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Illustrations:

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- Galvanized Rigid Risers for Service Attachments Above the Roof: 7-18
- Solid Wood Risers for Service Attachments Above the Roof: 7-20
- Customer-Owned Temporary Service Pole (one year maximum service): 7-22
- Customer-Owned Permanent/Temporary Wood Service Pole: 7-24
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A. GENERAL

1. Overhead service will not be supplied to any premises located in an area designated by the Department as an underground district.

2. The Department is converting some areas from overhead distribution to underground distribution. In such areas where overhead electric lines are present, the Department may require the service to be supplied from underground facilities, or from overhead facilities with provisions for future underground conversion.

3. The Department reserves the right to supply service to more than one customer from any pole or pole rack located in public property or on private property by easement or permit.

B. SERVICE DROPS

1. GENERAL

   a. The Department will furnish and install a single span of service wires (service drop) from the closest available Department pole to the customer's approved point of service. The service drop shall pass only over the premises served.

   b. The Department will determine the number of service drops to be supplied to any building or premises.

2. ALLOWABLE LENGTH

   The maximum length of a span of service drop conductors depends on the slope or grade of the land, intervening trees or structures, and the size of the conductors to be used, but shall not exceed 150 feet.

3. NUMBER OF SERVICE DROPS

   Normally only one service drop will be provided to any building or structure for each allowed class of service.

   Exceptions:

   a. A building may be permitted additional service drops for each allowed class of service provided the service drops are more than 150 feet apart as measured in a straight line and are supplied from the existing pole line or if otherwise required for the Department's operating convenience or necessity.

FIGURE 1
B. SERVICE DROPS (Cont.)

2. Where a group of residential buildings located on a single lot:

b. Extending up to 150 feet along and facing (paralleling) the pole line supplying service to the lot, a maximum of two service drops may be permitted for each allowed class of service, unless otherwise required for the Department's operating convenience or necessity.

![Figure 2](image2.jpg)

FIGURE 2

- Extending more than 150 feet along and facing (paralleling) the pole line supplying service to the lot, additional service drops may be permitted for each allowed class of service provided the service drops are more than 150 feet apart as measured in a straight line, or if required for the Department's operating convenience or necessity.

![Figure 3](image3.jpg)

FIGURE 3
C. SERVICE DROP CONDUCTOR CLEARANCES

1. GENERAL

   a. The minimum clearance for service drop conductors to the ground, structures, and other objects is specified in General Order 95 (G. O. 95) of the California Public Utilities Commission. Unless otherwise indicated, all clearances specified in this section are based on the use of insulated, abrasion-resistant service drop conductors.

   b. Service heads, support structures, and points of attachment shall be located to provide the required clearances as measured from the lowest point of the service drop, including the drip loop.

   c. When an existing service drop clearance is impaired because of changes made to premises by a customer, either the owner or tenant, the customer shall provide the means to correct the clearance violation at the customer's cost. If it is necessary for the Department to relocate the service drop to correct the impaired clearances, the customer shall reimburse the Department for the Department's costs.

2. CLEARANCES FROM BUILDINGS

   a. Vertical Clearances Above:

      Minimum Clearance From Buildings
      Non-Insulated Conductors (WP) Insulated Abrasion Resistant Conductors (IAR)

      (1) Building served - All portions of building including metallic or non-metallic cornice, decorative appendage, eaves, roof or parapet wall (See page 7-5, fig. 1) ................. 8 feet 1 foot (Note a)

      (2) Metallic or non-metallic non-walkable* overhang, patio cover or other structure ....... 8 feet 1 foot

      (3) Other buildings on the same premises (See page 7-5, fig.1) .......................... 8 feet 2 feet (Note b)

   Note a Clearance based on a point of attachment within 18 inches of the exterior wall facing the overhead lines from which the service will be supplied and within 30 inches of the roof overhang.

   Note b Increase to 8 feet minimum when installed over a metallic roof with less than a 3/8 rise (Approximately 37 degrees as measured from the horizontal).

   * Non-walkable: Those surfaces not normally intended to support humans such as, but not limited to, handrails, fences, walls, chimneys, parapet walls, cornices, aluminum or lath patio covers and decorative appendages or other light material used for patio covers.
C. SERVICE DROP CONDUCTOR CLEARANCES (Cont.)

b. Horizontal and Radial Clearances from openable windows, doors, exits, fire escapes, balconies, stairways, walkways. ................................................................. 3 feet
C. SERVICE DROP CONDUCTOR CLEARANCES (Cont.)

3. CLEARANCES OVER WALKWAYS, DRIVEWAYS, AND THOROUGHFARES - PUBLIC AND PRIVATE PROPERTY

Vertical clearances above ground for service drops crossing over public and private thoroughfares, driveways and properties shall conform to the following minimum clearances - Conductors:

<table>
<thead>
<tr>
<th>Condition</th>
<th>Minimum Clearance</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Crossing areas which are accessible only to pedestrians on all premises</td>
<td>10 feet</td>
</tr>
<tr>
<td>b. Crossing over private driveways or other areas accessible to vehicles on:</td>
<td></td>
</tr>
<tr>
<td>(1) Residential Premises</td>
<td>12 feet</td>
</tr>
<tr>
<td>(2) Commercial or industrial premises</td>
<td>16 feet</td>
</tr>
<tr>
<td>c. Crossing premises accessible to agricultural equipment</td>
<td>15 feet</td>
</tr>
<tr>
<td>d. Crossing public thoroughfares</td>
<td>18 feet</td>
</tr>
<tr>
<td>This clearance may grade from 18 feet at a position of not more than 12 feet from the curb line to a minimum clearance at the curb line of</td>
<td>16 feet</td>
</tr>
<tr>
<td>Note: If no curb exists, the outer limits of possible vehicular traffic may be used as the &quot;curb line&quot;.</td>
<td></td>
</tr>
<tr>
<td>e. Crossing over, or in proximity to, swimming pools, diving boards, platforms, or slides</td>
<td>See page 7-8</td>
</tr>
<tr>
<td>f. Crossing railroad tracks:</td>
<td></td>
</tr>
<tr>
<td>(1) Without overhead trolley wires</td>
<td>25 feet</td>
</tr>
<tr>
<td>(2) Operated with overhead trolley wires</td>
<td>26 feet</td>
</tr>
<tr>
<td>Note: In all cases, the service drop conductors shall clear trolley wires by not less than 4 feet.</td>
<td></td>
</tr>
</tbody>
</table>
C. SERVICE DROP CONDUCTOR CLEARANCES (Cont.)

SERVICE DROP CLEARANCES FOR RESIDENTIAL PREMISES

FIGURE 1

SERVICE DROP CLEARANCES FOR COMMERCIAL AND INDUSTRIAL SERVICES

FIGURE 2
C. SERVICE DROP CONDUCTOR CLEARANCES (Cont.)

4. CLEARANCES OVER SWIMMING POOLS

The installation of swimming pools under existing service drops should be avoided where practical. However, where a swimming pool must be located under existing service drop conductors, the clearances shown in Figure 1 below are required by General Order 95 (California Rules for Overhead Line Construction).

![Diagram of service drop conductor clearances over swimming pools]

**Figure 1**

**Detail A**
MINIMUM CLEARANCE FOR OPEN-WIRE DROPS

**Detail B**
MINIMUM CLEARANCE FOR DROPS WITH SPECIALLY APPROVED COVERING (0 – 300 VOLTS)

1. TRIPLEX SERVICE CABLE.
2. ABRASION-RESISTANT CABLES HAVING A GROUNDED METALLIC SHEATH (ARMORED SERVICE CABLE).

**Detail C**
MINIMUM CLEARANCE FOR DROPS ABOVE OR ADJACENT TO DIVING BOARDS AND PLATFORMS
C. SERVICE DROP CONDUCTOR CLEARANCES (Cont.)

5. CLEARANCES FROM SIGNS

The vertical and horizontal service drop clearance conductor from signs, whether mounted on buildings or isolated structures shall not be less than the following minimum clearances:

<table>
<thead>
<tr>
<th>Condition</th>
<th>Minimum Clearance</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Vertical clearance above signs without walkable surfaces</td>
<td>2 feet</td>
</tr>
<tr>
<td>b. Vertical clearance above surfaces of signs upon which persons might walk</td>
<td>8 feet</td>
</tr>
<tr>
<td>c. Vertical clearance under signs that are:</td>
<td></td>
</tr>
<tr>
<td>(1) Illuminated</td>
<td>2 feet</td>
</tr>
<tr>
<td>(2) Non-illuminated</td>
<td>1 foot</td>
</tr>
<tr>
<td>d. Horizontal clearance from signs which are:</td>
<td></td>
</tr>
<tr>
<td>(1) Illuminated</td>
<td>3 feet</td>
</tr>
<tr>
<td>(2) Non-illuminated</td>
<td>1 foot</td>
</tr>
</tbody>
</table>

6. CLEARANCES FROM OTHER CONDUCTORS

Service drop conductor clearance from telephone and CATV service drop conductors at crossings, and radially where approaching crossings, shall not be less than 2 feet

**Exception:** This clearance may be reduced to 1 foot within 15 feet of the point of attachment on the building or structure. For additional information, see Attachment Locations and Clearances on page 7-10 and Conduit Risers and Wood Attachment Risers on pages 7-16, 7-18 and 7-20.

D. SERVICE DROP ATTACHMENTS

1. GENERAL

a. On request, a Department service planner will provide assistance in determining a location for the service drop attachment to provide the required clearance for the Department's service drop conductors. See page 1-4 for service planning office locations and telephone numbers.

b. The Department will normally furnish and install standard wire holders (brackets) except as follows:

   (1) The customer shall install standard brackets supplied by the Department on buildings constructed of concrete, brick, wood, or finished stucco.

   (2) The customer will furnish and install any special brackets, racks, or structures required by the Department.

c. Attachment brackets shall be installed using through bolts or lag screws as specified by the Department.
D. SERVICE DROP ATTACHMENTS (Cont.)

2. ATTACHMENT LOCATIONS AND CLEARANCES

a. The service drop point of attachment shall normally be located on that portion of a building or structure facing and nearest the street, alley, easement or public way on which the Department’s pole is located. Attachments shall be installed at a height not less than specified in these requirements to permit service drops to be:

1. Installed and maintained in accordance with vertical, horizontal and radial clearances required above ground and from roofs, obstructions, windows, doorways, openings, balconies, fire escapes, swimming pools and other conductors.

2. Run free from trees, structures, poles, masts, antennas, vents, flood lights or other obstructions.
D. SERVICE DROP ATTACHMENTS (Cont.)

(3) Installed at a location where the weatherhead and point of attachment are safely accessible from a ladder placed on the ground. In general, enough space to provide a "4-to-1" vertical rise is required. When proposed locations will not provide the needed space, consult the appropriate Department service planning office before installing any service equipment or riser conduit.

(4) Attached at only one point on the building and without intermediate support.

(5) Arranged so as to not hamper or endanger workmen and firemen in the performance of their duties.

b. The maximum height of the point of attachment is determined by the service head height. For maximum service head height, see page 7-14.

c. The point of attachment shall be located in either of the following locations:

(1) On the wall nearest to and facing the overhead electric lines from which service will be supplied or on an adjoining wall within 18 inches of the wall nearest to the overhead lines from which service is to be supplied and where the service drop crosses no intervening part of the structure (See Figure 1).

(2) Above the roof on attachment riser or support structure and located:

(a) Within 18 inches of the wall nearest to and facing the overhead electric lines from which service is to be supplied and within 30 inches from the edge of the roof overhang and where the service drop crosses no intervening part of the structure (See Figure 2).

(b) Within 18 inches of the side wall adjacent to the wall nearest and facing the overhead electric lines from which service will be supplied and within 30 inches of the roof overhang but no further back than the highest point of the roof and where the service drop crosses no intervening part of the structure (See Figure 2).

Caution: For points of attachment located above the roof, consult with the Department of Building and Safety where the service drop conductor length over the roof will exceed 4 feet.
D. SERVICE DROP ATTACHMENTS (Cont.)

3. TYPICAL METHODS OF ATTACHING SERVICE DROPS ON BUILDING WALLS

a. Clearance from the attachment bracket to the service head shall not be less than 12 inches for a single-spool bracket or 16 inches for a three-spool bracket (measured from center spool) or a maximum of 30 inches.

b. For additional service drop clearance requirements, see page 7-4.
D. SERVICE DROP ATTACHMENTS (Cont.)

4. TYPICAL METHODS OF ATTACHING SERVICE DROPS ABOVE BUILDING ROOFS

   a. Clearance from the attachment bracket to the service head shall not be less than 12 inches for a single-spool bracket or 16 inches for a three-spool bracket (measured from center spool) or a maximum of 30 inches.

   b. References:

      (1) For additional service drop clearance requirements, see page 7-3.

      (2) For angle iron support details, see page 7-17.

      (3) For conduit attachment riser support details, see page 7-18.

      (4) For solid wood attachment riser details, see page 7-20.
E. SERVICE HEADS

1. GENERAL
   
   a. All service heads shall be located as required by the Department but not more than 25 feet above the ground directly below the service head.
   
   b. Service heads for the same class and voltage shall be grouped together and spaced not less than 9 inches or more than 18 inches apart unless otherwise required for Department convenience.
   
   c. Service heads for totalized services shall be separated by not less than 18 inches or more than 36 inches.
   
   d. Service heads of different classes served from the same pole shall be located as close together as practical.
   
   e. Service heads shall not be located more than 30 inches or less than 12 inches from a single-spool attachment bracket or 16 inches for a three-spool bracket (measured from center spool), except where otherwise specified by the Department.

2. RISER CONDUITS
   
   a. Conduit attachment risers shall be constructed of galvanized rigid conduit. For all other riser conduits, consult permitting agency.
   
   b. In general, the service raceway conduit shall be continuous and free of junction boxes and condulets.

   Exceptions:
   
   (1) In single-meter installations, a wireway or condulet may be permitted if the run of riser conduit has excessive length or bends making a continuous run of conduit impractical. Consult with the Department and the appropriate permitting agency before installing any service equipment.
   
   (2) In multi-meter installations, a sealable, bussed wireway is permitted to serve individual meter enclosures.

   Note: When permitted, junction boxes and wireways shall be sealable and installed in locations that are readily visible for perpetual inspection by the Department.

3. SERVICE ENTRANCE CONDUCTORS
   
   a. The number of service entrance conductors in a riser conduit shall not exceed two conductors per phase and paralleled service entrance conductors shall not be less than 1/0 AWG.

   Note: Each run of conductors in a riser conduit shall enclose a complete circuit (i.e., all phase conductors and the associated neutral conductor).
   
   b. The total number of service entrance conductors at a service head shall not exceed (a) six conductors per service head for a three-wire service or (b) eight conductors per service head for a four-wire service.
   
   c. The total number of service entrance conductors at a location for each voltage class of service shall not exceed (a) nine conductors for a three-wire service, or (b) twelve conductors for a four-wire service.

   Note: This limitation allows for a maximum "3-to-1" splice between the service entrance conductors and the service drop conductors at the service head.
E. SERVICE HEADS (Cont.)

d. Service entrance conductors shall extend a minimum of three feet beyond the service head unless otherwise specified by the Department. Spliced sections shall not be used to extend the length of the required tails.

e. The Department shall make connection at the service head between the service drop conductors and the customer's service entrance conductors.

f. Aluminum service entrance conductors shall be wire brushed and coated with an oxide inhibitor before terminating.

4. BUSWAY SERVICES

A busway service shall be required if the service entrance conductors exceed the number per location or size limits - see Service Entrance Conductors above. See page 3-48 for busway service head requirements.

5. LOCATIONS

a. Customers shall locate and install service heads as specified by the Department.

b. Service heads shall be located in either of the following locations:

(1) On the exterior wall nearest to the overhead electric lines from which the service will be supplied, or on an adjoining wall adjacent to the attachment bracket. For attachment bracket locations and bracket to service head clearance requirements, see page 7-9.

(2) Above the roof within 18 inches of the exterior wall nearest to the electric lines from which the service will be supplied and within 30 inches of the roof overhang.

Note: The service head shall generally be installed on the wall or above the roof in the area immediately above the meter. Where the proposed meter location will require a horizontal run of riser conduit to the service head, consult with the permitting agency before installing any service equipment.

c. Service heads shall not be located:

(1) More than 25 feet vertically above the final exterior grade level directly below the service head.

(2) On any wall with less than two feet from any common property line common to an adjacent property.

Note: All locations must provide adequate space for safely climbing a ladder to access the service head. In general a 4-to-1 rise is required. When proposed locations will not provide the allowable space, consult the Department before installing any service equipment.

d. Service heads supplied at the same class of service shall be grouped together and separated by not less than 9 inches or more than 18 inches.

e. Service heads for different classes of service supplied from the same pole shall be located as close together as practical.

f. Service heads for separate services that are totalized shall be separated by not less than 18 inches or more than 36 inches.
E. SERVICE HEADS (Cont.)

6. REPLACEMENT OR ADDITIONAL SERVICE HEADS

No service head shall be replaced or additional service heads installed for connection to existing service drops without prior approval of the Department.

F. STRUCTURES FOR CLEARANCE

1. GENERAL

   a. Where a structure is necessary to maintain required service drop clearances, the structure shall be installed and maintained by the customer. The structure shall be located on the building served.

   b. While the Department approves support structures, the customer must consult with the appropriate permitting agency regarding structural details and requirements.

   c. Attachment brackets for communication (i.e., telephone, CATV) service drops shall not be installed on any electric service drop riser conduit, riser support or in any location, which obstructs access to the Department’s attachment bracket, associated service head(s) or the area between the bracket and the service head(s).

2. ANGLE IRON RACKS

   a. An iron angle rack may be installed in above the roof installations to provide the required service drop conductor clearances.

   b. For angle iron rack construction details, see page 7-17.

3. CONDUIT ATTACHMENT RISERS AND WOOD ATTACHMENT RISERS

   a. Conduit attachment (periscope service) risers or solid wood attachment risers shall be required on all above-roof installations.

   b. Wood attachment risers shall be constructed of a single piece of solid wood - risers that are laminated, or constructed of separate pieces, are not permitted.

   c. Risers to which service drop conductors are attached shall be sufficiently supported to withstand the stresses imposed by the service drop conductors.

   d. For construction details of conduit attachment risers see Page 7-18 and for solid-wood attachment risers see Page 7-20.

4. CUSTOMER SERVICE POLES

   For construction details for customer-owned service poles, see:

   a. Page 7-22 for temporary wood poles limited to a maximum one year service.

   b. Page 7-24 for permanent or temporary wood poles.

   c. Page 7-26 for permanent or temporary metal poles.
ANGLE IRON RACKS

1-1/4" x 1-1/4" x 1/8"  0" - 30"  # 1 AWG  100
1-1/4" x 1-1/4" x 3/16"  31" - 60"  # 1 AWG  100
1-1/4" x 1-1/4" x 1/4"  0" - 60"  # 3/0  100
1-1/4" x 1-1/4" x 1/4"  61" - 96"  # 3/0  60
2" x 2" x 1/4"  0" - 60"  500 KCMIL  100
2" x 2" x 1/4"  61" - 96"  500 KCMIL  60

CONSULT DEPARTMENT EXCEEDING ABOVE MAXIMUMS

NOTES:

1. Angle iron rack members shall be hot-dipped galvanized after fabrication.

2. The dimension of the rack shall be sufficient to permit the anchor plates or angles to be bolted or lagged to the roof rafters. Lag screws shall have a 3/8-inch (minimum) diameter and shall have sufficient length to penetrate the roof rafters by not less than 2-1/2 inches.

3. Galvanized strap cross-brace is necessary where service drop conductors will approach the rack at a horizontal angle of less than 30-degrees. The rack construction illustrated will be suitable for the attachment of the service drops where built as specified in the table above.

4. Extension above roof needed to provide the required service drop clearance.

5. References:
   a. For application and clearance requirements, see page 7-13.
   b. For busway service head requirements, see page 3-48.
GALVANIZED RIGID CONDUIT RISERS FOR SERVICE ATTACHMENTS ABOVE THE ROOF

**Table:**

<table>
<thead>
<tr>
<th>Trade Size</th>
<th>Height of Load Above Roof (Min)</th>
<th>Height of Load Above Roof (Max)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-1/2&quot;</td>
<td>12&quot;</td>
<td>40&quot;</td>
</tr>
<tr>
<td>2&quot;</td>
<td>12&quot;</td>
<td>60&quot;</td>
</tr>
<tr>
<td>2-1/2&quot;</td>
<td>12&quot;</td>
<td>80&quot;</td>
</tr>
</tbody>
</table>

**NOTES:**

1. The arrangements shown above are suggested to provide the required service drop conductor ground and roof clearances as required by the agencies having jurisdiction. The customer should consult the Department and the permitting agency having jurisdiction for other methods of supporting the service drop conductors not shown.

2. The Department is not responsible for any damage to the building caused by rain or structural damage.
GALVANIZED RIGID CONDUIT RISER FOR SERVICE ATTACHMENTS ABOVE THE ROOF (Cont.)

3. The conduit attachment riser shall be constructed of galvanized rigid steel (GRC) and shall be continuous (no couplings) between the top of the riser and the lowest point of support.

4. Service drop attachment risers shall be located within 18 inches of the wall nearest to the overhead lines supplying service and within 30 inches of the roof overhang.

5. Enclosed risers (figure 1) must be securely supported at the plate and immediately above the meter socket. Typically risers may be secured with a 3/8-inch U-bolt through a 1/4-inch plate strap or attached directly to the wall studs. For other proposed means of attachment, consult the Department and the permitting agency.

6. Heavy-duty, two-hole pipe straps. The lower strap shall be secured to a 2-inch x 4-inch blocking between the wall studs directly above the meter socket. The upper strap shall be (a) attached to a 2-inch x 4-inch blocking between the wall studs directly below soffit (figure 2) or (b) attached to the plate (figure 3). The straps shall be secured using 3/8-inch x 3-inch lag screws or 3/8-inch bolts. As an alternate, a uni-strut (or equivalent) channel may be used to secure the riser to the building wall. For other proposed means of attachment, consult the Department and the permitting agency.

7. The clearance from the attachment bracket to the service head shall not be less than 12 inches for a single-spool bracket or 16 inches for a three-spool bracket (measured from the center spool) or more than 30 inches, except where otherwise specified by the Department.

8. Attachment bracket supplied and attached by the Department.

9. Install 2-inch x 4-inch blocking between, and solidly attached to, the rafters.

10. References:
    a. For service drop attachments, see page 7-9.
    b. For service drop clearances, see page 7-4.
    c. For service heads, see page 7-14.
    d. For acceptable meter locations, see page 5-2.
    e. For meter clearance and working space requirements, see page 5-10.
SOLID WOOD RISERS FOR SERVICE ATTACHMENTS ABOVE THE ROOF SERVICE

FIGURE 1

WOOD RISER ENCLOSED IN BUILDING WALL

FIGURE 2

WOOD RISER ATTACHED TO BUILDING WALL

ALTERNATE METHOD OF SECURING WOOD RISER TO BUILDING

DETAIL "A" - PLAN VIEW
SOLID WOOD RISERS FOR SERVICE ATTACHMENTS ABOVE THE ROOF SERVICE (Cont.)

<table>
<thead>
<tr>
<th>DIMENSION OF WOOD RISER</th>
<th>&quot;H&quot; - MAXIMUM RISER HEIGHT ABOVE Roof (FEET)</th>
<th>MAXIMUM SERVICE ENTRANCE CONDUCTORS (SEE NOTE 9)</th>
<th>MAXIMUM LENGTH OF SERVICE DROP (FEET)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4&quot; x 6&quot;</td>
<td>5</td>
<td>#1 AWG</td>
<td>150</td>
</tr>
<tr>
<td>4&quot; x 6&quot;</td>
<td>8</td>
<td>#1 AWG</td>
<td>75</td>
</tr>
</tbody>
</table>

NOTES:

1. The arrangements shown above are suggested to provide the required service drop conductor ground and roof clearances as required by the agencies having jurisdiction. The customer should consult the Department and permitting agency having jurisdiction for other methods of supporting the service drop conductors not shown.

2. The Department is not responsible for any damage to the building caused by rain or structural failure.

3. Wood attachment risers shall be constructed of solid wood - risers that are laminated or constructed of separate pieces are not permitted.

4. The attachment riser shall extend below the building plate a distance equal to the projection above the building plate, but not less than 36 inches.

5. For a wood riser enclosed in a building wall, secure the riser to the wall stud using two 1/2-inch bolts and washers spaced a maximum of 30 inches apart.

6. For a wood riser installed on the exterior of a building wall, secure the riser to the wall stud using 1/2-inch lag screws spaced a maximum of 30-inches apart. See Detail "A" for alternate method of attaching the wood riser to a building wall.

7. The clearance from the attachment bracket to the service head shall not be less than 12 inches for a single-spool bracket or 16 inches for a three-spool bracket (measured from the center spool) or more than 30 inches except where otherwise specified by the Department.

8. For service entrance conductors larger than #1 AWG, consult the Department.

9. References:
   a. For service drop attachments, see page 7-9.
   b. For service drop clearances, see page 7-4.
   c. For service heads, see page 7-14.
   d. For acceptable meter locations, see page 5-2.
   e. For meter clearance and working requirements, see page 5-10.
CUSTOMER-OWNED TEMPORARY SERVICE POLE - One year Maximum Service
200 AMPERES MAXIMUM, 0-600 VOLTS

FOR POLES EXCEEDING 24 FEET IN LENGTH, see pages 7-24 and 7-26.

NOTES:

1. The pole shall be self-supporting, solid timber and not less than 6 inches x 6 inches in diameter and 20 feet in length. The pole shall be butt-treated and free of knots or other imperfections that could impair the strength of the pole. Laminated poles, or poles constructed of separate pieces, are not permitted.

2. Service drop conductors, the service drop attachment bracket and the meter shall be furnished and installed by the Department - all other equipment shall be installed by the contractor.

3. Risers shall be 3/4-inch minimum Polyvinyl Chloride (PVC) schedule 40 or metallic conduit and shall be securely attached to the pole.

4. Floodlights, signs, ropes, and other similar equipment shall not be attached to the pole.

5. The pole shall be located:
   a. At least 10 feet from the Department service pole and, whenever practicable, at least 10 feet laterally from the center of the pole line but not more than 100 feet from the Department’s servicing pole.
   b. So that the ground clearance, buildings and other obstructions shall not reduce the service drop height below the required minimum clearances specified on pages 7-4 to 7-9.

6. A residential meter socket may be used for 125-ampere, single-phase services - a safety-socket meter panel is required for all others.

   Note: The short-circuit duty rating of the service equipment must meet or exceed the Department’s fault current value for the installation.

7. Service equipment and receptacles shall be weatherproof, rated for the load to be served and adequately bonded and grounded.
CUSTOMER-OWNED TEMPORARY SERVICE POLE - One Year Maximum Service (Cont.)

8. The numeric portion of the street address shall be provided on the pole on the side facing the street or drivable surface. Plastic or metallic numbers of the type used for house addresses are acceptable.

9. Additional references:
   a. For safety-socket meter panel details, see pages 2-24 and 2-26.
   b. Engineering Offices and telephone numbers, see page 1-4.
CUSTOMER-OWNED PERMANENT/TEMPORARY WOOD SERVICE POLE
200 AMPERES MAXIMUM, 0-600 VOLTS

NOTES:

1. The pole shall be a self-supporting, fully-treated round pole with a minimum length of 25 feet and a minimum diameter at the top of 5 inches.

2. Service drop conductors, service drop attachment bracket and the meter shall be furnished and installed by the Department - all other equipment shall be furnished and installed by the contractor.

3. Risers shall be 3/4-inch minimum polyvinyl Chloride (PVC) schedule 40 or metallic conduit and shall be securely attached to the pole.

4. Floodlights, signs, ropes, and other similar equipment shall not be attached to the pole.

5. The pole shall be located:
   a. At least 10 feet from the Department service pole and, whenever practicable, at least 10 feet laterally from the center of the pole line but not more than 150 feet from the Department’s servicing pole.
   b. So that the ground clearance, buildings and other obstructions shall not reduce the service drop height below the required minimum clearances specified on pages 7-4 to 7-9.

   Note: Consult with the area service planning office to determine the location of the attachment bracket on the pole required to meet the specified clearances.

6. For permanent service applications, a safety-socket meter panel is required for all commercial services. For temporary service applications, a residential meter socket may be used for a 125-ampere, single-phase service - a safety-socket meter panel is required for all others.

   Note: The service equipment short-circuit duty rating must meet or exceed the Department’s fault current value for the installation.
CUSTOMER-OWNED PERMANENT/TEMPORARY WOOD SERVICE POLE (Cont.)

7. The numeric portion of the street address shall be provided on the pole on the side facing the street or drivable surface. Plastic or metallic numbers of the type used for house addresses are acceptable.

8. Additional references:
   a. For safety-socket meter panel details, see pages 2-24 and 2-26.
   b. Engineering offices and telephone numbers, see page 1-4.
NOTES:

1. The service pole shall be constructed of a continuous, unbroken length of pipe provided with a pipe cap. The pipe shall be hot-dipped galvanized and threaded for attachment of the pipe cap. Acceptable grades for metal pipe are ASTM-A-53 (Type E or S), ASTM-A-500 and ASTM-A-501. Minimum pipe sizes shall conform to the following table:

<table>
<thead>
<tr>
<th>(H) MINIMUM POLE HEIGHT ABOVE GROUND (FEET)*</th>
<th>(D) MINIMUM POLE DEPTH BELOW GROUND (FEET)</th>
<th>SCHEDULE 40 (STANDARD)</th>
<th>SCHEDULE 80 (EXTRA STRONG)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>4</td>
<td>4&quot; (GRADE B)</td>
<td>4&quot; (GRADE A)</td>
</tr>
<tr>
<td>20</td>
<td>4-1/2</td>
<td>5&quot; (GRADE A)</td>
<td>4&quot; (GRADE B)</td>
</tr>
<tr>
<td>25</td>
<td>5</td>
<td>5&quot; (GRADE B)</td>
<td>5&quot; (GRADE A)</td>
</tr>
</tbody>
</table>

* Required pole height is based on the location of the point of attachment. See note 6b.
CUSTOMER-OWNED PERMANENT/TEMPORARY METAL SERVICE POLE (Cont.)

2. Attachments to metal poles shall be made with devices that will not affect the strength or integrity of the pole (see attachment detail). Drilling or welding are not acceptable.

3. The Department will furnish the attachment bracket and furnish and install the service drop conductors and meter. The customer shall install the attachment bracket and shall furnish and install the pole and all other equipment.

4. Riser conduits shall be 3/4-inch minimum polyvinyl Chloride (PVC) schedule 40 or metallic conduit. Metallic riser conduits are not required to be covered as long as the metal pole is effectively grounded and the metallic conduits are bonded to the pole. If a protective covering is required, see page 121 for conduit covering details.

5. Floodlights, signs, ropes, and other similar equipment shall not be attached to the pole.

6. The pole shall be located:
   a. At least 10 feet from the Department service pole and, whenever practicable, at least 10 feet laterally from the center of the pole line but not more than 150 feet from the Department’s servicing pole.
   b. So that the ground clearance, buildings and other obstructions shall not reduce the service drop height below the required minimum clearances specified on pages 7-4 to 7-9.

   Note: Consult with the area service planning office to determine the location of the attachment bracket on the pole required to meet the specified clearances.

7. For permanent service applications, a safety-socket meter panel is required for all commercial services. For temporary service applications, a residential meter socket may be used for a 125-ampere, single-phase service - a safety-socket meter panel is required for all others.

   Note: The service equipment short-circuit duty rating must meet or exceed the Department’s fault current value for the installation.

8. The numeric portion of the street address shall be provided on the pole on the side facing the street or drivable surface. Plastic or metallic numbers of the type used for house addresses are acceptable.

9. Additional references:
   a. For safety-socket meter panel details, see pages 2-24 and 2-26.
   b. Engineering offices and telephone numbers, see page 1-4.
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A. INTRODUCTION

1. This section is intended to assist Department customers in the design and evaluation of utility interconnections for customer-owned parallel-generation systems.

2. Interconnection agreement packages are available for proposed customer-owned parallel-generation facilities and may be obtained by contacting:

   Los Angeles Department of Water and Power
   Distribution Engineering
   Self-Generation Project Manager
   111 North Hope Street
   Room 819
   Los Angeles, CA  90012

   Tel:   (213) 367-3413
   FAX:  (213) 367-2919

B. DATA REQUIRED FOR DESIGN

1. When considering the installation of a parallel-generation facility, customers should contact the Department as soon as possible so that:

   a. The Department’s service planners can work with the customer to establish an acceptable interconnection scheme for the customer’s facility.

   b. Customers may avoid unnecessary expenses and delays in service caused by assuming interconnection schemes and equipment requirements.

2. At the time of initial contact, or as soon as possible, customers should provide the Department with the following information so that the Department may assist the customer in finalizing the customer’s plans:

   a. Electrical plans including load schedules and single-line diagrams.

   b. Plot and site development plans showing generator, disconnect, metering equipment locations and Department access to generator, disconnect and meter equipment locations.

   c. Energy source information:

      (1) Maximum kilowatt rating
      (2) Nominal voltage output
      (3) Voltage regulation
      (4) Maximum fault current contribution

   d. Protective system information:

      (1) Protective system plan
      (2) Manufacturer’s data sheets and maintenance requirements for protective equipment
      (3) Any additional information required by the Department
B. DATA REQUIRED FOR DESIGN (Cont.)

3. Upon receiving the requested information and engineering fees, the Department will provide customer requirements drawings and Department construction drawings as needed. Customer requirement drawings provide the customer with the information necessary to construct the interconnection facilities for the transformers, protective devices, meters and other necessary equipment that will be installed by the Department.

C. ELECTRIC RATES

Rates for the sale or exchange of electrical energy between the Department and the customer shall be in accordance with the established rates as specified in the latest publication of the Department’s Rate Ordinance as amended.

D. SELF-GENERATION INTERCONNECTION AGREEMENTS

1. Customers are required to complete a Self-Generation Interconnection Agreement (Agreement) with the Department before the generating facility may be interconnected to the Department’s electric system.

2. The Department normally uses a standard offer contract for Agreements. However, if the standard offer is not suitable for the needs of the generating facility, the customer may request the Department to consider a separate nonstandard interconnection agreement.

E. INTERCONNECTION COSTS

Customers are required to reimburse the Department for all expenses associated with completing the interconnection of the customer’s parallel-generation facilities including, but not limited to, extensions or modifications to the Department’s electric system and related facilities and construction costs.

F. TRANSFORMER REQUIREMENTS

1. Energy sources rated less than 500kVA may be connected on the secondary side of Department-owned transformers supplied from the 4800-volt electric system.

2. Energy sources rated 500-750 kVA may be required to be connected on the secondary side of dedicated Department-owned transformers supplied from the 34,500-volt electric system.

3. Energy sources rated over 750 kVA will be required to be connected on the secondary side of dedicated Department-owned transformers supplied from the 34,500-volt electric system. Transformers shall be sized to supply the complete installation and will serve no other customer. Secondary distribution may be provided at the most convenient serving voltage for the customer.

4. The Department may require that the Department-owned transformers used to supply the customer’s electric system be sized (i.e., kVA rating) equal to, or greater than, the customer’s total generator capacity.

5. See TRANSFORMER INSTALLATIONS ON THE CUSTOMER’S PREMISES on page 1-33 for additional information.

G. OPERATING REQUIREMENTS

1. Customers are required to operate the generating facilities, whether permanent or temporary, in accordance with the Agreement, The Department’s Electric Service Requirements, Rules, Rate Schedules and all other applicable codes and ordinances.
G. OPERATING REQUIREMENTS (Cont.)

2. Customers shall not:
   a. Energize an un-energized electric line or transformer.
   b. Reconnect the energy source after a protective device trip unless the customer’s electric system is energized by the Department’s electric system by the Department, or unless the customer’s electric system is isolated from the Department’s electric system by the Department.

3. Synchronous generators are capable of maintaining a distribution system energized even after the line protective device has opened and separated (relayed) the line from the Department’s electric system. Since the Department uses automatic reclosing schemes to energize relayed lines after a short time delay, customer-owned equipment or Department-owned equipment may be damaged if power is restored to a line that is already energized by the customer’s generator(s).

4. These operating and protective requirements have been established to protect the health and well being of the public and utility workers from malfunctions in Department or customer equipment.

H. METERING

1. Customers shall provide Department approved metering arrangements for the installation of Department-owned meters to measure the energy into, or out of, the installation at the interconnection point and at the energy source(s) output.

2. All metering equipment drawings must be submitted to, and approved by, the Department service planner before the customer installs any equipment.

I. INSPECTIONS

The Department requires that all conditions specified by these requirements be met and verified by the Department. In addition, an approval from the permitting agency for portions of the wiring and electrical equipment under their jurisdiction is required before the Department will establish the interconnection.

J. LIABILITY

1. Customers are responsible for damage caused to Department-owned equipment or other customers served from the Department’s electric lines as a result of mis-operation or malfunction of the customer’s energy source system.

2. The Department does not assume any responsibility for the protection of the customer’s generator(s) or any other portion of the customer’s electrical system. The customer is fully responsible for protecting the customer’s system so that faults or other disturbances on the Department’s system do not cause damage to the customer’s equipment.

K. DISCONNECTION OF CUSTOMER’S ENERGY SOURCES

1. GENERAL

   The Department reserves the right to disconnect the customer’s energy source(s) from the Department’s electric system:

   a. When the customer’s energy source is adversely affecting the Department’s electric system or other customer’s supplied from the Department’s electric system.
K. DISCONNECTION OF CUSTOMER’S ENERGY SOURCES (Cont.)

b. When the customer-installed protective system has been defeated or not properly maintained (lack of proper records is considered to be non-maintenance).

c. If the customer denies access to the Department to the generating facility or to required maintenance and operating records.

d. Under emergency conditions as determined by the Department.

2. NOTIFICATION

a. Under non-emergency conditions, generally a notice of disconnection will be provided in writing as follows:

(1) For energy sources rated less than 500 kVA, the Department will endeavor to provide notification 72 hours in advance of the scheduled disconnection

(2) For energy sources rated 500 kVA or greater, the Department will provide notification 72 hours in advance of the scheduled disconnection

b. Under emergency conditions, the Department reserves the right to disconnect the customer’s energy source(s) without notification.

c. If the customer-installed protective system becomes inoperative, the customer shall disconnect the energy source(s) from the Department’s electric system and immediately notify the Department. When the protective system problems have been corrected, the customer shall request the Department for permission to reconnect the customer generation system.

L. GENERATION DISCONNECTING MEANS

1. GENERAL

a. Customers shall furnish, install and maintain circuit disconnect switches as required by the Department to isolate the customer’s generator or generating system from the Department’s electric system. In general, a main service generator disconnect switch and a generator circuit disconnect switch will be required for synchronous generating systems while only a generator circuit disconnect switch will be required for induction or solar generating systems. See pages 8-12 and 8-14 for additional requirements.

b. The Department circuit disconnect switch shall be a safety switch with a readily verifiable visual air gap to assure positive circuit disconnect and shall be lockable in the open position. Locking provisions shall have a 3/8-inch minimum hole for use with a Department standard padlock having a 1-inch locking clearance.

Note: Safety switches shall have a viewing window to allow verification of the open switch condition without exposing the Department’s personnel to energized bus and shall be independent of the customer’s required circuit protection devices (i.e., circuit breakers or fuses). Removing customer-owned fuses shall not be permitted as a means of providing the required air gap.

2. ACCESS

Switches used to disconnect the energy source shall be accessible under all conditions and at all times to Department personnel. This may require disconnect switches to be located in a publicly accessible area or be provided with an interlock system to gain access to an installation in a security controlled area.
M. SIGNS AND LABELS

1. **The customer shall provide and install the following signs** as directed by the Department:
   a. A sign at the main service (meter) panel location identifying each generator disconnect location.
   b. A sign at each Department specified generator disconnect identifying the main service location.
   c. A sign on each personnel entrance door for Customer Stations.
   d. Any other signs deemed necessary by the Department to provide generator disconnect location information.

2. **The customer shall provide a sign to be installed by the Department** for each Department-owned padmount transformer connected to the customer’s parallel generation system.

3. **The customer shall provide and install the following diagrams** when required by the Department:
   a. A single-line diagram located at the main service panel location. The diagram shall be approved by the Department and installed by the customer as directed by the Department.
   b. A plot plan located at the main service panel showing the location of the generator disconnect(s). The plot plan shall be approved by the Department and installed by the customer as directed by the Department.

N. PROTECTIVE SCHEMES

1. Customer generating facilities shall be provided with protective schemes in order to insure the security of the Department’s electric system, security of other customers supplied from the Department’s electric system and the safety of Department operating personnel.

2. **In general, The Department will provide and install, at the customer’s cost, required protective equipment.** However, where mutually agreeable between the Department and the customer, the customer may provide and install, at the customer’s cost, protective equipment as specified by the Department for:
   a. Synchronous generators rated less than 300 KVA (240 KW) and induction generators rated less than 400 KVA (480 kW) when supplied from the Department’s 4800-volt electric system.
   b. Synchronous generators rated less than 400 KVA (320 KW) and induction generators rated less than 600 KVA (480 KW) when supplied from the Department’s 34,500-volt electric system.

3. The Department will install ground fault protection (GFP) equipment, at the customer’s cost, for customer generating facilities rated one megawatt (MW) and above and interconnected with the Department’s 34,500-volt electric system.

   **Note:** The Department may require GFP for customer generation facilities rated less than one MW and interconnected with the Department’s 34,500-volt electric system when the facilities are located in remote areas or whenever such protection, in the Department’s judgment, is necessary.

4. The electrical rating (kW) of the customer’s generating facility will determine, in part, the configuration in operating characteristics and protection requirements for a customer’s interconnection installation. Typical protection equipment requirements include, but are not limited to:
   a. Under-voltage (Device 27) protection
N. PROTECTIVE SCHEMES (Cont.)
   b. Over-voltage (Device 59) protection
   c. Under-frequency (Device 81U) protection
   d. Over-frequency (Device 81O) protection
   e. Tripping batteries, circuit breakers and battery chargers

   **Note:** See **SPECIFICATIONS** on page 8-8 for additional information.

5. Customer’s energy source circuit breakers must positively disconnect under all conditions. In most instances this will require the installation of a charger assisted, uninterruptible D.C. power source.

6. The Department reserves the right to review and approve any interconnection scheme involving customer initiation of the customer interconnecting breaker controls.

7. Protective equipment shall be readily accessible to the department for periodic inspection.

O. TELEMETRY

1. Customers shall provide an operating telephone service at each energy source installation when required by the Department.

2. For installation rated one MW and above, the Department requires that customer install telemetering equipment at the generating facility to provide continuous output information at the Department’s Energy Control Center. This information shall include, but not be limited to:
   a. Energy source watts and watt-hours.
   b. An indication of each energy source synchronizing disconnect information (i.e., open or closed).

P. MAINTENANCE

1. Where the Department installs the protective equipment, the Department is responsible for maintaining such equipment. Where the customer installs the required protective equipment, the customer shall provide monthly maintenance of the tripping battery and the battery charger.

2. For customer generation installations rated 500 kVA or more, maintenance of the customer’s energy source must be scheduled in advance to be compatible with the Department's electric system load requirements.

Q. RECORDS

1. Customers shall provide accurate records of the customer’s generating facility. Such records shall include but not be limited to:
   a. Tripping batteries and battery chargers, where protective equipment is installed by the customer:
      (1) Date and time of maintenance
      (2) Description of maintenance performed
Q. RECORDS (Cont.)

b. Each energy source:
   (1) On-line and off-line times
   (2) Generation output (kW)
   (3) Maintenance outages
   (4) Trip operations
   (5) Any unusual events

2. The Department reserves the right to periodically review the customer’s maintenance records for system analysis and to evaluate system disturbances.

R. SPECIFICATIONS

1. Customer generating facilities shall be constructed to meet the following specifications:
   a. System frequency shall be 60 cycles per second (Hz).
   b. Signal distortion shall be limited to 5-percent of the RMS value of the Department’s serving voltage and 25-percent of the waveform.
   c. Power factor of the customer’s electric system shall be limited as follows:
      (1) For generating systems rated less than one MW, the average monthly on-peak power factor shall not be less than 85-percent lagging.
      (2) For generating systems rated one MW or greater, the power factor shall not be less than 99.5-percent lagging or more than 99.5-percent leading.
         Note: The Department will measure these specifications at the metering facility.

2. Protective equipment relays used to open and close generator circuit breakers shall operate with the following specifications:
   a. Under-voltage (Device 27), 92 volts or higher with a maximum time delay of 2.0 seconds
   b. Over-voltage (device 59), 138 volts or less with a maximum time delay of 2.0 seconds
   c. Under-frequency (Device 81U), 57 Hz or higher with a maximum time delay of 2.5 seconds
   d. Over-frequency (Device 81O), 61 HZ or less with a maximum time delay of 2.5 seconds

S. TESTING AND EVALUATION

1. Customers shall test the generating facility before interconnecting with the Department’s electric system and provide written certification to the Department that the generating facility meets the Department’s specifications.
S. TESTING AND EVALUATION (Cont.)

2. The Department reserves the right to test the customer’s equipment before approving the connection to the Department’s electric system and the right to monitor onsite operations of the equipment.

3. If the generating facility does not meet the Department’s specifications, the Department may require the customer to disconnect the facility and make corrections or reimburse the Department for corrections as specified in the Agreement.

4. After the Department determines that the operation of an energy source will not be hazardous or impair the reliability of the Department’s electric system, the Department will provide written permission to complete the interconnection.

5. Where the customer installs protective equipment, the customer shall have the equipment tested at two-year intervals by a Department approved testing agency at the customer’s cost. It is the customer’s responsibility to arrange for contracts and payments to the approved testing agency and to complete testing within the two-year interval.

T. GENERATORS AND GENERATING SYSTEMS

1. Generating systems operated by customers shall be connected on the customer’s electric system on the load side of the customer’s service disconnecting means at a Department approved location.

   Exception: Solar (photovoltaic) and fuel cell generating systems may be connected on either the line side or load side of the customer’s service disconnecting means as allowed by the permitting agency but are subject to the following restrictions:

   a. Generation circuit connections may not be made in, or accessed through, any sealed utility compartment.

   b. Generation circuit conduits and conductors shall not be routed through any sealed utility compartment.

   Note: sealed utility compartments include terminating pull boxes and pull sections, metering compartments, and test-bypass compartments.

   Caution: Existing service equipment may not have a suitable solar or fuel cell connection point on the line side of the customer’s service over-current device and may require third party certification of any proposed connection location. Consult the LADBS or other applicable permitting agency regarding third party certification requirements.

2. Single-phase energy sources are limited to 20 kVA for each unit. Installations with multiple single-phase units shall use a three-phase interconnection system and balance the sources between the phases.

3. For synchronous generators, automatic synchronization is preferred. However, manual synchronization with relay supervision is acceptable.

4. Synchronous generators designed to be started as induction motors may not require synchronizing relays, but will not be permitted to start up if it results in detrimental effects to the Department’s electric system.

5. Voltage regulation equipment must be provided on the customer’s generator to maintain generation voltage to within normal Department limits.

6. Induction generator installations may require capacitors to correct the power factor. Protection schemes must be coordinated to insure that the capacitors will always be disconnected before the induction generator is disconnected.
T. GENERATORS AND GENERATING SYSTEMS (Cont.)

7. Generator installations rated 750 kVA or less may be required by the Department to meet conditions and specifications normally required for installations rated over 750 kVA. Safeguards that will be required and the degree of sophistication will depend on the type of equipment and the interconnection scheme.

U. INVERTERS

1. Inverters shall be utility interactive (i.e., inverter requires a utility voltage source to operate). Stand-alone inverters designed for customer electric systems that are operated independent the utility grid and dual-operation inverters that may be operated in either stand-alone or utility interactive modes are not permitted.

2. Inverters may be used to interface the customer’s energy source with the Department’s electric system and shall be designed to operate within the Department’s acceptable service supply voltage ranges. See Acceptable Voltage Ranges, page 1-26, for additional information.

3. Inverters require connection through an isolation transformer to prevent the introduction of a D.C. component onto the Department’s electric system caused by an inverter malfunction. The transformer may provide a one-to-one ratio or may match the inverter output voltage to the interconnection voltage.

4. Inverters are required to be line commutated and line feeding.

5. Suitable safeguards are required to prevent connection when the inverter is not synchronous with the Department’s electric system.

6. Inverter designs shall provide a “ramp in” feature during the interconnection operation (i.e., power will gradually ramp up from zero on the initial start up) to prevent voltage fluctuations.

7. Inverters are to be designed to operate as current sources rather than voltage sources due to the inherent stiffness of the Department’s electric system.
TYPICAL INTERCONNECTION ARRANGEMENTS WITH DEPARTMENT-OWNED TRANSFORMERS

FIG. 1 TYPICAL INTERCONNECTION ARRANGEMENT FOR CUSTOMER-OWNED GENERATING SYSTEMS

FIG. 2 ALTERNATE INTERCONNECTION ARRANGEMENT FOR CUSTOMER-OWNED SOLAR/FUEL CELL GENERATING SYSTEMS
TYPICAL INTERCONNECTION ARRANGEMENTS WITH
DEPARTMENT-OWNED TRANSFORMERS

NOTES:

1. The customer shall furnish, install and maintain equipment disconnect devices as required by the Department. The main service generator disconnect device is not required for generating facilities using only induction energy sources.

2. The customer’s generating system circuit shall be connected on the load side of the customer’s service disconnecting means (Main CB) as shown in figure 1.

   **Exception:** Solar and fuel cell generating systems may be connected on the line side of the customer’s disconnecting means as shown in figure 2. For additional information, see page 8-9, “Generators and Generating Systems”.

3. The customer shall provide facilities for installation of a Department performance (unit) meter. A safety-socket meter panel is required for feeder circuit breaker (CB) ratings up to 250 amperes. When the feeder CB rating exceeds 250 amperes, a current-transformer box or instrument-rated switchboard is required.

   **Exception:** Residential solar systems rated under 10kW require a customer-owned meter socket and meter as specified under the Department’s Solar Guidelines. The guidelines are available on the Department’s website at www.ladwp.com.

4. References:

   a. For additional LADWP generating system disconnect device requirements, see page 8-5.

   b. For metering requirements, see:

      (1) Sections 2 and 3 for facilities to be metered at 0-600 volts.

      (2) Section 4 for facilities to be metered at 601-4800 volts.

   c. For transformer installations, see page 8-3.
NOTES:

1. The customer shall furnish, install and maintain equipment disconnect devices as required by the Department. The Department may install additional disconnect devices, at the customer's expense, if the generating facility uses synchronous generators.

2. The customer shall provide facilities for installation of a Department performance (unit) meter. A safety-socket meter panel is required for feeder CB ratings up to 200 amperes. When the feeder CB rating exceeds 200 amperes, a current-transformer box or instrument-rated switchboard is required.

3. References:
   a. For generator disconnect requirements, see page 8-5.
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<td>4-10</td>
<td>A</td>
</tr>
<tr>
<td>409</td>
<td>NA</td>
<td>N/P</td>
</tr>
<tr>
<td>411</td>
<td>4-12</td>
<td>A</td>
</tr>
<tr>
<td>414</td>
<td>NA</td>
<td>N/P</td>
</tr>
<tr>
<td>416</td>
<td>NA</td>
<td>N/P</td>
</tr>
<tr>
<td>418</td>
<td>4-18</td>
<td>A</td>
</tr>
<tr>
<td>420</td>
<td>NA</td>
<td>U</td>
</tr>
</tbody>
</table>

Note: Changes in the table above reflect revisions to the 2004 publication of the EUSERC book.

Table Codes:

- **N/P**: No equivalent ESR page
- **A/C**: Acceptance Codes:
  - **A**: Department accepts EUSERC drawing.
  - **U**: Department does not accept EUSERC drawing.
  - **C**: Department accepts EUSERC drawing with some variations – consult ESR page for requirements.
  - **NA**: Not applicable to the Department’s service area

Note: See Page 9-10 for a listing of the differences between EUSERC drawings and Department ESR pages.

 Indicates latest revision
The following is an explanation of the Consult (C) references shown in the preceding Table:

<table>
<thead>
<tr>
<th>ESR PAGE</th>
<th>EUSERC DRAWING</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-12</td>
<td>347</td>
<td>The EUSERC Drawing includes an exception to Note 1 that permits edge-wise terminating facilities to have 9/16-inch holes in place of the studs.</td>
</tr>
<tr>
<td>2-15</td>
<td>344</td>
<td>The Department's requirement has a different conduit range and specifies a pull box size for 5-inch conduit.</td>
</tr>
<tr>
<td>2-41</td>
<td>328B</td>
<td>The Department restricts this current-transformer mounting base application to overhead supply only. Overhead supply means a top supply conduit entry from a weatherhead or a separate underground pull box.</td>
</tr>
<tr>
<td>2-43</td>
<td>329B</td>
<td>The Department restricts this current-transformer mounting base application to overhead supply only. Overhead supply means a top supply conduit entry from a weatherhead or a separate underground pull box.</td>
</tr>
</tbody>
</table>
| 3-12     | 3-25           | The upper and lower CT compartment flanges are limited to a maximum dimension of 1-1/4”.
| 3-14     | 326            | The upper and lower CT compartment flanges are limited to a maximum dimension of 1-1/4”.
| 3-40     | 348            | The Department’s requirement includes specifications for switchboards supplied from bus duct and bussed top hat enclosures. |
| 3-48     | 349            | For Customer Station applications, the Department requires one landing position for each 400 amperes of service capacity. |
| 4-6      | 401            | The Department requirement is limited 5 KV installations and includes expanded and more detailed notes. |
| 4-16     | 407            | The Department requirement is limited to 5 KV rated service equipment and the current transformer information is specific to Department applications. |
| 4-14     | 408            | The Department’s requirement is specific to the current transformers used by the Department. |
| 4-18     | 411            | The Department’s requirement is limited to 5 KV installations. |
GLOSSARY

The following terms are used through these electric service requirements:

**Accessible:** Capable of being reached conveniently and quickly during normal business hours for construction, operation, maintenance, inspection or testing without requiring Department personnel to climb over or remove obstacles; or to obtain special permission or security clearances. Some installations may require 24-hour access.

**Across-the-line starting current:** The electrical current required by a motor at starting with full line voltage and frequency, and with normally driven load mechanically connected. A stop-ammeter having not more than 15-percent over swing, or an oscillograph, shall be used when it is necessary to determine the starting current. Values indicated by the oscillograph during the first 10 cycles following energizing of the motor shall be disregarded.

**ANSI:** American National Standards Institute

**Application:** A request for electric service connection made to a Department Customer Service Branch Office.

**Approved:** The facilities installed by the customer are acceptable meets with the Department's service requirements, Rules, and policies.

**AWG:** American Wire Gauge

**Barriers:** See Isolating Barriers

**Building:** A structure standing alone, used for or intended for supporting or sheltering any use or occupancy, and requiring a separate permit by the permitting agency for each separate building or structure.

**Bus, Live:** Bus bars which are electrically energized.

**Busway (Bus Duct):** A raceway structure enclosing bus bars and equipped used to connect metering equipment to the point of service.

**Cablebus:** A raceway structure used in Customer Station installations to enclose the Department's service supply conductors. The structure is furnished and installed without supply conductors by the customer in accordance with the Department's specifications.

**Commercial Station:** An indoor or enclosed outdoor transformer facility installed on a customer's premises and supplied from the Department's 4800-volt electric system.

**Conductors, Service Entrance:** The conductors installed by the customer from the service point to the service and metering equipment and conforming to the City of Los Angeles electric code or other applicable governing code.

**Conductors, Service Supply:** The conductors installed by the Department from the supply source to the customer's service point.

**Conduit:** A pipe manufactured of Department-approved materials, whether direct buried or concrete encased, used to enclose electric conductors.

**Current Transformer:** An instrument transformer designed for use in the measurement of electrical current.

**Customer:** The owner, whether a person or business association, or any person or agency authorized to represent the owner's interests.
GLOSSARY (Cont.)

**Customer Generator:** A device installed and operated by a customer to supply electric energy to all, or part of, a customer's load. See "Stand-Alone Generator" and "Parallel Generator".

**Department:** The Los Angeles Department of Water and Power.

**Dog House:** A common term for a weatherproof enclosure built by the customer on the exterior of a building or other structure and used to enclose indoor service and metering equipment.

**Emergency Generator:** A customer generator used to supply electrical energy to all, or part of, a customer's load when the Department's electric system has been de-energized. See "Customer Generator".

**EXO:** Any assembled service wiring installation which does not use a switchboard.

**Final Grade:** The ground surface elevation after paving and improvements have been completed.

**First Floor:** The building floor that is closest to the elevation of, and above, the ground level.

**Housekeeping Pad:** A raised portion of the floor or a raised concrete foundation (pad) installed beneath service and metering equipment and generally intended to keep the equipment out of standing water.

**Industrial Station:** A transformer installation located on the customer's premises and supplied from the Department's 34,500-volt electric system.

**Inspection Authority:** Those City, County, State, and Federal agencies responsible for issuing electrical permits, making inspections of the customer's electrical wiring system, and for notifying the Department if such system meets all applicable codes and ordinances and is ready for service.

**Instrument Transformer:** A transformer that produces in its secondary circuit, a definite and known proportion of the current or voltage in its primary circuit.

**Intermittent Duty Operation:** A service characteristic where the load conditions are regularly repeated or demand alternating operation. A motor operation is considered to be intermittent if it is controlled by automatic switches (Actuated by pressure, liquid level, temperature, or other similar means), or the operating cycle has more than four starts in any 8-hour period and is not normally manually controlled.

**Isolating Barrier:** A partition of either conductive or nonconductive material used to mechanically isolate internal compartments or sections from other integral compartments or sections of the enclosure.

**Metered Circuits:** Those conductors extending from the secondary side of the meter to the customer's load circuits or outlets connected to such circuits.

**Meter, Instrument-Transformer Rated:** An electrical meter that is connected to a circuit through instrument transformers (i.e., current-transformers and, when required, voltage transformers) and used to accurately measure and register all the electrical energy consumed in the circuit.

**Meter Room:** A weatherproof, fully illuminated room, provided at the customer's option and approved by the Department.

**Meter Panel:** A panel used exclusively for mounting meter sockets and associated equipment.
GLOSSARY (Cont.)

**Meter, Self-Contained:** An electrical meter that is connected directly into a circuit and is used to accurately measure and register all the electrical energy consumed in the circuit.

**Operating Convenience:** The utilization, under certain conditions, of facilities or practices not usually employed which contribute to the overall efficiency of the Department's system.

**Parallel Generator:** A customer generator used to supply electrical energy to all, or part of, a customer's load and operated, or switched, in parallel with the Department's electric system. See “Customer Generator”.

**Pull Box:** A wall-mounted, fully-enclosed, metal enclosure used to connect the service supply conductors to the service entrance conductors.

**Pull Section:** A floor-standing, open-bottomed, metal enclosure used to connect the service supply conductors to the service entrance conductors.

**Raceway, Overhead:** The conduit or sealable wiring enclosure from the service head to the meter socket box, current-transformer box, instrument-transformer compartment, or disconnect device used, that is used to enclose the service entrance conductors.

**Raceway, Underground:** The conduit or sealable enclosure between the terminating enclosure and the meter socket box, current-transformer box, instrument-transformer compartment, or disconnect device, that is used to enclose the service entrance conductors.

**Rules:** The document, approved by the General Manager and the Board of Water and Power Commissioners, governing water and electric service in the Department and Water and Power service territory.

**Sealing Ring:** A device, supplied by the electrical equipment manufacturer, used to hold socket type meters in place with provisions for installing the Department's sealing devices.

**Sealing Rings, Security:** A heavy-duty sealing ring, supplied by the Department, incorporating an integrated barrel-lock device.

**Security Area:** Any area of a premises not readily available to public access, or requiring special permission or security clearances for access.

**Self-Generation:** See Parallel Generator

**Service Drop:** The Department's overhead conductors extending from the Department's pole line to the point of attachment on the building or structure.

**Service Entrance Conductors, Overhead:** All conductors (including bus or cable) installed by the customer from the service equipment to the point of connection with the Department's service drop conductors.

**Service Entrance Conductors, Underground:** All conductors (including bus or cable installed by the customer from the service equipment to the point of connection with the Department's service lateral conductors.

**Service Lateral:** The span of conductors installed underground in conduit by the Department from a supply source to an approved terminating enclosure.

**Service Location:** The place on the customer's property line where the Department-installed conduits connect to the conduits specified by the Department and installed by the customer.
GLOSSARY (Cont.)

**Service Point:** The location of connection between the Department's facilities and the customer's premises wiring.

**Stand-Alone Generator:** A customer generator used to supply electrical energy to all of, or part of, a customer's load; isolated from the Department's electric system with a non-paralleling switching arrangement, and using the Department's electric system as a standby service. See “Customer-Owned Generators”.

**Switchboard Service Section:** A floor-standing, metal enclosure used to terminate service conductor and having provisions for the Department's electric meters and associated equipment, and containing the customer's meter switch.

**Switchboard, specially Engineered:** A switchboard that does not conform to the standard switchboard design and includes one or more of the following conditions: (1) where the service exceeds 600 volts; (2) where the service voltage is 3∅ 3-wire; (3) where the meter switch rating exceeds the ampacity of the standard service section; (4) where the instrument-transformer compartment is supplied from a pull section located below the section (bottom-feed); (5) where multiple-metering sections are used; (6) where recessed meter panels are used.

**Switchboard, Standard:** An electrical switchboard with an instrument-transformer compartment and hinged meter panels, and the customer's meter switch.

**Switch, Service Main:** The breaker, fused-switch, or other approved disconnecting means with over-current protection located on the line side of two or more meters sockets.

**Switch, Meter:** The circuit breaker, fuse-switch, or other approved disconnecting means with over-current protection located on the load side of a meter and controlling all of, and only, the energy registered by the meter (new sequence). The “switch” may consist of up to a maximum of six disconnect devices grouped at one location.

**Terminating Enclosure:** A Department-approved enclosure (i.e., pull box or pull section, or bussed switchboard extension) installed at the underground point of service delivery and used for terminating the Department's service conductors and for joining the conductors to the customers service entrance conductors.

**Test-Bypass Disconnect Facilities (Test-Blocks):** An assembly used in conjunction with a self-contained meter socket and designed to allow the Department to de-energize the meter socket without disconnecting service to the customer.

**Test Switch:** An a device incorporating an arrangement of small knife switches connected in the secondary instrument-transformer circuit between the instrument transformers and the associated meter. The test switch is safety device installed by the Department and used to isolate the meter from the instrument transformers.

**Test Perch:** A bracket designed for mounting the Department's test switch.

**Voltage Transformer:** An instrument transformer designed for use in the measurement of voltage.