

Excavating Near SCL Poles



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1. Scope

This work practice covers the process for requesting pole and line information from Seattle City Light (SCL). Such requests are typically made by contractors when planning to excavate in areas adjacent to SCL utility poles in order to perform a pole analysis as required by the Washington Administrative Code (WAC).

This work practice also provides the requirements and process if a pole hold (also known as a “pole support” or “bracing”) is determined to be needed by a pole analysis.

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This work practice applies only to excavations adjacent to round wood or fiberglass distribution poles.

Excavations adjacent to steel, or glulam poles are outside the scope of this work practice. These are engineered structures with unique and site-specific foundation requirements. In these situations, Contractors are required to consult with SCL Structural Engineering.

Work performed by City departments, or under Public Works contracts by City departments, are outside the scope of this work practice.

Backfill requirements are outside the scope of this standard.

2. Application

This work practice is for contractors who plan to excavate in an area adjacent to an SCL wood or fiberglass utility pole.

Excavations adjacent to poles can undermine the stability of the poles, causing them to fall. To ensure the safety of the contractor, others around the excavation, and to avoid damage to poles, the requirements of the WAC shall be followed. If the excavation will be within the pole analysis zone (see Section 3.3 and Figure 3.3), an analysis shall be performed to determine if a pole hold is required as part of the excavation work. In that case, a pole hold plan shall be submitted to SCL, for informational purposes only, prior to the start of work.

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 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 Contractor Responsibility and Liability

The contractor has the responsibility to read and understand WAC Chapter 296-155, Part N – Excavation, Trenching and Shoring. WAC section 296-155-655 (9), Stability of Adjacent Structures applies to SCL poles adjacent to excavations.

The 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.

Any costs to repair damage or economic loss by SCL or other parties due to a pole failure or loss of stability resulting from an adjacent excavation or insufficient pole hold is the contractor's liability.

The contractor's submitted plan is for SCL's compliance records and information only. It does not relieve the contractor of liability.

SCL representatives and inspectors shall have the right to stop contractor work if the contractor is found to be performing an excavation adjacent to an SCL pole with no submitted plan or if the contractor fails to adhere to the submitted plan.

3.2 Professional Engineer (PE) Work

The contractor shall be responsible for hiring a Washington State registered Professional Engineer (PE) who is qualified to determine whether a pole hold is needed and can develop a pole hold plan.

3.3 Pole Analysis Zone

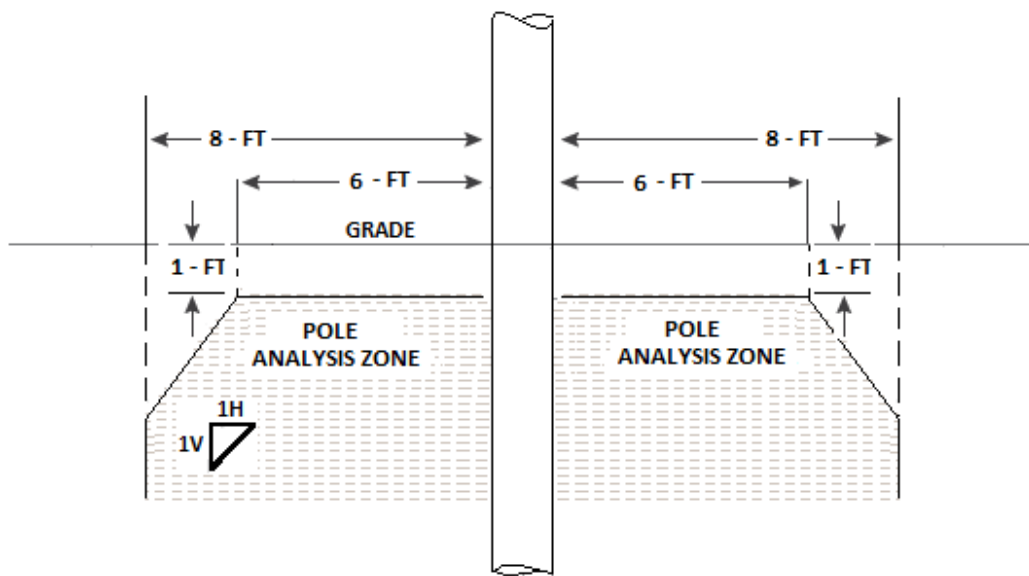
If an excavation is planned within the pole analysis zone, the contractor shall perform a pole stability analysis. To obtain the relevant pole and line information to perform the analysis, the contractor shall submit a pole and line data information request as described in this work practice. The zone begins at 1 ft below grade around the base of the pole and extends outward in a radius of 6 ft, 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 above the pole analysis zone without analysis or pole bracing, provided that the excavation site will not be open for longer than seven (7) days.

Excavations within the pole analysis zone without pole bracing are allowed if analysis calculations demonstrate that a pole hold is not required.

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

Figure 3.3. Pole Analysis Zone



3.4 Pole Hold Plan

This is the final plan, prepared specifically for the pole, line, and excavation conditions at the location and stamped by a PE, that the contractor will submit to SCL. The plan will be based on the results of the pole analysis conducted by the PE. A PE-stamped copy of the pole hold plan, including any drawings and calculations, shall be submitted to SCL. If a pole hold is not required based on analysis, a PE-stamped memo and calculations shall be submitted to SCL. Acknowledgement of receipt by SCL shall be received prior to starting any excavation work within the pole analysis zone.

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

- Soil conditions, including slopes, poor soils, high-ground water table, etc.
- 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

Also, in cases where removal of a guy (or guys) supporting the pole is part of the pole hold plan, pole capacity and overall stability due to unbalanced line loads shall be considered. In many cases, bracing will not sufficiently support the pole unless it is held near the elevation of the removed guy, and temporary guying should be considered instead of bracing.

3.5 Pole Hold Requirements

The pole hold shall not result in damage to the structural integrity of the existing wood pole and its foundation after the work is completed. Drilling into the pole for connection is not allowed, as doing so may damage or weaken the pole. See Section 3.6.

All pole holds shall be inspected daily, at a minimum, by the contractor to ensure structural integrity per the plan.

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

In addition, the 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 plans 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 contractor's PE based on the pole analysis and the site specifics as well as the duration of the planned work. The 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.

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

3.7 Pole Analysis

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

Contractors are responsible for conducting or obtaining existing soil analysis as part of the pole analysis when in poor or unstable soil.

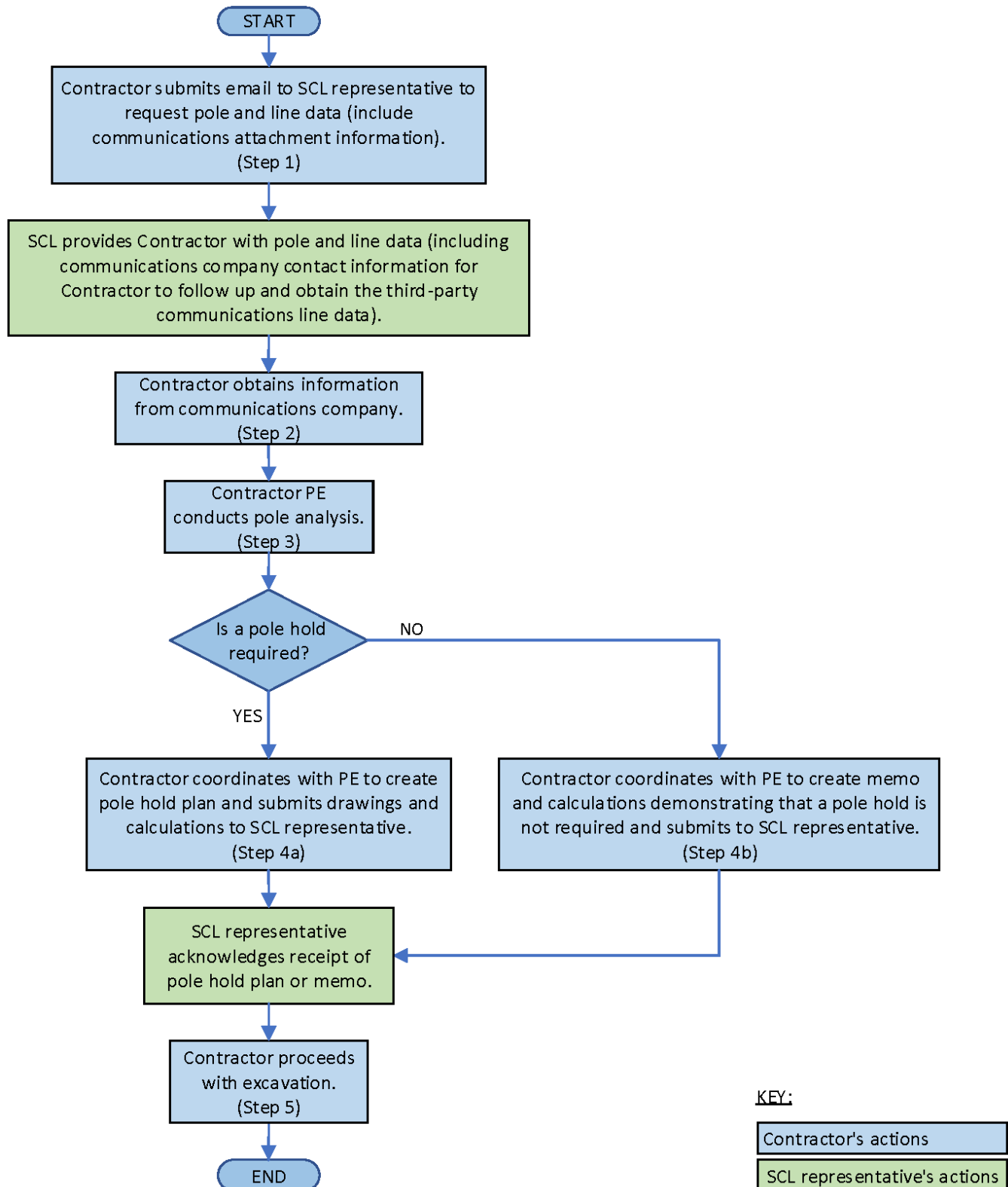
To obtain the necessary information to conduct the pole analysis, the contractor shall submit a request for pole and line data information to SCL. Request shall include information on any existing communications attachments on the pole. See Section 4 for step-by-step instructions for pole hold plan submissions.

If removal or relocation of a guy (or guys) is desired as part of the pole hold plan, the contractor shall notify an SCL representative, as additional coordination with, and review by, SCL Pole Engineering and Structural engineering will be required.

See Appendix for SCL overhead primary and secondary conductor types, line tensions, and pole physical data.

4. Process

Figure 4. Process Flow Diagram



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 the current condition of the conductors as well as the base (can be Google Street View or equivalent, if image 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." Note: if pole has multiple attachments, each ID number noted needs to be separated by a comma.

Contact information for SCL representatives can be found on the SCL website under Construction Services.

Include the address and pole number in the subject header.

The SCL representative will subsequently provide to the contractor the following:

- Pole height (total length of pole)
- Class of pole
- Pole species (if known). Will be either western redcedar (WRC) or Douglas fir (DF).
- Approximate embedded depth (typically 10% of pole height + 2 feet if not stated otherwise, e.g., 7 feet for a 50-ft pole)
- Approximate height of top of pole above grade (height minus embed)
- Approximate pole diameter at grade (See Appendix tables 4 and 5 for pole circumferences; diameter = circumference / pi)
- Quantity and type of SCL conductors (primary, secondary, neutral, service drops)
- Weight, diameter, and maximum working tensions of SCL conductors (See Appendix tables 1 and 2)
- 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

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. Conservative assumptions in the calculation may be made by the contractor's PE performing the pole analysis in cases where this information is not readily available.

Step 3: Conduct the Pole Analysis

Coordinate with a PE to conduct a pole analysis to determine whether a pole hold is required, and, if so, determine the plan for the pole hold.

If a pole hold is required, proceed to Step 4a. If a pole hold is not required, proceed to Step 4b.

Step 4a (Pole Hold Required): Create and Submit a Pole Hold Plan to SCL Representative

Coordinate with PE to create a pole hold plan. Submit to the SCL representative a PE-stamped copy of the pole hold plan to include 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 the pole hold will start
- Approximate duration of the 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. If this is part of the pole hold plan, the pole capacity and overall stability due to the unbalanced line loads shall be analyzed and shown in calculations. Additional coordination with, and review by, SCL Pole Engineering and Structural Engineering will be required.

Include the address and pole number in the subject header.

The SCL representative will subsequently confirm that the plan has been stamped by a PE registered in the State of Washington, and that it was created specifically for the pole to be held. The SCL representative will then contact the contractor to acknowledge receipt of submission and retain a copy for our records.

Step 4b (Pole Hold Not Required): Submit Memo and Calculations to SCL Representative

Submit to the SCL representative a memo and calculations demonstrating that a pole hold is not required.

Include the address and pole number in the subject header.

The SCL representative will subsequently confirm that the memo and calculations have been stamped by a PE registered in the State of Washington, and that the analysis was performed specifically for the pole to be held. The SCL representative will then contact the contractor to acknowledge receipt of submission and retain a copy for our records.

Step 5: Proceed with Excavation

Upon acknowledgement from the SCL representative of receipt of submission, the contractor may proceed with work following the submitted plan, after obtaining any permits that may be required by the Seattle Department of Transportation (DOT), or the appropriate AHJ.

5. References

SCL Construction Standard 0093.12; "Pole Attachment Identification and Tagging"

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

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

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

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

Neuansourinh, Ponet; SCL Standards Engineer and Originator of 0101.75

SCL Construction Standard 0093.07; “Field Guide to Third-Party Attachments on Poles”

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

Table 1. 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 2. 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 3. 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 4. 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 5. 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	–	–