Pole Holds

1. Scope

This standard covers the requirements and process for pole holds (also known as a “pole support” or “bracing”) when excavation is performed within the pole hold zone, as defined in this standard, of Seattle City Light (SCL) wood distribution poles and anchors.

All pole hold designs shall be submitted to SCL for review. See Section 4 for step-by-step instructions for pole hold design plan submittals.

This standard applies only to pole holds for round wood or fiberglass poles, in good soil. Poles with signs of instability (on slopes, erosion, leaning, rotting, sloughing, etc.) are outside the scope of this standard.

Pole holds for steel or glulam poles are outside the scope of this standard. These are engineered structures with unique and site-specific foundation requirements. In these situations, Excavation Contractors are required to consult with SCL Structural Engineering.

2. Application

This standard provides guidance to Excavation Contractors who wish to excavate within the “pole hold design submission required zone” (“pole hold zone”) of an SCL wood distribution pole. In such cases a pole hold must be performed as part of the excavation work, and a pole hold design plan submitted to SCL, for informational purposes only, prior to the start of work. See Section 3.3 and Figure 3.3 for information on the pole hold zone.

SCL does not provide pole hold design services but will provide pole and line data information required for the entity performing the excavation to perform a pole loading analysis and subsequently produce a plan for the design and construction of a pole hold plan specific to a project. See Section 4.

3. Discussion

3.1 Professional Engineer (PE) Work

The Excavation Contractor shall be responsible for hiring a Washington State registered Professional Engineer (PE), experienced in electrical line design and construction who can develop a pole hold plan for submission to SCL. At contractor's option, the work can be separated into two parts, each performed by separate PEs: one for line design and one for the pole bracing design based on the loads determined by the line design PE.

3.2 Excavation Contractor Liability

The Excavation Contractor shall be the responsible party for the safety of the workers, the public, and SCL's electrical facilities impacted while excavating and shall be responsible for designing, constructing, and maintaining the pole hold for the duration of the job, including restoration.

SCL review of the Excavation Contractor's submittal is for information purpose only and does not relieve the Contractor of liability.

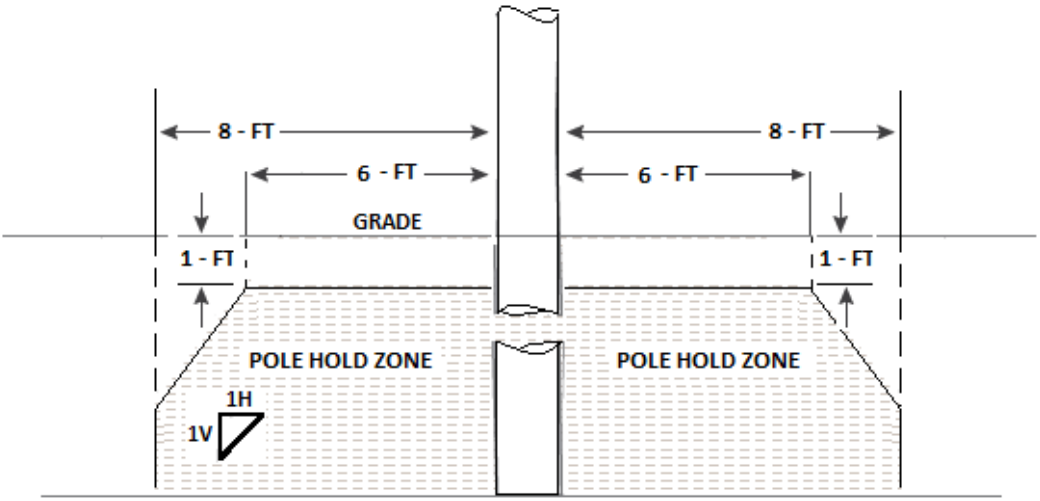
3.3 Pole Hold Design Submission Required Zone ("Pole Hold Zone")

The "pole hold zone" is the zone defined by SCL within which any excavation encroachment will require the Excavation Contractor to submit a pole hold request as described in this work practice. The zone begins at 1 ft below grade around the base of the pole and extends outward in a radius of six feet, then continuing from that point outward underground at a slope ratio of 1:1 and ending 8 ft from the base of the pole. See Figure 3.3.

Excavations shallower than 1 ft are allowed within the zone without pole bracing, provided that the excavation site will not be open for longer than seven (7) days.

Excavation for conduit riser installations shall meet the requirements of both SCL 0224.34 and SCL 0221.01.

Figure 3.3. Pole Hold Zone



3.4 Pole Hold Design Plan

This is the final plan, approved and stamped by a Professional Engineer (PE), that the Excavation Contractor will submit to SCL. The plan will be based on the results of the pole loading analysis conducted by the PE. A PE-stamped copy of the pole hold design, including any drawings and calculations, shall be submitted to SCL, and acknowledgement of receipt by SCL received, prior to starting any excavation work within the pole hold zone area.

Considerations regarding pole hold calculations shall include, but not be limited to, the following:

- Soil conditions
- SCL conductor loads (from information provided by SCL)
- If applicable, loads from communications lines (from information provided by communications companies)
- Wind loads on pole, lines, and equipment
- Additional wind area for conduit risers, if needed
- Unbalanced line tensions, line angles, dead ends, guying, etc. if applicable

3.5 Pole Hold Requirements

The pole hold design shall not result in damage to the structural integrity of the existing wood pole and its foundation after the work is completed.

All pole holds shall be inspected daily, at a minimum, by the Excavation Contractor to ensure structural integrity per the design.

Pole holds shall not impact SCL operations and delivery of power to its customers.

In addition, the Excavation Contractor shall be responsible for following the rules and regulation of the Authority Having Jurisdiction (AHJ) where the work is being performed.

All pole hold designs shall meet or exceed all applicable structural and clearance requirements of the latest revision of the National Electrical Safety Code (NESC).

3.6 Pole Hold Types

There are two type of pole holds: a truck pole hold and a static pole hold. The use of one or the other will be proposed by the Excavation Contractor’s PE based on the loading analysis and the site specifics as well as the duration of the planned work. The Excavation Contractor may also propose a combination of both methods. A discussion of each type of hold follows.

3.6.1. Truck Pole Hold

A truck pole hold is a pole hold achieved by means of a truck specifically configured for pole holding, such as a digger derrick. For this type of pole hold:

- Truck shall be specifically configured for pole holding. This cannot be done with other types of equipment.
- Truck shall be operated at all times by a qualified electrical worker during the pole hold. Operator shall not leave the truck while the pole is being held.
- Truck connection to the pole shall be a clamped or strapped connection type so the pole is not damaged or weakened by drilling into the pole.

3.6.2. Static Pole Hold

A static pole hold is a pole hold achieved by means of temporary guying, bracing, or other engineered solution.

Attachments of the bracing to the pole shall be done in such a manner as to avoid any damage to the pole by drilling.

Attachments shall be made by clamping or strapping. Guying may utilize existing guy anchor points if such exist.

3.7 Pole Loading Analysis

A pole loading analysis is required for all excavation that encroaches into the pole hold zone.

Excavation Contractors are responsible for conducting soil analysis as part of the pole loading analysis.

To obtain the necessary information to conduct the analysis, the Excavation Contractor must submit a request for pole and line data information to SCL. Request shall include information on any existing communications attachments on the pole. See Section 4 for step-by-step instructions for pole hold design plan submissions.

See the Appendix for SCL overhead primary and secondary conductor types and design tensions.

4. Submission Process

Step 1: Request Pole and Line Data

Submit via email to the SCL representative with which you are working the following information:

- Address of project
- Pole number (yellow vertical numbers on pole)
- Location of pole (plan or map)
- Photo(s) of pole, showing conductors as well as base (can be Google Street View or equivalent, if represents the current condition of the pole).
- For poles containing communications attachments, pole attachment identification (ID) tags (its 3-digit identifier, black number on yellow backing wrapped onto the cables). See also SCL Construction Standard 0093.12, Pole Attachment Identification and Tagging.

Include the phrase “Pole Hold: Request for Pole and Line Data Information, Pole #NNN” in the subject header.

In response SCL will provide, at a minimum:

- Pole height (total length of pole)
- Class of pole
- Approximate embedded depth
- Approximate height of top of pole above grade (height minus embed)
- Approximate pole diameter at grade
- Quantity and type of SCL conductors (primary, secondary, neutral, service drops)
- Weight, diameter, and maximum working tensions of SCL conductors
- Size of SCL guy wires if present
- Other SCL equipment on pole (transformers, streetlights)
- Names and contact names and contact information corresponding to each communications attachment on the pole.

Step 2: Obtain Information from Communications Company

Because communications attachments are installed, owned, and operated by third-party companies, SCL cannot directly provide information regarding the cable's physical characteristics or its working tensions.

With the contact information provided by SCL Joint Use, contact the appropriate communications company(ies) associated with communications attachments on the pole to request the weight, diameter, and maximum working tensions of all associated attachment cables.

Step 3: Conduct the Pole Loading Analysis

Using the information obtained from SCL as well as the communications company(ies), coordinate with a Professional Engineer (PE) to conduct a pole loading analysis to determine the design for the pole hold.

Step 4: Create a Pole Hold Plan

Include in the plan the following information:

- Design drawings that indicate the depth of excavation adjacent to the pole, horizontal distance from excavation to pole, and details of static bracing design or truck used for pole holding
- Load calculations
- Calculations for static bracing design or truck capacity
- Approximate date that pole hold will start
- Approximate duration of pole hold
- Pole hold method: truck or static
- Any plans for temporary relocation or removal or installation of guys or other changes to the pole configuration

Note: In addition to soil conditions, the design shall consider high groundwater table if it is expected or encountered above the bottom of the planned excavation.

Step 5: Submit the Pole Hold Plan to SCL

Submit to the SCL representative with which you are working a PE-stamped copy of the pole hold plan, including drawings and calculations.

Include the phrase "Pole Hold: Design Plan, Pole #NNN" in the header.

SCL will contact the Excavation Contractor to acknowledge receipt of submission.

Step 6: Obtain Permit

Upon acknowledgement from SCL of receipt of pole hold plan, the Excavation Contractor may proceed with work after obtaining a permit, as required by the Seattle Department of Transportation (DOT), or the appropriate AHJ.

5. References

City of Seattle Standard Specifications for Road, Bridge, and Municipal Construction

National Electrical Safety Code (NESC) C2-2017 Edition; Institute of Electrical and Electronics Engineers (IEEE), 2017

SCL Construction Standard 0221.01; “Customer Requirements for Trenching in the Right-of-Way”

SCL Construction Standard 0224.34; “Steel Conduit Risers”

Washington Administrative Code (WAC) 296-155; Part N, Excavation, Trenching, and Shoring

6. Sources

ANSI 05.1; "Wood Poles – Specifications and Dimensions," 2008

Kohashi, Owen; SCL Structural Engineer and subject matter expert for 0101.75

Neuansourinh, Ponet; SCL Standards Engineer and Originator of 0101.75

SCL Design Standard 9130.01; "26.4 kV Overhead Design: Primary Conductor Ruling Span, Sag, Tension and Stringing Tables"

SCL Design Standard 9131.01; "26.4 kV Overhead Design: Secondary Conductor Sag, Tension and Stringing Tables"

SCL Design Standard 9620.01, "Properties of Wood Poles"

Appendix. SCL Overhead Conductor and Wood Pole Physical and Design Data

Table A1. SCL Overhead Primary Conductor

Conductor Description	Weight (lb/ft)	Diameter (in)	SCL Max Tension (lb)	Ultimate Tensile Strength (lb)
#4 AWG Solid HD Cu	0.126	0.204	600	1970
#4 AWG Solid MHD Cu, Covered	0.136	0.264	600	1584
4/0 AAC Covered “Olive” (Neutral)	0.251	0.626	1250	3450
397.5 kcmil ACSR, “Chickadee”	0.432	0.743	1800	9940
954 kcmil ACSR “Rail”	1.075	1.165	3000	25900

Table A2. SCL Overhead Secondary Conductor

Conductor Name	Conductor Size (aluminum)	Neutral/ Messenger	Weight (lb/ft)	Overall Assembly Diameter (in)	SCL Max Tension (lb)	Ultimate Tensile Strength (lb)
Cockle	#2 AWG Triplex	#2 ACSR	0.233	0.750	902	1860
Janthina	1/0 Triplex	#2 ACSR	0.376	0.950	1249	2850
Cerapus	4/0 Triplex	2/0 ACSR	0.699	1.260	1996	5310
Costena	1/0 Quadruplex	1/0 ACSR	0.566	1.120	1685	4380
Appaloosa	4/0 Quadruplex	4/0 ACSR	1.063	1.490	2925	8350
n/a	350 kcmil Quadruplex	4/0 ACSR	1.590	1.848	2990	8350

Table A3. Fiber Stress (Modulus of Rupture and Modulus of Elasticity)

Treatment group	Fiber Stress (Ultimate Bending Stress or Modulus of Rupture) (psi)	Modulus of Elasticity x 1000 (psi)
Group A (air seasoning)		
Redcedar, western	6000	1120
Group B (boulton drying)		
Douglas fir, coast	8000	1920

Table A4. Physical Dimensions of Western Redcedar

		Class								
		H4	**H3**	**H2**	**H1**	**1**	**2**	**3**	**4**	**5**
Minimum circumference at top (in)		35	33	31	29	27	25	23	21	19
Length of pole (ft)	**Groundline distance from butt (ft)**	**Minimum circumference at 6 ft from butt (in)**								
30	5.5	–	–	–	–	40.0	37.5	35.0	32.5	30.0
35	6.0	–	–	48.0	45.5	42.5	40.0	37.5	34.5	32.0
40	6.0	56.5	53.5	51.0	48.0	45.0	42.5	39.5	36.5	34.0
45	6.5	59.0	56.0	53.5	50.5	47.5	44.5	41.5	38.5	36.0
50	7.0	61.5	58.5	55.5	52.5	49.5	46.5	43.5	40.0	37.5
55	7.5	64.0	61.0	57.5	54.5	51.5	48.5	45.0	42.0	–
60	8.0	66.0	63.0	59.5	56.6	53.5	50.0	46.5	43.5	–
65	8.5	68.0	65.0	61.5	58.5	55.0	51.5	48.0	45.0	–
70	9.0	70.0	67.0	63.5	60.0	56.5	53.0	49.5	46.0	–
75	9.5	82.0	68.5	65.0	61.5	58.0	54.5	51.0	–	–
80	10.0	74.0	70.5	67.0	63.0	59.5	56.0	52.0	–	–
85	10.5	75.5	72.0	68.5	64.5	61.0	57.0	53.5	–	–
90	11.0	77.0	73.5	70.0	66.0	62.5	58.5	54.5	–	–

Table A5. Physical Dimensions of Coastal Douglas Fir Poles

		Class								
		H4	**H3**	**H2**	**H1**	**1**	**2**	**3**	**4**	**5**
Minimum circumference at top (in)		35	33	31	29	27	25	23	21	19
Length of pole (ft)	**Groundline distance from butt (ft)**	**Minimum circumference at 6 ft from butt (in)**								
30	5.5	–	–	–	–	36.5	34.0	32.0	29.5	27.5
35	6.0	–	–	43.5	41.5	39.0	36.5	34.0	31.5	29.0
40	6.0	51.0	48.5	46.0	43.5	41.0	38.5	36.0	33.5	31.0
45	6.5	53.5	51.0	48.5	45.5	43.0	40.5	37.5	35.0	32.5
50	7.0	55.5	53.0	50.5	47.5	45.0	42.0	39.0	36.5	34.0
55	7.5	58.0	55.0	52.0	49.5	46.5	43.5	40.5	38.0	–
60	8.0	59.5	57.0	54.0	51.0	48.0	45.0	42.0	39.0	–
65	8.5	61.5	58.5	55.5	52.5	49.5	46.5	43.5	40.5	–
70	9.0	63.5	60.5	57.0	54.0	51.0	48.0	45.0	41.5	–
75	9.5	65.0	62.0	59.0	55.5	52.5	49.0	46.0	–	–
80	10.0	66.5	63.5	60.0	57.0	54.0	50.5	47.0	–	–
85	10.5	68.0	65.0	61.5	58.5	55.0	51.5	48.0	–	–
90	11.0	69.5	66.5	63.0	59.5	56.0	53.0	49.0	–	–