PURPOSE AND SCOPE

1. THIS DRAWING PROVIDES DESIGN PARAMETERS, APPLICATION AND ORDERING INFORMATION FOR GROUNDING OF EQUIPMENT, STRUCTURES, ETC. IN ELECTRICAL STATIONS INCLUDING TRANSMISSION AND DISTRIBUTION SUBSTATIONS AND SWITCHING STATIONS.

2. GROUNDING OF NON-CURRENT CARRYING METALLIC PARTS AND STRUCTURES TO LIMIT POTENTIAL GRADIENTS DURING GROUND FAULT CONDITIONS FOR PROTECTION OF PERSONNEL IN THE AREA AND MAINTAIN EQUIPMENT INTEGRITY AND RELIABILITY.

3. GROUNDING OF NEUTRALS TO STABILIZE CIRCUIT POTENTIALS WITH RESPECT TO EARTH AND PROVIDE MEANS FOR CIRCUIT RELAYING TO CLEAR GROUND FAULTS.

4. GROUNDING FOR LIGHTNING AND SWITCHING SURGE PROTECTION.

GROUND GRID SPECIFICATIONS

5. THE GROUND GRID SHALL BE BURIED 1'-6" MINIMUM BELOW UNFINISHED GRADE IN THE AREA WITHIN THE SUBSTATION SECURITY FENCE AND TERMINATED NOT LESS THAN 8 FT FROM THE FENCE. THE FENCE SHALL BE GROUNDED SEPARATELY FROM THE GRID UNLESS OTHERWISE NOTED ON THE APPROPRIATE PROJECT DRAWING. FOR FENCE GROUNDING, SEE ES 02607.

6. NEW STATION OR MAJOR STATION ADDITIONS WILL BE SPECIFICALLY ANALYZED TO DETERMINE THE APPROPRIATE GRID RESISTANCE AND GRID SPACING TO ASSURE PERSONNEL SAFETY.

7. THE GRID PERIMETER SHOULD ENCLOSE ALL ABOVE SURFACE GROUNDED METAL OBJECTS WITH AT LEAST 3 FT (6 FT PREFERRED) OUTSIDE CLEARANCE SPACING. SEE APPLICATION "S", THIS DRAWING, FOR REQUIREMENTS FOR HIGH VOLTAGE TOWERS AND POLES INSIDE STATION FENCE.

8. PERIMETER GROUND RODS ARE TO BE SPACED AT 20-30 FT APART AND AT THE CORNERS OR AS DETERMINED BY GROUNDING ANALYSIS. INTERIOR GROUND RODS SPACED 50 FT APART AND AT SPECIAL LOCATIONS.

9. 250 KCMIL MHD COPPER IS THE MINIMUM CONDUCTOR USED FOR GROUND GRIDS AND FOR CONNECTING STRUCTURES SUPPORTING HIGH VOLTAGE BUS AND EQUIPMENT TO THE GRID. USE 500 KCMIL MHD COPPER CABLE FOR FAULT DUTY EXCEEDING 35KA.

10. NO BOLTED CONNECTION IS TO BE USED ABOVE OR BELOW GROUND OR FOR TERMINATING GRID CONDUCTORS. USE APPROVED EXOTHERMIC OR APPROVED COMPRESSION CONNECTORS.

NOTES

1. FOR MATERIAL USED FOR FENCE GROUNDING, SEE ES 02607.

2. SOFT DRAWN COPPER MAY BE SUBSTITUTED FOR MHD BY EPC CONTRACTORS WITH ENGINEERING PERMISSION.

3. THE AMPCITY OF 30% CONDUCTIVITY COPPERWELD 7#8 AND 19#8 CABLES ARE 10kA AND 25kA RESPECTIVELY. IF THESE CONDUCTORS ARE FOUND, THE MAXIMUM SUBSTATION FAULT DUTY SHOULD BE VERIFIED TO BE LESS THAN THESE VALUES OTHERWISE, THEY SHOULD BE REPLACED.

4. GROUND RODS ARE STEEL WITH A COPPER CLADDING, USE THE PROPER TOOLS FOR DRIVING THE GROUND ROD. IT IS IMPORTANT THAT THE COPPER CLADDING NOT BE DAMAGED TO THE EXTENT THAT THE STEEL IS EXPOSED OR ELSE CORROSION AND EVENTUAL FAILURE OF THE GROUND ROD.

REFERENCES:

GROUNDING DESIGN STANDARD DRAWING MASTER LIST

COPPER AND ALUMINUM POWER CONNECTORS

ARRANGEMENT OF VOLTAGE TRANSFORMER (VT) AND COUPLING CAPACITOR VOLTAGE TRANSFORMER (CCVT)

ENGINEERING STANDARD

GROUNDING REQUIREMENTS FOR OUTDOOR ELECTRICAL SUBSTATIONS

SUBSTATION ENGINEERING

PACIFIC GAS AND ELECTRIC COMPANY
SAN FRANCISCO, CALIFORNIA
APPLICATIONS:

(A). STRUCTURES:

1. Each above surface grounded metal structure that supports energized bus should have a minimum of one connection to the grid. More connections to the grid are needed if:
   1. The structure base area dimension is greater than 5 ft square or support active devices: (switches, breaker, etc.)
   2. Then two ground copper connections shall be made on diagonally opposite corners.
   3. Structure has four or more separate legs, spaced 10ft or more apart then each leg of structure must be connected to the ground grid.

(B). AIR SWITCHES, CIRCUIT SWITCHERS:

   Provide continuous visible bonding connection from operating rod(s) to operating platform. Use 250 kcmil copper cable for bonding. (See Fig 3 through Fig 7, this drawing).

(C). POWER TRANSFORMERS:

   For 3-phase transformer neutrals (H0, X0), use one ground connection per bushing. For 4-wire systems neutral, see application 'E'. For single and 3-phase transformer case grounds, use two ground connections per transformer placed on diagonally opposite corners for tank grounding.

(D). NEUTRAL BUS FOR SINGLE PHASE EQUIPMENT:

   Neutrals for banks of single-phase transformers or regulators shall be made up separately from the ground grid - on a neutral bus mounted on insulators - and connected to the grid on one end with two ground cables. In a multi-bank installation, no more than two banks shall be connected to same neutral bus and the connection to the ground grid shall be made at a mid-point between the banks. All neutral bushings shall be connected to the neutral bus unless otherwise specified on arrangement drawings, and the appropriate note so specifies.

(E). FOUR WIRE DISTRIBUTION:

   Use two 250 kcmil copper cables from transformer low voltage neutral (X0) to ground grid (see Fig 19, this drawing) and from feeder termination structure to ground grid (see Fig 17, this drawing). The two cables shall be routed in separate trenches to different points on the ground grid.

(F). POWER CIRCUIT BREAKER (PCB'S), HIGH VOLTAGE CIRCUIT CIRCUIT BREAKERS (HVCB'S):

   Two ground connections for skid mounted PCB's or per tank for non-skid mounted breakers, frame mounted breakers shall have two ground connections to station grid. The two cables shall be placed on diagonally opposite corners, one *1/0 copper connection to terminal lug of HVCB structure and make connections to the thru bolt of the ground bus on the bottom of the cabinet. See Fig.11 this drawing. For bonding of bushing potential devices, see Fig. 29.

(G). REGULATORS:

   Three-phase regulators same requirements as outlined in application 'C', except for 3-phase step regulators operating at voltages 23kv and below, will be operated with the neutral ungrounded. For single-phase regulators, see application 'D' and 'E'. For single phase regulator case ground, see application 'C'.

(H). CARRIER COUPLING CAPACITORS AND COUPLING CAPACITOR VOLTAGE TRANSFORMERS (CCVT):

   Two ground connections to combination ground terminal and case ground. (See Fig 23 and Fig 24, this drawing). Refer to EDS 058104 for additional grounding information.

(I). POTENTIAL DEVICES/ VOLTAGE TRANSFORMERS:

   One ground connection to combination ground terminal and case ground. For other voltage transformer grounding, (see Fig 25 and Fig 26, this drawing). Refer to EDS 058104 for additional grounding information.

(J). POWER CAPACITORS, SHUNT CAPACITOR BANKS AND AIR CORE Reactors:

   Air core reactors and capacitor housing or supporting steel racks shall have two ground connections to the grid, (see Fig. 10, Fig 16 and Fig 22, this drawing).

   Peninsula grounding system is required for transmission shunt capacitor banks. For peninsula grounding, the ground conductors are electrically connected to the main station ground grid at only one point and totally isolated from all fences, fence grounds and the station ground grid except at one point of interconnection. Use two (2) 500 kcmil copper cables for 60kv through 230kv and three (3) 500 kcmil copper cables for 500kv systems to interconnect to the station grid and extend the conductors into the capacitor grid area. (See Fig 2, this drawing). Each capacitor step is individually fenced. This guard fence shall be separated from the main grounding grid and all other equipment by at least 10 feet, and may join adjacent capacitor guard fence of another step in the same capacitor bank group. Capacitor guard fence shall not be connected to the capacitor ground grid except to it's own ground rods. Cable passing under capacitor guard fence shall be isolated from fence by placing cable in 20 feet long, 2" PVC plastic conduit. (See Fig 2, this drawing).

(K). STEEL CONDUITS, JUNCTION BOXES, CABLE TRAYS AND RECEPTACLES (OUTDOOR):

   Must be bonded to structure ground with one #4 AWG copper cable.

(L). LOW VOLTAGE POTENTIAL TRANSFORMERS, STATION SERVICE TRANSFORMERS, DISTRIBUTION PANELS AND EQUIPMENT INDOORS:

   One #4 AWG copper cable connection to structure ground, the size of the cable would have to increase if the fault duty at the device exceeds its rating. For station service transformers normally supplied from transmission transformer bank tertiary, the minimum ground cable is 250 kcmil cu.
METER AND RELAY CABINETS (SCADA) ETC:

ONE 1/0 COPPER CABLE CONNECTION TO MAIN GROUND GRID AND VIA THRU BOLT AND 1-HOLE TERMINAL CONNECTORS MAKE CONNECTIONS TO THE SIDE OF THE CABINET AND THE GROUND BUS INSIDE THE CABINET.

CONTROL BUILDING AND BATTERY ROOM:

USE TWO 250 KCMIL COPPER CABLES FROM THE OPPOSITE CORNERS OF THE BUILDING TO THE MAIN SWITCHBOARD COPPER GROUND BUS BAR AND TIE TO SURROUNDING GROUND GRID. (SEE FIG 1, THIS DRAWING). ALL BUILDING STRUCTURES SHOULD BE LOCATED AT A MINIMUM OF 11 FT AWAY FROM STATION FENCE. FOR METALLIC BUILDING, (SEE APPLICATION "U", THIS DRAWING), FOR BATTERY ROOM GROUNDING REQUIREMENTS, REFER TO EDS 4018144, "TYPICAL INSTALLATIONS OF BATTERIES AND RACKS".

FENCE GROUNDING:

IT IS NOT NECESSARY TO GROUND CABLE SUPPORTS OR COVER PLATE SUPPORTS IN PULL BOXES.

PULL BOXES:

REFER TO ES 020607 - "METHOD OF GROUNDING FENCES".

PULL BOXES:

IT IS NOT NECESSARY TO GROUND CABLE SUPPORTS OR COVER PLATE SUPPORTS IN PULL BOXES.

REFER TO FIGURE 30 - DISTRIBUTION UNDERGROUND PRIMARY ENCLOSURE WITH METALLIC COVER.

LIGHTNING OR SURGE ARRESTERS:

ARRESTERS MOUNTED ON TRANSFORMERS SHALL BE GROUNDED WITH ONE GROUND CONNECTION DIRECTLY TO GROUND ROD NEAR THE TRANSFORMERS AND THEN CONTINUING THE CABLE TO GROUND GRID. (SEE FIG 20, THIS DRAWING). FOR FREE STANDING ARRESTERS, (SEE FIG 21, THIS DRAWING). MAKE GROUND CONNECTIONS DIRECT TO THE GRID WITH THE LEAST AMOUNT OF SHARP BENDS.

HIGH VOLTAGE TOWERS AND POLES INSIDE STATION FENCE:

I) IF INSIDE PERIMETER GROUND, TIE TO GROUND GRID, (SEE APPLICATION A).

II) IF OUTSIDE PERIMETER GROUND, TOWER MUST BE LOCATED 8 FT AWAY FROM THE GRID AND 8 FT AWAY FROM THE FENCE AND GROUND PER TRANSMISSION LINE STANDARDS.

III) IF OUTSIDE PERIMETER GROUND AND 8 FT CLEARANCE CANNOT BE MAINTAINED, CONTACT ENGINEERING FOR SPECIFIC GROUND GRID DESIGN.

IV) GUYS SHALL BE LOCATED INSIDE THE FENCE. DO NOT GROUND ANCHOR GUYS. MINIMUM DISTANCE FROM GROUND WIRE TO GUY BOLT OR GUY WIRE IS 6". INSTALL TWO INSULATOR BOBS IN THE GUY WIRE 8' MINIMUM ABOVE GROUND AND 8' MINIMUM FROM POLE.

SYNCHRONOUS CONDENSERS, SERIES CAPACITORS AND STATIC VAR COMPENSATION EQUIPMENT:

THESE EQUIPMENT WILL HAVE THEIR OWN INDIVIDUAL DESIGNED GROUNDING STANDARDS BASED UPON THE MANUFACTURERS' RECOMMENDATIONS.

METALLIC BUILDINGS LOCATED OUTSIDE THE MAIN GROUND PERIMETER (NOT APPLICABLE TO CONTROL BUILDING AND BATTERY ROOM):

INSTALL 250 KCMIL COPPER GROUND RING AROUND THE OUTSIDE OF THE BUILDING AND BOND TO THE BUILDING METAL STUDS AT OPPOSITE CORNERS WITH 250 KCMIL COPPER CABLE. THE GROUND RING SHOULD BE LOCATED 3 FT AWAY FROM THE BUILDING. (SEE FIG 1, DETAIL-A, THIS DRAWING).

GROUND WELL:

USE AS A MEANS TO LOWER OVERALL RESISTANCE (TO REMOTE EARTH) OF A GROUND GRID SYSTEM WHEN IT IS DIFFICULT TO LOWER THE RESISTANCE BY EXPANDING THE GRID ALONG A HORIZONTAL PLANE AS INDICATED BY SPECIFIC GROUNDING ANALYSIS RECOMMENDATIONS. SEE FIGURE 28 THIS DRAWING.

EXISTING GROUND GRID CONNECTIONS:

CONNECTIONS FROM EXISTING GROUND GRID TO NEW GROUND GRID CONDUCTORS SHOULD BE MADE WITH "HEAVY DUTY" EXOTHERMIC MOLDS OR APPROVED COMPRESSION CONNECTORS AS SHOWN ON SHEETS 12-14.

HANDRAILS:

METALLIC HANDRAILS, INCLUDING HANDRAILS ON STAIRWAY TO MPAC BUILDINGS, LOCATED INSIDE THE SUBSTATION GRID PERIMETER MUST BE GROUNDED. CONNECT EVERY OTHER HANDRAIL POST WITH ONE 1/0 COPPER CABLE TO THE MAIN GROUND GRID. (SEE FIG 1, DETAIL-B, THIS DRAWING)

FIRE ALARM CONTROL PANEL AND FIRE SUPPRESSION SYSTEM:

MUST BE BONDED TO SWITCHBOARD COPPER GROUND BUS OR 250 KCMIL COPPER CABLE WITHIN THE CABLE TRAY IN THE BUILDING WITH ONE #4 AWG COPPER CABLE.
FIGURE 1

TYPICAL ARRANGEMENT OF GROUND GRID

(SEE GROUND GRID SPECIFICATIONS, THIS DRAWING)

DETAIL-A

TYPICAL GROUNDING FOR METALLIC BUILDING OUTSIDE OF THE GRID

DETAIL-B

TYPICAL GROUNDING FOR METALLIC HANDRAILS

BOND TO BLDG METAL STUDS AT OPPOSITE CORNERS WITH 250 KCMIL COPPER CABLE

GROUND LUG

TO STATION GROUND GRID

250 KCMIL COPPER

13'-0" MIN (TYP AROUND BUILDING)

GROUNDING LUG

TO STATION GROUND GRID
FIGURE 2
TYPICAL GROUNDING ARRANGEMENT FOR 2 STEPS 500KV, SHUNT CAPACITOR BANKS
(SEE APPLICATION "J" FOR ALL OTHER CONDITIONS)
FIGURE 3
GROUNDING FOR TYPICAL
STEEL STRUCTURE INSTALLATION

Edge of platform
to be approx. 6'
from center line
of control rod

Do not connect
structure ground
near platform bond,

Copper cable
to station
ground

Show location of platform
(Dimension "Y")
on Arrangement
of foundation dwg.

FIGURE 4
GROUNDING & BONDING ARRANGEMENT
FOR ONE SWITCH

Flexible Copper Braid
Furnished by Switch
Manufacturer

Bar Lug, Offset
Copper Cable
Operating Platform

FIGURE 5
GROUNDING & BONDING ARRANGEMENT
FOR TWO OR MORE SWITCHES

Steel Bar
For 2 or
more Switches

Operating Platform

1/4" x 1/2" Everdur Capscrew
Code 19-3022 and 1/4" Everdur
Nut, Code 19-5013

FIGURE 6
GROUNDING FOR
MOAS AND CIRCUIT SWITCHERS

Circuit Switcher/MOAS
With Disconnect Switch

Circuit Switcher
Without Disconnect Switch

Flexible Copper Braid
Control Cab. (shown behind)
Operating Platform
FIGURE 7
GROUNDING OF GROUND SWITCHES

NOTES
(A) CONNECTION TO SW BASES AND STRUCTURE LISTED ON APPROPRIATE BILL OF MATERIALS.

FIGURE 8
GROUNDING AIR SWITCH WITH FIBERGLASS CONTROL ROD ON WOOD POLE

NOTES
SEE APPLICATION "S"-IV. SUBSTATION APPLICATION ONLY.

FIGURE 9
GROUNDING OF OPERATOR SUPPORT STRUCTURE

NOTES
(A) GROUND PAD ON OPERATOR SUPPORT STRUCTURE SHALL BE LOCATED AS SHOWN
(B) FOR BONDING OF PLATFORM, (SEE FIG 5, THIS DRAWING)
(C) IF GROUND SW IS USED, RUN ONE GROUND CONDUCTOR FROM GRID TO SW BASE, (SEE FIG 7, THIS DRAWING)

FIGURE 10
GROUNDING FOR SHUNT CAPACITOR BANKS

NOTES
SEE APPL "J" THIS DWG
LOCATED ON FAR END

FIGURE 11
GROUNDING OF HIGH VOLTAGE CIRCUIT BREAKERS

NOTES
TO COPPER BAR (INSIDE CABINET)
LOCATED ON OPPOSITE CORNER

GROUND CONNECTIONS TO STATION GRID
GROUNDING REQUIREMENTS FOR OUTDOOR ELECTRICAL SUBSTATIONS

**Figure 12**  
GROUNDING DEADEND (TENSION) STRUCTURE.

**Figure 13**  
PROVISION FOR ATTACHING PORTABLE GROUND TOOLS

**Figure 14**  
FOUNDATION CLEARANCES (MINIMUM DISTANCE OF TRENCH PARALLEL WITH FOUNDATION FOR TRANSFORMERS, HVCB’S, ETC.)

**Figure 15**  
TYPICAL DETAIL OF AN EXOTHERMIC CONNECTION

**Figure 16**  
GROUNDING FOR SERIES REACTORS

**Figure 17**  
STRUCTURE FOR UNDERGROUND FEEDER TERMINATION OR NEUTRAL CURRENT LIMITING REACTOR
GROUNDING OF TRANSFORMER (3-WIRE SYSTEM)

GROUNDING FOR FREE STANDING LIGHTNING ARRESTERS

GROUNDING FOR STRUCTURES WITH MULTIPLE INSULATOR BASES WITH NO CROSS METALLIC BRACING SUPPORT

ENGINEERING STANDARD
GROUNDING REQUIREMENTS FOR OUTDOOR ELECTRICAL SUBSTATIONS

PG&E CO.
DRAWING NUMBER REV.
067910 3

ELEVATION

PLAN VIEW
## Grounding Requirements for Outdoor Electrical Substations

### Figure 23
- **Grounding for 1-Unit CCVT on One Structure**

### Figure 24
- **Grounding for 3-Unit CCVT's on One Structure**

### Figure 25
- **Grounding for 1-Unit Voltage Transformer on One Structure**

### Figure 26
- **Grounding for 3-Unit Voltage Transformers on One Structure**

### Figure 27
- **Grounding Requirements for Terminating Secondaries of Current Transformers**

### Table: Ground Well Details

<table>
<thead>
<tr>
<th>Item</th>
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<th>Description</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>15-0124</td>
<td>DEEP WELL SUSPENDED ELECTRODE - LYNCONITE PART. 4&quot; X 1-1/2&quot; X 1/2&quot; LONG</td>
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<td>2</td>
<td>30-0960</td>
<td>CABLE SPLICE 500 KCMIL BOW TO 500 KCMIL BOW</td>
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<td>3</td>
<td>29-0390</td>
<td>500 KCMIL BOW PIGTAILS</td>
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<td>29-0390</td>
<td>GROUND GRID 500</td>
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<td>5</td>
<td>30-0991</td>
<td>TEE CONNECTORS (SEE NOTE 2)</td>
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<td>CABLE SPLICE 500 KCMIL BOW TO 250 KOMIL BOW</td>
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<td>7</td>
<td>29-0391</td>
<td>250 KOMIL BOW PIGTAILS</td>
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<td>9</td>
<td>30-0990</td>
<td>TEE CONNECTORS (SEE NOTE 2)</td>
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</table>

**Notes:**
1. Backfill well hole with a grounding backfill material slurry such as Lyncnite or GEMS. Material Code MS 008B.
2. Maximum separation of 2" between Tee connectors.

---

### Notes:
1. All current transformers installed on substation buses or added to circuit breakers, power transformers, etc. shall have all secondary windings short circuited and grounded when not in use.
2. Connect the #8 or #10 ground wire for unloaded CT's and remove the ground wire for loaded CT's.
FIGURE 29

(Grounding for Bushing Voltage Transformer)

GENERAL REQUIREMENTS

Each Power Circuit Breaker or Power Transformer having a bushing Voltage Transformer on the tank shall have the Voltage Transformer provided with a separate ground lead, independent of the Breaker Frame or Transformer Case grounding leads.

Multiple Voltage Transformers on one unit can have their grounding leads bussed together in convenient runs, i.e., for a breaker with 6 voltage transformers, the 3 on each side can be bussed to a separate single tie into the ground bus and possibly follow the inter voltage transformer conduit run.

The ground cable shall be supported as shown on this dwg. The grounded end of the ground switch of the Voltage Transformer shall be electrically connected to the ground terminal on the cabinet, (See Detail "B"). When adding Voltage Transformers to existing installation, provide an independent ground lead from the Voltage Transformer or group of Voltage Transformers and connect to the nearest exposed station ground cables.

This sheet supersedes EDS 102825 "Requirements For Grounding Bushing Voltage Transformer".
**TYPICAL MATERIALS TO BE USED:** (TO BE LISTED ON ARRANGEMENT OF GROUNDING BILL OF MATERIALS)

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<td>29-0394</td>
<td>CABLE ELECTRICAL BARE COPPER 4 AWG MEDIUM HARD DRAWN 7 STRAND .129 LBS/FT 600 LBS PER REEL.</td>
<td>(SEE APPLICATIONS, THIS DRAWING)</td>
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<tr>
<td>29-0392</td>
<td>CABLE ELECTRICAL BARE COPPER 1/0 AWG MEDIUM HARD DRAWN 7 STRAND .326 LB/FT 600 LBS PER REEL.</td>
<td>(SEE LIGHTING, EDS 459076)</td>
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<td>29-0391</td>
<td>CABLE ELECTRICAL BARE COPPER 250 KCM MEDIUM HARD DRAWN 19 STRAND, 0.574&quot; DIA, 0.772 LB/FT.</td>
<td>(SEE APPLICATIONS, THIS DRAWING)</td>
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<td>29-0390</td>
<td>CABLE ELECTRICAL BARE COPPER 500 KCM 37 STRAND, 0.813&quot; DIA, 1.544 LB/FT, MEDIUM HARD DRAWN</td>
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<td>30-3542</td>
<td>TERMINAL LUG STRAIGHT #250-500 KCM COPPER CADWELD * B-122-EG, 3/8&quot; x 1/2&quot;, FOR 250 - 500 KCM COPPER CABLE TO 2-HOLE NEMA FLAT</td>
<td>FOR CABLE-TO-FLAT, CADWELD STD. DUTY MOLD, TYPE GL., FOR 250 KCMIL USE CAT. NO. GLC-EG2V, &amp; CATRIDGE NO. 115 (SEE FIG 15, THIS DRAWING)</td>
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<tr>
<td>30-3543</td>
<td>TERMINAL LUG OFFSET BAR #250-500 KCM COPPER CADWELD * B-101-EG-OL TYPE LA 3/8&quot; x 1/2&quot; FOR 250 - 500 KCM COPPER CABLE TO 1-HOLE FLAT</td>
<td>(SEE APPLICATIONS, THIS DRAWING)</td>
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<tr>
<td>01-0098</td>
<td>ROD GROUND, 3/8&quot;x 12&quot;, (10 MIL MIN COPPER JACKET)</td>
<td>UC-1 DOCUMENT NO. 013109, SEE NOTE 4 SHEET 1</td>
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<td>30-3226</td>
<td>CONNECTOR GROUND, #2/0 AWG-#250KCM, CABLE-FLAT 1-BOLT #2/0 SOLID AWG TO #250 KCM COPPER</td>
<td>EXTERNAL NEUTRAL BUS APPLICATION FOR CABLE SUPPORT TO STRUCTURE ONLY</td>
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<td>GROUND WELL SUSPENDED ELECTRODE, LYNCOLE PART *K4-11-PGE</td>
<td>(SEE APPLICATIONS, THIS DRAWING)</td>
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FOR COMPRESSION CONNECTORS SEE SHEETS 13, 14, & 15 OF THIS DRAWING.

▲ ALL GROUND MATERIAL EXCEPT EXOTHERMIC MOLDS AND CHARGES (CARTRIDGES) WHICH ARE FURNISHED BY THE CONSTRUCTORS TO BE LISTED ON RESPECTIVE BILL OF MATERIAL FOR VARIOUS ARRANGEMENT DRAWINGS.
TYPICAL PG&E GROUNDLOK APPLICATIONS

EXISTING GROUND GRID

ARRESTER STRUCTURE

GROUND GRID

TEE

GC730/GC731

7-HOLE TERMINAL, GC910

2-HOLE TERMINAL, GC920

CROSS

GC740/GC741

SPLIT TEE

GC733

SEE SHEETS 14 & 15 FOR MATERIALS AND CODE NUMBERS

COMPRESION TYPE GROUNDLOK CONNECTORS FOR GROUND GRID

ENGINEERING STANDARD

GROUNDING REQUIREMENTS FOR OUTDOOR ELECTRICAL SUBSTATIONS

PG&E CO.

DRAWING NUMBER 067910

REV. 7

SHEET 13 OF 15 SHEETS

MICROFILM
## Type of Connector

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### NOTES:

* SOLID OR STRANDED
** 49 STRAND ROPE LAY

COMPRESSION TYPE GROUNDLOK CONNECTORS FOR GROUND GRID

ENGINEERING STANDARD
GROUNDBING REQUIREMENTS FOR OUTDOOR ELECTRICAL SUB STATIONS

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**NOTES:**

- **COMPRESSION TYPE GROUNDLOK CONNECTORS**
  - **SOLID OR STRANDED**
  - **49 STRAND ROPE LAY**

---

**ENGINEERING STANDARD**

**GROUNDING REQUIREMENTS FOR OUTDOOR ELECTRICAL SUBSTATIONS**

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