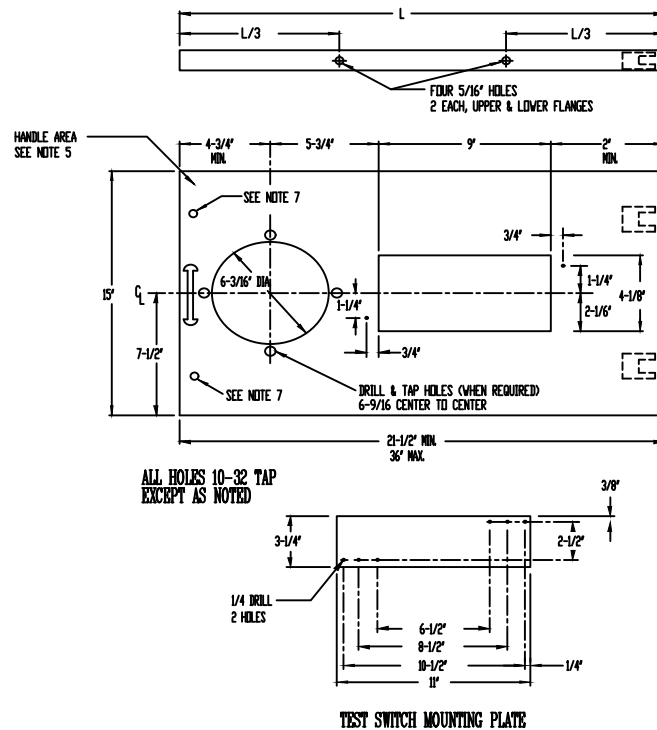
**ELECTRIC**  
**SWITCHBOARDS**  
**0-600 VOLTS**

SUBSTRUCTURE

DRAWING NUMBER  
**SB0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

# SOCKET METER PANEL



## NOTES:

1. The switchboard manufacturer shall drill, tap and slot the panel as shown for secondary test switches and shall furnish and install sockets complete with sealing rings.
2. Meter sockets installed on hinged panels shall be designed for back connection.
3. Meter panels shall be constructed of 12 gauge steel (minimum) and shall be hinged, reversible, sealable and interchangeable.
4. Hinges must support a 25-pound load applied at unsupported end with one-eighth inch maximum sag when open.
5. A handle shall be attached at the unsupported end of the meter panel with a minimum radial clearance of 1 inch from the meter socket or removable plate section.
6. Hinges shall be readily interchangeable, right or left, on the job site.
7. All securing screws and sealing screws on panel shall be captive. Studs and wing nuts shall be sealable when used.
8. Meter panels shall be capable of being opened 90° with meter and test facilities in place.
9. Removable plate shall be secured to rear of panel by screws of such length so as not to protrude through face of panel.



**Liberty Utilities®**

ENGINEERING AND CONSTRUCTION STANDARD

8.7.88 OF 91

**ELECTRIC  
SWITCHBOARDS  
0-600 VOLTS**

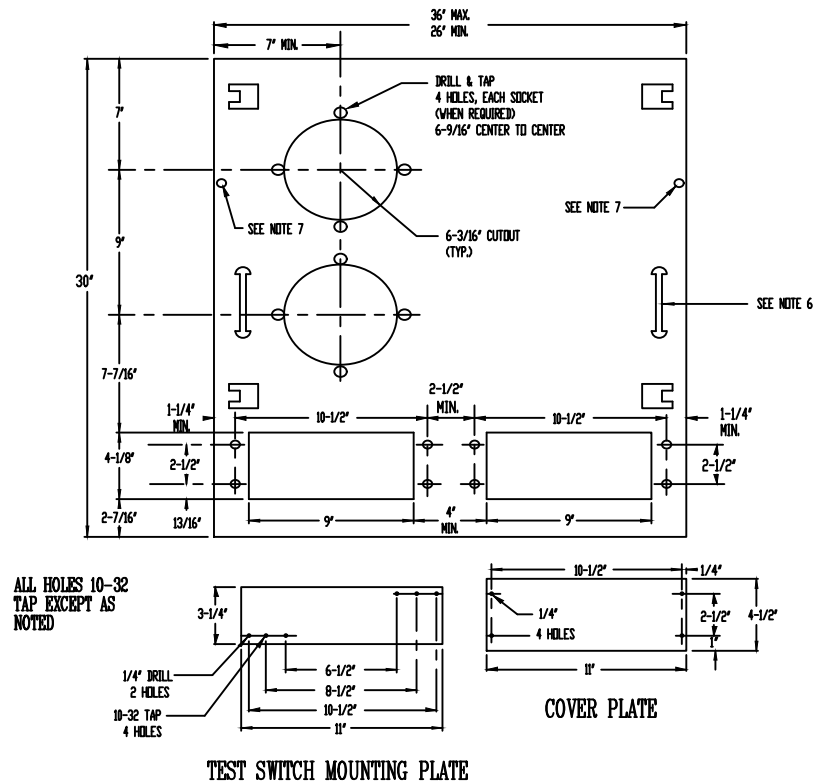
SUBSTRUCTURE

DRAWING NUMBER  
**SB0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04



# SOCKET METER & RECORDER PANEL



## NOTES:

1. The switchboard manufacturer shall drill, tap and slot the panel as shown and shall furnish and install sockets complete with sealing rings. All holes #10-32 UNC tap except as noted.
2. Removable plates shall be painted and attached to panel.
3. Meter panels shall be constructed of 12 gauge steel (minimum) and shall be hinged and sealable.
4. Hinges shall be readily interchangeable, right or left, on the job site. When clevis type or removable pin type hinges are used, provision shall be made so that pin can be removed from the top.
5. Hinges must support a 25-pound load applied at unsupported end with one-eighth inch maximum sag when open.
6. Panel shall have a handle attached to both sides.
7. All securing screws and sealing screws on panel shall be captive. Stud and wing nuts shall be sealable when used.
8. Hinged meter panel shall not be hinged to a filler panel.
9. Hinged meter panel shall be capable of being opened 90° with meter and test facilities in place. For recessed or enclosed meter panels, refer to sheet 8.7.72.
10. Meter sockets installed on hinged panels shall be designed for back connection.
11. For panel widths less than 26", consult LU.



**Liberty Utilities®**

ENGINEERING AND CONSTRUCTION STANDARD

8.7.89 OF 91

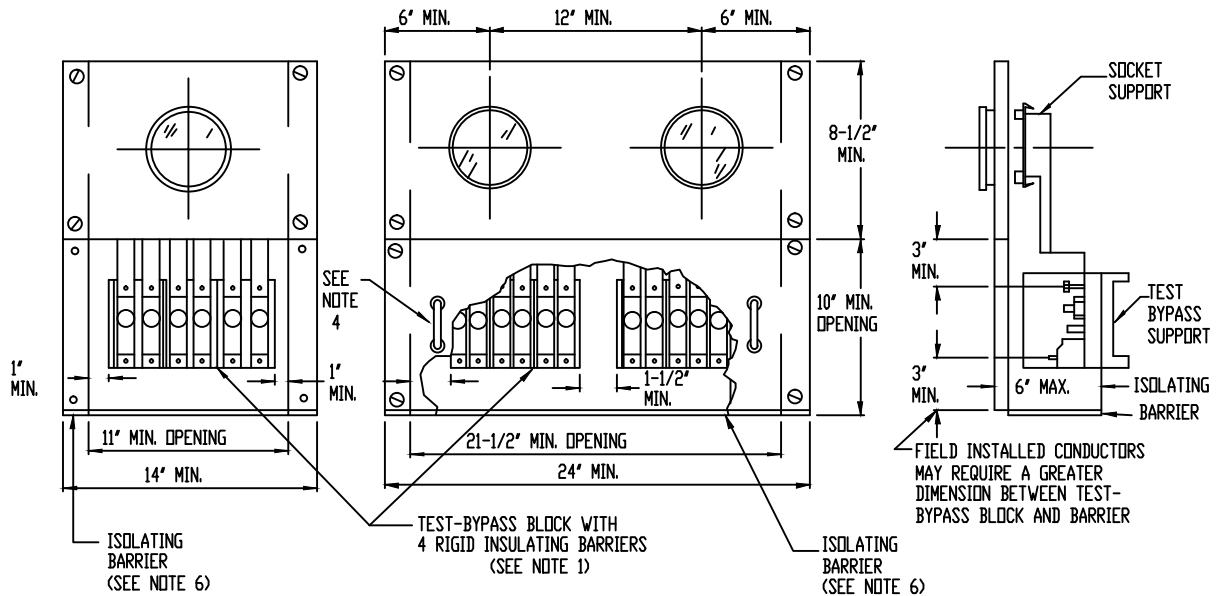
**ELECTRIC  
SWITCHBOARDS  
0-600 VOLTS**

**SUBSTRUCTURE**

**DRAWING NUMBER  
SB0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

## SELF CONTAINED METERS (0-200 AMP)



### NOTES:

1. Test-bypass blocks with rigid insulating barriers shall be furnished, installed, and wired or bussed to the meter socket by the manufacturer. Test-bypass blocks and barriers shall conform to LU Standards dwg. CM0001M, Sheets 8.3.15 - 8.3.16, requirements and physical arrangements shall conform to LU Standards dwg. CM0001M, sheet 8.3.20. Connection sequence is line-load, from left to right for each phase.
2. Metered conductors shall not pass through adjacent metering compartments except in enclosed wireways.
3. Meter panels shall be removable with a maximum of two meters per panel.
4. Test-bypass block cover panels shall be sealable and fitted with a lifting handle. All panels exceeding 16 inches in width shall require two lifting handles.
5. When a neutral is required for metering or testing, an insulated neutral terminal shall be provided behind each test-bypass cover panel. The terminal shall be readily accessible when the cover panel is removed and shall be individually connected to the neutral bus with a minimum size #8 AWG copper wire.
6. Factory installed full-width insulating barrier shall be located at the bottom of each test-bypass compartment.
7. For 3 phase, 4 wire, connect 7th jaw to body of neutral lug with #8 copper wire.
8. For 3 phase, 4 wire delta, identify right-hand test-bypass block (2 poles) as power leg.
9. For 3 phase, 3 wire, install bus to connect line and load poles together at top of center test-bypass block and connect 5th jaw to this bus using #8 copper wire.



**Liberty Utilities®**

ENGINEERING AND CONSTRUCTION STANDARD

8.7.90 OF 91

**ELECTRIC  
SWITCHBOARDS  
0-600 VOLTS**

**SUBSTRUCTURE**


**DRAWING NUMBER  
SB0001M**

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

10. For 1 phase, 3 wire, omit center test-bypass block.
11. For 1 phase, 3 wire, 208Y/120 volts, omit center test-bypass block and connect 5th jaw to body of neutral lug with #8 copper wire.
12. Meter panels shall be removable but shall be non-removable when meter is in place. Meter socket is to be supported independent of and attached to meter panel.
13. Separate line and load conductors shall be installed by the contractor or manufacturer for each meter socket.
14. Each line and load position shall be clearly identified by 3/4 inch minimum block lettering labeling.
15. All securing screws shall be captive. All panels shall be sealable.

## **11.0 METER SOCKETS**

See LU Standard GM0001M, for tabulation of LU meter socket requirements.

 <b>Liberty Utilities®</b>					ENGINEERING AND CONSTRUCTION STANDARD		8.7.91 OF 91
					<b>ELECTRIC SWITCHBOARDS 0-600 VOLTS</b>		SUBSTRUCTURE
DRAWN	DESIGN	SUPR	DATE	REV			DRAWING NUMBER
LL	ET	JM	08/17	04			<b><i>SB0001M</i></b>