12. ILLUSTRATIONS

12.1 GENERAL
Illustrations of typical service equipment and installations are shown in this section as an aid to interpretation of these Electric Service Requirements. The illustrations cover the majority of new services or changed services, and they show additional details that are necessary for clarification. In all cases the rules of the previous Sections of these Electric Service Requirements take precedence, and the Company should be consulted on questions of details not covered specifically in these illustrations.
EXPLANATION OF TERMS USED IN TYPICAL SERVICES TO SINGLE RESIDENTIAL PROPERTIES

OVERHEAD LINE
- COMPANY POLE
- ATTACHMENT TO BUILDING MAST, POLE, ETC. OR CONNECTION OF SERVICE ENTRANCE CONDUCTORS TO REAR BUS.

UNDERGROUND STREET MAIN
- SERVICE LATERAL
- LATERAL TERMINATES AND SERVICE ENTRANCE CONDUCTORS BEGIN AT POINT OF DELIVERY 18” INSIDE PROPERTY LINE WHETHER CONDUCTORS ARE SPLICED AT THIS POINT OR CONTINUOUS INTO BUILDING.
- ON SERVICES INSTALLED AFTER AUG. 1970 THE LATERAL TERMINATES AT AN END BOX IF THE METER IS INDOORS.

SERVICE DROP
- POINT OF DELIVERY
- WHEN BUILDING IS AT PROPERTY LINE.

PROPERTY LINE
- SERVICE ENTRANCE CONDUCTORS
- OUTDOOR METER
- BUILDING WALL
- INDOOR METER
- SERVICE EQUIPMENT
- END BOX

BASIC OVERHEAD SYSTEM

BASIC UNDERGROUND SYSTEM

Figure 12.01
OVERHEAD SERVICE CLEARANCE
120/240V.-PHASE

POLE ON SAME SIDE OF STREET AS BUILDING SERVED

USE STEEL MAST WHEN NECESSARY TO OBTAIN WIRE CLEARANCE

BUILDING AND POLE ON OPPOSITE SIDES OF STREET
SERVICE HEAD MUST BE ACCESSIBLE BY LADDER FROM FINISHED GRADE LEVEL.

Figure 12.02
SERVICE MAST INSTALLATION

- 1/2 MIN BOLTS
- TH: 1/2 STUDS
- (OP. ANCHOR PLATE)
- BROWNING

SERVICE HEAD

LEAVE AT LEAST 24" OF SERVICE CONDUCTORS FOR CONNECTION TO SERVICE DROP BY COMPANY.

H/W GALVANIZED STEEL CONDUIT

SERVICE BRACKET

INSULATOR (OPTIONAL)

SEAL WITH MASTIC OR AN APPROVED NEOPRENE SEAL

FLASHING

NO COUPLING PERMITTED ABOVE UPPER CONDUIT CLAMP

BLOCKING SOLIDLY INSTALLED BETWEEN RAFTERS

1/2 MIN BOLTS THRU STUDS (OR ANCHOR PLATE BRIDGING A STUD FOR 2-BOLT CLAMPS)

CONDUIT CLAMPS

OFFSET REDUCER (PERMITS DIRECT CONNECTION INTO HUB ON METER SOCKET.)

CLEANANCE TO GROUND - SEE FIGURE 12.02

30" MIN

CLEANANCE TO GROUND - SEE FigURE 12.02

4" MIN

12" MAX

LEAVE AT LEAST 24" OF SERVICE CONDUCTORS FOR CONNECTION TO SERVICE DROP BY COMPANY.

Figure 12.03

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### Typical Underground Installed by From Overhead Wires

**Note:**
Conduits not acceptable, Metallic Cable guard shall be provided.

![Diagram of typical underground installation](image)

### Table

<table>
<thead>
<tr>
<th>Item</th>
<th>Secondary 13KV</th>
<th>13KV</th>
<th>34KV</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Splice Box</td>
<td>Consult PECO</td>
<td>Consult PECO</td>
<td>Consult PECO</td>
</tr>
<tr>
<td>2. Conduit</td>
<td>Consult PECO</td>
<td>Consult PECO</td>
<td>Consult PECO</td>
</tr>
<tr>
<td>Radius</td>
<td>24” Minimum</td>
<td>30” Minimum</td>
<td>36” Minimum</td>
</tr>
<tr>
<td>Depth</td>
<td>24” Minimum</td>
<td>30” Minimum</td>
<td>30” Minimum</td>
</tr>
<tr>
<td>Radius</td>
<td>24” Minimum</td>
<td>30” Minimum</td>
<td>36” Minimum</td>
</tr>
<tr>
<td>Protection</td>
<td>Metallic Guard</td>
<td>Metallic Guard</td>
<td>Metallic Guard</td>
</tr>
<tr>
<td>Cable on Pole</td>
<td>Cable shall be securely fastened to pole and of sufficient length to permit the connection to company conductors. The company will connect the cable on the pole to the company conductors and assume ownership of facilities on it’s side of the service point.</td>
<td>Consult PECO</td>
<td>Consult PECO</td>
</tr>
</tbody>
</table>

*Figure 12.04*

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TYPICAL COMPANY TRANSFORMER INSTALLATIONS
ON CUSTOMER'S PREMISES

UNDERGROUND CONSTRUCTION

PE CO CIRCUIT
--- PROPERTY LINE

18" MANHOLE OR SPLICE BOX (WHEN REQ'D)

NUMBER OF CONDUCTORS AS REQ'D.

PROVISION FOR PE CO TRANSF

METERING

SERVICE CONTROL ASSEMBLY

AERIAL CONSTRUCTION

PE CO CIRCUIT
--- PROPERTY LINE

100' MAX

OVERHEAD WIRE - MINIMUM SIZE #6 CU OR EQUIVALENT PROVIDE ADEQUATE CLEARANCE ABOVE GROUND IN ACCORDANCE WITH APPLICABLE CODES

WOOD POLES - SIZE TO PROVIDE CLEARANCE IN ACCORDANCE WITH NATIONAL ELECTRICAL SAFETY CODE

TYPE OF TRANSF INSTALLATION TO BE DETERMINED BY COMPANY

METERING

SERVICE CONTROL ASSEMBLY

NOTE: COMPANY WILL MAKE SERVICE CONNECTION; SET METER; CUSTOMER TO PERFORM ALL OTHER NECESSARY WORK

Figure 12.05
TYPICAL OVERHEAD INSTALLATION
CUSTOMER OWNED

Figure 12.06

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TYPICAL UNDERGROUND CUSTOMER OWNED INSTALLATION

MAXIMUM SHORT CIRCUIT DUTY

PROPERTY LINE MANHOLE OR SPLICE BOX (WHEN REQ'D)

NUMBER OF SERVICE CONDUCTORS AS REQ'D

SERVICE CONTROL ASSEMBLY AS REQ'D

METERING

CUSTOMER OWNED TRANSFORMER

LOAD

13 KV

150 MVA

33 KV

CHECK WITH CUST., SUPT & POWER QUALITY

SEE Sect 11

SEE Sect 11

SEE TABLES 10 23 P, 10 23 P ABS, 10 25 A&B 10 26, 10 27, & 10 28

SEE TABLES 10 29 A&B

RECOMMENDED VOLTAGE RATING: 33,000 TO UTILIZATION VOLTAGE WITH TAPS FOR 34650, 33825, 32175, 31350

RECOMMENDED VOLTAGE RATING 13200A TO UTILIZATION VOLTAGE WITH TAPS FOR 13260, 13530, 12870, 12540

*LIGHTNING ARRESTERS ARE RECOMMENDED FOR DRY TYPE TRANSFORMERS SEE TABLE 10,218 & 10,228

NOTE FOR PECO

OWNERSHIP REQUIREMENTS

SEE REFERENCED PARAGRAPHS, FIGURES, AND TABLES ABOVE

THIS SKETCH IS TYPICAL FOR A SINGLE SERVICE IT SHOULD BE USED AS A GUIDE FOR DUAL OR REGULAR-RESERVE SERVICES AS INDICATED IN TABLES 10 23 -29B INCL

Figure 12.07
**Table 12.08**

**INSTALLATION OF SERVICE AND METER SUPPORT FOR TEMPORARY SERVICE LOOP**

**PLAN VIEW**

*Face service support so that service drop will pull evenly against each brace. (If 3 x 2" are used, position as shown)*

**GENERAL NOTES**

1. This standard is a change from Figure 8.42 in current PECO Electric Service Requirements Book Revised April 1996. Future revisions will contain this revised standard. However, because of safety reasons this standard is effective immediately and does not require any P.A./P.U.C. tariff revisions.

2. Service support (Note 2) shall be 6" x 8" or 3-1/4" x 6" (securely nailed or screwed together) clear and sound pine or fir (Note 6) without splice and braced securely.

**CONSTRUCTION NOTES**

a) The temporary service support shall be set at a minimum of 3 feet in firm ground with well tamped backfill.

b) Overhead services that cross over public streets, roads or highways shall not be attached to any structure at a height of less than 14 feet from the ground line. A higher attachment may be required to provide a minimum clearance of 18 feet above public streets, roads or highways. Service drop conductors shall meet all overhead clearance requirements of the latest issue of the National Electric Safety Code.

c) Pressure treated lumber is recommended

d) U.L. (Underwriters Laboratories) inspection and approval of installation is required before the installation can be energized.

e) The temporary support shall be within 10 feet of a drivable surface for access with an aerial lift device or the customer will be required to supply aerial triplex service to extend from the top of the support to within 5 feet of the ground and make the connections from this piece of triplex to the service entrance conductors. PECO will make the connection between the customer triplex and PECO triplex and the connection from the extended triplex to PECO owned distribution facilities.

   Caution: For safety reasons PECO employees shall not use a meter and service support as a support for an extension ladder.

f) Use a minimum of four #16d nails or 3" decking screws in each joint.

Ref. Constr. Std.S-1329

Figure 12.08

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1. CUSTOMER TO EXTEND SERVICE CONDUCTORS TO POINT OF DELIVERY AS DESIGNATED BY COMPANY, LEAVING SUFFICIENT SLACK FOR COMPANY TO MAKE CONNECTION
2. BEFORE DUGGING, CALL 800-242-1776 IN PA TO HAVE BURIED FACILITIES LOCATED

Figure 12.09
Figure 12.10 Deleted
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**TRANSFORMER FOUNDATION REQUIREMENTS**

**PRECAST**

**PRIMARY**

**SECONDARY**

**TRANSFORMER SIZE (KVA)**

**NOTE:** IN 4 KV AREAS WHICH ARE DESIGNATED TO BE CONVERTED TO 34 KV, THE 7' X 7' FOUNDATION LID MAY BE USED FOR THE FUTURE INSTALLATION OF 34 KV Padmount Transformers WHICH ARE 150 KVA OR LESS IN SIZE.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>CODE NO.</th>
<th>DESCRIPTION</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>139-84511</td>
<td>PRECAST TRANSFORMER FNDN. W/7' X 7' TOP</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>138-55527</td>
<td>ROD, GROUND , 1/2&quot; X 8'</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>138-12511</td>
<td>CLAMP, GROUND ROD</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>135-76855</td>
<td>WIRE, *4 SOLID COPPER, BARE</td>
<td>65</td>
</tr>
<tr>
<td>5</td>
<td>132-14606</td>
<td>CONNECTOR, TAP, VISE TYPE, *4 SOLID COPPER</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>*</td>
<td>METERING DUCT, METALLIC, 1 1/2 &quot; MIN. I.D.</td>
<td>*</td>
</tr>
<tr>
<td>7</td>
<td>*</td>
<td>BUSHING INSULATED</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>*</td>
<td>AS REQUIRED FOR 480Y/277V LOW VOLTAGE RATINGS ONLY SUPPLIED BY CUSTOMER</td>
<td>*</td>
</tr>
<tr>
<td>8</td>
<td>*</td>
<td>GROUNDING BUSHING FOR METERING CONDUIT</td>
<td>*</td>
</tr>
</tbody>
</table>

**NOTES**

(a) SET PRECAST TRANSFORMER FOUNDATION ON CRUSHED STONE. MINIMUM EXCAVATION IS 8' x 8' x 5' DEEP.

(b) INSTALL GUARD POSTS WHEN TRANSFORMER IS SUBJECT TO DAMAGE BY VEHICLES. USE 4" GALVANIZED STEEL PIPE FILLED WITH CONCRETE, SET IN 15" DIAMETER CONCRETE 3' DEEP. GUARD POST PIPE TO EXTEND 4' ABOVE FINAL GRADE.

(c) INSTALL *4 BARE COPPER FOR GROUNDING, PROVIDE 12" TO 18" COVER, EXTEND TO GROUND (ITEM 2) AND 2/0 COPPER WIRE EXTENDING THOUGH WALL OF PRECAST TRANSFORMER FOUNDATION.

(d) INSTALL WITH TOP APPROXIMATELY 3" ABOVE GRADE.

(e) EXTEND METERING CONDUIT 6" ABOVE VAULT LID IN FRONT RIGHT CORNER OF CABLE OPENING.

**PRECAST 3 PHASE TRANSFORMER FOUNDATION**

**7' X 7' TOP**

*Figure 12.11* Ref. Constr. Std.S-2231

---

**BILL OF MATERIAL**

**DESCRIPTION**

- PRECAST TRANSFORMER FOUNDATION W/7' X 7' TOP
- ROD, GROUND , 1/2" X 8'
- CLAMP, GROUND ROD
- WIRE, *4 SOLID COPPER, BARE
- CONNECTOR, TAP, VISE TYPE, *4 SOLID COPPER
- METERING DUCT, METALLIC, 1 1/2 " MIN. I.D.
- BUSHING INSULATED, AS REQUIRED FOR 480Y/277V LOW VOLTAGE RATINGS ONLY SUPPLIED BY CUSTOMER
- GROUNDING BUSHING FOR METERING CONDUIT

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**BILL OF MATERIAL**

<table>
<thead>
<tr>
<th>ITEM</th>
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<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>1</td>
<td>139-84513</td>
<td>PRECAST TRANSFORMER FOUNDATION</td>
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<tr>
<td>2</td>
<td>135-55527</td>
<td>ROD, GROUND</td>
</tr>
<tr>
<td>3</td>
<td>132-14606</td>
<td>CLAMP, GROUND ROD</td>
</tr>
<tr>
<td>4</td>
<td>135-76855</td>
<td>WIRE, 4X SOLID COPPER, BARE</td>
</tr>
<tr>
<td>5</td>
<td>132-14606</td>
<td>CONNECTOR, TAP, VISE TYPE, 4X SOLID COPPER</td>
</tr>
<tr>
<td>6</td>
<td>132-14606</td>
<td>METERING DUCT, METALLIC, 1 1/2&quot; MIN. I.D.</td>
</tr>
<tr>
<td>7</td>
<td>132-14606</td>
<td>BUSHING INSULATED</td>
</tr>
<tr>
<td>B</td>
<td>132-14606</td>
<td>GRUNDING BUSHING FOR METERING CONDUIT</td>
</tr>
</tbody>
</table>

**NOTES**

(a) SET PRECAST TRANSFORMERS FOUNDATION ON CRUSHED STONE. MINIMUM EXCAVATION IS 8" X 8" X 5' DEEP.

(b) INSTALL GUARD POSTS WHEN TRANSFORMER IS SUBJECT TO DAMAGE BY VEHICLES. USE 4" GALVANIZED STEEL PIPE FILLED WITH CONCRETE, SET IN 15" DIAMETER CONCRETE 3' DEEP. PIPE TO EXTEND 4' ABOVE FINAL GRADE.

(c) INSTALL 4" BARE COPPER FOR GROUNDING, PROVIDE 12" TO 18" COVER. EXTEND TO GROUND (ITEM 2) AND 2/0 COPPER WIRE EXTENDING THROUGH WALL OF PRECAST TRANSFORMER FOUNDATION.

(d) INSTALL WITH TOP APPROXIMATELY 3" ABOVE GRADE.

(e) ENTERING METERING CONDUIT 6" ABOVE VAULT LID IN FRONT RIGHT CORNER OF CABLE OPENING.

**PRECAST 3 PHASE TRANSFORMER FOUNDATION**  
8" X 8" TOP  

*Figure 12.12*  
Ref. Constr. Std.S-2232

---

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1 PHASE TRANSFORMER CONNECTIONS 4KV, 13 KV & 34 KV

LEAVE CONCENTRIC NEUTRAL WIRES LONG ENOUGH TO PERMIT SWITCHING. CONNECTED TO THE #2 COPPER USING VISE TYPE OR SPLIT BOLT COPPER CONNECTORS.

TYPES OF LOAD BREAK ELBOWS
- 15 KV 2 STR
- 15 KV 1/0 STR
- 35 KV PURPLE CUFF 1/0 STR

#2 BARE SOLID COPPER BETWEEN CASE GROUNDS & NEUTRAL

4" ABOVE FINISHED GRADE

APPROVED 15KV or 35KV CONCENTRIC NEUTRAL JACKETED CABLE

LEAVE SLACK FOR SWITCHING

COPPER CONNECTOR COMPRESSION OR VISE TYPE

INSTALL TRANSFORMER HOLD DOWN CLIPS (SUPPLIED WITH TRANSFORMER) USE 3/8 BOLTS & WASHERS 2 PER TRANSFORMER

#4 BARE SOFT DRAWN COPPER AROUND TRANSFORMER AND CONNECT TO GROUND ROD AND UP TO #2 COPPER

GROUND ROD 5/8" X 10' CU

SEE THE ILLUSTRATION SECTION, FIGURE 12.26 FOR PRIMARY CABLE TERMINATION. (E.S.R MANUAL)

Figure 12.13
LEAVE CONCENTRIC NEUTRAL WIRES LONG ENOUGH TO PERMIT SWITCHING, CONNECTED TO THE #2 COPPER USING VISE TYPE OR SPLIT BOLT COPPER CONNECTORS.

REQUIRED 3 PHASE TRANSFORMER CONNECTIONS 4KV, 13 KV & 34 KV

TYPES OF LOAD BREAK ELBOWS
15 KV 2 STR
15 KV 1/0 STR
35 KV PURPLE CUFF 1/0 STR

GROUNDING BUSHING
#4 BARE SOLID COPPER

REQUIRED CONCRETE MANHOLE COVER
7'x7' 4KV & 13KV
8'x8' 34KV

COPPER CONDUCTOR INSTALLED IN CONCRETE MANHOLE. INSTALLED BY MANUFACTURER

IF METERING EQUIPMENT WILL BE INSTALLED IN THE SECONDARY SIDE OF THE TRANSFORMER, SEE THE METERING SECTION.

RIGID METALLIC METERING CONDUIT WITH GROUNDING BUSHING, ONLY IF METERING EQUIPMENT IS INSTALLED IN TRANSFORMER.

Figure 12.14 GROUND ROD

SEE THE ILLUSTRATION SECTION, FIGURE 12.26 FOR PRIMARY CABLE TERMINATION.
<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CROSSARM, 8 FT TREATED</td>
</tr>
<tr>
<td>2</td>
<td>INSULATOR, ASA CLASS 55-5</td>
</tr>
<tr>
<td>3</td>
<td>INSULATOR, 4&quot; SUSPENSION</td>
</tr>
<tr>
<td>4</td>
<td>PIN, STEEL, LEAD TOP</td>
</tr>
<tr>
<td>5</td>
<td>PIN, POLE TOP</td>
</tr>
<tr>
<td>6</td>
<td>EYE, POLE PLATE</td>
</tr>
<tr>
<td>7</td>
<td>INSULATOR, SURGE GUY STRAIN</td>
</tr>
<tr>
<td>8</td>
<td>CLAMP, STRAIGHT LINE</td>
</tr>
<tr>
<td>9</td>
<td>POLE, WOOD CLASS B TREATED</td>
</tr>
<tr>
<td>10</td>
<td>CONDUCTOR, ALL ALUM OR ACSR, OR 1/0 OR 4/0 AWG BARE</td>
</tr>
<tr>
<td>11</td>
<td>CONNECTOR, COMPRESSION, TAP</td>
</tr>
</tbody>
</table>

**NOTE**

Insulators and clamps for service span to be furnished by customer. Structure to be guyed against customer's first span.

Replace porcelain insulators with polymer style

And descriptions of item #3 to Insulator, Suspension,
13KV TANGENT STRUCTURE (VERTICAL)

Figure 12.16
13KV TANGENT STRUCTURE (TRIANGULAR)
RIDGE PIN CONSTRUCTION

- Replace item #5 with new style braces
- Change description of item #4 to “Pin, Steel”

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CROSSARM, 8FT, TREATED</td>
</tr>
<tr>
<td>2</td>
<td>PIN, POLE TOP</td>
</tr>
<tr>
<td>3</td>
<td>INSULATOR, ASA CLASS 55-5</td>
</tr>
<tr>
<td>4</td>
<td>PIN, STEEL, LEAD TOP</td>
</tr>
<tr>
<td>5</td>
<td>BRACE, CROSSARM, WOOD, 30”</td>
</tr>
<tr>
<td>6</td>
<td>CLAMP, MESSENGER</td>
</tr>
<tr>
<td>7</td>
<td>BOLT, MACHINE, 5/8”</td>
</tr>
<tr>
<td>8</td>
<td>POLE, WOOD, CL.2, TREATED</td>
</tr>
<tr>
<td>9</td>
<td>CONDUCTOR, ALL ALUM. OR ACSR, 1/0 OR 4/0 AWG</td>
</tr>
<tr>
<td>10</td>
<td>LAG SCREW</td>
</tr>
<tr>
<td>11</td>
<td>BOLT, MACHINE, 3/8”</td>
</tr>
<tr>
<td>12</td>
<td>WASHER, ROUND</td>
</tr>
</tbody>
</table>

FOR REFERENCE ONLY
NOT TO BE USED FOR BIDDING OR CONSTRUCTION. DETAILS TO BE DETERMINED BY CUSTOMER'S ENGINEER

Figure 12.17

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13KV SWITCH AND FUSE STRUCTURE FOR OPEN WIRE SERVICE
(CUSTOMER'S OPEN-WIRE FEEDER)

NOTE

(a) POLE MUST BE LOCATED WHERE ACCESSIBLE TO TRUCK FOR MAINTENANCE.
(b) INSULATORS, DEADEND CLAMPS, AND NUTS FOR SERVICE SPAN WILL BE SUPPLIED BY CUSTOMER.
(c) FOR REFERENCE ONLY—NOT TO BE USED FOR BIDDING OR CONSTRUCTION DETAILS TO BE DETERMINED BY CUSTOMER'S ENGINEER.

ITEM DESCRIPTION
1. CROSSARM, 8 FT.
2. CROSSARM, 10 FT.
3. SWITCH, 14.4 KV, 400A, 20,000A MW.
4. FUSE 13.8 KV, 20,000A LC. ASTM.
5. WIRE, 4/0 STR. COPPER, BARE
6. WOOD MEMBER
7. LUB, 4/0 STR. COPPER

Describe: items #3 as Switch, 15kv, 600 A

Item#6 as operating rod with insulator

Figure 12.18
Old Switch, Replace with S-5169-E Switch

Replace porcelain insulator with polymer style

Describe: items #3 as Switch, 15kv, 600 A

Item#6 as operating rod with insulator

Figure 12.19
Old switch
Replace with S-5169-E Switch

---

**NOTES**

(a) Pole must be located where accessible to truck for maintenance.
(b) Deadend hardware and guys for service span will be supplied by customer.
(c) For reference only—not to be used for bidding or construction. Details to be determined by customer's engineer.

**ITEM** | **DESCRIPTION**
--- | ---
1 | Crossarm, 8 ft.
2 | Crossarm, 10 ft.
3 | Switch, 14.4kV, 400A, 20,000A. MOL.
4 | Lightning arrester, 10kV.
5 | Terminator
6 | Fuse, 13.8kV, 20,000A, LG. ASTM
7 | Wire, 4/0 STR. COPPER BARE
8 | Lug, 4/0 STR. COPPER
9 | Wood member
10 | Insulator, Surge Guy Strain

Describe: items #3 as Switch, 15kV, 600 A

Item#9 as operating rod with insulator

---

Figure 12.20

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Replace porcelain insulator with polymer style

Describe items #4 as insulator, suspension and polymer

Figure 12.21
NOTE
(a) BOND THROUGH BOLTS WITH COPPER BRAID WRAPPED TIGHTLY AROUND POLE AND FASTENED UNDER WASHERS. STAPLE AROUND POLE WITH A MINIMUM OF 8 STAPLES PER BONDING CIRCLE.

ITEM DESCRIPTION
1 INSULATOR, POST, 1 3/4" STUD, 46KV
2 BRACKET, F/POST INSULATOR
3 BOLT, MACHINE, 5/16" BOLTED, WASHED, CURVED, 5/8"-3/4" BOLT SIZE
4 BRAID, CU, 1/8" X 1/32"
5 STAPLE, RECTANGULAR, 63/64" X 1 1/4"
7 CLAMP, MESSENGER J-SHAPE

NOT TO BE USED FOR BIDDING OR CONSTRUCTION. DETAILS TO BE PROVIDED BY CUSTOMER'S ENGINEER.

Figure 12.22
33KV TANGENT STRUCTURES (TRIANGULAR) 
RIDGE PIN CONSTRUCTION

NOTE
(a) 7'-0" WHEN NEUTRAL CAN BE TEMPORARILY FLOATED, 8'-6" OTHERWISE.

ITEM DESCRIPTION
1 CROSSARM, 8 FT. TREATED
2 PIN, POLE TOP, STEEL, 3/4" 1 ST THREAD
3 INSULATOR, PIN, 34KV DIST. 1 ST THREAD
4 PIN, INSULATOR, II 5/4"L, 1" THREAD
5 BRACE, CROSSARM, WOOD, 30°
6 CLAMP, MESSENGER J-SHAPE

FOR REFERENCE ONLY.
NOT TO BE USED FOR BIDDING OR CONSTRUCTION.
DETAILS TO BE PROVIDED BY CUSTOMER'S ENGINEER.

Replace item#5 with new style braces

Figure 12.23

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Figure 12.24

NOTES

1. STRUCTURE TO BE DESIGNED FOR LINE CONDUCTOR TENSION OF 1500 LBS.
   PER CONDUCTOR AND PHASE SPACING OF 6FT MINIMUM.

2. INSTALLATION TO BE IN ACCORDANCE WITH COMPANY REQUIREMENTS.
   ALL APPLICABLE CODES AND LOCAL CONDITIONS.

3. THE FENCE (WALL OR SCREEN) MUST BE AT LEAST 8FT HIGH,
   AND INCLUDE ONE FOOT (3 STRANDS)
   OF BARED WIRE AT TOP UNLESS
   PROHIBITED BY LOCAL ORDINANCE.

FOR REFERENCE ONLY NOT TO BE
USED FOR BIDDING OR CONSTRUCTION.
DETAILS TO BE DETERMINED BY THE
CUSTOMER'S ENGINEER.
600 AMP VERTICAL MOUNTED INTEGRAL STYLE
GANG OPERATED LOAD BREAK SWITCH (S&C) 34KV

---

Figure 12.25A
NOTES

(a) OPERATING ROD INSULATORS Supplied WITH SWITCH. ONE ROD INSULATOR SHALL BE POSITIONED BETWEEN OVERBUILD AND UNDERBUILD IF BOTH ARE EXISTING; A SECOND ROD INSULATOR SHALL BE PLACED BETWEEN UNDERBUILD AND GROUND.

(b) NEW POLES—8'-6" REQUIRED FROM THE CROSSARM MOUNTING BOLT TO UPPERMOST NEUTRAL MOUNTING BOLT.

EXISTING POLES—8'-6" DESIRED, BUT 7'-0" Will BE THE MINIMUM CLEARANCE PERMITTED ON EXISTING POLES TO AVOID A POLE REPLACEMENT PROVIDED THE NEUTRAL CAN BE RELOCATED OR FLOATED.

(d) IF POSSIBLE, FACE SWITCH TOWARDS ROAD.

(e) REDRILL EXISTING HOLE FOR 3/4" BOLT IN POLE.

BILL OF MATERIAL

<table>
<thead>
<tr>
<th>ITEM</th>
<th>CODE NO.</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td>SWITCH, LD BREAK, 34KV, 600, VERT</td>
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<td>BOLT, MACHINE, 3/4&quot;, GALV</td>
<td>2</td>
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<tr>
<td>3</td>
<td>132-76063</td>
<td>WASHER, 3/4&quot;, CURVED</td>
<td>2</td>
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<tr>
<td>4</td>
<td>132-12762</td>
<td>STRAP, EXTENSION, 13</td>
<td>8</td>
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<td>5</td>
<td>137-37035</td>
<td>INSULATOR, SUSPENSION, 34KV</td>
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<td>6</td>
<td>SEE S-0252</td>
<td>CONNECTOR, TERMINAL LUG, COMPRESSION</td>
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<tr>
<td>7</td>
<td>132-13044</td>
<td>CLAMP, STRAIGHT LINE, SIDE ENTRY, F/1/0 &amp; 4/0</td>
<td>6</td>
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<tr>
<td>8</td>
<td>132-13022</td>
<td>CLAMP, STRAIGHT LINE, SIDE ENTRY, F/2/0 CU</td>
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<tr>
<td>9</td>
<td>132-23064</td>
<td>EYE BOLT, GALV, 5/8&quot; BOLT SIZE</td>
<td>6</td>
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<tr>
<td>10</td>
<td>SEE S-0251</td>
<td>VICE TYPE TAP CONNECTOR</td>
<td>1</td>
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<td>11</td>
<td>132-00014</td>
<td>STUD CONNECTOR</td>
<td>1</td>
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<td>12</td>
<td>138-00068</td>
<td>ARRESTOR, LIGHTNING</td>
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<td>13</td>
<td>132-05855</td>
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<td>132-01012</td>
<td>BRACKET, CROSSBAR, 18&quot;</td>
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<tr>
<td>15</td>
<td>195-78093</td>
<td>WIRE, COPPER, #4 AND, SOLID COVERED, S</td>
<td>4</td>
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<tr>
<td>16</td>
<td>SEE S-0150</td>
<td>5/8 MACHINe BOLT</td>
<td>8</td>
</tr>
</tbody>
</table>

REFERENCES

ELECTION ENG. AND INSTALLATION INSTRUCTIONS PACKED WITH SWITCH.

ALUM & ACSR LINE WIRE DEADENDS — S-1051-B

LINE TERMINATION OF ALUMINUM CONDUCTORS — S-0252

GROUNDING OF 34KV SWITCH HANDLES — — — S-1811

SPARE MATERIAL

<table>
<thead>
<tr>
<th>CODE NO.</th>
<th>DESCRIPTION</th>
</tr>
</thead>
</table>
| 198-39006| PIPE, STEEL, GALV, 1 1/2"
| 198-38208| MONOPHASE UNIT
| 197-37038| OPERATING ROD INSULATOR ASSEMBLY

Figure 12.25A (Contd.)
NOTES
(a) OPERATING ROD MAY BE INSTALLED IN THIS LOCATION IF MIDDLE UNDERGROUND PHASE AND SECONDARY ARE NOT ON THIS SIDE OF POLE.
(b) TO INCREASE LENGTH OF OPERATING ROD USE ITEMS LISTED UNDER SPARE MATERIAL. LENGTH MAY ALSO BE DECREASED.
(c) FOR INSTALLATION OF STANDING ARM (WHEN REQUIRED) SEE TB 3-1611
(d) OPERATING ROD INSULATORS SUPPLIED WITH SWITCH

BILL OF MATERIAL

<table>
<thead>
<tr>
<th>ITEM</th>
<th>CODE NO.</th>
<th>DESCRIPTION</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>131-02520</td>
<td>SWITCH, LD BREAK, 35.5REM, BODA, MONZ.</td>
<td>1</td>
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<tr>
<td>2</td>
<td>131-02521</td>
<td>BOLT, MACHINE, 5/8&quot; GALV.</td>
<td>*</td>
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<tr>
<td>3</td>
<td>131-02522</td>
<td>INSULATOR, PIN, 24KV DIST, 1&quot; THREAD</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>131-02523</td>
<td>PIN, INSULATOR, 11-24KV, 1&quot; THREAD</td>
<td>2</td>
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<tr>
<td>5</td>
<td>131-02524</td>
<td>LINK, CHAIN, FIGURE 6</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>131-02525</td>
<td>INSULATOR, SUSPENSION, 18-3/4&quot;</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>131-02526</td>
<td>PIN, POLE TOP, STEEL, 24&quot;, 1&quot; THREAD</td>
<td>1</td>
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<tr>
<td>8</td>
<td>131-02527</td>
<td>CROSSARM, # ID SLAMP</td>
<td>1</td>
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<tr>
<td>9</td>
<td>131-02528</td>
<td>CONDUCTOR CLAMP</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>PEW 5-0252</td>
<td>CONNECTOR, TERMINAL, COMPRESSION</td>
<td>6</td>
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<tr>
<td>11</td>
<td>PEW 5-0254</td>
<td>CONNECTOR, TAP, NIBBLE TYPE</td>
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</tr>
<tr>
<td>12</td>
<td>131-02593</td>
<td>BRACE, CROSSAN, WOOD/METAL ENDS, 37&quot;</td>
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<td>13</td>
<td>IBIC-02596</td>
<td>ARRESTER, LIGHTNING</td>
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<td>14</td>
<td>IBIC-02597</td>
<td>BRACKET, OFFSET, 1/2&quot;</td>
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<td>15</td>
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<tr>
<td>16</td>
<td>131-02599</td>
<td>3/4&quot; ROUND WASHER</td>
<td>12</td>
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<tr>
<td>17</td>
<td>131-02600</td>
<td>#1 SOL COPPER SD BARE</td>
<td>*</td>
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<tr>
<td>18</td>
<td>131-02601</td>
<td>3/4&quot; X 2&quot; MACHINE BOLT</td>
<td>*</td>
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<tr>
<td>19</td>
<td>131-02602</td>
<td>3/4&quot; LOCK WASHER</td>
<td>6</td>
</tr>
</tbody>
</table>

* AS REQUIRED

REFERENCES
Erection Drawing and Installation Instructions
PACKED WITH SWITCH
WOOD CROSSARM INSTALLATIONS

SPARE MATERIAL

<table>
<thead>
<tr>
<th>CODE NO.</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>131-02749</td>
<td>GUIDE BEARING, 1-1/2&quot; PIPE</td>
</tr>
<tr>
<td>131-02749</td>
<td>RIGID COUPLING 2-1/2&quot; PIPE</td>
</tr>
<tr>
<td>131-02749</td>
<td>INTERRUPTER UNIT</td>
</tr>
<tr>
<td>131-02749</td>
<td>PIPE, STEEL, GALV. 1-1/2&quot;</td>
</tr>
<tr>
<td>131-02749</td>
<td>OPERATING ROD INSULATOR ASSEMBLY</td>
</tr>
<tr>
<td>131-02749</td>
<td>HANDLE ASSY</td>
</tr>
<tr>
<td>131-02749</td>
<td>UNIVERSAL COUPLING</td>
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</tbody>
</table>

GROUNDING DETAIL

Figure 12.25B (Contd.)
UNWRAP SUFFICIENT AMOUNT OF CONCENTRIC NEUTRAL WIRES SO THE OPERATION OF THE ELBOW WILL NOT BE RESTRICTED. TAPE CONCENTRIC WIRES TO CABLE. INSTALL ELBOW PER MANUFACTURES SPECIFICATIONS. INSTALL (1) STRAND OF CONCENTRIC NEUTRAL WIRE THROUGH MOLDED HOLE IN ELBOW. CONTINUE WRAPPING UP AROUND ELBOW AND BACK THROUGH OTHER MOLDED HOLE. WRAP AROUND OTHER WIRES TO TERMINATE.

INSTALLATION OF ELBOW

2 LAYERS OF 1" PLASTIC TAPE OVER 8 LAYERS OF 1" HIGH VOLTAGE TAPE.

TERMINATION OF OUTER JACKET

REMOVE OUTER JACKET, ROUGHEN 2" OF JACKET WITH AL. OXIDE CLOTH AND APPLY 2" WIDE STRIP OF WATER SEALING COMPOUND TO BE USED AS A SEAL FOR THE DRAIN WIRES. BEND DRAIN WIRES BACK ALONG THE CABLE AND EMBED EACH WIRE INTO THE WATER SEALING COMPOUND. (MAKE SURE WIRES DO NOT TOUCH EACH OTHER). COAT WITH BONDING CEMENT AND INSTALL HIGH VOLTAGE AND PLASTIC TAPE AS SHOWN. REWRAP WIRES AROUND CABLE SEMI-CONDUCTING LAYER, AND TREAT AS UNJACKETED CONCENTRIC CABLE.
EDGE OF MACADAM

TYPICAL UNDERGROUND ARRANGEMENTS
PRIMARY & SECONDARY SHOWN

TYPICAL AERIAL ARRANGEMENTS
PRIMARY & SECONDARY SHOWN

LEGEND

CLUSTER MOUNTED TRANSFORMERS
SECONDARY ENCLOSURE OR SWITCH MODULE
TRANSFORMER
SECONDARY MAIN
SECONDARY SERVICE (CUSTOMER OWNED)
AERIAL SEC'D. LASHED
PRIMARY CONDUCTOR
TERMINAL POLE

ELECTRICAL DESIGN
COMMERCIAL DEVELOPMENTS

Figure 12.27

Ref. Constr. Std.S-5560sheet11
REAR OF BLDG.

PEDESTAL
(SINGLE OR COMBINATION) NOTE (A) (SEE DETAIL III)

MULTITAP CONNECTORS
NOTE (A) & CAUTION 1

SECONDARY CONDUITS
# SPARE DUCT
SEE NOTE (E)

OPTION 3
PEDESTAL, W/
INDIVIDUAL FEED TO METERS

SECONDARY CONDUITS
# SPARE DUCT
SEE NOTE (E)

OPTION 4
CUSTOMERS MANHOLE, W/
INDIVIDUAL FEED TO METERS

ELECTRICAL DESIGN
COMMERCIAL DEVELOPMENTS

Figure 12.30
Ref. Constr. Std.S-5560sheet14

[See Figure 12.33 for Notes and Bill of Material]
OPTION 5

[See Figure 12.33 for Notes and Bill of Material]
SECONDARY CONDUITS
N/ SPARE BUCT
SEE NOTE (g)

[See Figure 12.33 for Notes and Bill of Material]
DETAIL IV

Connections required per polarity and neutral when 2, 3, or 4 conductors are required from transformer. Windings same for X2, X3, and neutral.

[See Figure 12.33 for Notes and Bill of Material]
NOTES:

a) Transformer & switch modules shall be a minimum of 4'-0" from edge of walkway or protected with bumper posts (item 10).

b) Conduct installed parallel to buildings shall be a minimum of 4'-0" below ultimate building line.

c) Ownership of facilities shall be in accordance with the table 6.U. PECE service entrance requirements.

d) Primary cables to be owned and installed by customer for H.T. service.

e) Main disconnect required if more than 6 services are installed.

f) All sweeps are to be engaged in 5' of poured concrete to prevent pulling out with foundation installation.

g) Maximum number of secondary conductors to be installed per conduit 9.1 x 100 & 1 x 500.

h) Access to meter room shall be provided for customers and PEce personnel.

i) All customers & PEce conductors shall be tagged and identified as per PEce standard S-5560.

j) Manhole to be traffic bearing in drive area.

k) Connections to be made by PEce.

l) Bus conductors to be a minimum of 2 ft. above doors and windows; bus brackets to be mounted a minimum of 20 ft. apart.

m) Lashed rear bus brackets to be installed at a minimum of 10 ft. above grade to allow for a minimum of 12 ft. MIEEPA clearance of conductors above grade or tops of loading docks.

n) Wires and services shall not be energized unless conductors and busbar are strapped to the back of the splice box or pedestal so that conductors and busbar are supported and do not interfere with doors or cover.

o) Ground splice box or pedestal with 1103 lock (item 20).

REFERENCES

- Transformer concrete pad & grounding: S-1006/2006
- Lashed rear bus installation: S-1331-A
- Distribution transformers code numbers: S-0110
- Minimum depth of burial for underground conductors: S-2004
- Racking: S-2910 & S-2919

[See Figure 12.33 for Notes and Bill of Material]
NOTE (a) THE PREFERRED LOCATION FOR NEW BUS INSTALLATIONS IS ABOVE THE TOP WINDOW.

**BILL OF MATERIAL**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>CODE NO.</th>
<th>DESCRIPTION</th>
<th>FIG. I</th>
<th>FIG. II</th>
<th>FIG. III</th>
<th>FIG. IV</th>
<th>FIG. V</th>
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<tbody>
<tr>
<td>1</td>
<td>132-52023</td>
<td>PLATE, WALL, FOR ARM RACK</td>
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<td>2</td>
<td>132-12988</td>
<td>CLAMP, MESSENGER, LASHED BUS</td>
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<td>3</td>
<td>132-54056</td>
<td>RACK, ARM, PLATE MOUNTING FOR LASHED BUS MESSENGER CLAMP</td>
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<td>(4)</td>
<td>(6)</td>
<td>(6)</td>
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<td>5</td>
<td>199-03003</td>
<td>BOLT, EXPANSION, (\frac{3}{16})&quot; X 2 (\frac{1}{4})&quot;</td>
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<td></td>
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<td>6</td>
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<td>BRACE, RACK, SIDE 10&quot; FOR DEAD END</td>
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<td>10</td>
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</tbody>
</table>

Figure 12.34  Ref. Constr. Std.S-1331C
SERVICE TAPS

DEAD-END

BREAKDOWN

DETAIL-TAP

NOTES

(a) THIS STANDARD IS ALSO APPLICABLE FOR CONSTRUCTION OF 5 WIRE LASHED BUS.
(b) THE PREFERRED LOCATION FOR NEW BUS INSTALLATIONS IS ABOVE THE TOP WINDOW.

BILL OF MATERIAL

<table>
<thead>
<tr>
<th>ITEM</th>
<th>CODE NO.</th>
<th>DESCRIPTION</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>135-79828</td>
<td>WIRE, LASHING, 15 MIL, 1200FT, COIL</td>
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<td>2</td>
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<td>CLAMP, WIRE TERMINATION</td>
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<td>CONNECTOR, COMPRESSION TAP, ALUM</td>
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</tr>
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<td>4</td>
<td>132-12988</td>
<td>CLAMP, MEGE 1/0 ACSR</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>132-14028</td>
<td>COVER, PLASTIC, WIRE END 4/0 ALUM</td>
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<td>6</td>
<td>132-14030</td>
<td>COVER PLASTIC</td>
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</tr>
</tbody>
</table>

* AS REQUIRED

REFERENCES

COMPRESSI ON TAP CONNECTORS............ S-1059
LASHED SECONDARY BUS INSTALLATION ON BUILDINGS...... S-1331-C

Figure 12.35
Ref. Constr. Std.S-1331D
SINGLE PHASE FIBERGLASS TRANSFORMER PAD 43” x 37.5”

4” ABOVE FINISHED GRADE

30” PRIMARY
24” SECONDARY

28”

12” MIN
18” MAX

30” PRIMARY
24” SECONDARY

CABLES OR DUCTS NOT TO ENTER PAD FROM THE BOTTOM

PROPOSED DUCT

BACKGROUND

37-1/2”

43”

GROUND ROD
5/8” x 10’ cu.

FRONT

#4 BARE COPPER
SOFT DRAWN

COPPER CONNECTOR
COMPRESSION OR
VICE TYPE.

NOTE THE FRONT HAS
(2) EXTRA
ENCAPULATED
NUTS, FOR
HOLD DOWNS

TRANSFORMER PAD TO BE INSTALLED BETWEEN 4’ AND 10’ FROM FACE OF CURB.
TO BE INSTALLED ON VIRGIN SOIL AND QUARRY SCREENINGS,
WHEN LEVELING, LEAVE THE BACK 1/2 BUBBLE HIGH.
(USE CAUTION WHEN BACKFILLING AROUND PAD)

NOT DRAWN TO SCALE

Figure 12.36

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3 PHASE FIBERGLASS JUNCTION MODULE  65” x 69 1/2”

CABLES OR DUCTS NOT TO ENTER PAD FROM THE BOTTOM

PROPOSED PRIMARY DUCT

PROPOSED PRIMARY CABLE

3 PHASE FIBERGLASS JUNCTION MODULE  65” x 69 1/2”

GROUND ROD
5/8” x 10’ cu.

#4 BARE COPPER SOFT DRAWN

COPPER CONNECTOR COMPRESSION OR VICE TYPE.

MODULE PAD TO BE INSTALLED BETWEEN 4’ AND 10’ FROM FACE OF CURB.
TO BE INSTALLED ON VIRGIN SOIL AND QUARRY SCREENINGS,
(USE CAUTION WHEN BACKFILLING AROUND PAD) NOT DRAWN TO SCALE

Figure 12.37
## TYPICAL CONNECTIONS
RATE HT CUSTOMERS ON 33KV CIRCUITS AND LINES

<table>
<thead>
<tr>
<th>SERVICE</th>
<th>3-WIRE</th>
<th>4-WIRE</th>
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</thead>
<tbody>
<tr>
<td>Transformer Connections</td>
<td>![Diagram]</td>
<td>![Diagram]</td>
</tr>
<tr>
<td>Nominal Volts, kV</td>
<td>33</td>
<td>33</td>
</tr>
<tr>
<td>BIL, kV (Min.)</td>
<td>200</td>
<td>150</td>
</tr>
<tr>
<td>Service Cable (Min Size)</td>
<td>4/0 Al</td>
<td>4/0 Al</td>
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<tr>
<td>Service Cont. Equip</td>
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<td></td>
</tr>
<tr>
<td>Nominal Volts, kV</td>
<td>34.5</td>
<td>34.5</td>
</tr>
<tr>
<td>BIL, kV (Min.)</td>
<td>200</td>
<td>150</td>
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<tr>
<td>Lightning Arrestor</td>
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<td></td>
</tr>
<tr>
<td>Nominal Volts, kV</td>
<td>36</td>
<td>27</td>
</tr>
</tbody>
</table>

**NOTES:**
- Services supplied from UG Distribution must have \( \times \) transformers.
- Loading a transformer with not less than 5% of its rating prevents damage from ferroresonance.
- *Four or five legged core, three single phase core/coil assemblies, or tertiary winding (requires breaker on primary side)*

Figure 12.38
Precast Service Entrance Manholes
Minimum Acceptable Inside Dimensions
Single or Dual Services, 15 kV Cable (See Caution Below)

<table>
<thead>
<tr>
<th>CABLE SIZE</th>
<th>INSIDE DIMENSIONS (L x W x D)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to #2 AWG inclusive</td>
<td>4' x 4' x 6'</td>
</tr>
<tr>
<td>Up to 1000 kcmil inclusive</td>
<td>8' x 4' x 6'</td>
</tr>
</tbody>
</table>

NOTE:
1. Manholes placed in unpaved non-traffic areas may be fitted with full grating tops and have their depths reduced to 4'.

2. Local suppliers of precast manholes include A. C. Miller Concrete Products and Rotundo/Penn Cast.

CAUTION:
1. Cables must run straight through manhole or enter one end and leave through side at opposite end with no more than one bend as shown.

2. For dual services, duct entrances and cable racking must be vertical.

Figure 12.39
Precast Service Entrance Manholes
Minimum Acceptable Inside Dimensions
Single or Dual Services, 35 kV Cable (See Caution Below)

CABLE SIZE | INSIDE DIMENSIONS
(L x W x D)
---|---
1/0 and 4/0 only | 6′ x 4′ x 6′
Up to 750 kcmil inclusive | 8′ x 4′ x 6′

NOTE:
1. Manholes placed in unpaved non-traffic areas may be fitted with full grating tops and have their depths reduced to 4′.
2. Local suppliers of precast manholes include A. C. Miller Concrete Products and Rotundo/Penn Cast.

CAUTION:
1. Cables must run straight through manhole or enter one end and leave through side at opposite end with no more than one bend as shown.

2. For dual services, duct entrances and cable racking must be vertical.

Figure 12.40