DelDOT Utility

Handbook for Electric Utility Components

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1.0 Introduction

This Utility Handbook was developed to assist various users including but not limited to engineers, utility company representatives, and construction workers by providing high-level insight into how to identify various electric components/features.

Figure 1-1 shows a general diagram of the electric power network from generation to customer. Components identified in this handbook are typical of what is seen in the field and fall somewhere within the network visualized below.

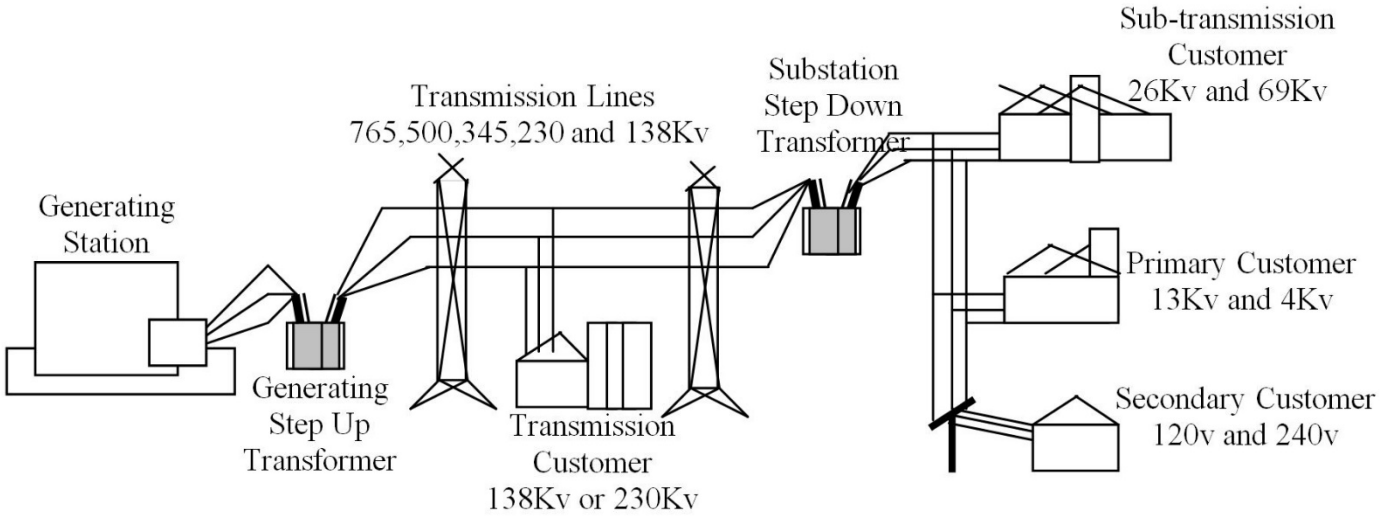

Figure 1-1: Diagram of electric power network from generation to customer

Each utility component identified in this handbook includes the following information:

Field Identification: How to identify the component in the field from visual observation.

Description and Purpose: Background on what the facility is and what function it serves.

Considerations and Additional Information: Other information to note when these facilities are present within a project site. This may contain other related facilities, impacts to design, and severity of impacts to them.

All information in this handbook is meant to guide the user. Field conditions and information shall be confirmed with the utility owner.

2.0 Safety

You should never open, close, connect, or touch any of the devices or components in this manual. Only trained and certified electricians with the applicable safety equipment are allowed.

It should be noted that all ground mounted electric equipment will have buried electric facilities running to/from the units.

3.0 Transmission vs. Distribution Lines

Figure 3-1: Transmission line utility pole with aerial facilities
Top to bottom: 3 transmission facilities, secondary facility, communication facilities

Figure 3-2: Distribution line utility pole with aerial facilities
Top to bottom: 3 primary facilities, secondary facility, communication facilities

3.1 Field Identification

Facilities may be copper (insulated or bare) or aluminum.
Transmission facilities are larger facilities and are sometimes attached to metal poles instead of wooden poles.
Distribution facilities are the electric facilities seen on most utility poles.

- Primary lines: Topmost lines on the utility pole.
- Secondary lines: Lines under primary lines but above communication lines.

Underground utility lines can be direct buried, in conduits, duct banks, or inner ducts. These may be identified by one-call marks on the ground connecting visible above-ground or at grade electric features.

3.2 Description and Purpose

Transmission: High voltage lines for long distance transporting
Distribution: Primary lines: Higher voltage lines – for short distance local electric transportation
Secondary lines: Lower voltage lines – to service customers (houses, businesses, traffic systems, street lighting, etc.)

3.3 Considerations & Additional Information

Clearances required to be clear around electric lines (sag and sway will vary and should be considered for necessary clearances):

- Transmission – up to 20 ft
- Primary – 10 ft
- Secondary – 4 ft

Note that these clearances are based on OSHA requirements and need to be verified with the utility companies. All clearances apply to both for permanent objects (signal poles, overhead signs, etc.) and any construction equipment (cranes, augers, etc.)

4.0 Aerial Transformers

4.1 Field Identification

Aerial Transformers are located near the top of utility poles that have aerial lines attached to them.

4.2 Description and Purpose

These transformers change the voltage of the electricity carried through cables. This typically occurs to allow power to be fed to adjacent buildings, street lighting, service pedestals, or for other general low voltage electrical uses.

4.3 Considerations & Additional Information

Transformers attached to utility poles will increase the time and cost associated with impacts to the pole.

Figure 4-1: Two aerial transformers on utility pole. Service being provided to pole-mounted streetlight.

5.0 Ground Mounted Enclosures

5.1 Field Identification

Box with door(s) with labels, usually warnings, relating to electric utility contained within. Ground mounted transformers typically open on one side, while switchgears typically open from two sides.

Figure 5-1: Ground mounted transformer with door and Delmarva Power identification number.

5.2 Description and Purpose

These enclosures allow for the voltage of electricity to be changed and provide access points located on the ground. They typically will serve commercial or large residential areas where the large voltage electricity enters the site.

5.3 Considerations & Additional Information

These enclosures usually have a concrete foundation that they sit on. Sometimes this foundation is marginally larger than the enclosure itself, but it could also be significantly larger. Impacts to the concrete foundation should be avoided, even if the impact does not reach to the enclosure itself. Maintain a minimum of 3-foot separation on the back or sides od a ground mounted transformer that does not have an access door. Maintain a minimum 10-foot separation on the front of a transformer where there is an access door. This includes any vegetation.

6.0 Utility Pole Number

Figure 6-1: Utility Pole with Delmarva Power pole number

Figure 6-2: Utility pole with Delmarva Power pole number (top) and Verizon pole number (bottom)

6.1 Field Identification

Numbering/Naming pinned or nailed to the pole (typically around eye height).

6.2 Description and Purpose

Unique identification number for a utility pole used by the owner and occupants on the pole to keep inventory of facilities.

6.3 Considerations & Additional Information

Confirmation with utility company is needed to determine the ownership of the utility pole.

6.4 Examples of nomenclature used by different utility entities

Delmarva Power: 5-digit number over 5-digit number (shown in Figure 6-1 and Figure 6-2)

Delaware Electric Co-op: 5- or 6-digit number, which may be vertical

Verizon: Single line number, typically orange and sometimes including Verizon logo (shown in Figure 6-2)

7.0 Electric Service Meter

7.1 Field Identification

Meters are typically round and placed in rectangular boxed enclosures (meter bases). Meters may be fed overhead or underground. They can be found on pedestals (photo to the right), poles, cabinets, large transformers, residences and businesses.

Pedestals typically consist of two conduits connecting to a mounted meter and disconnect switch. This is typically installed near a utility pole or other power source and feeds to a private facility (i.e. DelDOT control cabinet). The meter will typically have an identification number that corresponds to the utility's records.

Figure 7-1: Electric service meter on pedestal for DelDOT facility.

7.2 Description and Purpose

Meters are typically round and placed in rectangular boxed enclosures (meter bases). Meters may be fed overhead or underground. Electric meters are used by power companies to measure the amount of electricity used by customers.

7.3 Considerations & Additional Information

Underground conduits should be expected to exist between the power source, pedestal, and cabinet. These conduits can be seen entering the ground under the meter as shown in the photo to the left. Service meters that supply DelDOT-maintained facilities should include a DelDOT sticker as seen in the photo. If no sticker exists, the meter may be for a private service to a commercial or residential location. If found within the Right-of-Way, document the finding, and report this location to the project manager and the Utilities Section.

The electric service meter is typically the separation of ownership between the public utility and private service. Meters may be mounted directly to the utility pole where the electrical service drops.

7.4 References

DelDOT Standard Detail T-17

8.0 Conduit or Cable Drops

8.1 Field Identification

Conduit or cabling running along the utility pole down into the ground. The facility being dropped underground could be in conduit or simply cable.

8.2 Description and Purpose

Conduit or cabling provides a pathway for the aerial facility to go underground.

8.3 Considerations & Additional Information

Following the conduit/cabling up the pole can identify what facility it is. Many times, you can identify the power source for a service pedestal by locating the adjacent utility pole that has a conduit drop. Cabling dropping without conduit could be direct buried once underground, but confirmation with the utility company is needed.

Figure 8-1: Utility pole with various conduit drops for electric and communication facilities.

9.0 Guy Anchor and Pole Supports

9.1 Field Identification

Lateral supports attached or connected to a utility pole. Can be wires (guy anchors) or wooden poles (push braces).

9.2 Description and Purpose

Provide support to the utility pole to counteract the forces put on the pole by the overhead wires attached to the pole. Most commonly used when the utility pole is not “in-line” with the stretch of adjacent utility poles.

9.3 Considerations & Additional Information

These features are needed to maintain the structural integrity of the utility pole. Often, they can pose concerns to proposed or existing sidewalk due to vertical clearance. If a utility pole is proposed to be relocated out of the existing pole line, some sort of support will likely be needed. Additional R/W may be needed to accommodate this support. Generally, ownership of the guy and anchor is determined based on which utility the guy wire attaches to on the utility pole.

Figure 9-1: Push pole bracing Delmarva Power utility pole.

Figure 9-2: Guy anchor and wire supporting utility pole.

10.0 Manholes and Junction Wells

10.1 Field Identification

Underground facility with access point in the form of a lid (typically metal or fiberglass). Utility company logo/name are typically denoted on the lid.

10.2 Description and Purpose

Provide underground area for splicing, routing and transformers.

10.3 Considerations & Additional Information

Expect underground facilities (conduit, cabling) in the vicinity of the underground structure, typically in at least 2 directions. The underground facility that the manhole provides access to is typically larger than the footprint of the manhole. In some cases, the access point of a manhole or other lid may lead to a subsurface structure that is significantly larger. Size and orientation of the underground structure should be confirmed with the utility company and adequately detailed in the project design.

Figure 10-1: Delmarva Power manhole lid in sidewalk with Miss Utility markings for adjacent underground facilities.

Figure 10-2: DelDOT junction well lid (DDH denotes Delaware Department of Highways).

11.0 Substation

11.1 Field Identification

Property surrounded by a fence with large amounts of electrical facilities located inside.

11.2 Description and Purpose

Location where transmission line voltages (used to transport long distances) are changed to distribution level voltages (the electricity that is usable by residential and commercial customers).

11.3 Considerations & Additional Information

Avoidance is critical. Separations of equipment and offsets to fence for items within the substation fence are critical. Existing driveway length needs to be considered and maintained as these facilities see larger deliveries and are accessed by larger equipment periodically. The fence surrounding the substation typically has a grounding grid approximately 10 feet outside the footprint of the fence. Consider this when determining the proximity of design, as these are very expensive facilities. All efforts should be made to not impact them.

11.4 References

https://www.delmarva.com/SafetyCommunity/Education/Pages/EnergyBasics/Infrastructure101.aspx

Figure 11-1: Substation facility.

Figure 11-2: Substation perimeter fence.