1  SCOPE

1.1  This specification covers the construction of concrete foundations for use in Springfield Utility Board’s (SUB’s) substations.

2  GENERAL REQUIREMENTS

2.1  CONTRACTOR’S LIABILITY: The Contractor shall be solely and directly responsible for any damage, injury, expense, loss, inconvenience, delay, suits, actions, or claims of any character brought because of injuries or damage which may result from the carrying out of the work to be done under the Contract.

2.2  CONTRACTOR’S RESPONSIBILITY: The contractor is responsible for the removal of excavated materials and installation of aggregate. The Contractor shall assume all responsibility for working around the ground mat, and existing facilities. The Contractor shall provide all materials required to complete the job.

3  CONCRETE FOUNDATIONS

3.1  Construction of Fill

3.1.1  The fill shall be made with on-site aggregate, placed in successive layers of not more than six (6) inches in depth for the fill width of the cross section.

3.1.2  The contractor shall compact each layer of fill by use of standard tamping roller or other approved method, with water added as required, to 95 percent of maximum dry density within two percent of optimum moisture content as determined by AASHTO T 99, Method A.

3.2  Foundation Location

3.2.1  The foundations shall be laid out as shown on the foundation plan.

3.2.2  The contractor shall be responsible for the surveying and staking of the locations.
3.2.3 The layout must be approved by the engineer prior to any excavation.

3.3 Cleanup

3.3.1 Subgrade shall be smoothed prior to replacing the aggregate after approval of the engineer.

3.3.2 Site aggregate shall be replaced evenly over the switchyard surface.

3.4 Excavation

3.4.1 Non-aggregate spoils shall be removed from the substation envelope.

3.4.2 Site aggregate shall be removed from the foundation envelope.

3.5 Foundations

3.5.1 Concrete shall be ready-mixed conforming ASTM C 94, Option C, and these specifications. Portland cement shall be Type I, II, or III. Minimum allowable 28-day compressive field strength shall be 3,000 PSI when cured and tested in conformance with ASTM C 39.

3.5.2 Field strength shall be assumed as equal to 85 percent of the strength of laboratory-cured cylinders. Maximum size of course aggregate shall be 1-1/2 inches.

3.5.3 Slump range shall be two to four inches and the air entrapment between three and six percent by volume.

3.5.4 The contractor shall have test cylinders taken from each pour and tested by an approved testing laboratory to verify the strength of the concrete. The contractor shall submit complete data on the concrete mix for approval in conformance with the requirements of the ASTM C 94, Option C.

SUB shall select the testing laboratory. The testing laboratory shall invoice SUB directly and SUB shall pay for the required tests.
3.5.5 The results of the aforementioned tests shall be sent to:

ATTN: Nicholas Amann
Springfield Utility Board
1001 Main Street
Springfield, OR 97477

3.6 Reinforcing Steel

3.6.1 Deformed bars of sizes shown should conform to ASTM A 615, Grade 40.

3.6.2 The contractor shall provide concrete blocks to support reinforcing on earth and galvanized metal chairs or wire ties for formed members.

3.7 Forms

3.7.1 The contractor shall use new plywood for exposed areas. New shiplap or plywood shall be used for unexposed areas of rectangular footings. Seamless cardboard columns shall be used for unexposed areas of circular footings.

3.7.2 Materials shall produce tight forms and an acceptable finish.

3.7.3 Snap ties shall be of an approved type and shall break off not less than 5/8-inch from the surface.

3.8 Form Workmanship

3.8.1 A 3/4” chamfer (45-degree angle) strip shall be used with forms at all exposed edges.

3.8.2 Forms shall be constructed accurately to dimension and elevations required.

3.8.3 The contractor shall construct forms with tight joints to prevent the escape of mortar and to avoid the formation of fins.

3.8.4 Braces shall be used as required to prevent distortion during concrete placement.
3.9 Excavation

3.9.1 The contractor shall excavate the foundation to match the base dimensions as close as possible.

3.9.2 Foundations excavated in rock areas shall have the concrete poured directly against the solid bottom.

3.9.3 Foundations shall have a 6” base of compacted aggregate.

3.9.4 Contractor shall remove excavation and concrete spoils.

3.10 Placing Reinforcing Steel

3.10.1 The contractor shall place reinforcing steel in conformance with the information on the drawings and Concrete Reinforcing Steel Institute (CRSI) recommended practice for placing reinforcing bars, except as modified herein.

3.10.2 Minimum length of splices shall be 24 times that bar diameter, unless otherwise shown, but in no case less than 12 inches.

3.10.3 Tie splices with 18-gauge annealed wire as specified in the referenced CRSI standards shall be used.

3.11 Anchor Bolt

3.11.1 The contractor shall place all anchor bolts accurately with templates provided by SUB. The contractor will verify anchor bolt placement at the time concrete is poured.

3.11.2 Exposed threads will be wrapped with electrical tape, left clean, straight, and undamaged. Anchor bolt patterns are shown on provided drawings.

3.11.3 Anchor bolts and nuts shall conform to ASTM A 307.

3.11.4 The top 12” of anchor bolts shall be hot dipped galvanized after fabrication.

3.11.5 Three leveling nuts shall be provided with each anchor bolt, they shall be tapped oversize to accommodate the galvanizing process and re-tapped
after to clean the threads. All nuts shall be installed on anchor bolts and allow easy installation or removal by SUB personnel over the entire length of exposed threads.

3.11.6 The anchor bolts and leveling nuts shall be galvanized in accordance with ASTM A 153.

3.12 Placing Concrete

3.12.1 Prior to placing concrete, the contractor shall remove water from the excavation and all debris and foreign material from forms, check the reinforcing steel for proper placement and correct any discrepancies. Pour base of foundations directly against excavated hole.

3.12.2 Before depositing new concrete on old concrete, the contractor shall clean surface and pour a cement sand grout to a minimum of one-inch (1") over the surface. Proportions of cement and sand shall be as in the concrete mix.

3.12.3 Concrete shall be placed as soon as possible after leaving mixer, without segregation or loss of ingredients, without splashing forms or steel above. The vertical drop to final placement shall not exceed six feet. Placement shall conform to the requirements of ACI 304, except as modified herein.

3.12.4 Concrete shall not be placed when the ambient temperature is below 40 degrees F or approaching 40 degrees F and falling without special protection as approved by the Engineer.

3.12.5 Any concrete damaged by freezing shall be removed and replaced by the contractor at no additional cost to the owner.

3.12.6 The Engineer must inspect and approve each excavation and steel framework prior to pouring concrete.

3.13 Concrete Compaction

3.13.1 Approved vibrator shall be applied at points spaced not further apart than vibration's effective radius.
3.13.2 Vibrator shall be applied close enough to forms to vibrate surface effectively but not damage form surfaces.

3.13.3 Concrete shall be vibrated until it becomes uniformly plastic. Contractor shall not over vibrate.

3.14 Finishing

3.14.1 After the initial water has been absorbed, concrete shall be floated with a wood float and troweled with a steel trowel to a smooth finish free from trowel marks.

3.15 Removal of Forms

3.15.1 Form shall be removed after concrete has set sufficiently to carry the dead load and construction load it has to sustain and when approved by the Engineer. Forms shall be removed with care to prevent scarring and damaging the surface.

3.16 Foundation Backfill

3.16.1 All foundation backfill shall consist of listed fill material compacted in six-inch (6") lifts to a minimum of 92 percent of maximum relative compaction as determined by ASTM D1557. This also pertains to any disturbed material adjacent to any existing foundations.

3.17 Rejected Material

3.17.1 Any material condemned or rejected by the Engineer or his authorized inspector due to of nonconformity with the Contract Documents shall be removed at once from the vicinity of the work by the Contractor at his own expense, and the same shall not be used on the work.