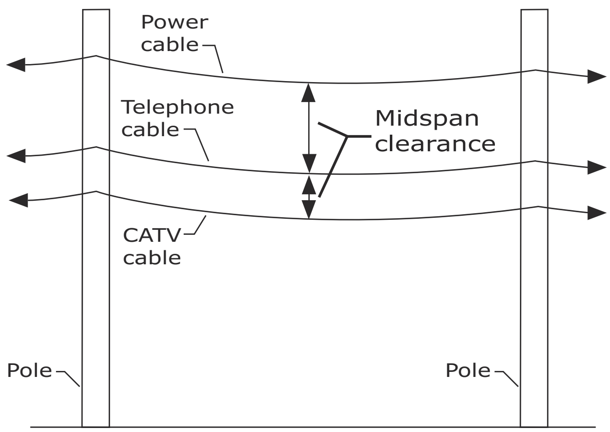
Clearances, continued

Midspan Clearances

Since the aerial support strand is strung between poles with a specified tension, the addition of the cable's weight produces sag. The lowest point of this sag is termed the midspan because of its location between two poles. Midspan clearances should be at least 75 percent of the clearance required at the pole. The OSP designer should consult the applicable codes, standards, and regulations in the geographic area for specific details. Vertical clearances between telecommunications cables and other utilities (e.g., power, CATV, other low-voltage signaling) should be checked at midspan clearances (see Figure 4.45).

Figure 4.45
Midspan clearances



CATV = Cable TV

Clearances, continued

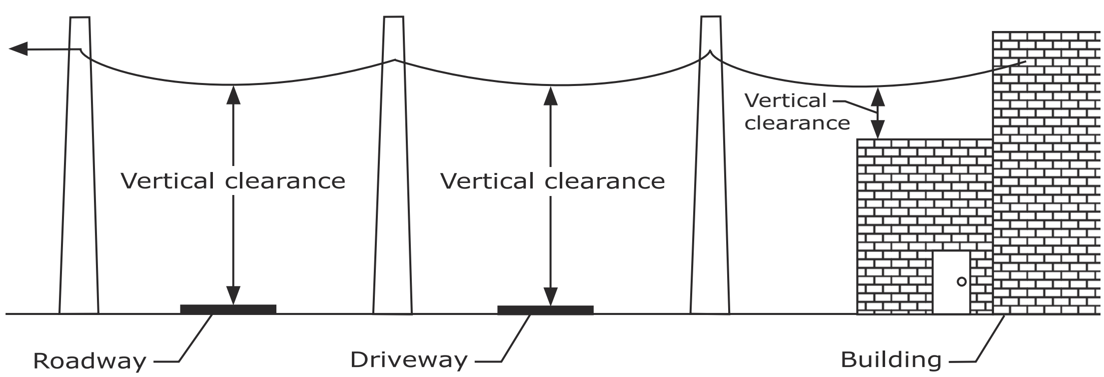
Vertical Clearances

Both attachment clearances and midspan clearances must meet minimum height requirements of the AHJ and the applicable codes, standards, and regulations in the geographic area (e.g., Part 2 of the *NESC* requirements) for vertical clearances over:

- Buildings.
- Permanent structures.
- Sidewalks.
- Driveways, parking lots, and alleys.
- Railroad tracks.
- Roads, streets, and other areas subject to truck traffic (e.g., industrial parks).
- Roofs accessible to vehicular and truck traffic.
- Balconies and roofs accessible to pedestrians only.
- Waterways.
- Sailboat rigging and launching areas.
- Rural roads.

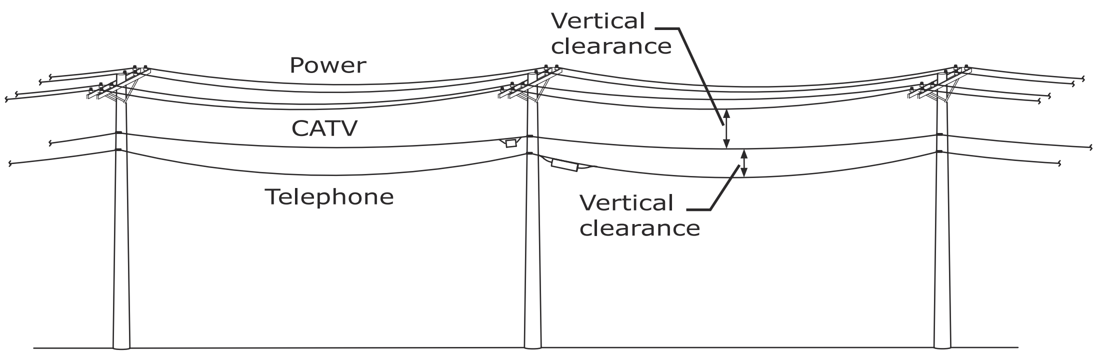
See Figures 4.46 and 4.47 and Tables 4.26 and 4.27 for vertical clearance requirements.

Figure 4.46
Vertical clearances over obstacles



Clearances, continued

Figure 4.47
Vertical clearances between utilities



CATV = Cable TV

Table 4.26
Example of *National Electrical Safety Code* (*NESC*) minimum vertical clearances of cables above ground or rails at midspan crossing

Span Length m (ft)	Public Streets, Roads, or Alleys Not Meeting m (ft)	Alleys m (ft)	Residence Driveways m (ft)	Ways for Pedestrians Only m (ft)	Railroad Tracks m (ft)
107 (351)	5.5 (18)	3.0 (10)	3.0 (10)	2.4 (8)	7.6 (25)
122 (400)	5.6 (18.4)	4.7 (15.4)	3.2 (10.5)	2.6 (8.5)	7.9 (25.9)
137 (449)	5.8 (19)	4.9 (16)	3.4 (11)	2.8 (9.2)	8.1 (26.6)
152 (500)	5.9 (19.4)	5.0 (16.5)	3.5 (11.5)	2.9 (9.5)	8.3 (27.2)
168 (551)	6.1 (20)	5.2 (17)	3.7 (12)	3.0 (10)	8.5 (28)
183 (600)	6.2 (20.4)	5.3 (17.4)	3.8 (12.5)	3.2 (10.5)	8.8 (28.9)

ft = Foot
m = Meter

NOTES: Based on 15 °C (59 °F), no wind, and initial stringing sag.

Some railroads may require additional vertical clearance.

Clearances, continued

Table 4.27
Example of *National Electrical Safety Code* (*NESC*) minimum vertical clearance of cable runs along and within limits of public highways

Span Length m (ft)	Urban Streets m (ft)	Alleys m (ft)	Ways for Pedestrians Only m (ft)	Rural Roads m (ft)
107 (351)	5.5 (18)	3.0 (10)	2.4 (8)	4.3 (14)
122 (400)	5.6 (18.4)	4.7 (15.4)	2.6 (8.5)	4.4 (14.4)
137 (449)	5.8 (19)	4.9 (16)	2.7 (8.6)	4.6 (15)
152 (500)	5.9 (19.4)	5.0 (16.5)	2.9 (9.5)	4.7 (15.4)
168 (551)	6.1 (20)	5.2 (17)	3.0 (10)	4.9 (16)
183 (600)	6.2 (20.4)	5.3 (17.4)	3.2 (10.5)	5.0 (16.5)

ft = Foot
m = Meter

NOTE: Based on 15 °C (59 °F), no wind, and initial stringing sag.

Facility Clearances (Government)

When federal, state, city, or county requirements differ, adhere to the more stringent requirements.

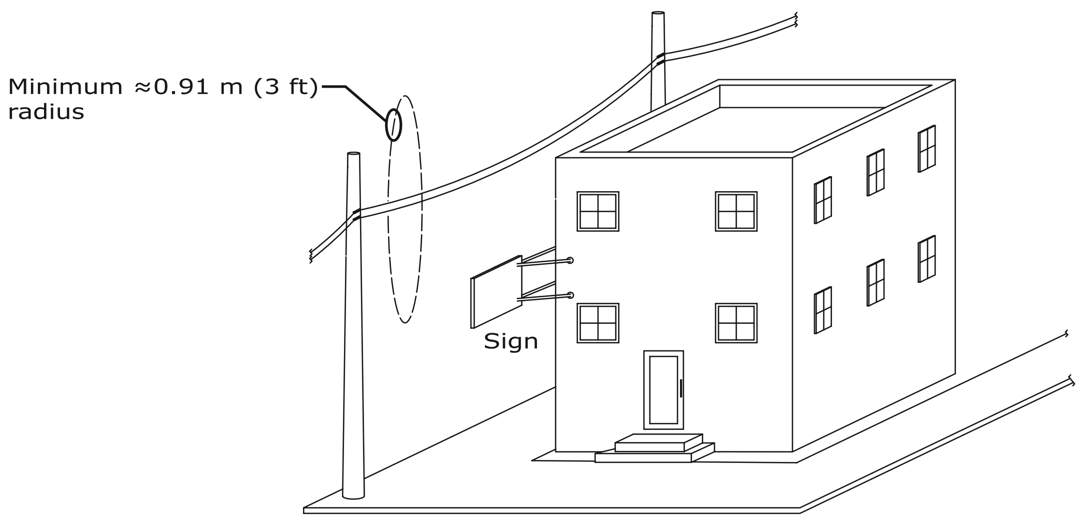
Clearances, continued

Radial Clearances

An ≈1.4 m (4.6 ft) horizontal and an ≈3.2 m (10.5 ft) vertical clearance (see Figure 4.48) should be maintained from:

- Antennas.
- Signs.
- Pole structures.
- Storage tanks.
- Chimneys.

Figure 4.48
Clearance distances



ft = Foot
m = Meter

Separations

Separation typically is defined as the distance in any direction between communication wires, cables, or attachments and power conductors, cables, or attachments.

Table 4.28 provides an example of *NESC* minimum separations between power and communications conductors and equipment.

Table 4.28
Separations

	Applicable Minimum Separations	
	Up to 8700 V	More than 8700 V
Separations Measured Between	**mm (in)**	**mm (in)**
Power and communications crossarms (center to center)	1220 (48)	1829 (72)
Power and communication conductors (at the pole)	1016 (40)	1525 (60)
Power conductors and communication equipment	1016 (40)	1525 (60)
Communication conductors and power equipment	1016 (40)	1525 (60)
Power equipment and communication equipment	1016 (40)	1525 (60)

in = Inch
mm = Millimeter
V = Volt

Pole Depth Below Ground

To provide the resistance moment discussed previously, the pole must have a sufficient segment of its length implanted in the ground. This offsets the force from wind, ice, apparatus cases, transformers, or other loadings.

The pole hole should be of sufficient diameter to permit the pole to settle freely to the bottom of the hole without trimming the butt and still have sufficient space between the pole and the sides of the hole to permit proper tamping of the backfill at every point around the pole and throughout the entire depth of the hole. The setting depth, in meters (with equivalent in feet), for poles of various lengths is shown in Table 4.29.

Pole Depth Below Ground, continued

Table 4.29
Pole setting depth required for various heights

Length of Pole ≈m (ft)	Depth of Setting in Average Firm Soil ≈m (ft)	Depth of Setting in Solid Rock ≈m (ft*)
4.9 (16)	1.1 (3.5)	0.9 (3.0)
5.5 (18)	1.1 (3.5)	0.9 (3.0)
6.1 (20)	1.2 (4.0)	0.9 (3.0)
6.7 (22)	1.2 (4.0)	0.9 (3.0)
7.6 (25)	1.52 (5.0)	0.9 (3.0)
9.1 (30)	1.7 (5.5)	1.1 (3.5)
10.7 (35)	1.8 (6.0)	1.2 (4.0)
12.2 (40)	1.8 (6.0)	1.2 (4.0)
13.7 (45)	2 (6.5)	1.4 (4.5)
15.2 (50)	2.1 (7.0)	1.4 (4.5)

*These depths are recommended where solid rock is encountered at ground level and the diameter of the hole is such as to permit pieces of rock to be tamped firmly between the pole surface and hole walls to prevent the pole from leaning.

ft = Foot
m = Meter

Soil and Rock

Table 4.30 lists the standard pole hole depths for setting poles in soil where solid or layered rock is found below the surface level.

Soil conditions may dictate fluctuations in pole setting depth as listed in the table.

Pole Depth Below Ground, continued

Table 4.30
Pole settings for solid rock below surface level

Depth Below Surface at Which Solid Rock is Found in ≈m (ft)	**Pole Length in ≈m (ft)**						
	6.1 (20)	**7.6 (25)**	**9.1 (30)**	**10.7 (35)**	**12.2 (40)**	**13.7 (45)**	**15.2 (50)**
	Minimum Hole Depth in ≈m (ft)						
0.0 (0.0)	0.91 (3)	0.91 (3)	1.1 (3.6)	1.2 (4)	1.2 (4)	1.4 (4.6)	1.4 (4.6)
0.2 (0.6)	1.1 (3.6)	1.1 (3.6)	1.2 (4)	1.4 (4.6)	1.4 (4.6)	1.7 (5.6)	1.7 (5.6)
0.3 (1)	1.2 (4)	1.2 (4)	1.4 (4.6)	1.5 (4.9)	1.5 (4.9)	1.7 (5.6)	1.7 (5.6)
0.5 (1.6)	1.2 (4)	1.4 (4.6)	1.2 (4)	1.7 (5.6)	1.7 (5.6)	1.8 (6)	1.8 (6)
0.6 (2)	1.5 (4.9)	1.5 (4.9)	1.7 (5.6)	1.8 (6)	1.8 (6)	2 (6.6)	2 (6.6)
0.8 (2.6)	1.2 (4)	1.5 (4.9)	1.7 (5.6)	1.8 (6)	1.8 (6)	2 (6.6)	2.1 (7)
0.91 (3)	1.2 (4)	1.5 (4.9)	1.7 (5.6)	1.8 (6)	1.8 (6)	2 (6.6)	2.1 (7)
1.1 (3.6)	1.2 (4)	1.5 (4.9)	1.7 (5.6)	1.8 (6)	1.8 (6)	2 (6.6)	2.1 (7)
1.2 (4)	1.2 (4)	1.5 (4.9)	1.7 (5.6)	1.8 (6)	1.8 (6)	2 (6.6)	2.1 (7)
1.4 (4.6)	1.2 (4)	1.5 (4.9)	1.7 (5.6)	1.8 (6)	1.8 (6)	2 (6.6)	2.1 (7)
1.5 (4.9)	–	1.5 (4.9)	1.7 (5.6)	1.8 (6)	1.8 (6)	2 (6.6)	2.1 (7)
1.7 (5.6)	–	–	1.7 (5.6)	1.8 (6)	1.8 (6)	2 (6.6)	2.1 (7)
1.8 (6)	–	–	–	1.8 (6)	1.8 (6)	2 (6.6)	2.1 (7)
2 (6.6)	–	–	–	–	–	2 (6.6)	2.1 (7)
2.1 (7)	–	–	–	–	–	–	2.1 (7)

ft = Foot
m = Meter

Depth of Pole Setting

Depth of Pole Holes

The OSP designer may have to consider setting depth when determining the length, class, and type of the poles required. The setting in soil depth as shown in Table 4.30 applies when:

- Poles are to be set in soil only.
- There is a layer of soil more than ≈0.6 m (2 ft) in depth over solid rock.
- The pole in solid rock is vertical.
- The diameter of the hole at the surface of the rock exceeds approximately twice the diameter of the pole at the same level.

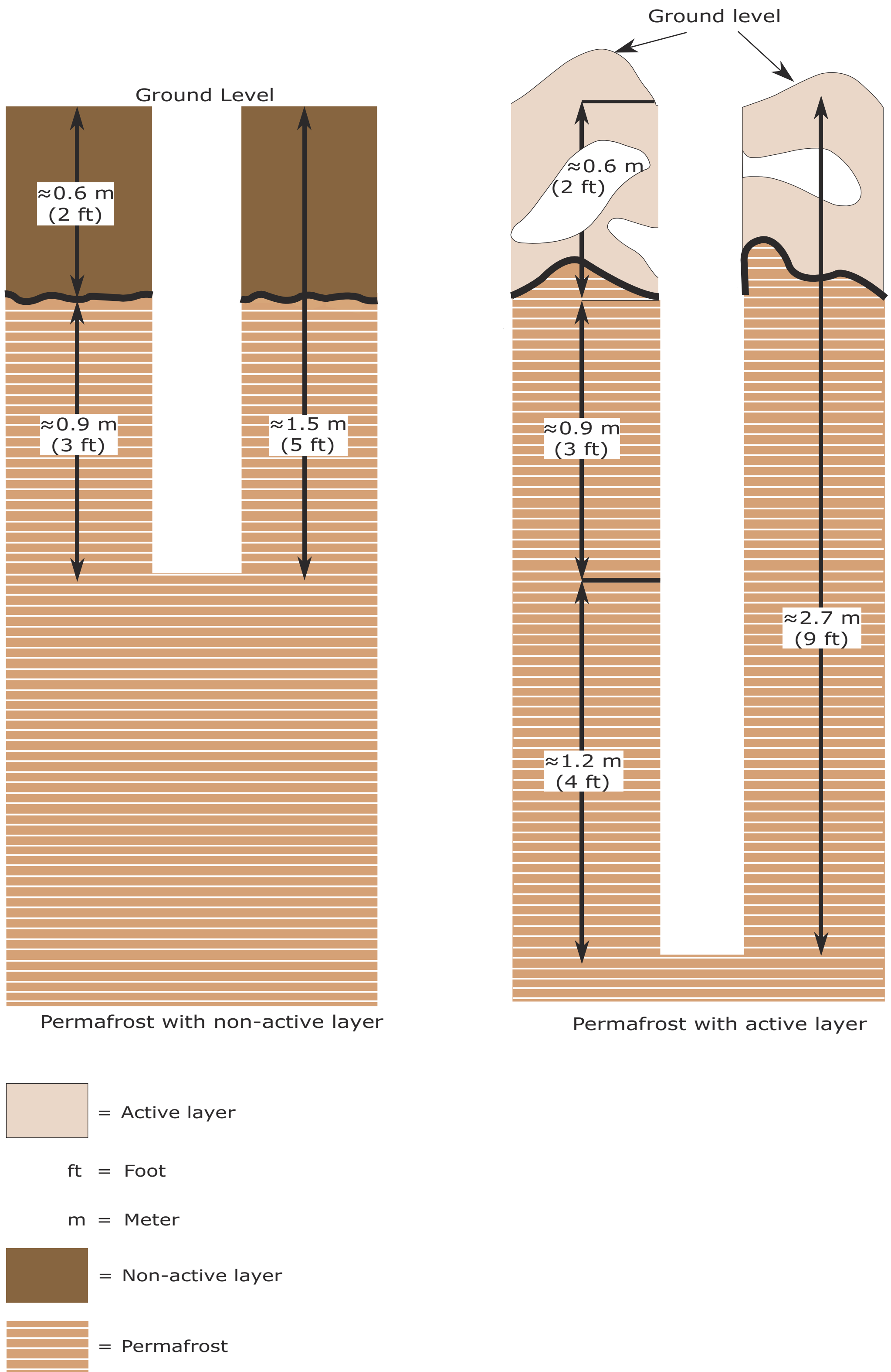
The setting in solid rock depth applies where solid rock is encountered at the ground line and where the hole is vertical, approximately uniform in diameter, and large enough to permit the use of tamping bars the full depth of the hole.

Frozen Soil

Permanently frozen soil or permafrost is common in the northernmost parts of North America, Europe, and Asia. When poles are placed in soils over permafrost, the depth of the pole hole must be increased; otherwise, the pole may be forced out of the ground or overturned during refreezing of the soil at the surface level (see Figures 4.49 and 4.50). The depth of seasonal thaws varies at different locations and depends primarily on the nature of the overlying soil and the amount of ground water during the refreezing process. When the soil overlying the permafrost is composed of coarse sand and gravel and is well drained, the soil is classified as non-active and the depth of the pole hole does not need to be increased over the standard setting for poles in average firm soil.

Depth of Pole Setting, continued

Figure 4.49
Typical settings of poles in permafrost



Depth of Pole Setting, continued

Figure 4.50
Effect on pole when active layer above permafrost is refrozen