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PROJECT #19.08

PROJECT MANUAL

FOR

UTILITY CONNECTION AND MONITORING FACILITY SITE PREP - PHASE 1: PACWAVE

SEAL ROCK, OREGON

FOR

OREGON STATE UNIVERSITY

Oregon State University

PacWave
TESTING WAVE ENERGY FOR THE FUTURE

APRIL 2020

SECTION 00 0101
PROJECT TITLE PAGE

PROJECT MANUAL
FOR

OREGON STATE UNIVERSITY
UTILITY CONNECTION & MONITORING FACILITY
SITE PREP - PHASE 1:
PACWAVE
SEAL ROCK, OREGON 97376

OREGON STATE UNIVERSITY
PACWAVE

APRIL 2020

PREPARED BY:

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COOS BAY, OREGON 97420
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SECTION 00 0110

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1.01 PROCUREMENT AND CONTRACTING REQUIREMENTS

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END OF SECTION

Geotechnical Investigation

PacWave South

Lincoln County, Oregon

Prepared for:

Oregon State University
Corvallis, Oregon

May 15, 2019

Foundation Engineering, Inc.
Professional Geotechnical Services

Foundation Engineering, Inc.
Professional Geotechnical Services

John Gremmels
Capital Planning and Development
Oregon State University
230 Oak Creek Building
Corvallis, OR 97330

May 15, 2019

PacWave South
Geotechnical Investigation
Lincoln County, Oregon

Project 2191039

Dear Mr. Gremmels:

We have completed the requested geotechnical investigation and soil resistivity testing for UCMF: PacWave South project in Lincoln County. Our report includes a description of our work, a discussion of site conditions, a discussion of local and regional geology, seismicity, and seismic hazards, a summary of laboratory testing, and recommendations for site preparation, foundations, pavements, and construction.

The site is covered by a ±1.3 to 3-foot thick layer of organic silt underlain by very dense sand. Therefore, spread footings founded in the very dense sand are suitable to support the new buildings.

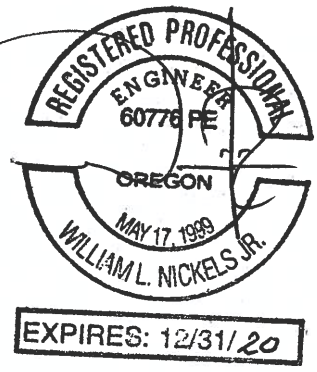
It has been a pleasure assisting you with this phase of your project. Please do not hesitate to call if you have any questions.

Sincerely,

FOUNDATION ENGINEERING, INC.

Mallory L. McAdams
Geotechnical Staff

William L. Nickels Jr., P.E., G.E.
President



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enclosure

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GEOTECHNICAL INVESTIGATION

PACWAVE SOUTH
LINCOLN COUNTY, OREGON

1.0 BACKGROUND

Oregon State University (OSU) is planning to develop a ±4.44-acre parcel adjacent to Highway 101, ±2 miles north of the City of Waldport. The project location is shown on the Vicinity Map (Figure 1A, Appendix A).

The development includes the construction of the Utility Connection and Monitoring Facility: PacWave project. The project includes three single-story metal buildings including a 150-foot long by 75-foot wide Power Conditioning Building, an 80-foot long by 60-foot wide Switch Gear and Storage Building, and an 85-foot long by 50-foot wide Data Control and Communications Center. A paved access road and parking are also planned.

OSU is the project owner. The design team includes TriAxis Engineering (TriAxis) and HGE, Inc. Preliminary survey information was provided by Dodge Surveying and Planning (Dodge). Foundation Engineering, Inc. was retained by OSU to complete a geotechnical investigation and provide foundation recommendations for the new buildings, pavements, and construction. Our work was outlined in a proposal dated March 27, 2019, and authorized by a signed Consultant's Agreement dated April 9, 2019.

2.0 FIELD EXPLORATION

We excavated nine exploratory test pits (TP-1 through TP-9) at the site on April 19, 2019, using a Case CX57C tracked excavator. The approximate test pit locations are shown on Figure 2A (Appendix A).

The test pits extended to maximum depths ranging from ±4.5 to 12 feet below the existing grades. The subsurface profiles were logged, and soil samples were obtained for possible laboratory testing and observation in our office. The subsurface profiles are discussed below.

3.0 DISCUSSION OF SITE AND SUBSURFACE CONDITIONS

3.1 Site Topography and Vegetation

The proposed facilities will be located on an undeveloped parcel that is presently covered with dense vegetation consisting of trees, blackberry bushes, and grass.

The property slopes moderately to gently up from west to east. Survey information completed by Dodge indicates ground surface elevations ranging from ±El. 50 on the northwest corner of the parcel (near Hwy 101) to ±El. 100 near the southeast corner. The proposed building areas slope gently to the east with existing ground surface elevations ranging from ±El. 87 to ±El. 100.

3.2 Subsurface Conditions

The subsurface profiles observed in the nine test pits were relatively consistent. A general discussion of the soils encountered in the test pits is provided below. Details of the conditions encountered in each test pit are summarized on the test pit logs (Appendix B).

Brown, organic silt was encountered at the ground surface of each exploration. The organics consist of duff and roots from the surface vegetation. This stratum was typically soft grading to medium stiff and extended to depths of ±1.3 to 3 feet.

A ±1-foot thick layer of grey, stiff, medium plasticity clay with some sand was encountered below the silt in TP-6 to a depth of ±4 feet.

The organic silt was typically underlain by dense to very dense sand with trace amounts of silt extending to ±12 feet, the maximum depth of the explorations. The sand was typically heavily iron-stained and strongly cemented to depths ranging from ±4 to 6 feet and moderately cemented thereafter.

3.3 Ground Water

Slow to moderate seepage was encountered in TP-1 through TP-3, TP-5, and TP-8 at depths ranging from ±1.5 to 10 feet. The observed seepage is likely surface water that has perched on the cemented sand. Based on a review of local water well logs available from the Oregon Water Resources Department (OWRD), the static ground water level is relatively deep.

4.0 FIELD AND LABORATORY TESTING

4.1 Laboratory Testing

The laboratory work included moisture content and percent fines tests to help classify the soils according to the Unified Soil Classification System (USCS), determine their homogeneity, and estimate their overall engineering properties. Non-tested samples were visually classified in accordance with ASTM D2488-09a and ASTM D2487-11. The laboratory test results are summarized in Table 1C (Appendix C).

4.2 Resistivity Tests

Three in-situ resistivity tests (ASTM G57) were completed at site locations selected by TriAxis. The approximate locations are shown on Figure 2A. The resistivity testing was completed using a Nilsson 400, 4-pin, soil resistance meter. The 4–pin resistance meter provides an estimate of the average resistivity of a soil profile extending to a depth equal to the spacing between the pins. The tests were performed with the pin spacing ranging from ±0.5 to 100 feet.

Resistivity values ranging from ±20,433 to 162,775 Ω-cm were recorded and are summarized in Table 2C. These values were reported to TriAxis in the field at the time of the testing.

5.0 SEISMIC CONSIDERATIONS

5.1 Site Response

A site response spectrum was developed for the site in accordance with the Oregon Structural Specialty Code (OSSC 2014), which is based on Section 1613 of the International Building Code (IBC 2012). The design maximum considered earthquake ground motion maps in the IBC (2012) are based on modified USGS (2008) maps with a 1% probability of exceedance in 50 years (i.e., a ±4,975-year return period).

Water well logs derived from wells drilled on NW Legion Road (±0.7 miles to the south) indicate the sand alluvium is typically underlain by siltstone or claystone bedrock at depths of ±40 to 50 feet. The well log information is consistent with the recent geophysical study completed by Siemens & Associates (SA 2019). Based on the test pit information and the depth to bedrock indicated in the well logs and geophysical study, we anticipate the subsurface profile consists of primarily dense to very dense sand followed by siltstone or claystone bedrock with depth.

The geophysical study completed by Siemens & Associates is summarized in a draft report dated May 2, 2019. Results of their Linear Microtremor Tomography study completed at the site indicate the average shear wave velocity in the upper 100 feet of the soil profile is 1,588 ft/s. Therefore, a Site Class C is appropriate. The seismic design parameters and OSSC response spectrum are shown on Figure 3A (Appendix A).

5.2 Liquefaction

Liquefiable soils typically consist of saturated, loose sand and non-plastic or low plasticity silt (i.e., a PI of less than 8). The proposed facility location is typically underlain by dense to very dense cemented sand extending to the maximum depth of the explorations.

Based on the density of the alluvium encountered in the explorations and the anticipated depth to bedrock, the risk of liquefaction for this site is relatively low.

5.3 Subsidence

In addition to liquefaction induced settlement, ground subsidence may occur during a CSZ interface earthquake. Ground subsidence is a regional phenomenon. It occurs because the subduction of the oceanic crust beneath the continental crust compresses the continental crust and pushes it upward. Prior to the earthquake, the continental crust is held in this position by friction at the interface. When the earthquake occurs, that frictional bond breaks, allowing the continental crust to drop. The hazard map included in the Oregon Resilience Plan (OSSPAC, 2013) indicates ground subsidence in the area that includes the PacWave South site could range from ±2 to 3 feet.

5.4 Tsunami Inundation

The current tsunami evacuation map for Seal Rock (DOGAMI, 2013) shows the PacWave South site location is outside of the hazard area for a distant source earthquake (i.e., a large Alaskan earthquake) and a CSZ induced tsunami. Therefore, there is no tsunami risk for the PacWave South facility.

6.0 ENGINEERING ANALYSIS AND DESIGN

6.1 Discussion of Soil Conditions

Based on the field exploration, the upper fine-grained alluvium contains an abundance of organic material due to the dense vegetation present across the site. This material is not suitable for foundation support and will need to be removed prior to building pad and foundation construction. Therefore, the following foundation design recommendations are based on the removal of the organic material.

6.2 Bearing Capacity

We estimated the bearing capacity of spread and continuous (strip) footings placed a minimum of 18 inches below finish grade on a minimum of 6 inches of compacted Select Fill underlain by dense to very dense sand. The Select Fill should extend a minimum of 6 inches outside of the footing edges. The allowable bearing pressure was estimated using a drained strength value (ϕ') for the sand of 34 degrees.

Our calculations suggest an allowable bearing pressure of 3,000 psf for isolated spread footings and continuous strip footings with a typical factor-of-safety of 3. This allowable value assumes a minimum footing width of 24 inches. For seismic or other transient loading (i.e., wind), the allowable bearing pressure may be increased by one-third.

6.3 Settlement

The soils beneath the new foundations consist of predominantly cemented or dense sand. Therefore, any settlement that occurs will occur relatively quickly as the foundations are loaded. Settlement of foundations bearing on compacted Select Fill underlain by dense to very dense cemented sand is expected to be less than ± ½ inch.

6.4 Sliding Coefficient and Passive Resistance for the Mat Foundation

A sliding coefficient of 0.5 is recommended to analyze the sliding resistance of new footings constructed on a minimum of 6 inches of compacted Select Fill.

Passive resistance of the soil in front of buried footings was calculated as an equivalent fluid density. An equivalent fluid density of 125 pcf is recommended for the evaluation of new footings, assuming the backfill around the footings will consist of compacted sand. A factor of safety has been applied to this value, since it is unlikely the footings will move lateral enough to mobilize the full passive resistance.

6.5 Slab-on-Grade

We anticipate the slab for the building will be supported on a minimum of 12 inches of Select Fill underlain by dense to very dense sand. For this condition, a modulus of subgrade reaction of 250 lb/in^3 (pci) is appropriate for design.

6.6 Pavement Design

Paved parking and a new paved access road that will connect the facility to Hwy 101 are planned. No formal traffic data was available at the time this report was prepared, but we understand a semi-truck hauling a 40-foot long trailer may access the site up to twice per month. Therefore, if the actual traffic data estimated by the design team is greater than the data we assumed for design, we should be contacted to review our analyses and provide a revised pavement section. The pavement design does not include construction traffic.

To estimate the required pavement section thicknesses, we assumed an average daily traffic (ADT) of 100, which includes primarily cars and small pickups, up to 10 delivery trucks. Two semi-trucks per month were also included. An M_R value of 5,000 psi was assumed for the compacted, native sand subgrade.

Pavement analysis was completed using the AASHTO (1993) procedure and input parameters recommended in the ODOT Pavement Design Guide (2019). Equivalent (18-kip) Single-Axle Loads (ESALs) for design were calculated using ESAL-conversion factors from the 2019 ODOT Pavement Design Guide. The analysis assumed a design life of 20 years for flexible pavements. Using the design traffic and M_R value, we calculated a flexible pavement section consisting of 3.5 inches of AC over 8 inches of base rock. This section is based on the assumption all of the surficial, organic-rich topsoil is removed as recommended below.

7.0 RECOMMENDATIONS

Construction recommendations provided below are based on the earthwork occurring during dry weather. Depending on the actual time of year construction begins, modifications to the recommendations may be required. Therefore, we recommend a preconstruction conference with the earthwork subcontractor to review the recommendations and make any necessary adjustments at that time.

7.1 General Earthwork and Material Recommendations

1. Select Fill material as defined in this report should consist of ¾-inch minus, clean (i.e., less than 5% passing the #200 U.S. Sieve), well-graded, crushed gravel or rock.

2. Granular Site Fill as defined in this report should consist of 3 or 4-inch minus, clean (i.e., less than 5% passing the #200 U.S. Sieve), well-graded, crushed rock. A material gradation should be provided to us for approval prior to delivery to the site.

3. Sand Fill should consist of well-graded, on-site or imported sand that is free of organics, debris, and plastic silt or clay. The sand should also contain less than 5% passing the #200 U.S. Sieve. Higher fines content may be approved if the work is completed during dry weather.

4. If a borrow area is developed on-site, it should be approved by a Foundation Engineering representative prior to construction. A sample or gradation of proposed imported material should be provided for approval, prior to delivery to the site.

5. Drain Rock should consist of 1 to 2-inch minus, clean (less than 2% passing the #200 sieve), open-graded gravel or rock.

6. Filter Fabric as defined in this report should consist of a non-woven geotextile with a grab tensile strength greater than 200 lb., an apparent opening size (AOS) of between #70 and 100 (US Sieve) and a permittivity greater than 0.25 sec-1.

7. Separation Geotextile should be a woven geotextile with Mean Average Roll Value (MARV) strength properties meeting the requirements of an AASHTO M 288-17 Class 2 geotextile. The geotextile shall have MARV hydraulic properties meeting the requirements of AASHTO M 288-17 with a permittivity greater than 0.1 sec^{-1} and an Apparent Opening Size (AOS) less than 0.6 mm (max average roll value). The permittivity is required to reduce the risk of subgrade pumping during wet weather. We should be provided a specification sheet for the selected geotextile for approval prior to delivery to the site.

8. Compact the subgrade and all fill to 95% relative compaction. The maximum dry density of ASTM D 698 should be used as the standard for estimating the relative compaction. Efficient compaction of granular fills will require a smooth drum, vibratory roller. Walk-behind plate compactors or hoe-mounted compactors will be required for smaller excavations where access with self-propelled equipment is not feasible. Field density tests should be run frequently to confirm adequate compaction of the fill.

9. The completed subgrade and building pad should be proof-rolled using a loaded, 10-yd^3 dump truck or another approved vehicle. Adequate compaction based on proof-rolling should be confirmed by a Foundation Engineering representative. Areas of pumping or deflection observed beneath the truck wheels should be reworked, or overexcavated and replaced with compacted Select Fill and proof-rolled again.

10. Place and compact all imported fills in loose lifts not exceeding 12 inches to the standard specified above.

11. Shore or slope the sides of all excavations to protect workers from sloughing or caving soils. An Oregon OSHA soil Type C is appropriate for the sandy soil. OSHA recommends a maximum slope of 1.5:1(H:V) for temporary cuts in these soils. The sands may suddenly cave, slough, or flow in the presence of surface runoff or if perched ground water is encountered. Therefore, flatter cuts and dewatering may be required if ground water daylights on cut slopes.

12. Contractors should be prepared to dewater excavations for utility construction or building site preparation, particularly if the work is completed during wet weather.

13. Permanent cut and fill slopes should be no steeper than 2:1(H:V).

14. Overexcavate all test pits that extend below the foundations and pavements. Replace the test pit backfill with compacted Select Fill. The approximate test pit locations are shown in Figure 2A.

7.2 Site Preparation and Building Pad Construction

A site grading plan was not available at the time this report was prepared. However, based on the site topography we anticipate cuts and fills will be required to develop the site and construct the building pads, access road, and parking areas. Therefore, general recommendations are provided below for site grading.

15. Strip the existing ground as required to remove duff, vegetation, and roots in the building (and parking) areas. Stripping depths may be as deep as 3 feet. Dispose of all strippings outside of construction areas, including proposed paved areas.

16. Replace the excavated, unsuitable soil with Sand Fill, Granular Site Fill, or Select Fill. Place and compact the fill as recommended above. Fills placed on slopes should be properly stripped and benched. No sliver fills are allowed.

17. Cut permanent slopes no steeper than 2:1(H:V). Flatter slopes and/or slope drains may be required if seeps or springs are encountered.

18. Place the Separation Geotextile over the approved subgrade prior to placing Select Fill for the building pads. The geotextile should be laid smooth, without wrinkles or folds, in the direction of construction traffic. Overlap adjacent rolls a minimum of 2 feet. Pin fabric overlaps or place the Select Fill in a manner that will not separate the overlap during construction. Seams that have separated will require removal of the Select Fill to establish the required overlap.

19. Place a minimum of 12 inches of Select Fill to construct the building pads. Compact the Select Fill as specified above.

20. The buildings should be set back a minimum of 10 feet from the top of fill slopes. We are available to review the final grading plan and complete stability analyses to potentially reduce this setback, if needed, as the design progresses.

21. Establish vegetation on the finished slopes that is compatible with the soil type. Surface erosion is possible in sand slopes prior to the establishment of mature cover. Therefore, perioding slope maintenance may be required during this time.

22. The building pads should be built up above the exterior finish grade to promote surface drainage away from the buildings. Do not allow loaded trucks or heavy construction equipment on the completed building pad unless required for a final proof-roll.

23. Proof-roll the completed building pad using a loaded truck (or other heavy equipment approved by Foundation Engineering) to identify any soft or pumping areas that may have developed over the construction period. Overexcavate any pumping base rock or subgrade and replace it with compacted Select Fill.

7.3 Foundation Design and Construction

24. Design continuous wall footings and isolated column footings using an allowable bearing pressure of 3,000 psf. This value may be increased by one-third for analysis of transient loads (i.e., earthquake or wind loads).

25. For sliding analysis, use a coefficient of friction of 0.5 between the footings and the Select Fill. Calculate the passive resistance against the sides of the buried footings using an allowable equivalent fluid density of 125 pcf.

26. Assume up to ± ½ inch of total and differential post-construction settlement, provided the foundations are designed and constructed as recommended herein.

27. Design the structure using OSSC 2014 seismic parameters shown in Figure 3A (Appendix A).

28. Excavate for the footings using a hoe equipped with a smooth-edged bucket. The excavation depth should accommodate a minimum of 6 inches of compacted Select Fill beneath the footings. The fill should extend at least 6 inches beyond the edges of all footings.

29. Overexcavation will be required for footing excavations terminating in soft material, clay or unsuitable fill. The finished footing excavations should be observed by a representative of Foundation Engineering to confirm the foundation soils and determine if any additional excavation is required.

30. Provide a minimum of 4 inches of compacted Select Fill under all other isolated concrete slabs and sidewalks. This thickness may have to be increased to support equipment if the work occurs during wet weather. All isolated slabs should be reinforced to help resist cracking or deformation.

7.4 Foundation Drainage

31. Install foundation drains along the perimeter of the new buildings. The drains should consist of 3 or 4-inch diameter, perforated or slotted, PVC pipe wrapped in a Filter Fabric. The pipe should be set at the base of the perimeter foundations. The pipe should be bedded in at least 4 inches of Drain Rock and backfilled to full depth with Drain Rock. The entire mass of Drain Rock should be wrapped in a similar Filter Fabric that laps at least 12 inches at the top.

32. Provide clean-outs at appropriate locations for future maintenance of the drainage system.

33. Discharge the drains by gravity flow into the nearest storm drain or other appropriate location. Do not discharge the drains directly onto slopes.

7.5 Subgrade Preparation and Pavement Construction

The subgrade should be prepared during dry weather and the pavement constructed as follows:

34. Strip the pavement areas as required to remove existing vegetation and roots. Stripping depths may be as deep as 3 feet. Dispose of all strippings outside of construction areas.

35. Bring the access road and parking areas to the required subgrade elevation using Borrow Material, Granular Site Fill, or Select Fill. Place and compact the fill as recommended above. Fills placed on slopes should be properly benched.

36. Excavate as required to accommodate the minimum pavement section in areas requiring cuts. Overexcavate any soft subgrade and replace it with compacted Select Fill or Granular Site Fill. Compact the subgrade during dry weather as specified above.

37. Place the Separation Geotextile over the approved subgrade prior to placing Select Fill. The geotextile should be laid smooth, without wrinkles or folds, in the direction of construction traffic. Overlap adjacent rolls a minimum of 2 feet. Pin fabric overlaps or place the Select Fill in a manner that will not separate the overlap during construction. Seams that have separated will require removal of the Select Fill to establish the required overlap.

38. Place 8 inches of Base Rock (Select Fill) over the prepared subgrade and compact as specified above.

39. Proof-roll the prepared base rock section prior to paving. Overexcavate and replace any areas of pumping base rock and/or subgrade with additional Select Fill.

40. Provide 3.5 inches of AC for the pavement areas. Compact the AC to a minimum of 91% relative compaction per the theoretical maximum density calculated from the Rice specific gravity.

8.0 DESIGN REVIEW/CONSTRUCTION OBSERVATION/TESTING

We should be provided the opportunity to review all drawings and specifications that pertain to site preparation and the design and construction of foundations and pavements. Foundation and pavement subgrade preparation will require field confirmation of subgrade conditions in accordance with recommendations provided herein. We recommend that we be present to confirm soil conditions in the bottom of all footing excavations prior to backfilling. Mitigation of subgrade pumping or persistent ground water infiltration will also require engineering review and judgment. That judgment should be provided by one of our representatives. Frequent field density tests should be run on all Select Fill. Fills too coarse or variable for density testing should be proof-rolled as recommended above. We recommend that we be retained to provide the necessary construction observation.

9.0 VARIATION OF SUBSURFACE CONDITIONS, USE OF REPORT, AND WARRANTY

The analysis, conclusions, and recommendations contained herein are based on the assumption the soil profiles and the ground water levels encountered in the test pits are representative of the overall site conditions. The above recommendations assume that we will have the opportunity to review final drawings and be present during construction to confirm the assumed foundation conditions. No changes in the enclosed recommendations should be made without our approval. We will assume no responsibility or liability for any engineering judgment, inspection, or testing performed by others.

This report was prepared for the exclusive use of Oregon State University and their design consultants for the PacWave South project in Lincoln County, Oregon. Information contained herein should not be used for other sites or for unanticipated construction without our written consent. This report is intended for planning and design purposes. Contractors using this information to estimate construction quantities or costs do so at their own risk. Our services do not include any survey or assessment of potential surface contamination or contamination of the soil or ground water by hazardous or toxic materials. We assume that those services, if needed, have been completed by others.

Climate conditions in western Oregon typically consist of wet weather for almost half of the year (typically between mid-October and late May). It is assumed that adequate drainage will be provided for construction and the build out condition. The recommendations for site preparation and foundation drainage are not intended to represent any warranty (expressed or implied) against the growth of mold, mildew, or other organisms that grow in a humid or moist environment.

Our work was done in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made.

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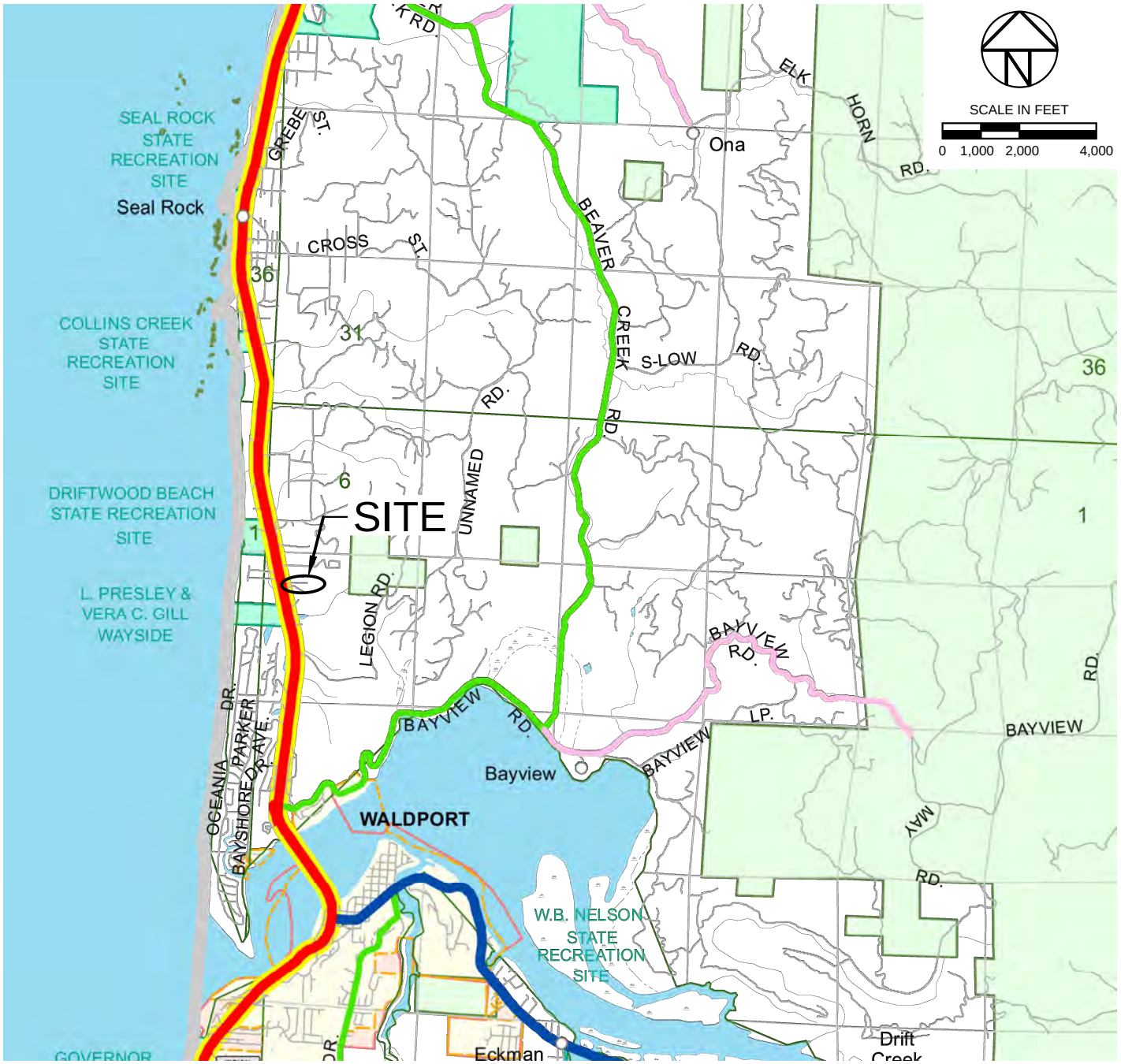
Appendix A

Figures

Foundation Engineering, Inc.
Professional Geotechnical Services



Note: Base map obtained from the Oregon Department of Transportion website.

DATE MAY 2019
DWN. EJG
APPR.
REVIS.
PROJECT NO.
2191039

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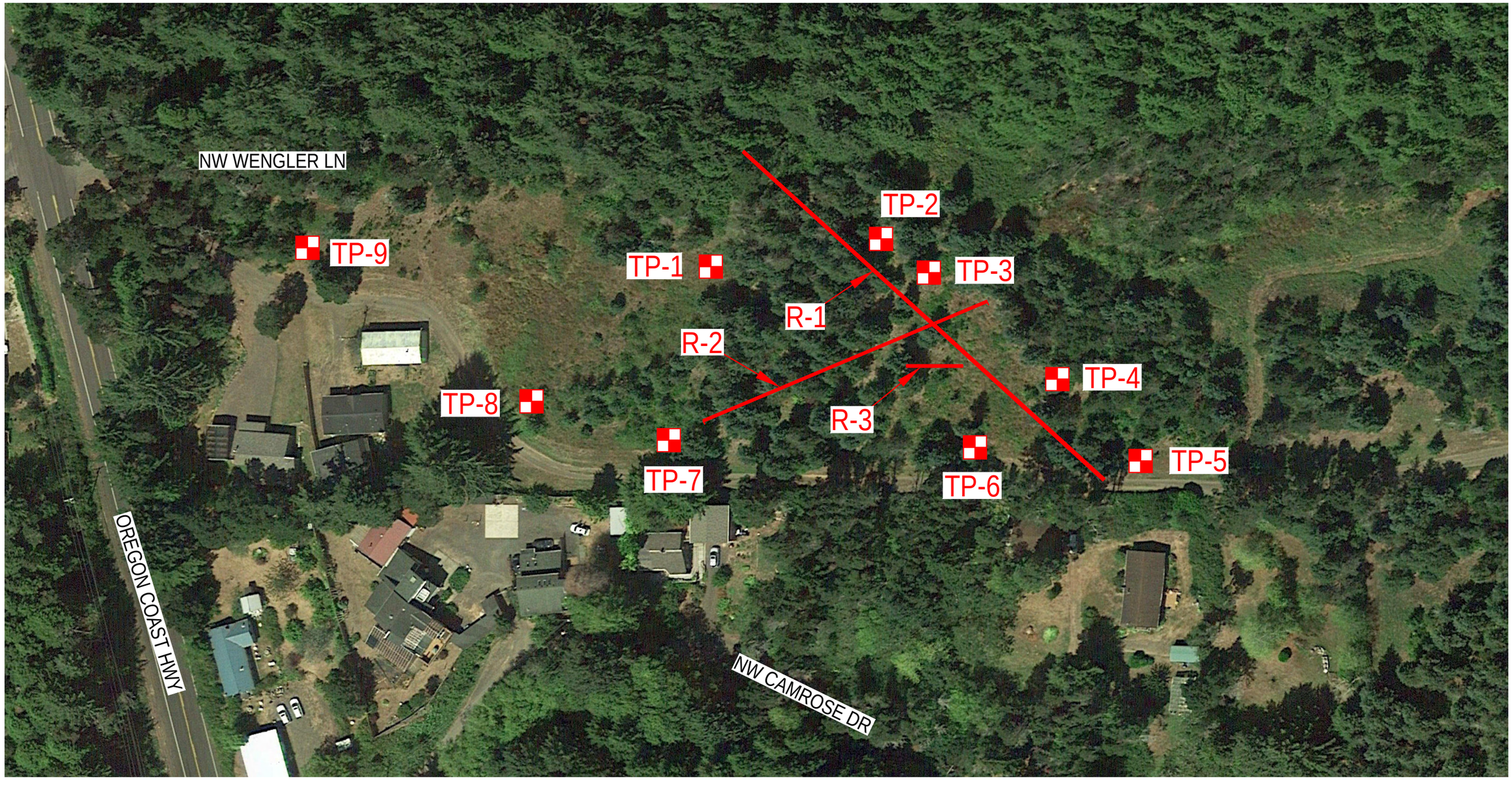
VICINITY MAP

PACWAVE SOUTH
LINCOLN COUNTY, OREGON

FIGURE NO.
1A

FILE NAME: FIG 1A



LEGEND

TP-1 TEST PIT NUMBER AND LOCATION

R-1 RESISTIVITY TEST NUMBER AND LOCATION

SCALE IN FEET

0 40 80 160

NOTES:
1. EXPLORATION LOCATIONS ARE APPROXIMATE ONLY.
2. SEE REPORT FOR A DISCUSSION OF SUBSURFACE CONDITIONS.
3. AERIAL IMAGE OBTAINED FROM GOOGLE EARTH.

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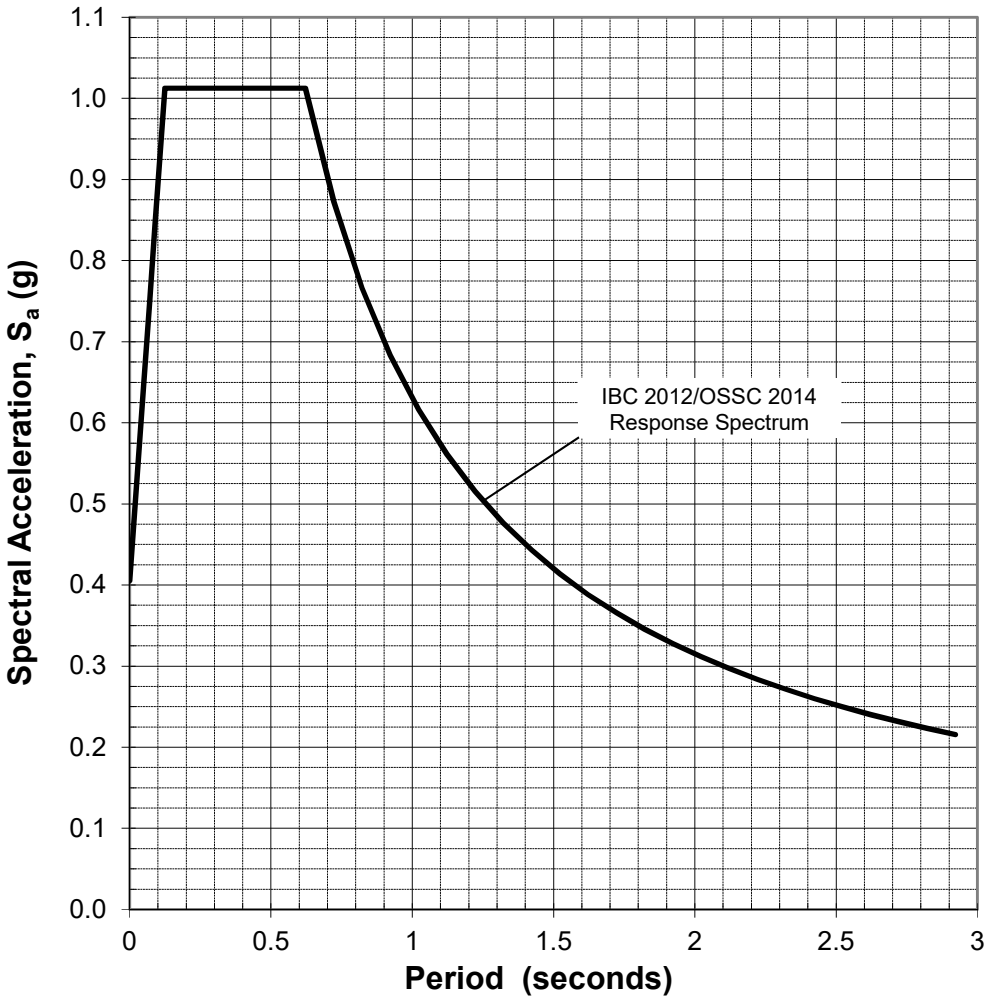
2191039

EXPLORATION LOCATIONS

PACWAVE SOUTH
LINCOLN COUNTY, OREGON

FIGURE NO.
2A

FILE NAME:FIG 2A



Notes:

1. The Design Response Spectrum is based on IBC 2012 Section 1613.
2. The following parameters are based on the modified USGS 2008 maps provided in IBC 2012/OSSC 2014:

   Site Class = C Damping = 5%

S_S =	1.52	F_a =	1.00	S_{MS} =	1.52	S_{DS} =	1.01
S_1 =	0.73	F_v =	1.30	S_{M1} =	0.95	S_{D1} =	0.63

3. S_S and S_1 values indicated in Note 2 are the mapped, Risk-Targeted Maximum Considered Earthquake (MCE_R) spectral acclerations for 1% probability of exceedence in 50 years.
4. F_a and F_v were established based on IBC 2012, Tables 1613.3.3(1) and 1613.3.3(2) using the selected S_S and S_1 values. S_{DS} and S_{D1} values include a 2/3 reduction on S_{MS} and S_{M1} as discussed in IBC 2012 Section 1613.3.4.
5. Site location is: Latitude 44.4595, Longitude -124.0736.

FIGURE 3A
IBC 2012/OSSC 2014 SITE RESPONSE SPECTRUM
PacWave South
Lincoln County, Oregon
2191039

Appendix B

Test Pit Logs

Foundation Engineering, Inc.
Professional Geotechnical Services

DISTINCTION BETWEEN FIELD LOGS AND FINAL LOGS

A field log is prepared for each boring or test pit by our field representative. The log contains information concerning sampling depths and the presence of various materials such as gravel, cobbles, and fill, and observations of ground water. It also contains our interpretation of the soil conditions between samples. The final logs presented in this report represent our interpretation of the contents of the field logs and the results of the sample examinations and laboratory test results. Our recommendations are based on the contents of the final logs and the information contained therein and not on the field logs.

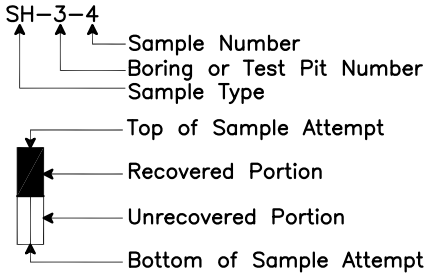
VARIATION IN SOILS BETWEEN TEST PITS AND BORINGS

The final log and related information depict subsurface conditions only at the specific location and on the date indicated. Those using the information contained herein should be aware that soil conditions at other locations or on other dates may differ. Actual foundation or subgrade conditions should be confirmed by us during construction.

TRANSITION BETWEEN SOIL OR ROCK TYPES

The lines designating the interface between soil, fill or rock on the final logs and on subsurface profiles presented in the report are determined by interpolation and are therefore approximate. The transition between the materials may be abrupt or gradual. Only at boring or test pit locations should profiles be considered as reasonably accurate and then only to the degree implied by the notes thereon.

SAMPLE OR TEST SYMBOLS



C – Pavement Core Sample
CS – Rock Core Sample
OS – Oversize Sample (3–inch split–spoon)
S – Grab Sample
SH – Thin–walled Shelby Tube Sample
SS – Standard Penetration Test Sample (split–spoon)

▲ Standard Penetration Test Resistance equals the number of blows a 140 lb. weight falling 30 in. is required to drive a standard split–spoon sampler 1 ft. Practical refusal is equal to 50 or more blows per 6 in. of sampler penetration.

● Water Content (%).

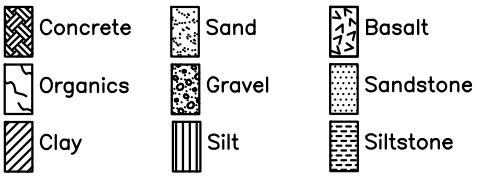
UNIFIED SOIL CLASSIFICATION SYMBOLS

G – Gravel	W – Well Graded
S – Sand	P – Poorly Graded
M – Silt	L – Low Plasticity
C – Clay	H – High Plasticity
Pt – Peat	O – Organic

FIELD SHEAR STRENGTH TEST

Shear strength measurements on test pit side walls, blocks of soil or Shelby tube samples are typically made with Torvane or Field Vane shear devices.

TYPICAL SOIL/ROCK SYMBOLS



WATER TABLE


Water Table Location

(1/31/16) Date of Measurement

FOUNDATION ENGINEERING INC.
PROFESSIONAL GEOTECHNICAL SERVICES

820 NW CORNELL AVENUE
CORVALLIS, OR 97330
BUS. (541) 757–7845

7857 SW CIRRUS DRIVE, BUILDING 24
BEAVERTON, OR 97008
BUS. (503) 641–1541

SYMBOL KEY

EXPLORATION LOGS

Explanation of Common Terms Used in Soil Descriptions

Field Identification	Cohesive Soils			Granular Soils	
	SPT*	S_u** (tsf)	Term	SPT*	Term
Easily penetrated several inches by fist.	0 – 2	< 0.125	Very Soft	0 – 4	Very Loose
Easily penetrated several inches by thumb.	2 – 4	0.125–0.25	Soft	4 – 10	Loose
Can be penetrated several inches by thumb with moderate effort.	4 – 8	0.25 – 0.50	Medium Stiff	10 – 30	Medium Dense
Readily indented by thumb but penetrated only with great effort.	8 – 15	0.50 – 1.0	Stiff	30 – 50	Dense
Readily indented by thumbnail.	15 – 30	1.0 – 2.0	Very Stiff	> 50	Very Dense
Indented with difficulty by thumbnail.	>30	> 2.0	Hard		

* SPT N–value in blows per foot (bpf)
** Undrained shear strength

Term	Soil Moisture Field Description
Dry	Absence of moisture. Dusty. Dry to the touch.
Damp	Soil has moisture. Cohesive soils are below plastic limit and usually moldable.
Moist	Grains appear darkened, but no visible water. Silt/clay will clump. Sand will bulk. Soils are often at or near plastic limit.
Wet	Visible water on larger grain surfaces. Sand and cohesionless silt exhibit dilatancy. Cohesive soil can be readily remolded. Soil leaves wetness on the hand when squeezed. Soil is wetter than the optimum moisture content and above the plastic limit.

Term	PI	Plasticity Field Test
Non–plastic	0 – 3	Cannot be rolled into a thread at any moisture.
Low Plasticity	3 – 15	Can be rolled into a thread with some difficulty.
Medium Plasticity	15 – 30	Easily rolled into thread.
High Plasticity	> 30	Easily rolled and re–rolled into thread.

Term	Soil Structure Criteria
Stratified	Alternating layers at least ¼ inch thick.
Laminated	Alternating layers less than ¼ inch thick.
Fissured	Contains shears and partings along planes of weakness.
Slickensided	Partings appear glossy or striated.
Blocky	Breaks into small lumps that resist further breakdown.
Lensed	Contains pockets of different soils.

Term	Soil Cementation Criteria
Weak	Breaks under light finger pressure.
Moderate	Breaks under hard finger pressure.
Strong	Will not break with finger pressure.

FOUNDATION ENGINEERING INC.
PROFESSIONAL GEOTECHNICAL SERVICES

820 NW CORNELL AVENUE
CORVALLIS, OR 97330
BUS. (541) 757–7645

7857 SW CIRRUS DRIVE, BUILDING 24
BEAVERTON, OR 97008
BUS. (503) 641–1541

COMMON TERMS

SOIL DESCRIPTIONS

Comments	Depth, Feet	Sample #	Location	C, TSF	Elev. Depth	Symbol	Soil and Rock Description
Surface: blackberry bushes, short grass, and coniferous trees Moderate seepage at ±18 inches	1 2 3 4 5 6 7 8 9 10 11 12	S-1-1 S-1-2 S-1-3 S-1-4			1.3 4.0 10.0		Soft to medium stiff organic SILT, trace sand (OL); brown, moist, low plasticity, fine sand, organics consist of roots up to ±½-inch diameter, (alluvium). Very dense SAND, trace silt (SP); grey and iron-stained, moist, non-plastic to low plasticity silt, fine sand, strong cementation, (alluvium). Very dense SAND , trace silt (SP); grey and iron-stained, moist, non-plastic to low plasticity silt, fine sand, moderate cementation, (alluvium). BOTTOM OF EXPLORATION

Project No.: 2191039

Surface Elevation: N/A (Approx.)

Date of Test Pit: April 19, 2019

Test Pit Log: TP-1

PacWave South

Lincoln County, Oregon

Comments	Depth, Feet	Sample #	Location	C, TSF	Elev. Depth	Symbol	Soil and Rock Description
Surface: blackberry bushes, short grass, and coniferous trees Slow seepage at ±10 feet	1 2 3 4 5 6 7 8 9 10 11 12	S-2-1 S-2-2 S-2-3 S-2-4 S-2-5			2.5 3.0 5.0 10.0		Soft organic SILT, trace sand (OL); brown, moist, low plasticity, fine sand, organics consist of roots up to ±2-inch diameter, (alluvium). Medium stiff below ±1 foot. Medium stiff SILT, some clay, trace sand, scattered organics (ML); brown, wet, medium plasticity, fine sand, organics consist of fine roots, (alluvium). Very dense SAND, trace silt (SP); grey and iron-stained, moist, non-plastic to low plasticity silt, fine sand, strong cementation, (alluvium). Very dense SAND, trace silt (SP); grey and iron-stained, moist to wet, non-plastic to low plasticity silt, fine sand, moderate cementation, (alluvium). BOTTOM OF EXPLORATION

Project No.: 2191039

Surface Elevation: N/A (Approx.)

Date of Test Pit: April 19, 2019

Test Pit Log: TP-2

PacWave South

Lincoln County, Oregon

Comments	Depth, Feet	Sample #	Location	C, TSF	Elev. Depth	Symbol	Soil and Rock Description
Surface: blackberry bushes, short grass, and coniferous trees	1 2 3 4 5 6 7 8 9 10 11 12	S-3-1 S-3-2 S-3-3 S-3-4			2.0 2.5 4.0 10.5		Soft organic SILT, trace sand (OL); brown, moist, low plasticity, fine sand, organics consist of roots up to ±1-inch diameter, (alluvium). Medium stiff below ±1 foot. Medium stiff SILT, some clay, scattered organics (ML); brown, wet, low to medium plasticity, organics consist of fine roots, (alluvium). Very dense SAND, some silt (SP-SM); grey and iron-stained, moist, non-plastic to low plasticity silt, fine sand, strong cementation, (alluvium). Very dense SAND, trace silt (SP); grey and iron-stained, moist, non-plastic to low plasticity silt, fine sand, moderate cementation, (alluvium). BOTTOM OF EXPLORATION
Moderate seepage at ±5 feet							

Project No.: 2191039 **Test Pit Log: TP-3**

Surface Elevation: N/A (Approx.) **PacWave South**

Date of Test Pit: April 19, 2019 **Lincoln County, Oregon**

Comments	Depth, Feet	Sample #	Location	C, TSF	Elev. Depth	Symbol	Soil and Rock Description
Surface: blackberry bushes, short grass, and coniferous trees	1 2 3 4 5 6 7 8 9 10 11 12	S-4-1 S-4-2 S-4-3 S-4-4			2.0 3.0 12.0		Soft organic SILT (OL); brown, moist, low plasticity, fine sand, organics consist of roots up to ±1-inch diameter, (alluvium). Stiff SILT, some clay, trace sand, scattered organics (ML); light brown, wet, medium plasticity, fine sand, organics consist of fine roots, (alluvium). Very dense SAND, trace silt (SP); grey and iron-stained, moist, non-plastic to low plasticity silt, fine sand, moderate to strong cementation, (alluvium). Manganese staining from ±3 to 5 feet. BOTTOM OF EXPLORATION
No seepage or ground water encountered to the limit of exploration							

Project No.: 2191039 **Test Pit Log: TP-4**

Surface Elevation: N/A (Approx.) **PacWave South**

Date of Test Pit: April 19, 2019 **Lincoln County, Oregon**

Comments	Depth, Feet	Sample #	Location	C, TSF	Elev. Depth	Symbol	Soil and Rock Description
Surface: blackberry bushes, short grass, and coniferous trees	1 2						Soft organic SILT, trace sand, some organics (OL); brown, moist, low plasticity, fine sand, organics consist of roots up to ±2-inch diameter, (alluvium).
					2.0		Stiff SILT, some clay and sand, scattered organics (ML); brown, wet, medium plasticity, fine sand, organics consist of fine roots, (alluvium).
	3	S-5-1			2.5		Very dense SAND, trace silt (SP); grey and iron-stained, moist, non-plastic to low plasticity silt, fine sand, strong cementation, (alluvium).
	4	S-5-2					
	5 6						
Moderate seepage at ±6 feet	7 8 9				6.0		Dense SAND, trace silt (SP); grey, moist to wet, non-plastic to low plasticity silt, fine sand, moderate cementation, (alluvium). Very dense below ±7.5 feet.
	10	S-5-3			10.0		BOTTOM OF EXPLORATION
	11 12						

Project No.: 2191039

Surface Elevation: N/A (Approx.)

Date of Test Pit: April 19, 2019

Test Pit Log: TP-5

PacWave South

Lincoln County, Oregon

Comments	Depth, Feet	Sample #	Location	C, TSF	Elev. Depth	Symbol	Soil and Rock Description
Surface: short grass and coniferous trees	1	S-6-1					Soft organic SILT, trace sand (OL); brown, moist, low plasticity, fine sand, organics consist of roots up to ±2-inch diameter, (alluvium).
	2				2.0		Stiff SILT, some clay, trace sand, scattered organics (ML); brown, wet, medium plasticity, fine sand, organics consist of fine roots, (alluvium).
	3	S-6-2			3.0		Stiff CLAY, some sand (CL); grey, wet, medium plasticity, fine sand, (alluvium).
No seepage or ground water encountered to the limit of exploration	4	S-6-3			4.0		Very dense SAND, trace silt (SP); grey and iron-stained, moist, non-plastic to low plasticity silt, fine sand, strong cementation, (alluvium).
	5				4.5		BOTTOM OF EXPLORATION
	6 7 8 9						
	10						
	11 12						

Project No.: 2191039

Surface Elevation: N/A (Approx.)

Date of Test Pit: April 19, 2019

Test Pit Log: TP-6

PacWave South

Lincoln County, Oregon

Comments	Depth, Feet	Sample #	Location	C, TSF	Elev. Depth	Symbol	Soil and Rock Description
Surface: blackberry bushes, short grass, and coniferous trees No seepage or ground water encountered to the limit of exploration	1 2 3 4 5 6 7 8 9 10 11 12	S-7-1 S-7-2 S-7-3			2.0 2.5 3.0 4.5		Soft organic SILT, trace sand (OL); brown, moist, low plasticity, fine sand, organics consist of fine roots, (alluvium). Stiff SILT, some clay and sand, scattered organics (ML); grey, moist, medium plasticity, fine sand, organics consist of fine roots, (alluvium). Dense SAND, trace silt (SP); grey and iron-stained, moist, non-plastic to low plasticity silt, fine sand, moderate cementation, (alluvium). Very dense SAND, trace silt (SP); grey and iron-stained, moist, non-plastic to low plasticity silt, fine sand, strong cementation, (alluvium). BOTTOM OF EXPLORATION

Project No.: 2191039

Surface Elevation: N/A (Approx.)

Date of Test Pit: April 19, 2019

Test Pit Log: TP-7

PacWave South

Lincoln County, Oregon

Comments	Depth, Feet	Sample #	Location	C, TSF	Elev. Depth	Symbol	Soil and Rock Description
Surface: tall grass Moderate seepage at ±2 feet	1 2 3 4 5 6 7 8 9 10 11 12	S-8-1 S-8-2			2.0 7.0		Soft to medium stiff organic SILT (OL); brown, wet, low plasticity, fine sand, organics consist of fine roots, (alluvium). Dense SAND, trace silt (SP); grey and iron-stained, wet, non-plastic to low plasticity silt, fine sand, moderate cementation, (alluvium). BOTTOM OF EXPLORATION

Project No.: 2191039

Surface Elevation: N/A (Approx.)

Date of Test Pit: April 19, 2019

Test Pit Log: TP-8

PacWave South

Lincoln County, Oregon

Comments	Depth, Feet	Sample #	Location	C, TSF	Elev. Depth	Symbol	Soil and Rock Description
Surface: blackberry bushes, short grass, and coniferous trees	1 2						Soft organic SILT, trace sand (OL); brown, moist, low plasticity, fine sand, organics consist of roots up to ±1-inch diameter, (alluvium).
	3	S-9-1			2.5		Stiff SILT, some clay, sand, and gravel (ML); brown, moist, low plasticity, fine sand, fine to coarse subrounded gravel up to ±2-inch diameter, (alluvium).
	4	S-9-2			3.0		Very dense SAND, trace silt (SP); grey and iron-stained, moist, non-plastic to low plasticity silt, fine sand, strong cementation, (alluvium).
No seepage or ground water encountered to the limit of exploration	5 6 7 8 9 10 11 12				4.5		BOTTOM OF EXPLORATION

Project No.: 2191039

Surface Elevation: N/A (Approx.)

Date of Test Pit: April 19, 2019

Test Pit Log: TP-9

PacWave South

Lincoln County, Oregon

Appendix C

Field and Laboratory Testing

Foundation Engineering, Inc.
Professional Geotechnical Services

Table 1C. Moisture Contents & Percent Fines

Sample Number	Sample Depth (feet)	Moisture Content (percent)	% Fines
S-1-2	2.5 - 3.0	15.8	2.1
S-1-3	3.5 - 4.0	21.3	
S-1-4	9.5 - 10.0	22.2	
S-2-2	2.5 - 3.0	73.3	
S-2-3	3.5 - 4.0	18.3	3.1
S-2-4	9.5 - 10.0	20.3	
S-3-1	3.0 - 3.5	26.4	
S-3-2	4.0 - 4.5	19.1	
S-3-3	8.0 - 9.0	22.6	
S-3-5	10.0 - 10.5	31.6	4.5
S-4-2	3.5 - 4.0	18.6	
S-4-3	5.0 - 6.0	66.4	
S-4-4	9.5 - 10.0	16.3	
S-5-1	2.5 - 3.0	31.2	
S-5-2	3.5 - 4.0	19.5	
S-5-3	9.5 - 10.0	22.7	
S-6-2	3.0 - 3.5	27.0	
S-7-1	2.0 - 2.5	47.1	
S-7-3	3.5 - 4.0	29.5	
S-8-1	3.0 - 4.0	54.7	
S-9-1	2.5 - 3.0	45.4	

Table 2C. Summary of Resistivity Testing

Location	Pin Spacing (ft)	Resistivity (Ω-cm)
R-1	0.5	162,775
	1	111,070
	3	86,175
	5	72,770
	7	56,301
	10	38,300
	30	51,705
	50	32,555
	70	32,172
	100	27,863
R-2	0.5	37,342
	1	59,365
	3	55,726
	5	63,195
	7	42,896
	10	42,130
	30	40,215
	50	22,022
	70	26,810
	100	20,433
R-3	0.5	57,450
	1	57,450
	3	68,940
	5	65,110
	7	56,301
	10	47,875
	30	45,960

SECTION 01 11 00

SUMMARY OF WORK

PART 1 GENERAL

1.01 SUMMARY OF WORK

A. The Work Contract consists of the site work necessary for the future construction of the Utility Connection and Monitoring Facility ("UCMF" or "Facility"), a Facility comprised of (3) three buildings, and the associated site improvements of a 4.44 acre unimproved parcel of OSU-owned property where the UCMF will be located. Project site is located on the Oregon Coast, south of Newport, Oregon.

Site preparation work includes clearing, earthwork, grading, and typical site preparation for building construction, paving, storm drainage, waterline improvements, and sidewalks. The existing private gravel drive, Wenger Lane, which extends thru the site to adjacent properties will be regraded, widened and partially paved including a replacement waterline. Refer to complete Scope of Work below.

B. Scope of Work:

1. Site clearing, tree removal, within boundaries of project limits within site. Site and pole barn building demo including slab, secure hazardous report prior per Lincoln County.
2. Erosion Control measures work: pre-grading, silt fencing, inlet protection, vegetation protection, etc.
3. Grading – excavation and fill work complete entire site, including export.
4. Wenger Lane improvements – grading, subgrade base rock, all underground utilities, waterline, hydrants, storm drain culverts, drainage swales, complete including CLPUD conduit and vaults, all work except paving at east end of Wenger Lane as described in item 6 below.
5. Contractor to coordinate with CLPUD (electric utility) to set transformer and provide temporary power.
6. HWY 101 driveway access improvements, except paving. Pave from HWY 101 to existing metal building location, Station 3+47 (refer to Sheet C2.1). Provide additional rock transition at edge of termination of paving on Wenger Lane, to be removed upon next phase for paving).
7. Bioswale and detention ponds, including storm flow control complete.
8. Grading, as mentioned above, for all building pads and drive areas, with 8 inches of baserock at paved areas (no paving this phase), 8 inches at building pads.

9. All Riprap slope protection, except at future rain drain outfalls at Switchgear Building.
10. Erosion control at exposed earth grades (seed and straw).
11. Site work excluded; vaults inside site (north side of Power Conditioning Building), storm drain inside site (rain drains, trench drains, trench drain piping, and “Substation Gravel”, on-site septic system, and fencing.
12. As-built drawings furnished by contractor upon completion. Refer to Division 1.

PERMITS – Secured by Owner:

1. Lincoln County Planning Department – Site Prep.
2. ODOT – Driveway Improvement and ROW use permits – submitted in November, December 2019.
3. DEQ 1200c permit.
4. DEQ 401 Water Quality permit.

Work shall be started within ten (10) calendar days after Notice to Proceed is issued in writing by Oregon State University. The Contract may not be signed prior to approval of the Contractor's Certificate of Insurance by Construction Contract Administration (“CPCA”), Oregon State University. Work shall be completed within _____ calendar days of the issuance of the Notice to Proceed.

1.02 CONTRACTORS USE OF PREMISES

A. Contractor shall limit use of the Premises for work and storage to allow for:
   1. Owner occupancy, day and night.
   2. Public use, day and night.
   3. Security.
   4. Safe entry and exit for vehicles and pedestrians.
   5. Fire egress.

B. Coordinate all operations with the Owner's Authorized Representative during the construction period. A 96 hour notification is required prior to scheduled utility shutdowns or street closures, but more lead time is often required to schedule around other critical activities.

C. Limit Contractor's employee parking to locations designated at the Pre-construction Conference.

1.03 OWNER OCCUPANCY

A. The Owner will occupy the Premises during the entire period of construction for the conduct of normal operations. Cooperate with Owner's Authorized Representative in construction operations to minimize conflict and to facilitate the Owner's usage especially in the following areas:
   1. Restricted access and parking.
   2. Use of stairs.

3. Storage space availability.

B. Conduct operations in such a way to ensure the least inconvenience to the general public, including:
   1. Limitations and easements.
   2. Emergency vehicle access.
   3. Building access to the public, day and night.

1.04 ASBESTOS AND OTHER HAZARDOUS MATERIAL

A. The Owner has made a reasonable attempt to locate and identify asbestos or other hazardous material that may be encountered during the course of the Work.

B. If the Contractor observes or suspects the existence of asbestos, polychlorinated biphenyl (PCB) or other hazardous materials in the structure or components of the building, the Contractor shall immediately stop work and notify the Owner's Authorized Representative.

C. The Owner will arrange for the removal of asbestos, polychlorinated biphenyl (PCB) or other hazardous materials as required by Facilities Services personnel or by separate contract.

D. Schedule ten (10) days of slack or "down" time for the removal of hazardous materials without penalty to Owner for the delay of the Contract.

1.05 LEAD BASED PAINT

A. The Owner may have tested existing paint in the project area and if levels are found the following conditions apply.

B. Contractor shall remove paint as specified for surface preparation and capture removed material for disposal.

C. Contractor shall follow OSHA guidelines involving exposure to workers.

D. Owner will provide containers for Contractor's use at project site.

E. Contractor shall comply with the requirements of DEQ and EPA and shall submit a lead abatement plan.

F. Contractor shall separate lead contaminated material from effluent and water.

G. Owner will dispose of lead paint and effluent resulting from stripping operation.

H. Soil contaminated by stripping operations shall be replaced with topsoil.

END OF SECTION

SECTION 01 24 76

APPLICATIONS FOR PAYMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Work of this Section includes forms and procedures for progress payments.

B. Related work specified elsewhere.
   1. For the primary discussion of payments, refer to OSU General Conditions, Section E, as supplemented.
   2. In compliance with OSU General Conditions, Section K, no payments beyond 75% will be made by the Owner before two complete copies of the draft Operation and Maintenance Manuals have been received for review by the Owner.

1.02 APPLICATION FORMS

A. For applications for payment, use sample contract payment request on company letterhead, or AIA Document G702, supported by AIA Document G703, Continuation Sheet, or similar document.

B. Prepare the Schedule of Values in such a manner that each major item of Work and each subcontracted item of Work is shown as a line item broken down in terms of material and labor costs on AIA Document G703, Application Certification of Payment, Continuation Sheet or similar format. The sample continuation sheet shall be the minimum Schedule of Values breakdown.

C. The Schedule of Values shall be submitted for review by the Owner prior to the first application for payment; and may be used when, and only when, accepted in writing by the Owner.

D. Payment request is to include the Contractor's Federal Tax Identification number and return address.

1.03 PAYMENTS

A. The Owner will make progress payments on account of the Contract once monthly for the scheduled duration of the project (i.e. three (3) payments on a three-month project), based on the value of work accomplished or materials on the job site, as stated in the Schedule of Values on the Application and Certificate Payment.

B. Notwithstanding the foregoing, as this project is scheduled to take _____ months to complete, Owner will only make _____ payments, plus a final retainage payment, as applicable.

C. Complete and forward Application to the Owner on or about the 15th day of each month for work performed the previous month and include certified payroll statements as specified in the OSU General Conditions.

D. Submit one (1) copy of forms requesting payment to the Owner.

E. Payments will be made on protected materials on hand at the job site properly stored, protected, and insured.

F. Estimated quantities shall be subject to the Owner's review and judgment.

1.04 EARLY PURCHASE AND PAYMENT OF MATERIALS AND EQUIPMENT

A. Order materials and equipment requiring a long lead or waiting time early so as not to delay progress of the Work.

B. The Contractor will be reimbursed for early order materials or equipment upon receipt and verification of quality and quantity against submittals and shipping documents by the Owner's Authorized Representative.

C. Receipt shall be to the job site or stored at Owner's other premises in an orderly and safe manner, secured from normal weather damage.

D. Security remains the responsibility of the Contractor.

END OF SECTION

CONTRACT PAYMENT REQUEST

DATE: _____

TO: Administrative Services Accounting
Oregon State University
3015 SW Western Blvd
Corvallis, OR 97333

Payment Request No. _____Contract No. _____ Period from _____ to _____

Project: _____

Original Contract Amount ..... $_____

Change Orders (Net Amount) ..... $_____

Contract Total to Date ..... $_____

==========

Total Completed and Stored to Date ..... $_____

Less Retainage (5%), if applicable ..... $_____

Total Earned, Less Retainage (if applicable) ..... $_____

Less Previous Payments ..... $_____

Net Amount Due this Request ..... $_____

The undersigned Contractor certifies that, to the best of his/her knowledge, information, and belief, the Work covered by this request has been completed in accordance with the Contract Documents, that all amounts have been paid for Work for which previous applications for Payment were issued and payments received from the Owner, and that the amount shown herein is now due.

Contractor:_____

By: _____Date: _____

Federal Tax ID Number:_____

Address:_____

CONTINUATION SHEET

Project Name:

Application No.:

Date:

Period To:

WRN No.:

NOTES:

Amounts are stated to the nearest dollar.
Use Column I on Contracts where variable retainage for line items may apply, or if retainage is required.

Change Orders are usually listed as the last items of the basic schedule.

A	B	C	D	E	F	G		H	I
Item No.	**Description of work**	**Scheduled Value**	**Work Completed**		**Materials Presently Stored (Not in D or E)**	**TOTAL Completed & Stored (D+E+F)**	**% Completed (G/C)**	**Balance to Finish (C-G)**	**Retainage**
			From Previous Applications	This Period					
TOTALS									

SECTION 01 25 00

PRODUCT SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General requirements for the Work in relation to substitutions and product options.

B. Submit to F.M. Global (the Owner's insurance carrier) shop drawings, samples, and product data (such as manufacturer's standard schematic drawings and other literature) when required by individual Specifications sections.

C. Related Work Specified Elsewhere
   1. Instructions to Bidders.
   2. OSU General Conditions.

1.02 REQUESTS FOR SUBSTITUTIONS

A. Requests for substitution of products in place of those specified shall be in accordance with Instructions to Bidders, and as specified herein.

1.03 CONTRACTOR'S RESPONSIBILITIES

A. Investigate proposed products and determine that they are equal or superior in all respects to products specified.

B. Provide same guarantee for accepted substitutions as for products specified.

C. Coordinate installation of accepted substitutions into the Work, making such changes as may be required for the Work to be complete in all respects.

1.04 SUBSTITUTIONS DURING BIDDING

A. Submit two (2) copies of the following information with each request to the Owner:
   1. CSI substitution request form.
   2. Comparison of proposed substitution with product, material or system specified.
   3. Complete data, substantiating compliance of proposed substitution with the Contract Documents.
   4. Test numbers and supporting reports, indicating compliance with referenced standards.
   5. Evidence that warranty requirements are acceptable.
   6. Details indicating specific deviations proposed for the substitution.
   7. Reference and applicable Specification sections.
   8. Applicable product samples.

B. All substitution requests shall be received in the Owner's office no less than ten (10) calendar days before bid opening. Requests received after this date will

not be considered.

1.05 SUBSTITUTIONS DURING CONSTRUCTION

A. Substitutions will normally not be considered after date of Contract except when required due to unforeseen circumstances.

B. Within a period of thirty (30) days after date of Contract, the Owner may, at its option, consider formal written requests for substitution of products in place of those specified, when submitted in accordance with the requirements stipulated herein.

C. One or more of the following conditions must be documented in any such request:
   1. Required for compliance with final interpretation of code or insurance requirements.
   2. Required due to unavailability of a specified product.
   3. Required because of the inability of the specified product to perform properly or to fit in the designated space.
   4. Substitution would be substantially in the best interest of the Owner in terms of cost, time, or other considerations.

1.06 SUBSTITUTIONS NOT PERMITTED

A. If implied on submittals without first requesting approval thereof.

B. If acceptance will require substantial revision of the Contract Documents.

END OF SECTION

SUBSTITUTION REQUEST FORM

TO: _____

PROJECT: _____

SPECIFIED ITEM:

_____	_____	_____	_____
Section	Page	Paragraph	Description

The undersigned requests consideration of the following:

PROPOSED SUBSTITUTION: _____

Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes description of changes to Contract Documents which proposed substitution will require for its proper installation.

The undersigned states that the following paragraphs, unless modified on attachments, are correct:

1. The proposed substitution does not affect dimensions shown on Drawings.

2. The undersigned will pay for changes to the building design, including engineering design, detailing and construction costs caused by the requested substitution.

3. The proposed substitution will have no adverse effect on other trades, the construction schedule, or specified warranty requirements.

4. Maintenance and service parts will be locally available for the proposed substitution.

The undersigned further states that the function, appearance and quality of the Proposed Substitution are equivalent or superior to the Specified Item.

Submitted by:

Signature _____

Firm _____

Address _____

_____

Date _____

Telephone _____

Attachments:

For use by Design Consultant:

☐ Accepted ☐ Accepted as noted

☐Not Accepted ☐ Received too late

By _____

Date _____

Remarks _____

SECTION 01 31 19

PROJECT MEETINGS

PART 1 GENERAL

1.01 PRE-CONSTRUCTION MEETING

A. Architect/Engineer/Designer, Contractor and Owner will meet prior to start of the Work (within seven (7) days after notice to proceed) to discuss at least the following topics and any others of mutual interest.
   1. Schedule of Values
   2. Permit Status/tree protection/erosion control
   3. List of sub-contractors
   4. Job inspections.
   5. Early purchase of, and/or lead time requirements for material and equipment/prepurchase of equipment
   6. Monthly payment date/SOP for pay requests
   7. Portion of site to be occupied by construction.
   8. Parking/Staging areas
   9. Non-smoking campus requirements
   10. Maintenance of access and safety.
   11. Processing of field decisions and change orders
   12. Labor provisions/labor rates for subs
   13. Material submittals/deferred submittals
   14. Owner access during construction.
   15. Review of Contract Documents/review ADA requirements/cross-slopes
   16. Coordination procedures and separate contracts.
   17. Progress schedules.
   18. Critical Work sequencing.
   19. Safety and emergency procedures/24 hour contact numbers
   20. Security procedures.
   21. Hazardous materials.
   22. Progress meetings.
   23. Contract close-out.

B. Location of Meeting: Project site

1.02 PROGRESS MEETINGS

A. The Contractor will schedule and administer progress meetings and will:
   1. Prepare agendas.
   2. Schedule progress meetings, frequency, time and day to be determined during pre-construction meeting.
   3. Make physical arrangements for and preside at meetings.
   4. Record minutes and include decisions.
   5. Distribute copies of minutes to participants within four (4) days after

meetings.

B. Location of Meetings: Project site.

C. Attendance:
   1. The Owner or Owner's Authorized Representative.
   2. Contractor.
   3. Subcontractors affected by agenda.
   4. Project Architect/Engineer/as necessary.
   5. Owner will attend meeting to ascertain Work is expedited consistent with progress schedule and with Contract Documents.

D. Minimum Agenda:
   1. Review and approve minutes from previous meeting.
   2. Review Work progress since previous meeting.
   3. Discuss field observations, and problems.
   4. Review delivery schedules, construction schedule, and identify problems which impede planned progress.
   5. Review proposed changes.
   6. Material submittals.
   7. Note all new subcontractors performing Work at the job site.

END OF SECTION

SECTION 01 33 23

SHOP DRAWINGS, PRODUCT DATA, SAMPLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Submit to the Owner shop drawings, samples, and product data (such as manufacturer's standard schematic drawings and other literature) when required by individual Specifications sections.

B. Related Work Specified Elsewhere
   1. Instructions to Bidders.
   2. OSU General Conditions.

1.02 SUBMITTAL SCHEDULING

A. For items requiring review by the Owner only, submittals shall be sent to the Owner at least 15 calendar days before the date each is required for fabrication or installation.

B. Submittals to be reviewed by Owner's consultants shall be sent to the Owner at least 20 calendar days before the date each is required for fabrication or installation.

C. Submittals to be reviewed by F.M. Global shall be sent to Owner as directed in individual specification sections.

D. Submittals involving Substitution requests or other modifications requiring review by the Owner and/or the Owner's consultants shall be sent to the Owner at least 20 calendar days before the date each is required for fabrication or installation.

1.03 SUBMITTAL CONTENT AND FORMAT

A. General Requirements:
   1. Shop Drawings: Submit in electronic format and, if requested by Owner's Authorized Representative, submit one reproducible transparency and 1 print of each drawing.
   2. Product Data: Submit electronically, and if requested by Owner's Authorized Representative, up to 6 hard copies.
   3. Samples: Submit the number and type stated in each Specification Section. Submit a minimum of three sets of color samples where color selection is required.
   4. Submittals shall include:
      a. Date and revision dates return date requested.
      b. Project title and number.
      c. The names of the Contractor, subcontractor, supplier, and manufacturer.

d. Identification of product or material, with Specification Section number.
e. Relation to adjacent critical features of work or materials.
f. Field dimensions, clearly identified as such.
g. Applicable standards, such as ASTM number or Federal Specification.
h. Identification of deviations from Contract Documents, and for products accompanied by Substitution request as required by Section 01 25 00.
i. Contractor's stamp legibly signed, essentially as follows:
    1) The undersigned, acting on behalf of the Contractor, certifies that this submittal has been reviewed and is approved; products have been verified as being as specified, field measurements and field construction criteria have been or will be coordinated, and the submittal is in compliance with Contract Documents.

5. Re-submission Requirements:
    a. Revise initial drawings as required and resubmit as specified for initial submittal.
    b. Indicate on drawings any changes which have been made other than those requested by the Owner or the owner's consultants.
6. The Owner may return without review any submittal not meeting the requirements listed above.

B. Shop Drawings:
1. Present data in a clear and thorough manner.
2. Details shall be identified by reference to sheet and detail, schedule or room numbers shown on Contract Documents.
3. Structural items shall be identified by location in the completed structure. Identify details by reference to contract sheet and detail numbers.
4. Minimum sheet Size: 8 ½ x 11".

C. Product Data:
1. Manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations and other standard descriptive data:
    a. Clearly mark each copy to identify pertinent product or models.
    b. Show dimensions, weights, and clearances required.
    c. Show performance data consisting of capabilities, ROM, KW, pressure drops, design characteristics and consumption; conforming as closely as possible to the test methods referenced in the Plans and Specifications.
    d. Show wiring or piping diagrams and controls.
2. Manufacturer's standard schematic drawings and diagrams:
    a. Modify to delete information which is not applicable.
    b. Supplement standard information to provide information specifically applicable to the Work.

D. Samples:
1. Insure that samples are of sufficient size to indicate the general visual effect or color.

2. Where samples must show a range of color, texture, finish, graining, or other property, submit sets of pairs illustrating the full scope of this range.
3. One (1) sample or one (1) set of approved samples will be retained by the Owner; final work will be measured against approved samples.

1.04 QUALITY ASSURANCE

A. Process submittals in ample time for review, as applicable, so as to not delay the Work. All submittals shall be received by the Owner within ten (10) days after pre-construction.

1.05 DEFINITIONS

A. The Owner will mark reviewed materials as follows:
   1. “No Exception Taken,” which means fabrication, manufacture and/or installation may proceed.
   2. “Make Revisions Noted,” which means fabrication, manufacture and/or installation may proceed with revisions as noted.
   3. “Revise and Resubmit,” which means that fabrication, manufacture and/or installation may not proceed.
   4. “Rejected,” which means do not proceed; make arrangements for the review of the proposed Work with the Owner as soon as possible.

1.06 PROCESSING

A. Review submittals, make necessary corrections, and become familiar with the content of the submittals.

B. Mark each item with Contractor’s stamp.

C. Accompany submittals with a transmittal letter bearing the project name, Contractor’s name, number of items, and other pertinent data.

D. Keep one copy of each reviewed submittal on the job site at all times.

E. Be responsible for obtaining and distributing prints of shop drawings to the various suppliers, and the Owner once review process has been completed. Make prints of reviewed shop drawings only from transparencies which carry the appropriate stamp and endorsement.

END OF SECTION

SECTION 01 42 13

ABBREVIATIONS AND SYMBOLS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Words which may be found elsewhere in the Project Manual and Drawings are abbreviated in accordance with the standards set forth in the following table:

A/C	air conditioning
AB	anchor bolt
AC	asphaltic concrete
ACT	acoustical tile
AD	area drain
ADD	addendum
ADD'L	additional
ADH	adhesive
AFF	above finish floor
AGG	aggregate
AL	aluminum
ALLOW	allowable
ALT	alternate
ANOD	anodized
AP	access panel
APPRX	approximate
ARCH	architect(ural)
ASPH	asphalt
AUTO	automatic
AVE	avenue
BD	board
BIT	bituminous
BLDG	building
BLKG	blocking
BM	bench mark, beam(s)
BOT	bottom
BRZ	bronze
BS	both side
CB	catch basin
CEM	cement
CF	cubic foot
CFOI	contractor furnished owner installed
CG	corner guard
CH	ceiling height
CI	cast iron
CJ	control joint
CKBD	chalkboard
CL	centerline
CLG	ceiling
CLR	clear(ance)
CM	construction manager
CMT	ceramic mosaic (tile)
CMU	concrete masonry unit
COL	column
COM	communications
CONC	concrete
CONN	connect(ion)
CONST	construction
CONT	continuous or continue
CONTR	contract(or)
CPT	carpet
CRS	course(s)
CS	countersink
CSMT	casement
CT	ceramic tile
CTR	center
CVG	clear vertical grain
CW	cold water
CWT	ceramic wall tile
CY	cubic yard

D	depth
DEMO	demolish, demolition
DEP	depressed
DF	drinking fountain
DIA	diameter
DIAG	diagonal
DIM	dimension
DISP	dispenser
DIV	division
DL	dead load
DMT	demountable
DN	down
DP	dampproofing
DR	door
DS	downspout
DT	drain tile
DTL	detail
DW	dumbwaiter
DWG	drawing(s)
DWR	drawer
EA	each
EB	expansion bolt
EF	each face
EJ	expansion joint
EL	elevation
ELEC	electric(al)
EMBED	embedment
EMER	emergency
ENCL	enclose(ure)
EP	electrical panel board
EQ	equal
EQUIP	equipment
EST	estimate
EVT	equiviscious temperature
EW	each way
EWC	electric water cooler
EX.EXIT	existing
EXH	exhaust
EXP	exposed
EXT	exterior
FA	fire alarm
FAF	fluid applied flooring
FARF	fluid applied resilient floor
FAS	fasten, fastener
FBD	fiberboard
FBT	finished blowing temperature
FD	floor drain, fire damper
FE	fire extinguisher
FEC	fire extinguisher cabinet
FF	factory finish
FGL	fiberglass
FHMS	flathead machine screw
FHWS	flathead wood screw
FIN	finish(ed)
FLCO	floor cleanout
FLR	floor(ing)
FLUR	fluorescent
FND	foundation
FOC	face of concrete
FOIC	furnished by owner/installed by contractor
FOIO	furnished by owner/installed by owner
FOM	face of masonry
FP	fireproofing, flash point
FPHB	freeze-proof hose bib
FR	fire resistive, fire rated
FRM	frame(d), (ing)
FS	full size
FSS	finished structural slab
FT	foot
FTG	footing
FTS	finished topping slab
GA	gage, gauge
GALV	galvanized
GB	grab bar or gypsum board
GC	general contractor
GI	galvanized iron
GL	glass, glazing
GLS	glass resin wall surfacing
GP	gypsum
HB	hose bib
HBD	hardboard

HC	hollow core
HD	heavy duty
HDR	header
HDW	hardware
HM	hollow metal
HOR	horizontal
HP	high point
HR	hour
HT	height
HTG	heating
HVAC	heating, ventilating, air conditioning
HWD	hardwood
HWH	hot water heater
ID	inside diameter, identification
IN	inch
INCIN	incinerator
INCL	include(d), ion)
INT	interior
INV	invert
JB	junction box
JC	janitor’s closet
JT	joint
KD	kiln dried
KCP	Keene’s cement plaster
KO	knockout
KP	kick plate
LAB	laboratory
LAM	laminate(d)
LAV	lavatory
LBS	pounds
LH	left hand
LL	live load
LONGIT	longitudinal
LP	low point
LW	lightweight
MAX	maximum
MB	machine bolt
M. MECH	mechanic(al)
MFR	manufacture(r)
MH	manhole
Min	minimum, minute
MISC	miscellaneous
MO	masonry opening
MO#	model number
MOD	modular
MPH	miles per hour
MS	machine screw
MTL	metal
MULL	mullion
MWP	membrane waterproofing
NAT	natural, natural finish
NIC	not in contract
NO	number
NOM	nominal
NTS	not to scale
OA	overall
OBS	obscure
OC	on center(s)
OD	outside diameter
OF	overflow
OFCI	owner furnished contractor installed
OFOI	owner furnished owner installed
OHMS	ovalhead machine screw
OHWS	ovalhead wood screw
OPG	opening
OPP	opposite
OZ	ounce(s)
P	paint(ed)
PB	push button
PCF	pounds per cubic foot
PCP	putting coat plaster
PERF	perforate(d)
PL	plate, property line
PLAM	plastic laminate
PLAS	plaster

PNL	panel
PP	push plate
PR	pair
PREP	prepare
PSF	pounds per square foot
PSI	pounds per square inch
PT	point, pressure treated
PTN	partition
PVC	polyvinyl chloride
PWD	plywood
QT	quarry tile
R	rise
RA	return air
RAD	radius
RCP	reflected ceiling plan
RD	roof drain
REF	reference
REFR	refrigerator
REINF	reinforce(ing)
REQ	required
RET'G	retaining
REV	revision(s), revised
RH	right had
RM	room
RO	rough opening
RSF	resilient sheet flooring
SC	solid core
SCHED	schedule
SEC	section
SF	square feet (foot)
SHT	sheet
SHTHG	sheathing
SIM	similar
SL	sleeve
SOG	slab on grade
SPEC	specification(s)
SQ	square
SS	storm sewer
S4S	finished 4 sides
SD	storm drain
ST	steel, street
ST ST	stainless steel
STD	standard
STR	structural
SUPP	supplement
SUPT	support
SUSP	suspended
SV	sheet vinyl
T	tread
TBM	top bench mark
T&G	tongue and groove
TB	towel bar
TC	top of curb
TEL	telephone
TEMP	tempered
THK	thickness
TKBD	tackboard
TO	top of
TP	top of paving
TRANS	transverse
TS	top of slab
TV	television
TW	top of wall
TYP	typical
UNO	unless noted otherwise
VAT	vinyl asbestos tile
VB	vapor barrier
VCT	Vinyl Composition Tile
VERT	vertical
VG	vertical grain
VIF	verify in field
VWC	vinyl wall covering
W	width, wide, water
W/	with
W/O	without
WC	water closet
WD	wood, wood finish
WP	waterproof(ing)
WNS	wainscot
WR	water resistant
WS	waterstop

WW	window wall	WWF	woven wire fabric
WWC	wood wall covering		

B. Words which may be found elsewhere in the Project Manual and Drawings are abbreviated in accordance with the standards set forth in the following table:

&	and
l	angle
@	at
i	diameter, round
"	inches
:	is, shall b
'	feet
z	perpendicular
/	per
%	percent
#	pound, number
X	by (as in 2 by 4)

END OF SECTION

SECTION 01 42 16

DEFINITIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Words which may be found elsewhere in the Contract Documents are defined in accordance with the standards set forth in the following table:

Approve:

Where used in conjunction with Architect's response to submittals, requests, applications, inquiries, reports and claims by Contractor, the meaning of term "approved" will be limited to the Architect's responsibilities and duties as specified in General and Supplementary Conditions. In no case will "approval" by Architect be interpreted as a release of Contract requirements.

As Detailed, As Shown:

Where “as detailed”, “as shown” or words of similar importance are used, it shall be understood that reference to the Drawings accompanying the Specifications is made unless otherwise stated.

As Directed, As Required, As Authorized, As Reviewed, As Accepted:

Where “as directed”, “as required”, “as authorized”, “as reviewed”, “as accepted” or words of similar importance are used, it shall be understood that the direction, requirement, permission, authorization, review, or acceptance of the Architect is intended, unless otherwise stated.

As Indicated:

Where “as indicated” is used it shall be understood that reference to Drawings and/or Specifications is made unless otherwise stated.

Directed, Requested, etc.:

Terms such as "directed," "requested," "authorized," "selected," will be understood as "directed by Architect," "requested by Architect," and similar phrases shall not be interpreted to extend Architect's responsibility into Contractor's responsibility for construction supervision.

Furnish:

Except as otherwise defined in greater detail the term "furnish" is used to mean supply and deliver to project site, ready for unloading, unpacking, assembly, installation, etc., as applicable in each instance.

Indicated:

The term "indicated" is a cross-reference to graphic representations, notes or schedules on drawings, to other paragraphs or schedules in the specifications and to similar means of recording requirements in Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used in lieu of "indicated," it is for purpose of helping reader locate cross-reference and no limitation of location is intended except as specifically noted.

Install:

Except as otherwise defined in greater detail, the term "install" is used to describe operations at project site including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations, as applicable in each instance.

Installer:

The term "installer" is defined as the entity (person or firm) engaged by Contractor, or its subcontractor or subsubcontractor for performance of a particular unit of Work at project site, including installation, erection, application and similar required operations. It is a general requirement that such entities (Installers) be expert in operations they are engaged to perform.

Provide:

Except as otherwise defined in greater detail, term "provide" means furnish and install, complete and ready for intended use, as applicable in each instance.

END OF SECTION

SECTION 01 42 19

REFERENCE STANDARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Quality Assurance.

B. Location of References.

C. Schedule of References.

1.02 QUALITY ASSURANCE

A. For products or quality of work specified by association, trade, or federal standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard by date of issue current on date of Contract Documents.

C. General Applicability of Standards: Except where Contract Documents include more stringent requirements, applicable standards of the construction industry have the same force and effect as if bound or copied directly into Contract Documents.

D. Such standards are made a part of the Contract Documents by reference.

E. Individual sections indicate which codes and standards the Contractor must keep at the project site, available for reference.

F. Referenced industry standards take precedence over standards which are not referenced but recognized in industry as applicable.

G. Non-referenced standards are not directly applicable to the Work, except as a general requirement of whether the Work complies with standards recognized in the construction industry.

1.03 LOCATION OF REFERENCES

A. Valley Library, Oregon State University.

1.04 SCHEDULE OF REFERENCED ASSOCIATIONS

AIA	American Institute of Architects WWW.AIA.ORG
AISC	American Institute of Steel Construction WWW.AISC.ORG
AISI	American Iron and Steel Institute WWW.STEEL.ORG
ANSI	American National Standards Institute WWW.ANSI.ORG
APA	American Plywood Association WWW.APAWOOD.ORG
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers WWW.ASHRAE.ORG
ASTM	American Society for Testing and Materials WWW.ASTM.ORG
AWPA	American Wood Protection Association WWW.AWPA.COM
AWS	American Welding Society WWW.AWS.ORG
BIA	Masonry Institute of America WWW.MASONRYINSTITUTE.ORG
BOLI	Oregon Bureau of Labor and Industries WWW.BOLI.STATE.OR.US
CCB	Construction Contractors Board WWW.OREGON.GOV.CCB/
CDA	Copper Development Association WWW.COPPER.ORG
CISPI	Cast Iron Soil Pipe Institute WWW.CISPI.ORG
CSI	Construction Specification Institute WWW.CSINET.ORG

DEQ	Department of Environmental Quality (Oregon) WWW.OREGON.GOV/DEQ/
DHI	Door and Hardware Institute WWW.DHI.ORG
DOT	Department of Transportation WWW.DOT.GOV
EPA	U.S. Environmental Protection Agency WWW.EPA.GOV
FM	Factory Mutual System WWW.FMGLOBAL.COM
FS	Federal Specification General Services Administration Specifications and Consumer Information Distribution Section (WFSIS) WWW.GSA.GOV/PORTAL/CONTENT/103856
IBC	International Building Code WWW.ICCSAFE.ORG
ICBO	International Conference of Building Officials PUBLICECODES.CITATION.COM/ICOD/IBG/INDEX.HTM
IRS	Internal Revenue Service WWW.IRS.GOV
ISA	Instrumentation Systems and Automation Society WWW.ISA.ORG
NAAMM	National Association of Architectural Metal Manufacturers WWW.NAAMM.ORG
NBFU	National Board of Fire Underwriters WWW.NFPA.ORG
NEC	National Electric Code WWW.NECPLUS.ORG
NEMA	National Electrical Manufacturers' Association WWW.NEMA.ORG
NESC	National Electrical Safety Code WWW.IEEE.ORG

NFPA	National Fire Protection Association WWW.NFPA.ORG
NRCA	National Roofing Contractors' Association WWW.NRCA.NET
OAR	Oregon Administrative Rules ARCWEB.SOS.STATE.OR.US/404.HTML
OESP	State of Oregon Electrical Specialty Code http://www.bcd.oregon.gov/programs/online_codes.html
ORS	Oregon Revised Statutes LANDRU.LEG.STATE.OR.US/ORS/
OSHA	Occupational Safety and Health Administration WWW.OSHA.GOV
OSSC	Oregon Structural Specialty Code http://www.bcd.oregon.gov/programs/online_codes.html
PS	Product Standard STANDARDS.GOV/STANDARDS.CFM
SDI	Steel Door Institute WWW.STEELDOOR.ORG
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association WWW.SMACNA.ORG
SPRI	Single Ply Roofing Institute WWW.SPRI.ORG
SSPC	Steel Structures Painting Council WWW.SSPC.ORG
SWRI	Sealing, Waterproofing and Restoration Institute WWW.SWIRONLINE.ORG
UBC	Uniform Building Code (See ICBO)
UFC	Uniform Fire Code WWW.NFPA.ORG
UL	Underwriters' Laboratories, Inc. WWW.UL.COM

UMC	Uniform Mechanical Code WWW.UBC.COM
UPC	Uniform Plumbing Code WWW.UBC.COM
WHL	Warnock Hersey Laboratories WWW.INTEK.COM/MARKS/WH/
WCLIB	West Coast Lumber Inspection Bureau WWW.WCLIB.ORG
WWPA	Western Wood Products Association WWW.WWPA.ORG

END OF SECTION

SECTION 01 45 00

QUALITY CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Codes, regulations and permits.

B. Procedures for quality control.

1.02 OWNER RESPONSIBILITIES

A. Owner will employ and pay for services of an independent testing laboratory to perform inspection, sampling and testing as required by local building authority.

B. Owner's Authorized Representative will provide on-site observation during construction.

1.03 CODES, REGULATIONS AND PERMITS

A. All Work shall conform with the Oregon Structural Specialty Code (OSSC) based on the International Building Code (IBC), as amended by the State of Oregon Building Codes Division and the edition designated by the governing authority.

B. Contractor shall comply with all applicable state and local construction codes.

C. References to codes, Specifications and standards referred to in the Contract Documents shall mean, and are intended to be, the latest edition, amendment or revision of such reference standard in effect as of the date of these Contract Documents.

D. The Owner shall be responsible for all permits and City of Corvallis plan review fees; the Contractor shall be responsible for all licenses and associated fees required for the Project.

E. Contractor shall arrange and attend all required permit inspections and furnish evidence of approved City inspection reports per Section 01 77 00.

1.04 QUALITY OF WORK

A. It is the true and specific intent of these Specifications that quality of Work on all phases of the construction and embracing all the trade sections shall be of high quality performed by workers skilled in their trade and performing their Work only according to the standard of best practice of the trade.

B. All manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with manufacturer's directions unless otherwise specified.

C. If Work is required in a manner to make it impossible to produce first quality Work, or should discrepancies appear among Contract Documents, request interpretation from Architect before proceeding with Work.

D. Failure to secure interpretation may cause rejection by Architect or owner of installation.

1.05 LAYOUT

A. Be responsible for properly laying out the Work and for lines and measurements for the Work.

B. Verify the figures shown on the drawings before laying out the Work and report errors or inaccuracies to the Architect before commencing Work.

C. Strict compliance with maximum slopes is required. Accessible parking spaces and adjacent access aisles with slope exceeding 2% in any direction, as determined by OSU, shall be removed and replaced by the contractor at their expense.

D. Strict compliance with maximum slopes is required. New sidewalks exceeding 1:20 slope or with cross slope exceeding 2%, as determined by OSU, shall be removed and replaced by the contractor at their expense. Ramps exceeding 1:16 slope or with cross slope exceeding 2%, as determined by OSU, shall be removed and replaced by the contractor at their expense.

1.06 SUPERVISION

A. The Contractor shall maintain effective supervision on the project at all times Work is being performed.

B. The superintendent shall be the same person throughout the project and shall attend the preconstruction conference.

1.07 INSPECTIONS AND TESTING

A. Contractor shall notify the Owner at least twenty-four (24) hours in advance of any required progress inspection or final inspection including final punch list inspection.

B. Cooperate with laboratory personnel, provide access to Work and furnish incidental equipment material and labor required for field testing and sample taking.

1.08 EVALUATION OF TESTS AND INSPECTIONS

A. Results of laboratory and/or field control tests and inspections shall be the principal basis upon which satisfactory completion of Work shall be judged.

B. If results of tests and inspections indicate Work is below requirements of Contract Documents, that portion of Work is subject to rejection.

1.09 ADJUSTMENTS

A. Remove and replace Work so rejected at Contractor's expense including costs of subsequent tests and inspections until Work meets requirements of Contract Documents.

B. The Owner reserves the right to perform any testing as may be required to determine compliance with the Contract Documents.

C. Costs for such testing will be the Owner's responsibility unless testing indicates noncompliance. Cost for such testing indicating noncompliance shall be borne by the Contractor.

D. Noncomplying Work shall be corrected and testing will be repeated until the Work complies with the Contract Documents.

E. Contractor will pay costs for retesting noncomplying Work.

END OF SECTION

SECTION 01 51 00

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This Section specifies requirements for temporary services and facilities, including utilities, construction and support facilities, security and protection.

1.02 REQUIREMENTS OF REGULATORY AGENCIES

A. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction.

B. Standards: Comply with NFPA Code 241, "Building Construction and Demolition Operations", ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition".

C. Electrical Service: Comply with NEMA, NEC and UL standards and regulations for temporary electric service; install service in compliance with National Electric Code (NFPA 70).

D. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use; obtain required certifications and permits if required.

1.03 PROTECTION

A. Protect sidewalks, asphalt paving, concrete, trees, shrubs, and lawn areas at all times from damage resulting from construction activities.

B. Prevent materials from clogging catch basins and yard drains; leave drains clean and in proper working condition.

C. Protect Existing Irrigation Systems:
   1. In the event damage occurs to an underground irrigation system as a direct result of a Contractor's activities, the Contractor shall repair/replace or be assessed a charge at the discretion of the Owner.
   2. If repairs are to be made by the Contractor, the repairs will be inspected by the Owner’s Authorized Representative prior to backfilling.
   3. Any galvanized pipe that requires repair shall be repaired at a threaded coupling, not by use of a compression coupling.

D. Protect Existing Air Handling Systems:
   1. Contractor shall be responsible for protection of the cleanliness of the existing air handling system at all times. This protection shall include:
      a. During site work or building demolition, prefilters shall be provided and maintained on all building outside air intakes at all times throughout the

construction duration.

b. During any interior work that may create dust in the interior space and adjacent corridor/hallways, air filters shall be provided and maintained on all affected air return and exhaust grilles. Where air flow in or out of the space is not required, all air duct openings shall be temporarily blanked off with plywood or sheet metal.
c. Prior to starting any work, the Contractor shall record and submit to the Owner's Authorized Representative, pressure readings across all existing air handler air filter banks before installation of new prefilters.
d. Upon completion of all Work affecting existing air handling systems, the Contractor shall remove all temporary filters, covers and associated parts and restore the system to its original operating condition unless otherwise stated elsewhere in the Contract Documents

E. Clean, repair, resurface, or restore existing surfaces to their original, or better, condition, or completely replace such surfaces to match existing, where damaged by construction operations.

F. Security is the responsibility of the Contractor.

G. Construction Debris:
1. Debris shall not be allowed to remain around the buildings during performance of Work, but shall be disposed of as rapidly as it accumulates.
2. On completion of Work, the buildings and grounds shall be left in a condition that is equal to or better than original condition.
3. In case of failure to do so, the Owner may remove rubbish and charge the cost to the Contractor.

H. The Contractor shall manage a safe job environment for both the safety of all the people around the Work site as well as the safety of the Owner's and general public's property.

I. The Contractor shall provide and maintain suitable barricades, shelters, lights, and danger signals during the progress of the Work; they shall meet the requirements of the local building code and OSHA.

1.04 DRAINAGE

A. Verify that all rain drains in the construction areas are in working order and notify the Owner's Authorized Representative in writing of any rain drains that are plugged, prior to the start of the Work.

B. Start of Work will be considered as acknowledgment that all drains are clear and in good working order.

C. All drains shall be left in a clean and proper working condition.

1.05 CONSTRUCTION PROJECT SAFETY FORM

A. Contractor shall submit to the Owner, prior to signing the Contract, the completed "Construction Project Safety Form", which is provided with instructions at the end of this Section.

1.06 TEMPORARY UTILITIES

A. Temporary Utilities:
   1. Prepare a schedule indicating dates for implementation and termination of each temporary utility.
   2. At the earliest feasible time, when acceptable to the Owner, change over from use of temporary service to use of the permanent service.

B. Conditions of Use:
   1. Keep temporary services and facilities clean and neat in appearance.
   2. Operate in a safe and efficient manner.
   3. Take necessary fire prevention measures.
   4. Do not overload facilities or permit them to interfere with progress.
   5. Do not allow hazardous, dangerous or unsanitary conditions, or public nuisances to develop or persist on the site.

C. Electrical Service:
   1. Service limited to 20 amp 120V circuits will be paid for by the Owner.
   2. Connection to the service shall be the responsibility of the Contractor, with the Owner's approval.
   3. Coordinate with the Owner's Authorized Representative.

D. Water Service:
   1. Service in reasonable quantities for the Project will be paid for by the Owner.
   2. Connection to the service shall be the responsibility of the Contractor, with the Owner's approval.
   3. Coordinate with the Owner's Authorized Representative.

1.07 TEMPORARY SUPPORT FACILITIES

A. Temporary Sanitary Facilities:
   1. Provide and maintain an adequate number of facilities for the use of all persons employed on the Work during construction.
   2. Provide enclosed, weatherproof facilities with heat as required.
   3. Use of new or existing Owner's facilities will not be permitted.

B. Temporary Heat and Ventilation:
   1. As necessary, provide temporary heat and ventilation required by construction activities, for curing or drying of completed installations or protection of installed construction from adverse effects of low temperatures

or high humidity. Select safe equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce the ambient condition required and minimize consumption of energy.

C. Telephone Equipment: Provide telephone communications at project site.

D. Existing Services:
   1. Do not interrupt any existing service.
   2. Prior request and approval of the Owner's Representative will enable the Owner to shut down any utility required by the Work.
   3. Contractor shall not shut down utilities.

1.08 TEMPORARY BARRIERS AND ENCLOSURES

A. Provide barriers and fencing to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage.

B. Provide Commercial grade chain link fence construction.

C. Provide 6 foot high fence around construction site as directed by Owner’s Authorized Representative; equip with vehicular and pedestrian gates with lock.

D. Exterior Closures: Provide temporary secured, weather-tight closures at exterior openings, to permit acceptable working conditions and protection of the Work.

E. Interior Closures:
   1. Provide temporary floor to ceiling partitions (not plastic sheeting) and ceilings as required to separate work areas from Owner occupied areas, to prevent penetration of dust and moisture into Owner occupied areas, to reduce construction noise, and to prevent damage to existing materials and equipment.
   2. Paint surfaces exposed to view from Owner occupied areas.

1.09 ODORS

A. Work that causes excessive odors shall be performed only after coordination with the Owner’s Authorized Representative. Filtering of air intakes to units may be required to prevent odors and vapors from entering the buildings.

B. Contractor shall provide 7 days advance notice to the Owner’s Authorized Representative in order for advance notice to be forwarded to building occupants. Work stoppage may occur if advance notification has not been coordinated or odors and vapors from the work are found to generate complaints from building occupants.

1.10 FIRE SAFETY

A. Ensure that required exit routes remain unobstructed while building is occupied.

B. Abide by all fire safety requirements for buildings under construction, alteration

or demolition as required by Article 87, of the Uniform Fire Code as adopted by the State of Oregon.

C. An emergency telephone shall be provided on site. Cellular telephone equipment is acceptable.

D. Fire Suppression Equipment:
   1. Install and maintain temporary fire protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10 "Standard for Portable Fire Extinguishers", and NFPA 241 "Standard for Safeguarding Construction, Alterations and Demolition Operations".
   2. Maintain equipment in working condition with current inspection certificate attached to each.
   3. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell.
   4. Store combustible materials in containers in fire-safe locations.
   5. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways, and other access routes for fighting fires.
   6.
   6. Provide continual supervision of welding operations, combustion type temporary heating units, and similar sources of fire ignition.
   7. When possible, relocate hot work to a designated hot work area.
   8. If the materials or equipment cannot be relocated to a designated hot work area, use the least hazardous form of hot work that will get the job done and prepare the area properly.
   9. Manage mobile hot work using the formal hot work permit system. (mentioned in the next bullet point and also a directive in the OSU Hot Work Safety Program)
   10. Make sure both fire protection and hot work equipment work properly.
   11. Train all personnel involved in hot work operations and activities so that they have the understanding, knowledge, and skills necessary to safely perform their jobs.

1.11 CONSTRUCTION AIDS

A. Scaffolding: comply with applicable OSHA requirements.

B. Material Handling Equipment:
   1. Provide necessary cranes, hoists, towers, or other lifting devices.
   2. Use only experienced operators.
   3. Remove equipment as soon as possible after task is ended.
   4. Coordinate placement of such equipment with Owner’s Authorized Representative.
   5. Obtain required permits and meet requirement of governing authorities

regarding applicable regulations.

C. Materials or debris shall not be allowed to free fall from building.

D. The use of chutes or conveyors must be approved by Owner.

1.12 TEMPORARY CONTROLS

A. Water Control:
   1. Maintain excavations free of water.
   2. Provide, operate, and maintain necessary pumping equipment.

B. Protection:
   1. Protect installed Work and provide special protection where specified in individual specification sections.
   2. Prohibit traffic or storage upon waterproofed or roofed surfaces.

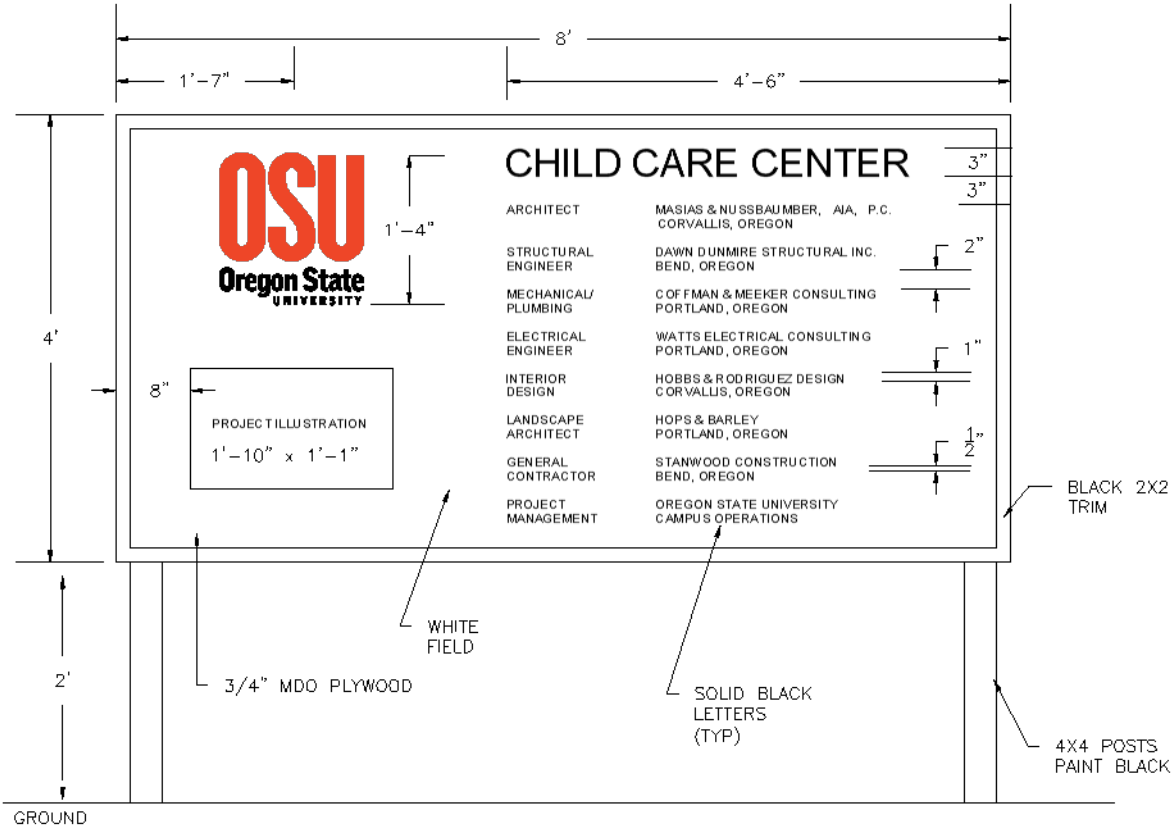
C. Security:
   1. Provide security and facilities to protect Work and existing facilities and Owner's operations from unauthorized entry, vandalism, or theft.
   2. Coordinate operations with Owner's Authorized Representative.

D. Temporary Traffic Control /Pedestrian Accessibility
   1. A continuous route for all pedestrians, including persons with disabilities and bicyclists, shall be maintained at all times. When existing pedestrian facilities are disrupted, closed, or relocated in a construction zone, temporary pedestrian facilities shall be provided.
   2. Temporary pedestrian facilities should be safe and accessible. There should be no curbs or abrupt changes in grade that could cause tripping or be a barrier to wheelchair use.
   3. Signage shall be provided directing people to the temporary accessible route. The signage shall include the International Symbol of Accessibility.
   4. Contractors shall not block temporary walkways with vehicles, equipment, construction materials, signs, trash, or other objects that might prohibit pedestrian passage.
   5. Construction equipment and equipment operation must be separated from any open walkways. At construction zones, pedestrian fences or other protective barriers shall be provided to prevent access into the construction zone.

1.13 PROJECT SIGNAGE

A. Contractor is permitted to post only one project identification sign based on the following example:

OSU TYPICAL JOB SIGN



1.14 PREPARATION

A. Consult with Owner to review jobsite areas required for field offices, material storage and stockpiles, equipment storage, access to different locations, etc.

1.15 PERFORMANCE

A. Confine equipment, apparatus, and storage of material to work limits. The Owner will not be responsible for protection of materials and equipment from damage, pilfering, etc.

B. Install temporary facilities in such a manner that the installed work will not be damaged.

C. Do not use facilities of existing building unless authorized in writing by the Owner.

D. Effective September 1, 2012, OSU became a non-smoking campus and smoking is prohibited on all Campus property.

E. Keep facilities well maintained.

F. Relocate temporary facilities as required during job progress.

G. At Substantial Completion, clean and renovate permanent facilities that have been used during the construction period, including but not limited to:
   1. Replace air filters and clean inside of ductwork and housings.
   2. Replace significantly worn parts and parts that have been subject to unusual operating conditions.
   3. Replace lamps that are burned out or noticeably dimmed by substantial hours of use.

Oregon State University Construction and Maintenance Safety Requirements

EH&S, 130 Oak Creek Building, Corvallis, OR 97331-7405, (541) 737-2505, FAX (541) 737-9090

Complete OSU Construction and Maintenance Safety Form - Send completed documents (including Site Safety Plan and all separate answer pages) to Construction Contract Administration along with the signed contract and bonds.

Project Isolation - All construction and remodeling activities regardless of size and/or scope must be fenced, barricaded, or otherwise protected to restrict entrance and to ensure the safety of those in the general area. See isolation requirements.

Site Safety Plan - A site safety plan will be required and will address:

- General Information
- Emergency Information
- Key Organization Personnel
- Hazard Evaluation/Facility Impact
- Emergency Procedures
- Work Zones
- Security Measures
- Fire Protection

A model plan is attached. This form can be used if another plan has not already been prepared. Contact OSU Environmental Health & Safety for more information 737-2505.

Isolation Requirements

General: All construction, maintenance, and remodeling activities, regardless of size or scope, must be fenced, barricaded, or otherwise isolated to restrict entrance and to ensure the safety of those in the general area.

Outdoor Activities: Outdoor projects require the following perimeter isolation:

- A six foot chain-link fence, with controlled access points, extending in all directions around the excavation or building site such that no area of the construction is accessible to pedestrians or unauthorized personnel or vehicles.
- Isolation area will include vehicle loading and unloading areas.
- At the University's option, other barricading plans may be accepted. These may apply to projects such as road resurfacing, parking lot striping, exterior building water proofing, deliveries, etc. Contact EH&S regarding other barricading plans.

Overnight: Any excavation across or adjacent to sidewalks or pathways which must be left open overnight, must be identified with working, blinking construction lights in addition to solid barricades

Indoor Activities: Indoor construction or maintenance projects which will create dust, potentially

hazardous fumes or vapors, or offensive odors are subject to the following isolation:

- Areas where existing doors can provide isolation will be labeled "Construction Area--Authorized Personnel Only ".
- All other areas will be isolated by a solid barrier. The minimum barrier allowed is 4 mil poly sheeting sealed to prevent migration of dust.
- Mechanical ventilation may be required.
- A solid wall is required if building envelope is opened to the outside.

Contractor Responsibilities

- The contractor will provide all barricading, isolation, and fencing material. OSU will not provide any materials.
- The contractor will also provide all appropriate warning and detour signs when sidewalks, exits, or roads are closed.
- Contractor will provide all other construction area signs.

OSU Construction and Maintenance Safety Form

Send completed safety documents to Construction Contract Administration with contract and bonds.

Date: _____ Project: _____

Start Date: _____ Completion date: _____

Contractor: _____ Contact: _____

Work # _____ 24 hr #: _____

OSU Project Mgr: _____ Work / 24hr #'s: _____

Dept Contact: _____ OSU EH&S Contact: _____

Preconstruction meeting? **Y** **N** Date/Time/Location: _____

For the following items, prepare answers on a separate sheet for all items marked "Yes". Precede each answer with the appropriate item number. All boxes need to be checked

Y	N	For This Project	If YES, then:
		1 Will any confined spaces be accessed?	Describe location of entry Specify location of permit Notify EH&S prior to entry See SAF 209
		2 Will hot work be performed (welding, cutting, brazing, etc.)?	Provide min. 5# 2A10BC extinguisher within 10 ft If indoors - provide and describe ventilation See SAF 214
		3 Any products brought to campus?	Provide MSDS on site prior to first use; Make available to OSU on request
		4 Will lead paint be impacted?	Describe plan to limit contamination
		5 Will asbestos-containing-material be impacted?	Coordinate with OSU asbestos manager
		6 Will <u>any</u> materials (construction debris, soil, water, etc) be removed from campus?	Describe in detail identity and disposition of material (how, where)
		7 Any open trenches or holes?	Describe isolation procedures (see Page 1)
		8 Will a crane be used?	Describe crane safety plan (include plan to prevent loads above occupied areas)
		9 Is this project building a new facility, a major remodel?	Provide Site Safety plan Describe isolation procedures (see Page 1)
		10 Is this a minor remodeling project?	Provide, or fill out model Site Safety Plan form (see Page 3) Describe isolation procedures (see Page 1)
		11 Will air contamination be produced (e.g. dust, CO, solvent vapors, VOCs, odors)?	Describe project ventilation and isolation Indicate position of building air intake(s)
		12 Will there be noise > 85 dB?	Describe noise minimization plan
		13 Will this project use a scaffold or an external chute?	Describe isolation, dust control, installation
		14 Will this project involve a working surface >6' above a lower level	Describe fall protection
		15 Will any "blind" saw-cuts or penetrations be made in existing foundations, floors, ceilings and/or walls?	Describe plan for detecting and protecting power lines or other building utility lines.

EH&S Review: _____ Date: _____

Model Site Safety Plan

1. General Information

Contractor name_____
Address_____
City, State, Zip_____
Site Safety Officer_____ Project Dates_____
Project Name_____

2. Emergency Information

Emergency Response	911	OSU EH&S and OSU Facilities Services must be notified in the event of an emergency
Hazardous Materials Spill		
MSDS on-site location		
OSU EH&S	(541) 737-2505	
Facilities Services	(541) 737-2969	

3. Contractor Key Personnel

	Name	Phone	Emergency Contact
Company Owner			
Project Manager			
Job Supervisor			
Site Safety Officer			
Other Responsible Individual			
24 Hour Notification			

List of employees on site _____

_____

_____

4. Hazard Evaluation/ Facility Impact	
Physical	**Yes / No**
Heavy Equipment	
Noise	
Heat	
Elevation	
Radiation Materials	
Excavations	
Underground Utilities	
Confined Spaces	
Fire Prevention	
Electrical	

5. Emergencies
Services
Evacuation Route
First Aid Location
Hazardous Materials Spill Procedure

6. Work Zones

Material Storage_____
Parking locations_____
Individuals with OSU keys_____
Access issues_____

7. Security measures_____

8. Fire protection

END OF SECTION

SECTION 01 56 39

TREE AND PLANTING PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Section includes temporary fencing, barricades, and guards to protect trees, plants and groundcovers not indicated to be removed, as necessary and required to prevent damage above and below grade.

1.02 DEFINITIONS

A. Dripline: Outer perimeter of branches of any tree or plant.

B. Groundcover: Includes but not limited to plants and grass.

1.03 PERFORMANCE REQUIREMENTS

A. The Contractor shall exercise utmost care to protect existing trees and plants designated to remain and shall comply with all protection requirements provided by Owner and City of Corvallis as conveyed through the Owner's Authorized Representative.

B. The Contractor shall install tree protection fencing as detailed and shall prevent damage to shrubs, groundcover, trees, root systems, soil, bark, foliage, branches and limbs due to construction activities, including but not limited to:
   1. Soil contamination, erosion, and compaction.
   2. Excessive wetting, and ponding due to storm water, and construction run-off.
   3. Alteration of grade, stockpiling of soil, debris, and materials.
   4. Damage to soil, roots, bark, trunk, limbs, branches, and foliage.
   5. Prevent unauthorized cutting, breaking, skinning and bruising of roots, branches, and bark.

1.04 SUBMITTALS

A. Procedural proposal for tree and plant protection, describe methods of protection, and stabilization, provide drawings and supporting documentation as directed.

B. Contractor's Condition Inspection; include written report and color photographs.

1.05 PROJECT CONDITIONS

A. Install protection during initial mobilization at the Work site, and maintain until substantial completion.

B. If, in the opinion of the Owner's arborist, additional protection is required, the

Contractor shall install additional fencing as directed and without cost to the Owner.

C. The location and requirements for additional fencing shall be determined by the Owner's arborist prior to, and at any time during the course of the Work.

D. Fencing:
   1. Fencing shall be installed at the tree and plant protection areas as detailed on Plans, or as directed by the Owner's Authorized Representative.
   2. Tree and plant protection fences shall remain in place until all Work is completed and shall not be removed or relocated without the approval of the Owner's Authorized Representative.

E. Driving and Parking:
   1. Not permitted off paved surfaces without the approval of the Owner's Authorized Representative.
   2. When approved, the Contractor shall place plywood of sufficient thickness and width to support vehicles and prevent rutting on the area to be driven on.
   3. Care shall also be taken with respect to existing lawn sprinkler systems.

F. Storage of materials and Debris: Not permitted off paved surfaces.

PART 2 PRODUCTS

2.01 MANUFACTURED COMPONENTS

A. Chain Link Fencing: 11 gage galvanized chain link, six feet. tall, and 1.5 inch inside diameter galvanized steel line posts and 2.5 inch inside diameter corner posts, provide lockable gates as necessary.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Inspect trees, plants, and groundcovers, document existing conditions prior to installation of protection.

3.02 EXECUTION

A. Pruning and Cutting of Roots, Branches and Foliage:
   1. Review conditions with Architect or Owner prior to need for work, and proceed as directed.
   2. All pruning to be done by Owner's landscape maintenance personnel or ISA Certified arborist under the direction of Owner's Landscape Management Department.

3. Perform pruning and cutting with sharp instruments intended for the purpose; do not break or chop.

B. Root Cuttings:
   1. Carefully and cleanly cut roots and branches of trees indicated to be left standing where such roots and branches obstruct new construction.
   2. Protect exposed roots with wet burlap until they can be covered with soil.

C. Excavation and Trenching Within Drip Lines:
   1. Permitted where indicated, and at other specifically approved locations.
   2. Tunnel under or around roots by hand digging or boring.
   3. Do not cut main lateral roots and tap roots over one inch diameter; cut smaller roots which interfere with installation of new Work.
   4. Do not allow exposed roots to dry out before permanent backfill is placed; provide temporary earth cover, or pack with peat moss and wrap with burlap.
   5. Water and maintain roots in moist condition and temporarily support and protect from damage until permanently relocated and covered with backfill.

D. Existing Grading: Maintain within drip line of trees and plants unless otherwise indicated on the drawing and approved by the Owner's Authorized Representative.

E. Tree Protection:
   1. Provide temporary fence complying with Section 01 51 00 for protection of trees to remain.
   2. Extend fencing ten feet beyond dripline, except where greater distance is required for protection of Elm trees.
   3. Prevent entry into protected areas except as authorized in writing by the Owner's Authorized Representative.

3.03 REPAIR AND REPLACEMENT OF TREES AND PLANTS

A. Repair trees or shrubs damaged by construction operations as directed by the Owner.

B. Make repairs promptly after damage occurs to prevent progressive deterioration of damaged trees.

C. Damaged Trees, Shrubs and Groundcover:
   1. Replace where Owner's Authorized Representative determines restoration to normal growth pattern is not possible; plant and maintain as directed.
   2. Replacement trees up to 13 inches caliper and shrubs up to 4 feet tall: Same size as damaged tree or shrub, species selected by the Owner's Authorized Representative.
   3. Trees over 13 inch caliper and shrubs greater than 4 feet tall: Compensate

Owner as determined by an acceptable consulting arborist registered with the American Society of Consulting Arborists.

4. Replacement groundcovers: Same size and quality as damaged species selected by Owner's Authorized Representative.

END OF SECTION

SECTION 01 57 13
TEMPORARY EROSION AND SEDIMENT CONTROL

1.01 SECTION INCLUDES

A. Prevention of erosion due to construction activities.

B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.

C. Restoration of areas eroded due to insufficient preventive measures.

D. Compensation of Owner for fines levied by authorities having jurisdiction due to non-compliance by Contractor.

E. Requirements of NPDES 1200-C Erosion and Sediment Control Permit issued by Oregon DEQ.

1.02 RELATED REQUIREMENTS

A. Section 31 1000 - Site Clearing: Limits on clearing; disposition of vegetative clearing debris.

B. Section 31 2200 - Grading: Temporary and permanent grade changes for erosion control.

C. Section 31 3700 - Riprap: Temporary and permanent stabilization using riprap.

D. Section 32 1123 - Aggregate Base Courses: Temporary and permanent roadways.

E. Section 32 9219 - Seeding: Permanent turf for erosion control.

1.03 REFERENCE STANDARDS

A. EPA (NPDES) - National Pollutant Discharge Elimination System (NPDES), Construction General Permit; Current Edition.

1.04 PERFORMANCE REQUIREMENTS

A. Comply with requirements of EPA (NPDES) for erosion and sedimentation control, as specified by the NPDES, for Phases I and II, and in compliance with requirements of Construction General Permit (CGP), whether the project is required by law to comply or not.

B. Also comply with all more stringent requirements of State of Oregon, DEQ Erosion and Sedimentation Control Manual.

1. Owner to secure NPDES 1200-C Oregon DEQ Permit and pay all associated fees.
    a. Permit shall remain in effect until project completion (all phases).
    b. Contractor is responsible for continual permit compliance until project completion (all phases).
2. Contractor shall follow all requirements set forth by DEQ, including, but not limited to the following:
    a. Provide full-time inspection and visual monitoring reports.
    b. Continuous Erosion and Sediment Control Plan drawing updates throughout project duration.
        1) ECS drawings are found with Drawings for reference and basis of continual compliance.
        2) All changes / revisions to Permit Drawings must be submitted to Architect and DEQ.
        3) Develop and follow an Erosion and Sedimentation Prevention Plan and submit periodic inspection reports.

C. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.

D. Timing: Put preventive measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.

E. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.
    1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.
    2. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall events that might occur in 25 years.

F. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
    1. Control movement of sediment and soil from temporary stockpiles of soil.
    2. Prevent development of ruts due to equipment and vehicular traffic.
    3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.

G. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.

1. Prevent windblown soil from leaving the project site.
2. Prevent tracking of mud onto public roads outside site.
3. Prevent mud and sediment from flowing onto sidewalks and pavements.
4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.

H. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
   1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
   2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.

I. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
   1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.

J. Open Water: Prevent standing water that could become stagnant.

K. Maintenance: Maintain temporary preventive measures until permanent measures have been established.

1.05 SUBMITTALS

A. See Section 01 3323 - Shop Drawings, Product Data, Samples for submittal procedures.

B. Contractor to update Erosion and Sedimentation Control Plan and Schedule as required by permitting agency.
   1. Submit installation phasing plan or revisions not less than 7 days prior to anticipated start of clearing, grading, or other work involving disturbance of ground surface cover. Include:
      a. Schedule of temporary preventive measures, in relation to ground disturbing activities.
      b. Other information required by law.
   2. Contractor shall submit copies of any changes made to Erosion and Sedimentation Control Plan and Schedule throughout duration of project.

C. Certificate: Mill certificate for silt fence fabric attesting that fabric and factory seams comply with specified requirements, signed by legally authorized official of manufacturer; indicate actual minimum average roll values; identify fabric by roll identification numbers.

D. Inspection Reports: includes actual reports performed and furnished by others.
   1. Contractor to submit name, certification number and contact information for person responsible for ESC inspections per permitting agency requirements.
   2. Submit report of each inspection:
      a. Identify each preventive measure
      b. Indicate condition of site and preventative measures
      c. Specify maintenance or repair required and accomplished.
      d. Any other requirements as directed by permitting agency.

E. Maintenance Instructions: Provide instructions covering inspection and maintenance for temporary measures that must remain after Substantial Completion.

PART 2 PRODUCTS

201 MATERIALS:

A. All materials shall be submitted for approval prior to installation.

B. Mulch: Protective layer of straw or other suitable mulch material to the soil surface. Mulch shall be free of all weed or plant seeds and contain no substances detrimental to plant life.
   1. Cellulose mulch, produced from virgin wood or straw, processed so the fibers remain uniformly suspended under agitation in water. The fibers shall have moisture-absorption and percolation properties.
      a. Straw mulch used for non-hydroseeding applications shall be from bent grass, bluegrass, fescue or other rye grass singly or in combination. Straw shall not be moldy, caked, decayed, or of otherwise low quality.
   2. Provide certification that the mulch material is free of noxious weed seeds or plant parts.
   3. Straw or hay.
   4. Erosion control matting or netting.

C. Grass Seed for Permanent Cover: See Section 32 9219 Seeding

D. Straw Bales: Air dry, rectangular straw bales.

1. Cross Section: 14 by 18 inches, minimum.
2. Bindings: Wire or string, around long dimension.
3. Straw Bale Stakes: One of the following, minimum 3 feet long:
    a. Steel U- or T-section, with minimum mass of 1.33 pound per linear foot.
    b. Wood, 2 by 2 inches in cross section.

E. Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:
    1. Average Opening Size: 30 U.S. Std. Sieve, maximum, when tested in accordance with ASTM D4751.
    2. Permittivity: 0.05 sec^-1, minimum, when tested in accordance with ASTM D4491.
    3. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D4355/D4355M after 500 hours exposure.
    4. Tensile Strength: 100 pounds-force, minimum, in cross-machine direction; 124 pounds-force, minimum, in machine direction; when tested in accordance with ASTM D4632/D4632M.
    5. Elongation: 15 to 30 percent, when tested in accordance with ASTM D4632/D4632M.
    6. Tear Strength: 55 pounds-force, minimum, when tested in accordance with ASTM D4533/D4533M.
    7. Color: Manufacturer's standard, with embedment and fastener lines preprinted.

F. Silt Fence Posts: One of the following, minimum 5 feet long:
    1. Steel U- or T-section, with minimum mass of 1.33 pound per linear foot.
    2. Softwood, 4 by 4 inches in cross section.
    3. Hardwood, 2 by 2 inches in cross section.

G. Wattles: Biodegradable Straw Wattle:
    1. SediMax-SWB9 (Straw Wattle Biodegradable 9 inch) by Tensar International Corporation; www.tensacorp.com; Telephone number: 1-800-TENSAR-1 or approved equal.
        a. The wattle shall be composed of agricultural straw and be wrapped in biodegradable tubular organic, woven jute net.
        b. The netting weight shall be approximately 1.28 ounces/linear ft. and shall be made from a woven, lightweight woven jute netting.

The netting shall have aperture openings measuring 0.50 x 1.0 inches.

c. Cylindrical Configuration with Closed Ends.
   1) Diameter: 9", 12" or 20"
   2) Length: 25.00 ft. max.

H. Biofilter Bags: Plastic mesh bags filled with clean 100% recycled wood waste.
   1. Locations: as needed.

I. Gravel: See Section 32 1123 for aggregate.

J. Traffic Bearing Aggregate Surface. See Section 31-2323 - Fill.

K. Riprap: See Section 31 3700.

L. Concrete Washout System.
   1. Provide containment, removal and disposal of concrete waste and concrete wash water by furnishing, maintaining and removing temporary concrete washout bins.
   2. Location: Keep washout area at least 50 feet from streets, storm drains, open drainage areas and streams.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.02 PREPARATION

A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

3.03 SCOPE OF PREVENTIVE MEASURES

A. In all cases, if permanent erosion resistant measures have been installed temporary preventive measures are not required.

B. Construction Entrances: Traffic-bearing aggregate surface - Existing.
   1. Where necessary to prevent tracking of mud onto right-of-way, provide wheel washing area out of direct traffic lane, with drain into sediment trap or basin.

C. Linear Sediment Barriers: Made of silt fences.
   1. Provide linear sediment barriers:
      a. Along downhill perimeter edge of disturbed areas, including soil stockpiles.

b. Along the top of the slope or top bank of drainage channels and swales that traverse disturbed areas.
c. Along the toe of cut slopes and fill slopes.
d. Perpendicular to flow across the bottom of existing and new drainage channels and swales that traverse disturbed areas or carry runoff from disturbed areas; space at maximum of 200 feet apart.
e. Across the entrances to culverts that receive runoff from disturbed areas.

2. Space sediment barriers with the following maximum slope length upslope from barrier:
   a. Slope of Less Than 2 Percent: 100 feet..
   b. Slope Between 2 and 5 Percent: 75 feet.
   c. Slope Between 5 and 10 Percent: 50 feet.
   d. Slope Between 10 and 20 Percent: 25 feet.
   e. Slope Over 20 Percent: 15 feet.

D. Storm Drain Curb Inlet Sediment Trap: Protect each curb inlet using one of the following measures:
   1. Filter fabric wrapped around hollow concrete blocks blocking entire inlet face area; use one piece of fabric wrapped at least 1-1/2 times around concrete blocks and secured to prevent dislodging; orient cores of blocks so runoff passes into inlet.
   2. Straw bale row blocking entire inlet face area; anchor into pavement.

E. Storm Drain Drop Inlet Sediment Traps: As detailed on drawings.

F. Temporary Splash Pads: Stone aggregate over filter fabric; size to suit application; provide at downspout outlets, hose bib locations, and storm water outlets.

G. Soil Stockpiles: Protect using one of the following measures:
   1. Cover with polyethylene film, secured by placing soil on outer edges.
   2. Cover with mulch at least 4 inches thickness of pine needles, sawdust, bark, wood chips, or shredded leaves, or 6 inches of straw or hay.

H. Mulching: Use only for areas that may be subjected to erosion for less than 6 months.

I. Erosion Control Seeding: Use where vegetated cover is required. See Section 32-9219 Seeding.

3.04 INSTALLATION

A. Traffic-Bearing Aggregate Surface: See Section 32-1123 Aggregate Base Courses.

B. Silt Fences:
   1. Store and handle fabric in accordance with ASTM D4873/D4873M.
   2. Where slope gradient is less than 3:1 or barriers will be in place less than 6 months, use nominal 16 inch high barriers with minimum 36 inch long posts spaced at 6 feet maximum, with fabric embedded at least 4 inches in ground.
   3. Where slope gradient is steeper than 3:1 or barriers will be in place over 6 months, use nominal 28 inch high barriers, minimum 48 inch long posts spaced at 6 feet maximum, with fabric embedded at least 6 inches in ground.
   4. Where slope gradient is steeper than 3:1 and vertical height of slope between barriers is more than 20 feet, use nominal 32 inch high barriers with woven wire reinforcement and steel posts spaced at 4 feet maximum, with fabric embedded at least 6 inches in ground.
   5. Install with top of fabric at nominal height and embedment as specified.
   6. Embed bottom of fabric in a trench on the upslope side of fence, with 2 inches of fabric laid flat on bottom of trench facing upslope; backfill trench and compact.
   7. Do not splice fabric width; minimize splices in fabric length; splice at post only, overlapping at least 18 inches, with extra post.
   8. Fasten fabric to wood posts using one of the following:
      a. Four nails per post with 3/4 inch diameter flat or button head, 1 inch long, and 14 gage, 0.083 inch shank diameter.
      b. Five staples per post with at least 17 gage, 0.0453 inch wire, 3/4 inch crown width and 1/2 inch long legs.
   9. Fasten fabric to steel posts using wire, nylon cord, or integral pockets.
   10. Wherever runoff will flow around end of barrier or over the top, provide temporary splash pad or other outlet protection; at such outlets in the run of the barrier, make barrier not more than 12 inches high with post spacing not more than 4 feet.

C. Straw Bale Rows:
   1. Install bales in continuous rows with ends butting tightly, with one bale at each end of row turned uphill.
   2. Install bales so that bindings are not in contact with the ground.
   3. Embed bales at least 4 inches in the ground.

4. Anchor bales with at least two stakes per bale, driven at least 18 inches into the ground; drive first stake in each bale toward the previously placed bale to force bales together.
5. Fill gaps between ends of bales with loose straw wedged tightly.
6. Place soil excavated for trench against bales on the upslope side of the row, compacted.

D. Mulching Over Large Areas:
1. Dry Straw and Hay: Apply 2-1/2 tons per acre; anchor using dull disc harrow or emulsified asphalt applied using same spraying machine at 100 gallons of water per ton of mulch.
2. Erosion Control Matting: Comply with manufacturer's instructions.

E. Mulching Over Small and Medium Areas:
1. Dry Straw and Hay: Apply 4 to 6 inches depth.
2. Erosion Control Matting: Comply with manufacturer's instructions.

F. Temporary Seeding: See Section 32-9219 Seeding.

3.05 MAINTENANCE

A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces
0.5 inches or more rainfall at the project site, and daily during prolonged rainfall.

B. Repair deficiencies immediately.

C. Silt Fences:
1. Promptly replace fabric that deteriorates unless need for fence has passed.
2. Remove silt deposits that exceed one-third of the height of the fence.
3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.

D. Straw Bale Rows:
1. Promptly replace bales that fall apart or otherwise deteriorate unless need has passed.
2. Remove silt deposits that exceed one-half of the height of the bales.
3. Repair bale rows that are undercut by runoff or otherwise damaged, whether by runoff or other causes.

E. Clean out temporary sediment control structures weekly and relocate soil on site.

F. Place sediment in appropriate locations on site; do not remove from site.

3.06 CLEAN UP

A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Erosion and Sediment Control Inspector and Architect.

B. Clean out temporary sediment control structures that are to remain as permanent measures.

C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

END OF SECTION

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Summary:
   1. Product options.
   2. Owner-furnished products.
   3. Product delivery, storage and handling.

1.02 PRODUCTS

A. Products:
   1. New material, machinery, components, equipment, fixtures, and systems forming the Work, but does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work.
   2. Products may also include existing materials or components specifically identified for reuse.

B. Use interchangeable components of the same manufacture for similar components.

C. Unless otherwise specified, all material and equipment shall be new; free from defects impairing strength, durability, and appearance; of current manufacture.

D. Items specified shall be considered minimum as to quality, function, capacity, and suitability for application intended.

E. Items incorporated into the Work shall conform to applicable specifications and standards designated, and shall be of size, make, type, and quality specified.

F. Design, fabricate, and assemble in accordance with current best engineering, industry, and shop practices.

G. Manufacture like parts of duplicate units to standard size and gauge to make them interchangeable.

H. Two or more items of the same kind shall be identical and made by the same manufacturer.

1.03 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

C. Products Specified by Naming One [or More] Manufacturer[s]: Products of manufacturer[s] named and meeting specifications, no options or substitutions allowed.

D. Substitution Procedure: Under Section 01 25 00.

1.04 REUSE OF EXISTING PRODUCTS

A. Except as specifically indicated or specified, materials and equipment removed from existing construction shall not be used in the completed Work.

B. For material and equipment specifically indicated or specified to be reused in the Work:
   1. Use care in removal, handling, storage, and reinstallation to assure proper function in the completed Work.
   2. Arrange for transportation, storage, and handling of products which require off-site storage, restoration, or renovation.
   3. Remove and reinstall mechanical units, vents, guys, antennae, and electrical and grounding wires or conduits.

1.05 OWNER FURNISHED PRODUCTS

A. Designate delivery dates of Owner-furnished items in the construction schedule.

B. Receive, unload, store and handle Owner-furnished items at the site; protect from damage.

1.06 DELIVERY, STORAGE AND HANDLING

A. Transport, handle, store and protect products in accordance with manufacturer's instructions.

B. Arrange deliveries in accordance with construction schedules; coordinate to avoid conflict with Work and site conditions.

C. Deliver and store products in undamaged condition in manufacturer's original containers or packaging with identifying labels intact and legible.

D. Inspect shipments to assure compliance with Contract Documents and

reviewed submittals, and that products are undamaged.

E. Prevent soiling or damage to products or packaging.

F. Interior Storage: Maintain required temperature and humidity ranges. Verify that Owner furnished storage meets product manufacturer's requirements.

G. Exterior Storage:
   1. Store materials above ground to prevent soiling and/or moisture infiltration.
   2. Cover materials with waterproof breathable sheet coverings; provide adequate ventilation.
   3. All storage locations to be approved in advance by the Owner.

H. Arrange storage to provide access for inspection.

I. Coordinate with Owner’s Authorized Representative all on-site storage activities.

J. Provide for security of stored products.

END OF SECTION

SECTION 01 73 29

CUTTING AND PATCHING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Requirements and limitations for cutting and patching of Work.

1.02 RELATED SECTIONS

A. Section 01 25 00, Product Substitution Procedures.

B. Section 01 33 23, Shop Drawings, Product Data, Samples

1.03 SUBMITTALS

A. Submit written request in advance of cutting or alteration which affects:
   1. Structural integrity of any element of the Work.
   2. Efficiency, maintenance, or safety of any operational element.
   3. Visual qualities of sight exposed elements.
   4. Work of Owner or separate contractor.

B. Include in request:
   1. Identification of project.
   2. Location and description of affected work.
   3. Necessity for cutting or alteration.
   4. Description of proposed work, and products to be used.
   5. Alternatives to cutting and patching.
   6. Effect on work of Owner or separate contractor.
   7. Written permission of affected separate contractor.
   8. Date and time work will be executed.

PART 2 PRODUCTS

2.01 MATERIALS

A. Primary Products: Those required for original installation.

B. Product Substitution: For any proposed change in materials, submit request for substitution under provisions of Section 01 25 00.

PART 3 EXECUTION

3.01 EXAMINATION

A. Inspect existing conditions prior to commencing Work, including elements subject to damage or movement during cutting and patching.

B. After uncovering existing work, inspect conditions affecting performance of Work.

C. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

A. Provide temporary supports to ensure structural integrity of the Work.

B. Provide devices and methods to protect other portions of the Work from damage.

C. Provide protection from elements for areas which may be exposed by uncovering work.

3.03 CUTTING AND PATCHING

A. Execute cutting, fitting and patching to complete work.

B. Fit products together, to integrate with other work.

C. Remove and replace defective or non-conforming work.

D. Provide openings in the work for penetration of mechanical and electrical work.

3.04 PERFORMANCE

A. Execute work by methods to avoid damage to other Work, and which will provide appropriate surfaces to receive patching and finishing.

B. Cut rigid materials using masonry saw or core drill. Pneumatic tools are not allowed without prior approval from Owner's Authorized Representative.

C. Restore work with new products in accordance with requirements of Contract Documents.

D. At penetrations of fire rated walls, partitions, ceiling or floor construction, completely seal voids with approved fire rated material, to full thickness of the penetrated element.

E. Refinishing:
   1. Refinish surfaces to match adjacent finish.
   2. For continuous surfaces, refinish to nearest intersection or natural break.
   3. For an assembly, refinish entire unit.

END OF SECTION

SECTION 01 74 00

CLEANING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Related requirements specified elsewhere, cleaning for specific products or work: Specification section for that work.

B. Maintain premises and public properties free from accumulations of waste, debris, and rubbish, caused by operations.

C. At completion of Work remove waste materials, rubbish, tools, equipment, machinery and surplus materials, and clean all sight-exposed surfaces; leave project clean and ready for occupancy.

1.02 QUALITY ASSURANCE

A. Standards: Maintain project in accord with applicable safety and insurance standards.

B. Hazard Control:
   1. Store volatile wastes in covered metal containers.
   2. Provide adequate ventilation during use of volatile or noxious substances.

1.03 MATERIALS

A. Use only cleaning materials recommended by manufacturer of surface to be cleaned.

B. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

1.04 DURING CONSTRUCTION:

A. Wet down dry materials and rubbish to lay dust and prevent blowing dust.

B. At reasonable intervals during progress of Work clean site and public properties, and dispose of waste materials, debris and rubbish.

C. Provide on-site containers for collection of waste materials, debris and rubbish.

D. Remove waste materials, debris and rubbish from site and legally dispose of at public or private dumping areas off Owner's property.

E. Vacuum clean interior building areas when ready to receive finish painting, and continue vacuum cleaning on an as-needed basis until project is ready for Substantial Completion or occupancy.

F. Handle materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights.

1.05 FINAL CLEANING

A. Employ experienced workers, or professional cleaners, for final cleaning.

B. In preparation for Substantial Completion or occupancy, conduct final inspection of sight-exposed interior and exterior surfaces, and of concealed spaces.

C. Remove grease, dust, dirt, stains, labels, and other foreign materials from exposed interior and exterior finished surfaces.

D. Remove putty, paint, labels, lubricants, etc., from windows, mirrors, and sash, and then polish, taking care not to scratch glass.

E. Vacuum carpeting (shampoo where required), removing debris and excess nap.

F. Repair, patch and touch up marred surfaces to specified finish, to match adjacent surfaces.

G. Replace air filters where units were operated during construction.

H. Maintain cleaning until project, or portion thereof, is occupied by Owner.

END OF SECTION

SECTION 01 77 00

CONTRACT CLOSEOUT

PART 1 GENERAL

1.01 DESCRIPTION

A. The requirements specified in this section relate to all Contractors individually performing under these Contract Documents:
   1. Project Record Documents.
   2. Final review and payment.

B. Related work specified elsewhere:
   1. OSU General Conditions.
   2. Shop Drawings, Product Data and Samples, Section 01 33 23.

1.02 PROJECT RECORD DOCUMENTS

A. The Project Record Documents shall be organized to include the following information:
   1. Table of Contents
   2. Project Team List
   3. Specifications (Including Addenda and Change Orders)
   4. Drawings
   5. Inspection Reports, as applicable
   6. Original Signed Warranty(ies)
   7. Maintenance Instructions

B. Two sets of the Project Record Documents shall be submitted for review upon 75% completion of the Work.

C. Bind sets in black, hard cover, three-ring binders, limited in size to 3” rings per binder, with each section clearly indexed with tabbed divider pages.

D. The project team list shall include the name, address, and phone number of the Owner, Contractor, Inspector, Subcontractors, and the materials manufacturers.

E. Legibly mark each Specification section to indicate actual as-built condition indicating changes in the Work made by addenda or change order or actual materials used and actual manufacturer(s) used.

F. Maintain current and accurate as-built mark-ups during construction and make available to Owner’s Authorized Representative upon request.

G. Legibly mark the drawings to indicate actual as-built conditions indicating changes in the Work made by addenda or change order or actual conditions which differ from the drawings.

H. Redraw or provide new drawings as required for a complete as-built set of drawings. The Contractor shall maintain current and accurate as-built mark-ups during construction and make available to Owner's Authorized Representative.

I. Include inspection reports if applicable.

J. Include, in a single section, all copies of the Project's labor and material warranties clearly marked to identify the Owner's responsibilities under the terms of each warranty and the section of Work that each warranty covers. One set must be clearly marked as containing original documents.

K. In the case of an elevator installation, the Contractor's and manufacturer's warranty shall provide for the Owner's right to respond to emergency/car failure situations for the purpose of extricating individuals trapped in the elevator.

L. Include maintenance instructions complete with technical information and name, address, and phone number of the Contractor(s) and manufacturer(s) of each material and product.

1.03 FINAL REVIEW AND PAYMENT

A. Prior to completion, the Contractor shall inspect the Work and make a Punch-list noting all items that are incomplete and/or incorrect.

B. The Contractor shall notify all Subcontractors in writing of incomplete and/or incorrect items. Notify far enough in advance of the completion date that the Work can be completed on schedule. Said Work shall be immediately corrected.

C. Should conditions prevail which prohibit some elements of the Work from being accomplished, but the work-in-place will perform the primary function (i.e., painting cannot be completed due to high moisture content of masonry walls.) the Contractor shall record the reason with this Punch-list item requesting temporary delay in completion from the Owner in writing.

D. Notify the Owner in writing that all items are completed and ready for final review or else that the Work product is fully usable, but some listed deficiencies remain to be completed. Submit all record documents at this time.

E. The Owner will review all documents. When the documents include a Contractor's request for delay in completion, the Owner will review all Work which is certified as complete to the best knowledge of the Contractor. The Owner will also review the listed incomplete Work and assign a value to such uncompleted work.

F. The Contractor shall make the required corrections to the Work expeditiously. A letter will be addressed to the Contractor informing the Contractor of the project status.

G. When Contract closeout procedures are completed and all Punch-list deficiencies have been corrected, provide Owner with final corrected Project Record Documents based on Owner's preliminary review. **In addition, provide Owner with one electronic copy of all Project Record Documents.**

H. Final Completion by the Owner will be documented and the Contractor will receive written notice of acceptance of the Work and notification that final payment may be billed and released.

I. All warranties shall commence and become effective beginning on the date of Substantial Completion.

END OF SECTION

SECTION 02 4100

DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Building demolition excluding removal of hazardous materials and toxic substances.

B. Selective demolition of built site elements.

C. Abandonment and removal of existing utilities and utility structures.

1.02 RELATED REQUIREMENTS

A. Refer to Oregon State University Invitation to Bid, ("ITB") TITLE: UTILITY CONNECTION AND MONITORING FACILITY: PACWAVE for complete Instructions to Bidders, bid dates, Prebid Conference dates, Bidding and Contract Requirements, Summary of Work and all other Division 0 and 1 Requirements, including Exhibits.

B. Section 01 5713 - Temporary Erosion and Sediment Control.

C. Section 31 1000 - Site Clearing.

PART 2 PRODUCTS

2.01 MATERIALS

A. Not used.

PART 3 EXECUTION

3.01 SCOPE

A. Remove portions of existing buildings as noted.

B. Remove paving and curbs as required to accomplish new work.

C. Remove all other paving and curbs as indicated on drawings.

D. Within area of new construction, remove foundation walls and footings to a minimum of 2 feet below finished grade.

E. Remove other items indicated, for salvage and recycling.

3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
   3. Provide, erect, and maintain temporary barriers and security devices.
   4. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   5. Do not close or obstruct roadways or sidewalks without permit.
   6. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
   7. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.

B. Do not begin removal until receipt of notification to proceed from Owner.

C. Protect existing structures and other elements that are not to be removed.
   1. Provide bracing and shoring.
   2. Prevent movement or settlement of adjacent structures.
   3. Stop work immediately if adjacent structures appear to be in danger.

D. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

E. Refer to Demolition Drawings of all respective disiplines: site/civil, architectural, structural, plumbing, mechanical, and electrical.
   1. Contractor to coordinate all trades, and demo as needed for all.

3.03 EXISTING UTILITIES

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone; identify and mark utilities to be subsequently reconnected, in same manner as other utilities to remain.

3.04 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 31 1000
SITE CLEARING

PART 1 GENERAL

1.01 SCOPE

A. Remove and eradicate all noxious weeds as determined by the Oregon Department of Agriculture State and County Noxious Weed Lists per OAR 603-052-1200 Oregon Noxious Weed Quarantinue Requirements.

1.02 SECTION INCLUDES

A. Clearing and protection of vegetation.

B. Demolition of existing structures to be removed and Removal of existing debris.

1.03 RELATED REQUIREMENTS

A. Geotechnical Investigation Report - Foundation Engineering, Inc., May 15, 2019.

B. Section 01 1100 - Summary: Limitations on Contractor's use of site and premises.

C. Section 01 5100 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

D. Section 01 5639 - Tree and Planting Protection: Protection of vegetation to remain.

E. Section 01 5713 - Temporary Erosion and Sediment Control.

F. Section 01 7700 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products.

G. Section 31 2200 - Grading: Topsoil removal.

H. Section 31 2323 - Fill: Filling holes, pits, and excavations generated as a result of removal operations.

PART 2 PRODUCTS

2.01 MATERIALS

A. Fill Material: As specified in Section 31 2323 - Fill and Backfill

PART 3 EXECUTION

3.01 SITE CLEARING

A. Minimize production of dust due to clearing operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

3.02 EXISTING UTILITIES AND BUILT ELEMENTS

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits. Engineer will obtain SHPO Clearance, Lincoln County Utility Permit, and ODOT Utility Permit.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Protect existing structures and other elements that are not to be removed.

E. Call for utility locates prior to digging and wait for location field marks.

3.03 VEGETATION

A. Scope: Remove trees, shrubs, brush, and stumps in areas to be covered by paving, gravel shoulders, sidewalks, underground utilities, concrete apron, and other improvements shown on the Drawings.

B. Do not begin clearing until vegetation to be relocated has been removed.

C. Do not remove or damage vegetation beyond the limits indicated on drawings.
   1. 5 feet outside the of construction limits.

2. Exception: Specific trees and vegetation indicated on drawings to be removed.
3. Exception: Selective thinning of undergrowth specified elsewhere.

D. Install substantial, highly visible fences at least 3 feet high to prevent inadvertent damage to vegetation to remain:
   1. At vegetation removal limits.
   2. Around trees to remain within vegetation removal limits; locate no closer to tree than at the drip line.
   3. Around other vegetation to remain within vegetation removal limits.
   4. See Section 01 5100 Construction Facilities adn Temporary Controls and 01 5639 Tree and Planting Protection for fence construction requirements.

E. In areas where vegetation must be removed but no construction will occur other than pervious paving, remove vegetation with minimum disturbance of the subsoil.

F. Vegetation Removed: Do not burn, bury, landfill, or leave on site, except as indicated.
   1. Chip, grind, crush, or shred vegetation for mulching, composting, or other purposes; preference should be given to on-site uses.
   2. Trees: Sell if marketable; if not, treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.
   3. Existing Stumps: Treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.
   4. Fill holes left by removal of stumps and roots, using suitable fill material, with top surface neat in appearance and smooth enough not to constitute a hazard to pedestrians.

G. Dead Wood: Remove all dead trees (standing or down), limbs, and dry brush on entire site; treat as specified for vegetation removed.

H. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to Owner.

3.04 DEBRIS

A. Remove debris, junk, and trash from site.

B. Break up as required and remove existing concrete designated for removal.

C. Leave site in clean condition, ready for subsequent work.

D. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 31 2200

GRADING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Removal of topsoil.

B. Rough grading the site for site structures.

C. Finish grading.

1.02 RELATED REQUIREMENTS

A. Geotechnical Investigation Report - Foundation Engineering, Inc., May 15, 2019.

B. Section 31 2323 - Fill: Filling and compaction.

PART 2 PRODUCTS

2.01 MATERIALS

A. Topsoil: See Section 31 2323.

B. Other Fill Materials: See Section 31 2323.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

B. Verify the absence of standing or ponding water.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Stake and flag locations of known utilities.

C. Locate, identify, and protect from damage above- and below-grade utilities to remain.

D. Provide temporary means and methods to remove all standing or ponding water from areas prior to grading.

E. Protect site features to remain, including but not limited to bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs, from damage by grading equipment and vehicular traffic.

3.03 ROUGH GRADING

A. Remove topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.

B. Do not remove topsoil when wet.

C. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.

D. Strip the pavement areas as required to remove existing vegetation and roots. Stripping depths may be as deep as 3 feet. Dispose of all strippings outside of construction areas. Refer to Geotechnical Report.

E. Excavate as required to accommodate the minimum pavement section in areas requiring cuts. Overexcavate any soft subgrade and replace it with compacted Select Fill or Granular Site Fill. Compact the subgrade during dry weather as specified above.

F. Do not remove wet subsoil, unless it is subsequently processed to obtain optimum moisture content.

G. When excavating through roots, perform work by hand and cut roots with sharp axe.

H. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

I. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack surface water control.

3.04 FINISH GRADING

A. Before Finish Grading:
   1. Verify building and trench backfilling have been inspected.
   2. Verify subgrade has been contoured and compacted.

B. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove soil contaminated with petroleum products.

C. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.

D. Maintain stability of topsoil during inclement weather. Replace topsoil in areas where surface water has eroded thickness below specifications.

3.05 TOLERANCES

A. Top Surface of Subgrade: Plus or minus 0.10 foot (1-3/16 inches) from required elevation.

B. Top Surface of Finish Grade: Plus or minus 0.04 foot (1/2 inch).

C. Top Surface of Subgrade: Plus or minus 1/10 foot from required elevation.

D. Top Surface of Finish Grade: Plus or minus 1/2 inch.

3.06 REPAIR AND RESTORATION

A. Existing Facilities, Utilities, and Site Features to Remain: If damaged due to this work, repair or replace to original condition.

3.07 FIELD QUALITY CONTROL

A. See Section 31 2323 for compaction density testing.

3.08 CLEANING

A. Leave site clean and raked, ready to receive landscaping.

END OF SECTION

SECTION 31 2316
EXCAVATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Excavating for building volume below grade, footings, and paving.

B. Trenching for utilities outside the building to utility main connections.

1.02 RELATED REQUIREMENTS

A. Document Geotechnical Report, by Foundation Engineering, Inc., May 15, 2019: Geotechnical report; clearing, excavation requirements and findings of subsurface materials.

B. Section 31 2200 - Grading: Grading.

C. Section 31 2323 - Fill: Fill materials, backfilling, and compacting.

1.03 PROJECT CONDITIONS

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 EXCAVATING

A. Excavate to accommodate new structures and construction operations.

B. Building Foundation Excavation:
   1. Excavate for the footings using a hoe equipped with a smooth-edged bucket. The excavation depth should accommodate a minimum of 6 inches of compacted Select Fill beneath the footings. The fill should extend at least 6 inches beyond the edges of all footings.
   2. Overexcavation will be required for footing excavations terminating in soft material, clay or unsuitable fill. The finished footing excavations should be observed by Architect to confirm the foundation soils and determine if any additional excavation is required.

C. Pavement Area Excavation:
   1. Strip the pavement areas as required to remove existing vegetation and roots. Stripping depths may be as deep as 3 feet. Dispose of all strippings outside of construction areas.
   2. Excavate as required to accommodate the minimum pavement section in areas requiring cuts. Overexcavate any soft subgrade and replace it with compacted Select Fill or Granular Site Fill. Compact the subgrade during dry weather as specified above.

D. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

E. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.

F. Cut utility trenches wide enough to allow inspection of installed utilities.

G. Hand trim excavations. Remove loose matter.

H. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 31 2323.

I. Provide temporary means and methods, as required, to remove all water from excavations until directed by Architect. Remove and replace soils deemed suitable by classification and which are excessively moist due to lack of dewatering or surface water control.

J. Determine the prevailing groundwater level prior to excavation. If the proposed excavation extends less than 1 foot into the prevailing groundwater, control groundwater intrusion with perimeter drains routed to sump pumps, or as directed by the Architect. If the proposed excavation extends more than 1 foot into the excavation, control groundwater intrusion with a comprehensive dewatering procedures.

K. Remove excavated material that is unsuitable for re-use from site.

L. Stockpile excavated material to be re-used in area designated on site.

M. Remove excess excavated material from site.

3.02 FIELD QUALITY CONTROL

A. See Section 01 4500 - Quality Requirements, for general requirements for field inspection and testing.

B. Provide for visual inspection of load-bearing excavated surfaces by Architect before placement of foundations.

3.03 PROTECTION

A. Divert surface flow from rains or water discharges from the excavation.

B. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.

C. Protect open excavations from rainfall, runoff, freezing groundwater, or excessive drying so as to maintain foundation subgrade in satisfactory, undisturbed condition.

D. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

E. Keep excavations free of standing water and completely free of water during concrete placement.

END OF SECTION

SECTION 31 2316.13

TRENCHING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Utility Trench Excavation, Bedding, and Backfill.

B. This section consists of furnishing all labor, materials, incidentals and equipment, as well as performing all work required for excavation, foundation stabilization, pipe bedding, pipe zone material, trench backfill, compaction, final grading, hauling and disposal of material resulting from the construction of utility piping, and all related appurtenances. Included also is the locating and protecting of existing utilities and other improvements (see Division 1), shoring, and bracing, excepting only such work as is covered and included under other sections of this Division, or other Divisions of these Contract Documents.

C. Excavation must be in accordance with ORS 757.541 to 757.571 and all other applicable laws and regulations.

1.02 RELATED REQUIREMENTS

A. Section 31-2200 - Grading

B. Section 31-2319 - Dewatering

C. Section 31-4100 - Shoring

D. Section 01-4500 - Compaction Testing

1.03 DEFINITIONS

A. Trench Excavation - Trench excavation consists of the removal of all material encountered in the trench to the limits shown on the Plans or as directed. Trench excavation shall be classified as either unclassified excavation or rock excavation.

1. Unclassified excavation is defined as the removal of all material as required to complete the planned improvements, regardless of type, nature or condition of materials encountered, except that which is designated as rock excavation.
2. Rock excavation is defined as the removal of boulders composed of igneous, sedimentary or metamorphic stone material which have a least dimension of 36-inches or more, or a displacement of one cubic yard or more; or the removal of solid ledge rock which, in the opinion of the Engineer, requires for its removal drilling and blasting, wedging, sledging, barring or breaking with power operated tools.
    a. No soft or disintegrated rock; hard-pan or cemented gravel that can be removed with a hand pick or power operated excavator or shovel; no loose, shaken, or previously blasted rock or broken stone in rock fillings or elsewhere; and no rock outside of the minimum limits of measurement allowed, which may fall into the excavation, will be measured or allowed.
    b. When solid rock layers have an overburden of non-rock material (unclassified material) which cannot practically be stripped and handled separately, and/or when solid rock is interspersed with non-rock material, the entire mass will be classified as solid rock if the actual solid rock fraction exceeds 85% of the entire volume.

B. Trench Foundation - Trench foundation is defined as the bottom of the trench on which the pipe bedding is to lay and which provides support for the pipe.

C. Foundation Stabilization - Foundation stabilization is defined as the furnishing, placing and compacting of specified materials for any unsuitable material removed from the bottom of an excavation, as directed by the Engineer, to provide a firm trench foundation.

D. Pipe Bedding - Pipe bedding is defined as the furnishing, placing and compacting of specified materials on the trench foundation so as to uniformly support the barrel of the pipe. The total bedding depth shall be as shown on the Contract Drawings.

E. Pipe Zone - Pipe zone is defined as the furnishing, placing and compacting of specified materials for the full width of the trench and extending from the top of the bedding to a level above the top outside surface of the barrel of the pipe as shown on the Contract Drawings.

F. Trench Backfill - Trench backfill is defined as the furnishing, placing and compacting of material in the trench extending from the top of the pipe zone to the bottom of pavement base, ground surface or surface material. Plans generally show locations for each type of backfill class.

G. Drain Rock - Drain rock is defined as the furnishing, placing and compacting of specified free draining material for the full width of the drain trench (perforated pipe drains) and extending to a level as specified above the top outside surface of the pipe barrel.

1.04 REFERENCES

A. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012. ASTM D698-12e2.

B. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2015. ASTM D6938-15.

C. Oregon Standard Specifications (OSS) - The Oregon Department of Transportation, ODOT/APWA Oregon Chapter Standard Specifications for Construction; 2015 Edition.

1.05 SUBMITTALS

A. See Section 01 3323 - Shop Drawings, Product Data, Samples for submittal procedures.

B. Samples: 10 lb sample of each type of fill; submit in air-tight containers to testing laboratory. Submit at least 2 weeks in advance of use.

C. Materials Sources: Submit name of imported materials source.

D. Compaction Density Test Reports.

E. Drawings, data, methods and use plans for shoring and bracing.

F. Drawings, data, method and use plans for bypass pumping and dewatering.

1.06 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

B. When fill materials need to be stored on site, locate stockpiles where designated.
   1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
   2. Prevent contamination. Maintain stockpiles neat and orderly.
   3. Access to all fire hydrants, water valves and meters, manholes, and other equipment and valves shall be maintained. Stockpiles shall not be permitted to block any stormwater drainage ditches, gutters, drain inlets, culverts or natural water courses.
   4. Protect stockpiled material which is to be later incorporated into the work so that excessive wetting or drying of the material does not occur. Material shall be brought to near optimum moisture content prior to placement and compaction. Depending on the moisture content of stockpiled materials, necessary processing may include aeration, mixing and/or wetting. No additional payment will be allowed for protecting or preparing native backfill materials.
   5. If approved native materials become unsuitable (too wet or mixed with unsuitable materials) due to negligence by the Contractor, then imported granular materials may be required for backfilling at the subject location at no additional cost to the Owner.
   6. Comply with all requirements of the 1200-C Construction Stormwater Permit (if applicable).
   7. Protect stockpiles from erosion and deterioration of materials. Provide necessary protection so that silt-laden runoff does not occur and to prevent wind blown dust. Grade to prevent surface water from ponding on stockpiles.
   8. Remove promptly any materials no longer needed at Site. Clean storage and stockpile areas when complete to a condition equal to or better than previous.

PART 2 - PRODUCTS

2.01 TRENCH FILL MATERIALS

A. Trench Foundation - the trench foundation shall be undisturbed native material when suitable. Where ground water or other unstable conditions exist and the native material cannot properly support the pipe, additional excavation may be required. The trench shall be stabilized with foundation stabilization material when such conditions are present in the opinion of the engineer.

B. Foundation Stabilization - Foundation Stabilization: 2½”-0, 2"-0, or 1½”-0 dense graded aggregate base rock meeting OSS Sections 00641 and 02630. Required when native trench foundation material contains groundwater, or is unsuitable to provide a firm foundation in the opinion of the Engineer.

C. Pipe Bedding - Material for pipe bedding shall be clean, hard, sound, durable, well-graded, ¾"-0 or 1"-0 crushed rock, free from organic matter meeting OSS Section 02630.10.

D. Pipe Zone - Material for pipe zone shall be the same material used for bedding.

E. Trench Backfill
   1. Class “A” Backfill: Native or common excavated material, free from organic or other deleterious material, free from rock larger than 2-inches, and which meets the characteristics required for the specific surface loading or other criteria of the backfill zone in the opinion of the Engineer. If stockpiled material becomes saturated or unsuitable, Class B Backfill shall be substituted. Engineer must approve material prior to use.
   2. Class “B” Backfill: 1”-0 or ¾”-0 dense-graded aggregate meeting OSS Section 02630.10.
   3. Class “C” Backfill: Clean, well-graded sand.
   4. Class “E” Backfill (CLSM or CDF): Controlled Low-Strength Material (cement slurry) conforming to OSS Section 00442.
      a. Slurry shall consist of a highly flowable lean concrete mix; mixture of Portland cement, fly ash, fine aggregates, water and admixtures as required for a mixture that results in a hardened, dense, non-settling, hand excavatable fill.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that survey bench marks and intended elevations for the work are as indicated.

B. Verify proper approved plans are in place for shoring, bypass pumping, dewatering, traffic control, etc.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. Clearing & Grubbing and removal of obstructions to be completed prior to excavation.

C. Incidental to excavation shall be the furnishing, installing and removal of all shoring, sheeting, bracing and pumping equipment as required to support adjacent earth banks and structures, keep excavations free from water, and to provide for the safety of the public and all personnel working in excavations.

D. Locate, identify, and protect utilities that remain and protect from damage.

E. Saw-cut existing pavements where required to proper limits in clean and straight lines as required.

F. Notify utility company for new services and/or removal and relocation of existing utility connections.

G. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, curbs, and service connections to remain from excavating equipment and vehicular traffic.

H. Protect plants, lawns, rock outcroppings, and other features to remain.

I. Coordinate and provide all utility locates prior to any excavation as required by local, state and federal laws and regulations. When the precise location of subsurface structures and/or utilities

is unknown, locate such items by hand excavation prior to utilizing mechanical excavation equipment. Use hand excavation when mechanical equipment might damage existing improvements which are to remain undisturbed. See Division 1 for other requirements.

3.03 TRENCHING

A. Notify Architect or Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

B. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.

C. Do not interfere with 45 degree bearing splay of foundations.

D. Cut trenches wide enough to allow inspection of installed utilities.

E. Hand trim excavations. Remove loose matter.

F. Remove large stones and other hard matter that could damage piping or impede consistent backfilling or compaction.

G. Remove, haul, and dispose of all formations and materials, natural or man-made, irrespective of nature or conditions encountered, within lines and grades shown on the Plans or defined herein, and as necessary for completion of the proposed improvements. The method of excavation shall be as determined by the Contractor, and as required for special protection of existing improvements. Special care shall be taken to avoid overexcavation below subgrades. Store and protect materials suitable for use as backfill where applicable.

H. Remove excavated material that is unsuitable for re-use from site.

I. Remove excess excavated material from site.

J. Excavate to the lines and grades shown on the project Plans, allowing for forms, shoring, working space and bedding. Provide a minimum clearance around pipe barrel in all directions or greater in accordance with the standard trench detail drawing.

K. Shoring and Bracing
   1. Sheet and brace excavation as necessary to prevent caving and to protect adjacent structures, property, workers and the public.
   2. The design, planning, installation and removal of all sheeting, shoring, sheet piling, lagging and bracing shall be accomplished in such a manner as to maintain the required excavation or trench section and to maintain the undisturbed state of the soil below and adjacent to the excavation.
   3. Horizontal strutting below the barrel of a pipe and the use of pipe as support are not acceptable.
   4. All sheeting, shoring and bracing shall conform to safety requirements of OSHA and other Federal, State and local agencies.

3.04 PREPARATION FOR UTILITY PLACEMENT

A. Compact subgrade to density equal to or greater than requirements for subsequent fill material. Over-excavate and place Foundation Stabilization material where necessary or directed.

B. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.

C. When, in the opinion of the Engineer, the trench foundation materials are not suitable for the support of the pipe, soft soils shall be removed and Foundation Stabilization materials, as specified, shall be placed and compacted in lifts not exceeding 6-inches in compacted thickness to the required grade. Each lift shall be compacted to at least 95% of the maximum dry density in accordance with ASTM D698.

3.05 BACKFILLING

A. Backfill to contours and elevations indicated using unfrozen materials. Fill up to subgrade elevations unless otherwise indicated. Employ a placement method that does not disturb or damage other work. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

B. Maintain optimum moisture content of fill materials to attain required compaction density. Before placing the material, condition, aerate, or wet the material so that the moisture content of each layer is within minus 4% to plus 2% of optimum moisture content.

C. Place and compact pipe bedding material before placing pipe in the trench. Dig depression for pipe bells to provide uniform bearing along the entire pipe length. Place and compact bedding material in even lifts not exceeding 6-inches in depth until the required depth is obtained. Thoroughly compact each lift of bedding material to at least 95% of the maximum dry density in accordance with ASTM D698.

D. Place materials in the pipe zone, in layers not exceeding 6-inches thick, in a manner that equalizes the pressure on the pipe and minimizes stress. As required under the haunches of pipe and areas not accessible to mechanical tampers or to testing, compact with hand methods to ensure thorough contact between the material and the pipe. Thoroughly compact.

E. Backfill the trench above the pipe zone in successive lifts not exceeding 9-inches in loose thickness. Do not allow the backfill to free-fall into the trench until at least 3 feet of cover is provided over the top of the pipe. Each lift shall be compacted, using suitable mechanical or pneumatic equipment, to a minimum of 95% of the maximum dry density as determined by ASTM D698. If the specified compaction is not obtained, the Contractor may be required to use a modified compaction procedure and/or reduce the thickness of lifts. If approved materials meeting the specifications cannot be compacted to the required density regardless of compactive effort or method, the Engineer may reduce the required density or direct that alternate materials be used. In no case shall excavation and pipe laying operations proceed until the Contractor is able to compact the backfill to the satisfaction of the Engineer.

F. CLSM. When CLSM Backfill is required, backfill above pipe zone with CLSM material. If the CLSM is to be used as a temporary surfacing, backfill to top of the trench and strike off to provide a smooth surface. If CLSM is not to be used as a temporary surface, backfill to bottom of the proposed resurfacing. Use steel plates to protect the CLSM from traffic a minimum of 24 hours.

G. When backfilling is complete; the Contractor shall finish the surface area as specified. In paved or graveled areas, the Contractor shall maintain the surface of the trench backfill level with

H. existing adjacent grades with ¾”-0 or 1"-0 crushed rock free from organic matter and meeting OSS Section 02630.10, until pavement replacement is completed and accepted by Owner.

I. Correct areas that are over-excavated.
   1. Thrust bearing surfaces: Fill with concrete.
   2. Other areas: Use specified Foundation Material, compacted to minimum 95 percent of maximum dry density.

J. Reshape and re-compact fills subjected to vehicular traffic.

3.06 FIELD QUALITY CONTROL

A. Perform compaction density testing on compacted fill in accordance with ASTM D6938.

B. See Section 01-4500 for Compaction Testing specifications, locations, and quantities.

END OF SECTION

SECTION 31 2319
DEWATERING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Controlling surface water runoff, dewatering pipeline trenches and structural excavations and other elements required for control of water if work conditions should dictate the need.

1.02 RELATED SECTIONS

A. Section 31-4100 - Shoring.

B. Section 31-2323 - Fill.

C. Section 31-2316 - Excavation

D. Section 31-2316.13 - Trenching

1.03 SUBMITTAL

A. Prior to commencing excavation, the Contractor shall submit a statement of the method, installation and details of proposed dewatering system to Engineer. The statement shall also include disposal.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials and equipment required for control of water shall be furnished and maintained as required to perform the construction.

PART 3 - EXECUTION

3.01 GENERAL

A. The necessary machinery, appliances and equipment shall be provided and operated to keep excavations free from water during construction, and to dispose of the water so as not to cause injury to public or private property or to cause a nuisance or a menace to the public. Sufficient pumping equipment and machinery in good working condition shall be provided for all emergencies including power outage, and sufficient workers shall be available at all times for the operation of the pumping equipment.

B. The dewatering system shall not be shut down between shifts, on holidays or weekends or during work stoppages without written permission from the Architect.

3.02 CONTROL OF WATER

A. Control of groundwater such that softening of the bottom of excavations, or formation of “quick” conditions or “boils” during excavation, shall be prevented. Dewatering systems shall be designed and operated so as to prevent removal of the natural soils. Natural or compacted soils softened by saturation with groundwater or standing surface water shall be removed and replaced as instructed by the Engineer at no additional expense to the Owner.

B. During construction of structures, installation of pipelines, placing of structure and trench backfill and the placing and setting of concrete, excavations shall be kept free of water. Surface runoff shall be controlled so as to prevent entry or collection of water in excavations. The static water level shall be drawn a minimum of one foot below the bottom of the excavation, except two feet below the bottom of excavations for structures, so as to maintain the undisturbed state of the foundation soils and allow the placement of fill or backfill to the required density. The dewatering system shall be installed and operated so that the groundwater level outside the excavation is not reduced to the extent that would damage or endanger adjacent structures or property.

C. The release of groundwater to its static level shall be performed in such a manner as to maintain the undisturbed state of the natural foundation soils, prevent disturbance of compacted backfill and prevent flotation or movement of structures and pipelines. Underdrain systems and hydrostatic relief valves shall be operational prior to release of groundwater.

D. The Contractor shall not obstruct any component of the existing storm drain system but shall use proper measures to provide for the free passage of surface water.

E. Provisions shall be made to take care of surplus water, mud, silt, or other runoff pumped from excavations and trenches or resulting from sluicing or other operations. Siltation of completed or partially completed structures and pipelines by surface water or by disposal of water from dewatering operations shall be cleaned up at the Contractor's expense.

F. Discharge of ground and surface runoff water shall be to the existing drainage ways and storm systems. Contractor shall comply with all applicable federal, state and local laws and regulations pertaining to erosion control and discharge of water off-site.

G. The Contractor shall be responsible for any damages to existing on- and off-site facilities and work in-place resulting from mechanical or electrical failure of the dewatering system.

H. Pumping of native silts and sands shall be avoided.

END OF SECTION

SECTION 31 2323

FILL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Filling, backfilling, and compacting for curbs, footing subgrades, slabs-on-grade, paving, and sidewalks.

B. Backfilling and compacting for utility trenches shall be as specified in 31 2316.13 - Trenching.

C. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

D. Rigid plastic foam block fill.

E. Filling with Cobble Stone at drainage swales.

1.02 RELATED REQUIREMENTS

A. Geotechnical Investigation Report - Foundation Engineering, Inc., May 15, 2019.

B. Section 01 5713 - Temporary Erosion and Sediment Control: Slope protection and erosion control.

C. Section 31 2200 - Grading: Site grading.

D. Section 31 2316 - Excavation: Removal and handling of soil to be re-used.

E. Section 31 2316.13 - Trenching: Excavating and Fill for utility trenches .

F. Section 31-2319 - Dewatering.

G. Section 32-1123 - Aggregate Base Course.

H. Section 32-1216 - Asphalt Paving.

I. Section 32-1313 - Concrete Paving.

1.03 DEFINITIONS

A. Finish Grade Elevations: Indicated on drawings.

1.04 REFERENCE STANDARDS

A. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2014.

B. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012.

C. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2007.

D. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2012.

E. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2008.

F. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2010.

G. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2010.

H. ODOT/APWA Standard Specifications or Oregon Standard Specifications (OSS) - State standard specifications.

1.05 SUBMITTALS

A. See Section 01 3323 - Shop Drawings, Product Data, Samples for submittal procedures.

B. Product Data for Manufactured Fill.

C. Shop Drawings for Manufactured Fill.

1. Submit plan, section, and profile drawings. Indicate size, type, location, and orientation of each geofoam block.
2. Submit location and type of connectors.
3. Indicate proposed weighting or guying.

D. Soil Samples: 10 pounds sample of each type of fill; submit in air-tight containers to testing laboratory.

E. Materials Sources: Submit name of imported materials source.

F. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used, including manufactured fill.

G. Compaction Density Test Reports.

1.06 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

B. When fill materials need to be stored on site, locate stockpiles where indicated.
1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
2. Prevent contamination.
3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. General Fill - Fill Type Class A: Use native or common material excavated from within limits of the project, free from vegetation and other detrimental material and containing no frozen ground. Maximum particle size shall be 3 inches. Engineer will make approval prior to placement. Compact to at least 95 percent of the maximum dry density, as determined by ASTM D 698.

B. Granular Fill - Fill Type Class B: Use high quality, dense-grade, 1"-0 crushed rock, with less than 5 percent passing the U.S. Standard No. 200 sieve, compact to at least 98 percent of the maximum dry density, as determined by ASTM D698. Class B Granular Fill shall conform to Section 02630 of ODOT/APWA 2018 Oregon Standard Specifications for Construction.

C. Building Foundation "Select" Fill: ¾-inch minus, clean (i.e., less than 5% passing the #200 U.S. Sieve), well-graded, crushed gravel or rock.

D. Structural Fill: Use high quality, clean, dense-grade 1-1/2"-0 crushed rock conforming to Section 02630 of ODOT/APWA 2018 Oregon Standard Specifications for Construction. Compact to at least 95 percent of the maximum dry density, as determined by ASTM D1557.

E. Sand - Fill Type Class C: Clean sand; free of silt, clay, loam, friable or soluble materials, and organic matter.
1. Graded in accordance with ASTM C136/C136M; within the following limits:
   a. No. 200 sieve: Less than 5 percent passing.

F. Drainrock Fill - Fill Type Class D: Use granular permeable material; coarse, clean, free drain open graded 1 inch to 2 inch minus crushed rock containing no fines or round rock, less than 2 percent passing the #200 sieve.

G. Substation Rock Fill:
1. Substation surfacing rock shall achieve a wet electrical resistivity of 3000 ohm-meters or greater
2. Substation surfacing rock shall be installed in a 6-inch (150mm) layer over the entire indicated area in the notes of drawings C10-01, C10-02 with the exception of driving paths that are away from electrical equipment.
3. Substation surfacing rock shall be 1.5-inch minus with less than 10% passing a 3/8” sieve.
4. Substation surfacing rock shall be crushed so that all faces are fractured; round river rock or fractured river rock is not acceptable.

H. Fill Type Class E

1. Use controlled low strength material (CLSM), a highly flowable lean concrete mix; a mixture of fly ash, Portland cement, fine aggregates and water which results in a harden, dense, non-settling fill and is excavatable. CLSM shall conform to Section 004420 of the ODOT/APWA 2018 Standard Specification for Construction.

I. Amended Topsoil - Fill Type Class F: Amended topsoil excavated on-site or from borrow.
   1. Unclassified.
   2. Graded.
   3. Free of roots, rocks larger than 1/2 inch, subsoil, debris, large weeds and foreign matter.
   4. Acidity range (pH) of 5.5 to 7.5.
   5. Containing a minimum of 4 percent and a maximum of 25 percent inorganic matter.
   6. Soil Amendment: See Section 32 9219 - Seeding and Section 32 9300 - Plants and Drawings for soil amendments at landscape locations.

J. Riprap - Class 50 Riprap per OSS 00390.00. Install per OSS 0390.00.

2.02 ACCESSORIES

A. Separation Geotextile Fabric: Non-biodegradable, non-woven, permeable stabilization fabric, 5 oz/yd weight minimum.
   1. Mean Average Roll Value (MARV) strength properties meeting the requirements of an AASHTO M 288-17 Class 2 geotextile.
   2. Flow Rate (ASTM D4491): 110 gpm/sf.
   3. Permittivity greater than 0.1 sec-1. The permittivity is required to reduce the risk of subgrade pumping during wet weather.
   4. Apparent opening size (AOS): 0.6 mm (max average roll value).
   5. Grab Strength (ASTM D 4632): 200 lbs minimum.
   6. Grab Elongation (ASTM D 4632): 50 percent.

B. Geotextile Filter Fabric: Same as above.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench marks and intended elevations for the Work are as indicated.

B. Identify required lines, levels, contours, and datum locations.

C. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.

D. Verify structural ability of unsupported walls to support imposed loads by the fill.

E. Verify areas to be filled are not compromised with surface or ground water.

3.02 PREPARATION

A. Scarify, compact and proof roll subgrade surface to a depth of 6 inches to identify soft spots. Proof roll in the presence of the Architect. Do not place any fill in the building zone until proof rolling has been performed and observed by the Architect.

B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with Fill Type B.

C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

D. Until ready to fill, place 4 inches of compacted granular structural backfill over footing subgrades to protect the footing subgrades from foot traffic and the elements. Maintain excavations and prevent loose soil from falling into excavation.

3.03 SEPARATION GEOTEXILE FABRIC

A. Place the Separation Geotextile over the approved subgrade prior to placing Select Fill. The geotextile should be laid smooth, without wrinkles or folds, in the direction of construction traffic. Overlap adjacent rolls a minimum of 2 feet. Pin fabric overlaps or place the Select Fill in a manner that will not separate the overlap during construction. Seams that have separated will require removal of the Select Fill to establish the required overlap.

3.04 FILLING

A. Fill to contours and elevations indicated using unfrozen materials.

B. Employ a placement method that does not disturb or damage other work.

C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

D. Maintain optimum moisture content of fill materials to attain required compaction density.

E. Granular Fill: Place and compact materials in equal continuous layers not exceeding 8 inches compacted depth.

F. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth.

G. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

H. Correct areas that are over-excavated.
   1. Load-bearing foundation surfaces: Use structural fill, flush to required elevation, compacted to 98 percent of maximum dry density.
   2. Other areas: Use Fill Type B, flush to required elevation, compacted to minimum 98 percent of maximum dry density.

I. Reshape and re-compact fills subjected to vehicular traffic.

J. Maintain temporary means and methods, as required, to remove all water while fill is being placed as required, or until directed by the Architect. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.05 FILL AT SPECIFIC LOCATIONS

A. Use general granular fill (Type B) unless otherwise specified or indicated.

B. Structural Fill at Building pads:
   1. See note above regarding proof rolling preparation.
   2. Use Fill Type Building Foundation Select Fill.
   3. Fill up to subgrade elevations.
   4. Maximum depth per lift: 8 inches, compacted.
   5. Minimum thickness: 12 inches under entire building pad, to underside of building slab.
   6. Compact to minimum 95 percent of maximum dry density per ASTM D 698.

C. At Bioswaled Areas:
   1. Use Fill Type Class F.
   2. Use Fill Type D, below Amended Soil F, depth as detailed.
   3. Fill up to finish grade elevations.
   4. Compaction not required.
   5. See Section 31 2200 for topsoil placement.
   6. Refer to Detailed Drawings.

D. All Other Planting Areas :
   1. Use Fill Type Class F.
   2. Compact to 65 percent of maximum dry density.
   3. See Section 31 2200 for topsoil placement.

3.06 TOLERANCES

A. Top Surface of General Filling: Plus or minus 1/2 inch from required elevations.

B. Top Surface of Filling Under Paved Areas: Plus or minus 1/4 inch from required elevations.

3.07 FIELD QUALITY CONTROL

A. See Section 01 4500 - Quality Control, for general requirements for field inspection and testing.

B. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, or ASTM D6938.

C. When using the nuclear method of ASTM D6938, the gauge shall be field calibrated according to ASTM standards.

D. For general fill, Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D 698 ("standard Proctor").

E. For "Structural Fill" evaluate results in relation to compaction curve determined in accordance with ASTM D1557 ("modified proctor").

F. If tests indicate work does not meet specified requirements, remove work, replace and retest.

G. Frequency of Tests: For structural fill, tests shall be taken each day of production.

3.08 CLEANING

A. See Section 01 7400 - Cleaning for construction waste management and disposal, for additional requirements.

B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION

SECTION 31 4100

SHORING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Shoring and bracing of trenches and other excavation as required to furnish safe and acceptable working conditions, protect existing and new structures, utilities, vegetation and maintaining existing slopes, fills and open excavations.

B. The Contractor shall have sole responsibility to determine the construction means and methods required to satisfy the requirements of this section. The method of shoring and bracing may include the use, or the combination of sheeting, shoring, bracing, sloping, sliding trench shield or other methods to accomplish the work.

C. Shoring and bracing shall also include other means and procedures such as draining and recharging groundwater and routing and disposing of surface runoff, required to maintain the stability of soils.

1.02 RELATED SECTIONS

A. Section 31-2316.13 - Trenching

B. Section 31-2319 - Dewatering

1.03 QUALITY ASSURANCE

A. The method of protection shall be according to the Contractor's design.

B. The Contractor shall design sheeting, shoring, bracing, etc. in accordance with Oregon Occupational Safety and Health Act (OSHA).

C. The Contractor's design shall furnish a safe place of work pursuant to OSHA provisions of 1970 and the subsequent amendments and regulations and provide for protection of the work, structures and other improvements.

1.04 SHORING AND BRACING SAFETY PLAN

A. For trenches and excavations 5 feet or more in depth, the Contractor shall have a detail plan design of sheeting, shoring, bracing, sloping, etc., available at the work site for review by the Engineer and OSHA representative, to be made for worker protection from hazards of caving ground.

1.05 CONTRACTOR'S SUPERVISOR

A. The Contractor shall appoint a qualified supervisor, who shall be responsible for determining the shoring system that shall be used, depending on local soil type, water table, and so on.

B. B. This supervisor shall have experience in the direction of such excavation and shoring work.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 GENERAL

A. Shoring and bracing shall be installed and maintained continuously and not be limited to normal working hours.

B. The construction of sheeting, shoring and bracing shall not disturb the state of soil adjacent to the trench of excavation or below the excavation bottom. Sheeting, shoring and bracing shall be removed after placement and compaction of initial backfill except otherwise specified.

3.02 STRUCTURE AND EXISTING PIPING

A. The Contractor shall provide support of existing and new structures where necessary. Existing piping shall be protected with shoring and bracing where excavation could expose the pipe and/or cause damage to the pipe.

3.03 DAMAGES

A. Any damages to new or existing structures occurring through settlements, water or earth pressures, or other causes due to failure or lack of sheeting, shoring or bracing, or through negligence or fault of the Contractor shall be repaired by the Contractor at their own expense.

END OF SECTION

SECTION 32 1123
AGGREGATE BASE COURSES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aggregate base course.

B. Aggregate final course, gravel drive areas, and other areas as noted.

C. Paving aggregates.

1.02 RELATED REQUIREMENTS

A. Geotechnical Investigation Report - Foundation Engineering, Inc., May 15, 2019.

B. Section 31 2323 - Fill: Compacted fill under base course.

C. Section 32 1216 - Asphalt Paving: Finish and binder asphalt courses.

D. Section 32 1313 - Concrete Paving: Finish concrete surface course.

1.03 REFERENCE STANDARDS

A. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012.

B. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2007.

C. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2012.

D. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2008.

E. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2010.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

PART 2 PRODUCTS

2.01 MATERIALS

A. Refer to Section 31-2323 Fill.
   1. Provide Building Foundation "Select" Fill.

2.02 SOURCE QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for testing and analysis of aggregate materials.

B. Provide materials of each type from same source throughout the Work.

2.03 SEPERATION GEOTEXTILE

A. Refer to Section 31-2323 for specification requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench marks and intended elevations for the work are as indicated.

B. Verify substrate has been inspected, gradients and elevations are correct, and is dry.

3.02 PREPARATION

A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.

B. Do not place aggregate on soft, muddy, or frozen surfaces.

3.03 INSTALLATION

A. Install Seperation Geotextile over the approved subgrade prior to placing Select Fill.

B. Under Bituminous Concrete Paving:
   1. Place Aggregate Type Building Foundation Select Fill to a total compacted thickness of 8 inches.
   2. Compact to 95 percent of maximum dry density.

C. Under Portland Cement Concrete Paving:
   1. Place Aggregate Type Building Foundation Select Fill to a total compacted thickness of 8 inches.
   2. Compact to 95 percent of maximum dry density.

D. Gravel Drive Area:
   1. Place Aggregate Type Fill Type Class B, (ODOT rock) to a total compacted thickness of 8 inches.
   2. Compact to 95 percent of maximum dry density.

E. Gravel surface around transformers, above grounding cabling grid, gravel drive as noted in Drawings:
   1. Place Aggregate Type Substation Rock to a total compacted thickness of 8 inches.
   2. Compact to 95 percent of maximum dry density.

F. Proof-roll the prepared base rock section prior to paving. Overexcavate and replace any areas of pumping base rock and/or subgrade with additional Select Fill.

G. Place aggregate in maximum 4 inch layers and roller compact to specified density.

H. Level and contour surfaces to elevations and gradients indicated.

I. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.

J. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.

K. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.04 TOLERANCES

3.05 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.

B. Compaction density testing will be performed on compacted aggregate base course in accordance with ASTM D1556, ASTM D2167, or ASTM D6938.

C. If tests indicate work does not meet specified requirements, remove work, replace and retest.

3.06 CLEANING

A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION

SECTION 32 1216

ASPHALT PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Bituminous concrete paving.

B. Surface sealer.

1.02 RELATED REQUIREMENTS

A. Section 32-1123 - Aggregate Base Courses: Aggregate base course.

1.03 REFERENCE STANDARDS

A. Hot Mixed Asphalt Concrete (HMAC) - Asphalt concrete is a hot mix of asphaltic cement; well graded, high quality aggregate; mineral filler and additives, as required; plant mixed into a uniformly coated mass, hot laid in on a prepared foundation, and compacted to a specified density.

B. Oregon Standard Specifications (OSS), ODOT/APWA Standard Specifications; Current Edition.

C. ASTM D946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction; 2009. ASTM D946-09a.

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with OSS.

B. Mixing Plant: Conform to OSS.

C. Obtain materials from same source throughout.

D. Provide quality control per subsection 00745.16 of OSS. The intent of this project is for the Contractor to provide a certified ODOT mix design and compaction tests as provided in Section 00745.16. Other testing provided by Section 00745.16 may be required at the discretion of the Engineer.

E. FIELD CONDITIONS

1. Do not place asphalt when ambient air or base surface temperature is less than 40 degrees F, or surface is wet or frozen.

PART 2 PRODUCTS

2.01 MATERIALS

A. Asphalt Cement: PG64-22 performance grade asphalt cement conforming to ODOT requirements.

B. HMAC shall be Level 2 HMAC, ½-inch Dense Graded Mix in accordance with OSS Section 00745.

C. Tack Coat: Emulsified asphalt. Asphalt Tack Coat shall consist of CSS-1 or CSS-1h emulsified asphalt (EA) tack coat conforming to OSS 00730.

D. Joint Sealant:

1. Joint seal shall meet the test requirements of ASTM D 244.
2. Joint seal material shall be CRS-1 or CRS-2 and shall meet the requirements of OSS; Section 02710 for Cationic Emulsified Rapid Setting Asphalt.

2.02 ASPHALT PAVING MIXES AND MIX DESIGN

A. Submit proposed mix design of each class of mix for review prior to beginning of work.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that compacted subgrade is dry and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

C. Verify finish grade for manholes, catch basins, and other items within pavement area.

D. Sequencing and Scheduling. Notify Engineer and appropriate state, county or city department at least 48 hours prior to placement of aggregate base and pavement to permit inspection.

E. Adhere to all applicable ODOT, OSHA, county and city regulations pertaining to road closure, traffic control, and other related safety precautions.

3.02 BASE COURSE

A. Section 32-1123 - Aggregate Base Courses.

B. Ensure that aggregate base and other surfaces on which asphaltic concrete pavement is to be placed, are sound and compacted.

3.03 PREPARATION

A. To provide for the convenience and safety of the traveling public, pavement replacement shall be performed immediately following the completion of backfilling operations. In the event that pavement replacement cannot be performed as such, the Contractor shall maintain the trench backfill on a daily basis, as directed, until pavement replacement has been completed.

B. Pavement Sawcutting. Utility trenches in existing pavement areas shall be sawcut immediately prior to repaving. Sawcuts shall be made a minimum of 12 inches outside the limits of the trench, or to the outer extents of pavement damaged as a result of the Contractor's operations, whichever is greater. See Trench Detail Drawing if applicable in Drawings. Depth of saw cut shall be sufficient to permit removal of material without damage to adjoining surfaces to remain.

C. Manholes, inlets, and other structures shall have been completed, adjusted, cured and otherwise prepared, as applicable, and made clean and ready for asphalt placement. Cover top surfaces with paper or other material to prevent adherence of asphalt or tack coat.

3.04 TACK COAT

A. Apply tack coat in accordance with manufacturer's instructions.

B. Ensure all surfaces are clean and dry. Remove all loose material.

C. Contact surfaces of manholes, inlets, gutters, curbs, existing pavement edges and other surfaces shall be treated with a layer of asphalt tack coat to provide a good bond and seal.

D. Coat surfaces of manhole and catch basin frames with oil to prevent bond with asphalt pavement. Do not tack coat these surfaces.

E. Contact surfaces of existing pavement shall be treated with a layer of tack coat asphalt. Material, equipment, and construction shall conform to the requirements of Section 00730 of OSS. The tack coat shall be cured thoroughly prior to the application of the asphaltic overlay. Do not place on wet surfaces or during cold weather.

F. Apply tack coat asphalt with a pressure distributor capable of uniformly applying the emulsified asphalt at even heat on variable surface widths up to 16-feet, at readily determined and controlled rates from 0.05 to 0.20 gallons per square yard, and with uniform pressure. Pressure distributor shall include a tachometer, pressure gages, accurate volume measuring devices and a thermometer for measuring temperature of tank contents. Pressure distributor shall be equipped with a positive power asphalt pump and full circulation spray bars adjustable both laterally and vertically. Set bar height for triple lap coverage.

G. Tack coat asphalt shall be at a temperature between 140º F and 185º F as recommended by the manufacturer at the time of application.

H. Do not place HMAC on the tack coat until the asphalt separates from the water, but before it loses its tackiness.

I. Application Rate (gallons / yd2)
   1. Surface: Aggregate Base; 0.33; 0.67 if diluted 1:1 with water
   2. Surface: New HMAC; 0.05 to 0.07; 0.10 to 0.13 if diluted 1:1 with water
   3. Surface: Oxidized AC; 0.07 to 0.10; 0.13 to 0.20 if diluted 1:1 with water
   4. Surface: Milled AC; 0.10 to 0.13; 0.20+ if diluted 1:1 with water

J. Joints between existing and new asphaltic concrete shall be filled with crack sealant asphalt.

3.05 PLACING ASPHALT PAVEMENT

A. Unless otherwise specified herein, HMAC shall be mixed, processed, hauled, laid, compacted and finished in accordance with OSS Section 00745.

B. HMAC shall not be placed when the ambient temperature is below 40 degrees F unless otherwise approved by Engineer. When, in the judgment of the Engineer, the weather is such that satisfactory results cannot be achieved asphalt concrete paving operations shall be suspended.

C. Care shall be taken at all times to prevent segregation in the mixture.

D. HMAC at the time of placement shall have a temperature of at least 250 degrees F.

E. Place asphalt within 24 hours of applying primer or tack coat.

F. Deposit HMAC from haul vehicles so segregation is prevented. HMAC shall not be windrowed.

G. Placement
   1. HMAC should be placed using a self-contained, self-propelled paver supported on tracks or wheels that do not contact the mix being placed.
   2. When leveling irregular surfaces and raising low areas, do not exceed 2-inches actual compacted thickness on any one lift.
   3. Place the mix in the number of lifts and courses, and to the compacted thickness for each lift and course as shown on the Plans. Limit the minimum lift thickness to twice the maximum aggregate size in the mix.

H. Pavement shall be placed, shaped, compacted and finished to the grades and cross sections shown on the Plans or established. Taper new overlays at limits to match existing asphalt pavement.

I. HMAC shall be compacted using self-propelled steel wheeled static rollers, vibratory rollers, or pneumatic tired rollers capable of achieving the minimum compaction specified. If vibratory rollers are used, they should be specifically designed for compaction of HMAC, have adjustable amplitude and frequency, and be capable of at least 2000 vibrations per minute. Finish rolling should be performed by a static roller or a vibratory roller in the static mode.

J. Place to 2-inch compacted thickness minimum or as shown in the Drawings. Asphalt concrete pavement in excess of 2-inches thick shall be constructed in multiple lifts of approximately equal thickness. The maximum compacted thickness of any individual lift shall not exceed 2- inches.

K. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

L. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

M. Asphalt concrete pavement shall be compacted to a minimum of 92% relative compaction with the theoretical maximum density determined by AASHTO T-209. Testing shall be performed at random locations using a nuclear gauge operated in the back-scatter mode. At least one density test shall be performed every 1000 lineal feet on each spread or a minimum of one test each day of production.

N. Test the top surfaces with a 12-foot long straight edge in conformance with Section 00745.70 of OSS. The finish grade shall have a smooth uniform surface for storm drainage with no low spots that would collect water, causing puddling.

O. Surface of the asphalt concrete after compaction shall be smooth and true to a tolerance of 0.02 foot of the established cross section and grade, conforming to Section 00745.70 of OSS. Any mixture that become loose or broken, mixed with dirt, or is in any way defective, shall be removed and replaced with fresh hot mixture which, when compacted, shall conform to the surrounding area. There shall be no sign of roller marks. All costs in correcting defective surfaces shall be borne by the Contractor.

3.06 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch measured with 10-foot straight edge.

B. Variation from True Elevation: Within 1/2 inch.

3.07 FIELD QUALITY CONTROL

A. See Section 01-4000 - Quality Requirements, for general requirements for quality control.

3.08 PROTECTION

A. Immediately after placement, protect pavement from mechanical injury for 7 days or until surface temperature is less than 140 degrees F.

B. No traffic shall come in contact with any newly paved surface until surface has cooled and set sufficiently to prevent marking. The Contractor is responsible for this traffic control.

C. After completion of paving, the Contractor shall remove from the site all debris resulting from the Contractor's operation.

D. All costs incurred in the repair of deficiencies or damages shall be borne by the Contractor, and no additional compensation shall be due the Contractor.

END OF SECTION

SECTION 32 1313
CONCRETE PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete sidewalks, stair steps, integral curbs, and extruded curbs and concrete ramps.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete.

B. Section 31 2200 - Grading: Preparation of site for paving and base and preparation of subsoil at pavement perimeter for planting.

C. Section 32 1123 - Aggregate Base Courses: rock base course.

1.03 REFERENCE STANDARDS

A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).

B. ACI 301 - Specifications for Structural Concrete; 2016.

C. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000.

D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2018.

E. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2015a.

F. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2015.

G. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2014.

H. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2004 (Reapproved 2013).

I. ASTM D1752 - Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction; 2004a (Reapproved 2013).

PART 2 PRODUCTS

2.01 PAVING ASSEMBLIES

A. Comply with applicable requirements of ACI 301.

B. Concrete Sidewalks, Concrete Curbs, and Curb Gutters: 3,000 psi 28 day concrete, 4 inches thick, Portland cement, exposed aggregate finish.

2.02 FORM MATERIALS

A. Wood form material, profiled to suit conditions.

B. Joint Filler: Preformed; non-extruding bituminous type (ASTM D1751) or sponge rubber or cork (ASTM D1752).
   1. Thickness: 1/2 inch.

2.03 REINFORCEMENT

A. Reinforcing Steel: ASTM A615/A615M, Grade 80 (80,000 psi) yield strength; deformed billet steel bars; unfinished or as specified in plans.

2.04 CONCRETE MATERIALS

A. Obtain cementitious materials from same source throughout.

B. Concrete Materials: As specified in Section 03 3000.

2.05 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.

B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
   1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.

C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended by manufacturer.

D. Concrete Properties:
   1. Compressive strength, when tested in accordance with ASTM C39/C39M at 28 days; 3,500 psi.
   2. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
   3. Calcined Pozzolan Content: Maximum 10 percent of cementitious materials by weight.
   4. Silica Fume Content: Maximum 5 percent of cementitious materials by weight.
   5. Water-Cement Ratio: Maximum 40 percent by weight.
   6. Total Air Content: 4 percent, determined in accordance with ASTM C173/C173M.
   7. Maximum Slump: 4 inches.
   8. Maximum Aggregate Size: 1-1/2 inch.

2.06 MIXING

A. Transit Mixers: Comply with ASTM C94/C94M.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify compacted subgrade is acceptable and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

3.02 SUBBASE

A. See Section 32 1123 for construction of base course for work of this Section.

3.03 PREPARATION

A. Moisten base to minimize absorption of water from fresh concrete.

B. Coat surfaces of manhole frames with oil to prevent bond with concrete pavement.

C. Notify Architect minimum 24 hours prior to commencement of concreting operations.

3.04 FORMING

A. Place and secure forms to correct location, dimension, profile, and gradient.

B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

3.05 REINFORCEMENT

A. Place reinforcement at midheight of slabs-on-grade.

3.06 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.

B. Ensure reinforcement, inserts, embedded parts, formed joints are not disturbed during concrete placement.

3.07 EXTRUDED CURBS

A. The pavement shall be dry and cleansed of loose or deleterious Materials prior to curb placement.

B. Extruded cement concrete curb shall be placed, shaped and compacted true to line and grade with an approved extrusion machine. The extrusion machine shall be capable of shaping and thoroughly compacting the concrete to the required cross section.

C. The cement concrete mixture shall be homogeneously mixed to conform with above when delivered to the hopper of the curb machine. Each hopper load of cement concrete shall be run through the curb laying machine, adjusted properly to form and compact the cement mix for the concrete curb.

D. Joints in the extruded cement concrete curb shall be spaced at 15-foot intervals or shall match existing transverse joints or cracks in existing pavement. Joints shall be cut vertically.

3.08 JOINTS

A. Place 3/8 inch wide expansion joints at 20 foot intervals and to separate paving from vertical surfaces and other components and in pattern indicated.

B. Provide scored joints.
   1. At 3 feet intervals, unless shown otherwise.
   2. Between sidewalks and curbs.

3.09 FINISHING

A. Sidewalk Paving: Light broom, texture perpendicular to direction of travel with troweled and radiused edge 1/4 inch radius.

B. Median Barrier: Light broom, texture perpendicular to direction of travel with troweled and radiused edge 1/4 inch radius.

C. Curbs and Gutters: Light broom, texture parallel to pavement direction.

3.10 TOLERANCES

A. Maximum Variation of Surface Flatness: 1/4 inch in 10 ft.

B. Maximum Variation From True Position: 1/4 inch.

3.11 PROTECTION

A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.

END OF SECTION

SECTION 32 3113
CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Posts, rails, and frames.

B. Wire fabric.

C. Concrete.

D. Manual gates with related hardware.

E. Automatic gate operators.

F. Accessories.

G. Vinyl privacy slats.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete anchorage for posts.

1.03 REFERENCE STANDARDS

A. ASTM A392 - Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric; 2011a.

B. ASTM F567 - Standard Practice for Installation of Chain-Link Fence; 2011.

C. ASTM F1083 - Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures; 2013.

D. ASTM F2200 - Standard Specification for Automated Vehicular Gate Construction; 2017.

E. CLFMI WLG 2445 - Wind Load Guide for the Selection of Line Post and Line Post Spacing; 2017.

F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

J. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3323 - Shop Drawings, Product Data, Samples for submittal procedures.

B. Product Data: Provide data on fabric, posts, accessories, fittings and hardware.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Fence Installer: Company with demonstrated successful experience installing similar projects and products, with not less than five years of documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Automatic Gate Operators:
   1. Lift Master.
   2. Substitutions: Section 01 2500 Product Substitution Procedures.

2.02 MATERIALS

A. Posts, Rails, and Frames:

B. Posts, Rails, and Frames: ASTM F1083 Schedule 40 hot-dipped galvanized steel pipe, welded construction, minimum yield strength of 30 ksi.

C. Wire Fabric: Class 2: 2 oz/sf of zinc coating.

D. ASTM A392 zinc coated steel chain link fabric.

E. Concrete: ASTM C 94/C 94M, ready-mixed; Normal portland Cement, 3000 psi strength at 28 days, 3 inch slump; 3/4 inch nominal sized coarse aggregate.

2.03 COMPONENTS

A. Line Posts: 2.38 inch diameter.

B. Corner and Terminal Posts: 2.88 inch diameter.

C. Gate Posts: 3-1/2 inch diameter.

D. Top and Brace Rail: 1.66 inch diameter, plain end, sleeve coupled.

E. Gate Frame: 1.66 inch diameter for welded fabrication.

F. Fabric: 2 inch diamond mesh interwoven wire, 9 gage, 0.1144 inch thick, top selvage twisted tight, bottom selvage twisted tight.

G. Tension Wire: 6 gage, 0.1920 inch thick steel, single strand.

H. Tension Band: 14 inches on center spacing at posts.

I. Tie Wire: steel wire.

2.04 MANUAL GATES AND RELATED HARDWARE

A. Hardware for Single Swinging Gates: 180 degree hinges, 2 for gates up to 60 inches high, 3 for taller gates; fork latch with gravity drop and padlock hasp; keeper to hold gate in fully open position.

B. Location and Quantity:
   1. Provide two (2) gates, 4'-0" wide.
   2. Location: to be determined by Architect.

2.05 AUTOMATIC GATE OPERATORS

A. Cantilever Sliding Gates: Pre-wired, pedestal mounted gate operator for horizontal sliding gates, per ASTM F2200 and UL 325.
   1. Type: Type II, Cantilver slide, alumimum alloy gate frame with chain link fabric.
   2. Class: Class II, cantilever slide, per ASTM F 1184.
   3. Width: 30 feet, refer to Drawings.
   4. Operating type: drive belt.
   5. Control Functions: Open, Pause, Close.
   6. Maximum Open/Close Time: 10 seconds.
   7. Access: Card and Keypad.
   8. Maximum gate weight: 1,500 pounds (560 kilograms).
   9. Horsepower Rating: Suitable for connected load.
   10. Entrapment Protection Devices: Provide sensing devices and safety mechanisms complying with UL 325.
      a. Primary Device: Provide electric sensing edge, wireless sensing, NEMA 1 photo eye sensors, or NEMA 4X photo eye sensors as required with momentary-contact control device.
      b. Secondary Device: Provide electric sensing edge with wireless edge kit or non-monitored safety edge as an option along with continuous-constant control device.
   11. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.

a. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
   1) Outdoor Locations: Type 3.
b. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.

12. Location and Quantity
    a. Provide (2) 30'-0" wide Cantilever Sliding Gates at locations shown on Drawings.
    b. Provide (2) Automatic Gate Operators in locations shown on Drawings.

2.06 ACCESSORIES

A. Caps: Cast steel galvanized; sized to post diameter, set screw retainer.

B. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings; steel.

C. Privacy Slats: Vinyl strips, sized to fit fabric weave, color as selected. Provide at Dumpster Enclosure.

2.07 FINISHES

A. Hardware: Hot-dip galvanized to weight required by ASTM A153/A153M.

B. Accessories: Same finish as framing.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Verify that areas are clear of obstructions or debris.

3.02 INSTALLATION

A. Install framework, fabric, accessories and gates in accordance with ASTM F567.

B. Place fabric on outside of posts and rails.

C. Set intermediate posts plumb, in concrete footings with top of footing 2 inches above finish grade. Slope top of concrete for water runoff.

D. Line Post Footing Depth Below Finish Grade: ASTM F567.

E. Corner, Gate and Terminal Post Footing Depth Below Finish Grade: ASTM F567.

F. Brace each gate and corner post to adjacent line post with horizontal center brace rail. Install brace rail one bay from end and gate posts.

G. Provide top rail through line post tops and splice with 6 inch long rail sleeves.

H. Install center brace rail on corner gate leaves.

I. Do not stretch fabric until concrete foundation has cured 28 days.

J. Stretch fabric between terminal posts or at intervals of 100 feet maximum, whichever is less.

K. Position bottom of fabric 2 inches above finished grade.

L. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches on centers.

M. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.

N. Install bottom tension wire stretched taut between terminal posts.

O. Install support arms sloped outward and attach barbed wire; tension and secure.

P. Do not attach the hinged side of gate to building wall; provide gate posts.

Q. Install hardware and gate with fabric to match fence.

R. Provide concrete center drop to footing depth and drop rod retainers at center of double gate openings.

S. Install operator in accordance with manufacturer's instructions and in accordance with NFPA 70.

3.03 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch.

B. Maximum Offset From True Position: 1 inch.

C. Do not infringe on adjacent property lines.

3.04 CLEANING

A. Clean jobsite of excess materials; scatter excess material from post hole excavations uniformly away from posts. Remove excess material if required.

B. Clean fence with mild household detergent and clean water rinse well.

END OF SECTION

SECTION 32 9219

SEEDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preparation of subsoil.

B. Placing topsoil.

C. Hydroseeding, mulching and fertilizer for seeded areas only.

D. Maintenance.

1.02 RELATED REQUIREMENTS

A. Section 31 2200 - Grading: Preparation of subsoil and placement of topsoil in preparation for the work of this section.

B. Section 31 2323 - Fill: Topsoil material sutable to sustain vegetative growth.

1.03 DEFINITIONS

A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass. All others listed on the Oregon Noxious Weed List, current edition.

1.04 SUBMITTALS

A. See Section 01 3323 - Shop Drawings, Product Data, Samples for submittal procedures.

B. Certificate: Certify seed mixture approval by authority having jurisdiction.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable. Deliver seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.

B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

PART 2 PRODUCTS

2.01 SEED MIXTURE

A. Seed Mixture:

1. Slope Stabilization Mix: Native Salt Tolerant Erosion Control mix, by Sunmark Seeds International, Fairview, Oregon, or approved equal
   a. 5 lbs. per 1,000 sq. ft. seeding rate:

1)	Meadow Barley	50 percent/wt.
2)	California Brome	30 percent
3)	Roemer's Fescue	8 percent
4)	Strawberry Clover	5.5 percent
5)	Farewell to Spring	2 percent
6)	Hooker's Evening Primrose	2 percent
7)	Tufted Hairgrass	1.5 percent
8)	Spice Bentograss	1 percent

   b. Location: All areas disturbed by construction activities, unless noted otherwise on Drawings.
2. Biofiltration Seed Mix: Coastal Grasslands Mix by Sunmark Seeds International, Fairview, Oregon, or approved equal.
   a. 5 lbs. per 1,000 sq. ft. seeding rate, 65.42 PLS lbs. per acre:

1)	Meadow Barley	40 percent/wt.
2)	California Brome	25 pecent

3) Sicklekeel Lupine 20 percent
4) Small Camas 4 percent
5) Roemer's Fescue 3.9 percent
6) Slough Sedge 3.5 percent
7) Tufted Hairgrass 2 percent
8) Poverty Rush 0.10 percent
9) Spike Bentgrass 0.50 percent

b. Location: All Biofiltration areas, unless noted otherwise on Drawings.

2.02 SOIL MATERIALS

A. Topsoil: Type Class F as specified in Section 31 2323-Fill.

B. Biotic Soil Amendment, Amended Soil for Planting Areas:
1. PermaMatrix Biotic Soil Amendment HYDRO.
a. Composition: Organics, Microbes, Mycorrhizae, Burlap/Straw Fiber, Plant Growth Aids:
1) Organic Humic Compounds: 6.4 - 6.6 pH.
2) Blended Fiber: NA pH.
3) Charcoal (Biochar): 8.0 - 9.0 pH.
4) EcoLive Mycorrhizae: 6.0 - 7.0 pH.
5) Ecobiotics Microbial Suite: 6.5 - 6.7 pH.
6) Water Storing Organic Polymer: 6.0 - 7.0 pH.
2. Or approved equal. Substitutions: See Section 01-6000 - Product Requirements.

2.03 ACCESSORIES

A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.

B. Fertilizer: Slow-release, sutable for aquatic ecosystems as determined by EPA; recommended for grass, with fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil, as indicated by analysis.

C. Erosion Fabric: Jute matting, open weave.
1. Locations: all slopes greater than 5:1.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared soil base is ready to receive the work of this Section.

3.02 PREPARATION

A. Prepare subgrade in accordance with Section 31 2200.

B. Place topsoil in accordance with Section 31 2200.

3.03 FERTILIZING

A. Apply fertilizer in accordance with manufacturer's instructions.

B. Provide 10ft buffer strip adjacent to any water body. Apply no fertilizer in this strip.

C. Apply after smooth raking of topsoil and prior to roller compaction.

D. Do not apply fertilizer at same time or with same machine as will be used to apply seed.

E. Mix thoroughly into upper 2 inches of topsoil.

F. Lightly water to aid the dissipation of fertilizer.

3.04 HYDROSEEDING

A. Mix seed, fertilizer and mulch with water to form a homogenous, uniform slurry and apply with a hydraulic seeder at a rate as specified for each seed mix. Apply evenly in two intersecting directions.

B. Do not hydroseed area in excess of that which can be mulched on same day.

C. Do not hydroseed when wind velocity is greater than 5 miles per hour at the site

D. Immediately following seeding, apply mulch to a thickness of 1/8 inches. Maintain clear of shrubs and trees.

E. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.

F. Unused Loads: Once fertilizer is mixed into the slurry, no more than 30 minutes should lapse before it is applied to prevent fertilizer from burning the seed. If mixture, containing no fertilizer, remains in the tank for more than 8 hours it shall be removed from the job site at the contractor's expense.

G. Following germination, immediately re-seed areas without germinated seeds that are larger than 4 by 4 inches.

3.05 PROTECTION

A. Identify seeded areas with stakes and string around area periphery. Set string height to 24 inches. Space stakes at 48 inches.

B. Cover seeded slopes where grade is 4 inches per foot or greater with erosion fabric. Roll fabric onto slopes without stretching or pulling.
   1. Lay fabric smoothly on surface, bury top end of each section in 6 inch deep excavated topsoil trench. Provide 12 inch overlap of adjacent rolls. Backfill trench and rake smooth, level with adjacent soil.
   2. Secure outside edges and overlaps at 36 inch intervals with stakes.
   3. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.
   4. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 6 inches.

3.06 MAINTENANCE

A. Provide maintenance at no extra cost to Owner; Owner will pay for water.

B. See Section 01 7000 - Execution Requirements, for additional requirements relating to maintenance service.

C. Maintain seeded areas immediately after placement until grass is well established and exhibits a vigorous growing condition.

D. Neatly trim edges and hand clip where necessary.

E. Immediately remove clippings after mowing and trimming.

F. Water to prevent grass and soil from drying out.

G. Roll surface to remove minor depressions or irregularities.

H. Immediately reseed areas that show bare spots.

I. Protect seeded areas with warning signs during maintenance period.

END OF SECTION

SECTION 33 0513
CLEANOUTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sanitary Sewer and Storm Cleanouts.

1.02 SUBMITTALS

A. See Section 01 3323 - Shop Drawings, Product Data, Samples for submittal procedures.

1.03 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

1.04 FIELD CONDITIONS

A. Cold and Hot Weather Requirements: Comply with requirements of ACI 530/530.1/ERTA or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.01 CLEANOUTS

A. Clean-outs shall be provided on service laterals and as shown on the Drawings. Frame and cover shall be Inland Foundry Co., Inc. Pattern No. 220; or approved equivalent. Cover shall be marked "S" or "SEWER" for santitary sewer installations.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify items provided by other sections of Work are properly sized and located.

B. Verify that built-in items are in proper location, and ready for roughing into Work.

C. Verify excavation for manholes is correct.

3.02 PREPARATION

A. Coordinate placement of inlet and outlet pipe or duct sleeves required by other sections.

3.03 CLEANOUTS INSTALLATION

A. Prepare native soil and place and compact the crushed rock base to 95% maximum dry density. Backfill material around cleanouts shall be as specified for trenches.

END OF SECTION

SECTION 33 1113
WATER UTILITY AND DISTRIBUTION PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe and fittings for site water lines including water mains, and service piping.

1.02 RELATED REQUIREMENTS

A. Section 31 23 16.13 - Trenching: Excavating, bedding, and backfilling.

B. Section 31-2323 - Fill: Bedding and backfilling.

C. Section 33-1120 - Boring, Tunneling and Jacking Highway Crossing

D. Section 33 13 00 - Disinfecting of Water Utility Distribution: Disinfection of site service utility water piping.

1.03 REFERENCES

A. Seal Rock Water District latest Design Standards.

B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2012 (ANSI B16.18).

C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; The American Society of Mechanical Engineers; 2012.

D. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals; 1998 (Reapproved 2011).

E. AWS A5.8/A5.8M - Specification for Filler Metals for Brazing and Braze Welding; American Welding Society; 2011 and errata.

F. AWWA C104/A21.4 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings; American Water Works Association; 2008 (ANSI/AWWA C104/A21.4).

G. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; American Water Works Association; 2012 (ANSI/AWWA C111/A21.11).

H. AWWA C115/A21.15 - Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges; 2011.

I. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast; American Water Works Association; 2009 (ANSI/AWWA C151/A21.51).

J. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service; American Water Works Association; 2009 (ANSI/AWWA C509).

K. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances; American Water Works Association; 2010 (ANSI/AWWA C600).

L. AWWA C605 - Underground Installation of PVC Pressure Pipe and Fittings for Water, 2005.

M. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Transmission and Distribution; American Water Works Association; 2007 (ANSI/AWWA C900/C900a).

1.04 SUBMITTALS

A. See Section 01 3323 - Shop Drawings, Product Data, Samples for submittal procedures.

B. Product Data: Provide data on pipe materials, pipe fittings, and accessories.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with municipality requirements.

B. All materials used in contact with potable water shall meet the requirements of the National Sanitary Foundation (NSF), Standard 61 and shall bear the NSF insignia.

C. Water Pipe, Fittings, and other appurtenances shall be American made.

D. Provide thrust blocking and restraint at all pipe joints as required to prevent movement under pressure testing and subsequent long-term use.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store in shipping containers with labeling in place.

PART 2 PRODUCTS

2.01 WATER PIPE

A. Ductile Iron Pipe (DIP) and Fittings: Centrifugally cast DIP conforming to AWWA C151 and AWWA C150.
   1. Pipe Thickness: Pipe thickness shall be Class 52 minimum.
   2. Pipe and Fitting Coatings: Pipe interior shall be cement mortar lined conforming to AWWA C104. External pipe coating shall be an asphaltic coating in accordance with ANSI/AWWA C151/A21.51.
   3. Pipe Joints: AWWA C111 integral cast socket bell with SBR rubber gaskets. Joints shall be as structurally strong as the pipe itself.
      a. Water-tight joint seal. U.S. Pipe "Tyton-Joint" or approved equivalent.
      b. Restrained Joints: When required by the conditions or Drawings, restrained push-on pipe joints shall be provided.
   4. Ductile Iron Fittings: Fittings shall conform to ANSI/AWWA C110/A21.10-08 Standard (full body), or ANSI/AWWA C153/A21.53 Standard (compact). Fittings up to 24-inch shall be rated at 350 psi. Fittings over 24-inch shall be rated at 250 psi minimum.
      a. Joints shall be mechanical joint, push-on, or flange as shown in the Drawings and required by installation conditions.
      b. Mechanical Joint Fittings: Mechanical Joints (MJ) and gaskets for mechanical joint fittings shall conform to ANSI/AWWA C111/A21.11-07 Standard. Furnish with standard high-strength, low-alloy steel T-bolts and hexagonal nuts conforming to ANSI/AWWA C111/A21.11. Gasket material shall be vulcanized styrene butadiene rubber (SBR) or ethylene propylene rubber (EPDM) in accordance with ANSI/AWWA C111/A21.11.
         1) MJ restraints shall be used for all MJ fittings unless otherwise specified. Joint restraints shall be specifically designed for the pipe material being used (PVC, DIP, etc.). Device shall be cast from Grade 65-45-12 ductile iron in accordance with ASTM A536 and shall consist of multiple gripping wedges incorporated into the follwing gland. Device shall not reduce the standard deflection capabilities of MJ fittings. Device shall have a rated working pressure of at least 350 psi with a safety factor of not less than 2 to 1. "MEGALUG" by EBAA Iron, Ford Meter Box Uni-Flange Restraint, or approved equivalent.
      c. Flanged fittings: Faced and drilled to standard 125-pound template per ANSI Class 125 B16.1 Standard unless ANSI Class 250 B16.1 fittings are indicated on Drawings. Flange thickness shall conform to ANSI/AWWA C115/A21.15-05.
         1) Flange Gaskets shall be 1/8-inch thick SBR rubber per ANSI/AWWA C111/A21.11 Appendix C, Sec. C.2 with at least (3) three bulb type rings molded into both faces of the gasket. Gaskets shall be full face style with holes for bolts. Flat rubber gaskets and/or thinner gaskets are not approved.
         2) Bolts and nuts shall be stainless steel or cadmium plated with anti-seize lubricant.
   5. Ductile Iron Pipe and Fittings shall be as manufactured by: US Pipe, Tyler Pipe, McWane, Inc., or approved equivalent.

B. Copper Tubing: ASTM B88, Type K, annealed:
   1. Fittings: ASME B16.18, cast copper, or ASME B16.22, wrought copper.
   2. Joints: Compression connection or AWS A5.8, BCuP silver braze.
   3. Alternate: ASTM B88, Type L, soft annealed with no joints.
   4. Application: Domestic water service piping and/or as shown on the Drawings.

C. PVC Pipe, AWWA C900: Rigid PVC pipe, 4-inch through 12-inch nominal diameter, conforming to all requirements of AWWA C900, Polyvinyl Chloride Pressure Pipe. Shall be made from quality PVC resin compounded to provide physical and mechanical properties that equal or exceed cell class 12454 as defined in ASTM D1784. Pipe shall be designated for use as water supply and distribution pressure pipe, and shall conform to the outside diameters of cast iron pipe.
   1. Pipe furnished shall be Pressure Class 235 (DR 18).
   2. Pipe to be furnished in 20 foot lengths with integral wall-thickened bell ends.
   3. Fittings: AWWA C111, ductile iron conforming to those specified above for DIP.
   4. Joints: The bell joint shall consist of an integral wall section with a bonded-in elastometric gasket manufactured in conformance with the requirements of ASTM F477. Gaskets shall be Rieber type to resist rolling during installation. The bell section shall be designed to be at least as hydrostatically strong as the pipe wall and meet the requirements of AWWA C900 and ASTM D3139.
   5. A non-toxic vegetable soap lubricant shall be supplied by the pipe manufacturer with pipe.
   6. C900 PVC Pipe shall be as manufactured by: JM Eagle, CertainTeed, North American Pipe Corporation, or approved equivalent.

D. Polyethylene pipe shall meet Seal Rock Water District Design Standards. Section 5.7.6.

2.02 TRACER WIRE AND WARNING TAPE

A. Tracer Wire: Provide detectable tracer wire along all non-metallic water pipes.
   1. Tracer Wire shall be No. 10 AWG minimum, solid copper.
   2. Insulation shall be 0.030-inch thick HDPE designed for direct bury.
   3. Insulation for tracer wire along water piping shall be blue in color.
   4. Wire shall be placed on pipe and taped every 5 feet with a small amount of slack to keep the wire straight along the pipe.

B. Warning Tape. Provide warning tape in trench over all installed pipelines.
   1. Underground warning tape shall be 6-inch wide, 4-mil-thick, APWA Standard Blue color, reading “CAUTION – WATER LINE BURIED BELOW.”
   2. Warning tape shall be placed over the pipe zone material, approximately 15 to 18 inches below finish grade. Lay tape flat and untwisted, centered over the pipe and with wording facing upwards.

2.03 BEDDING AND COVER MATERIALS

A. Bedding: As specified in Section 31 2316.13.

B. Cover: As specified in Section 31 2316.13.

2.04 ACCESSORIES

A. Concrete for Thrust Restraints shall meet ASTM C94 with a 28-day compressive strength of at least 3000 psi. Reinforcement shall meet ASTM A615, Grade 60.

PART 3 EXECUTION

3.01 PREPARATION

A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare pipe connections to equipment with flanges or unions.

3.02 TRENCHING

A. See the section on trenching for additional requirements.

3.03 INSTALLATION - PIPE

A. Install ductile iron piping and fittings to AWWA C600 and manufacturer's instructions. Contractor shall have on site all proper tools and equipment to properly and safely install the pipe.

B. PVC pipe shall be installed and handled in accordance with the Manufacturer's Installation Guide, the Uni-Bell Uni-PUB-09, AWWA C605, and these specifications. Contractor shall have on site all proper tools and equipment to properly and safely install the pipe.

C. Properly prepare trench and trench bedding. Do not construct trench in a manner which requires bending of the pipe. Utilize fittings rather than bending pipe.

D. Provide concrete thrust blocking at all bends, valves, tees and other fittings in accordance with the Plans, as required to prevent movement due to thrust.

E. Prior to lowering pipe into the trench, the Engineer will check for damage to the pipe. The Contractor shall repair or replace, as directed, all damaged or flawed pipe prior to installation.

F. Thoroughly clean inside the pipe before laying. Prevent foreign material from entering the pipe while it is being placed in the trench. Remove all foreign material from the inside of the pipe and joint before the next pipe is placed. Keep debris, tools, rags or other materials out of the pipe at all times. When pipe laying is not in progress, cover the exposed end of the pipe using a watertight expanding plug, or by other approved means to prevent entry of trench water or other foreign materials into the pipe.

G. Lay pipe with bell ends facing the direction of laying. For lines on an appreciable slope, face bells up-grade unless otherwise directed by the Engineer.

H. At no time shall pipe be deflected at a joint, either in the vertical or horizontal plane, in excess of the maximum deflection recommended by the pipe manufacturer or 3 degrees, whichever is less. Maximum deviation from grade shall not exceed ½-inch. No deflection is allowed at push-on joints.

I. Where new water pipe is installed near existing or new sanitary sewer lines, all provisions of current OAR 333-61-050 (Crossings - Sanitary sewers and waterlines), regarding placement of pipe near, under, or over sanitary sewer lines shall be followed.

J. Thoroughly clean the ends of the pipe to remove all foreign matter from the pipe joint. Lubricate the bell and spigot ends with NSF approved pipe lubricant, as recommended by the manufacturer.

K. Install pipe to allow for expansion and contraction without stressing pipe or joints.

L. Install access fittings to permit disinfection of water system performed under Section 33-1300.

M. Place tracer wire properly before pipe zone fill is complete. Place warning tape as specified. Complete trench fill.

N. Hdpe pipe welding and deflection per manufacturer's requirement/guidelines.

3.04 FIELD QUALITY CONTROL

A. Filling and Flushing Water Piping

1. After installation of water piping, fill pipes slowly while venting all air. Fill with potable water at a maximum rate to maintain 2 fps or less. Take all required precautions to prevent entrapping air in the pipes. Flush all sections of pipe to remove any solids or material that may be in the pipe. If no hydrant is installed at the end of the main, provide a tap large enough to develop sufficient flow rates to achieve a velocity between 3 to 5 feet per second in the main. Control and dispose flushing water in a proper manner to avoid erosion, flooding, property damage, and discharge of chlorinated water in an unacceptable manner.
2. All waterlines shall be flushed as specified herein as to remove any foreign material. The contractor shall provide all fittings and backflow preventions as required to perform the flushing.
3. In addition to flushing, all waterlines six (6) inches and larger shall be “pigged” as specified herein to remove any foreign mater.
    a. “Pigging” shall be accomplished prior to hydrostatic testing and disinfection.
    b. A minimum of three (3) pigs shall be flushed through the waterlines. The Contractor has the option of running all three pigs at the same time or running the pigs one at a time. Identify individual pigs if all three pigs are to be ran simultaneously.

c. Pigs shall be polyurethane form as manufactured by Knapp Poly Pig, Inc. or as approved by Engineer.
d. It shall be the responsibility of the Contractor to flush the pigs through the waterlines and retrieving pigs after the test. If one or more pigs fails to run the complete length of the waterline, Contractor shall be responsible for retrieving the pigs and repeating the test.
e. Contractor shall provide erosion control as required to prevent damage to surrounding vegetation and existing ground.
f. The Contractor shall re-pig the waterlines as required if after pigging and disinfection of the treated waterlines, the bacteriological test fails.
g. Contractor shall notify Engineer and Owner a minimum of 24-hours prior to pigging the waterlines. Engineer can require waterlines to be re-pigged if excessive foreign material is encountered during pigging.
h. The contractor shall be required to temporarily remove and replace any reducers, pipe spools and fittings as required placing and removing pigs for the flushing.

B. Pressure Testing Water Piping
1. Per Seal Rock Water District Design Standards.
2. Hydrostatic pressure testing shall be conducted after the waterline has been flushed.
3. All waterlines and service lines shall be subjected to hydrostatic pressure testing. Testing shall be conducted by the Contractor in the presence of the Engineer or Owners representative. Engineer and Owner shall be notified at least 2 working days in advance.
4. Testing shall not be commenced until all thrust blocking has been in place for not less than 10 days and sufficient backfill has been placed to prevent pipe movement.
5. Furnish and operate all pumps, gauges, plugs, saddles, corporation stops, miscellaneous hose and piping, and measuring equipment necessary for performing the test. Provide certifications of accuracy for gauges from an approved laboratory when requested.
6. Perform pressure testing with hydrant auxiliary gate valves open and pressure against the hydrant valve. After the pipe test is completed, test each gate valve in turn by closing it and relieving the pressure beyond. This test of the gate valve is acceptable if there is no immediate loss of pressure
7. All visible leaks on new waterlines shall be repaired, regardless of the amount of leakage.
8. Test Procedure - Rigid Piping (PVC, D.I.)
a. The test section shall be slowly filled with water and all air expelled from the pipe prior to testing.
b. All valves isolating the test section shall be securely closed and the specified test pressure applied by means of a pump connected near the lower end of the test section.
c. The test pressure shall be 150 psi and the duration shall be at least 2-hours at the test pressure. Provide additional pumping during the test period to continuously maintain pressure within 5 psi of that required (PVC and D.I. pipe only). Use a clean container of potable water to supply the pump.
d. Accurately determine the quantity of water required to maintain and restore the required pressure at the end of the test by pumping through an approved positive displacement water meter.
e. The allowable leakage rate for the test section shall be determined from the following formula where L = allowable leakage (gph), S = length of pipe being tested, D = nominal diameter of pipe (inches), and p = average test pressure (psi):
1) $L = SD\sqrt{p} / 148{,}000$
9. Compare the amount of water added during the test to the allowable leakage for the test section. If the amount of water added is less than the allowable leakage, then the section shall be considered to have passed hydrostatic testing and the Contractor may proceed with disinfection. If the amount of water added to the section exceeds the allowable leakage, the Contractor shall, at his own expense, determine the source of leakage, repair or replace the defective elements, and repeat the test until the pipeline withstands the test pressure and the allowable leakage requirements have been satisfied.

C. See 33 13 00 for Disinfection requirements.

END OF SECTION

SECTION 33 1200

WATER UTILITY DISTRIBUTION EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Gate valves, backflow preventer assemblies (and fiberglass enclosures), hydrants, and other water system related appurtenances.

1.02 RELATED REQUIREMENTS

A. Section 31 23 16 - Excavation: Excavating of trenches.

B. Section 31 23 16.13 - Trenching: Excavating, bedding, and backfilling.

C. Section 31 23 23 - Fill: Bedding and backfilling.

D. Section 33-1120 - Boring, Tunneling, Jacking.

E. Section 33-1300 - Disinfecting of Water Utility Distribution: Disinfection of site service utility water piping.

1.03 REFERENCES

A. Seal Rock Water District Design Standards.

B. AWWA C104/A21.4 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings; American Water Works Association; 2008 (ANSI/AWWA C104/A21.4).

C. AWWA C115/A21.15 - Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges; 2011.

D. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service; American Water Works Association; 2009 (ANSI/AWWA C509).

E. AWWA C511 - Reduced-Pressure Principal Backflow Prevention Assembly; 2007 (ANSI/AWWA C511).

F. AWWA C550 - Protective Epoxy Interior Coatings for Valves and Hydrants, American Water Works Association; 2013 (ANSI/AWWA C550).

G. UL 246 - Hydrants for Fire-Protection Service; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3323 - Shop Drawings, Product Data, Samples for submittal procedures.

B. Product Data: Provide data on pipe materials, pipe fittings, valves and accessories.

C. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with municipality requirements.

B. All materials used in contact with potable water shall meet the requirements of the National Sanitary Foundation (NSF), Standard 61.

C. Water Valves and other appurtenances shall be American made.

D. Provide thrust blocking and restraint at all pipe joints as required to prevent movement under pressure testing and subsequent long-term use.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store valves in shipping containers with labeling in place.

PART 2 PRODUCTS

2.01 SHUT-OFF VALVES

A. Valves: Manufacturer's name and pressure rating shall be marked on valve body. Unless otherwise indicated on the drawings, standard shut-off valves in waterlines 2" through 12" shall be resilient wedge gate valves. Special note shall be taken of the various end connections (flange, mechanical joint, thread, etc.) required for each valve. Buried valves shall be furnished with specified valve boxes and lids and shall include a stem extension where required to bring the operating nut to within 2 feet of finish grade when the valve nut is greater than 3 feet from finish grade otherwise.

B. Gate Valves 2 Inches through 12 Inches:
   1. AWWA C509, iron body, resilient seat, non-rising stem (NRS), wedge gate valves. Valves shall be manufactured to open when the stem is rotated counterclockwise. Provide a 2-inch square operating nut unless otherwise specified. Valve end configurations and sizes shall be as shown on the Plans. All valves shall be 250 psi working pressure, 500 psi test pressure.
      a. All internal parts shall be accessible without removing the body from the line. Pressure retaining surfaces shall have O-rings and no flat gaskets.
      b. Wedge shall be cast iron completely encapsulated with resilient material. The resilient material shall be permanently bonded to the wedge meeting ASTM D429.
      c. Stems shall be cast copper alloy. Valve hardware shall be stainless steel.
      d. Valve shall be fully (body, bonnet, and o-ring plate) fusion bonded epoxy coated inside and out in accordance with AWWA C550.
      e. Bolts and nuts for valve connections to main line shall be cadmium plated.
   2. Valves shall be Kennedy Valve Model KS-FW; Mueller 2360 Series; Clow; or approved equivalent.

2.02 VALVE BOXES

A. Valve Boxes.
   1. Cast iron traffic rated valve boxes and lids shall be furnished and installed with all buried gate valves.
   2. Boxes shall be two-piece (top and base) adjustable length for varying installation conditions, with a slip type means of adjustment, and a top flange. Box shall be suited for valve size.
   3. Shaft shall be 7 inch inside diameter. Cover shall be “pocket” type and lettered “WATER”.
   4. Shaft extensions shall be provided where required.
   5. Boxes shall be Rich No. 931 or equal.

2.03 BACKFLOW PREVENTION ASSEMBLY VALVES

A. Potable Water Reduced Pressure Assembly, ANSI/AWWA C511
   1. Provide one Reduced-Pressure Assembly as shown on the Drawings. Device must be approved by the OHA Drinking Water Services.
   2. Orientation: Inlet and outlet flow vertical
   3. Ductile iron Grade 65-45-12 main and relief valve body, stainless check seats, and disc holder, silicone elastomer disc and stainless steel spring.
   4. Fusion epoxy coated internal and external per AWWA C550.
   5. UL/FM approved OS & Y AWWA C515 resilient wedge valves for shut-off on each side.
   6. Size:3-Inch, flange ANSI B16.1 Class 125 ends.
   7. Working pressure of 175 psi minimum. 350 psi hydrostatic test pressure.
   8. Valve: Febco Master Series 3-inch LF 880V-OSY or approved equivalent.
   9. Accessories:
      a. Valve Setter: Febco 611 Flange X Flange or equivalent, 3-inch.
      b. Fiberglass Enclosure: ASSE 1060 Certified insulated fiberglass enclosure for exterior use with 1/8" thick yacht quality fiberglass shell and minimum 1.5" thick polyisocyanate foam insulation. Enclosure shall be anchored to concrete pad with

interior stainless steel anchors and shall include full port one-way deck drain provisions. Enclosure shall have lockable swing-out, removable access panels on two sides and lockable flip-top lid to allow maintenance access to valve without removal of enclosure. Hubbell HotBox No. LM041041045 (old No. LB4FEM) or approved equivalent.

B. Double Check Detector Assembly, ANSI/AWWA C510
   1. Provide one Double Check Detector Assembly as shown on the Drawings. Device must be approved by the OHA Drinking Water Services.
   2. Orientation: Inlet and outlet flow vertical.
   3. Ductile iron Grade 65-45-12 main and relief valve body, stainless steel check seats, and disc holder, silicone elastomer disc and stainless steel spring.
   4. Fusion epoxy coated internal and external per AWWA C550.
   5. UL approved OS&Y AWWA C515 resilient wedge valves for shut-off on each side.
   6. Bypass Meter: AWWA C700 compliant, 5/8"x3/4" meter with cfm read.
   7. Size: 6-Inch, flange ANSI B16.1 Class 125 ends.
   8. Working pressure of 175 psi minimum. 350 psi hydrostatic test pressure.
   9. Valve: Febco MasterSeries 6" 880V-OSY or approved equivalent.
   10. Accessories:
      a. Valve Setter: Febco 611 Flange X Flange or equivalent, 6-inch.
      b. Fiberglass Enclosure: ASSE 1060 Certified insulated fiberglass enclosure for exterior use with 1/8" thick yacht quality fiberglass shell and minimum 1.5" thick polyisocyanate foam insulation. Enclosure shall be anchored to concrete pad with interior stainless steel anchors and shall include full port one-way deck drain provisions. Enclosure shall have lockable swing-out, removable access panels on two sides and lockable flip-top lid to allow maintenance access to valve without removal of enclosure. Hubbell HotBox No. LM053053056 (old No. LB8FEM) or approved equivalent.

2.04 COUPLINGS

A. Transition, reducing, and straight couplings, 2-inch through 12-inch, shall have cast ductile iron or carbon steel body, and resilient gaskets. TPS Hymax 2000 Series; Romac 501; or approved equal.

2.05 HYDRANTS

A. Hydrants: Type as required by utility company.

B. Hydrant Extensions: Fabricate in multiples of 6 inches with rod and coupling to increase barrel length.

C. Hose and Streamer Connection: Match sizes with utility company, two hose nozzles, one pumper nozzle.

D. Finish: Primer and two coats of enamel in color required by utility company.

2.06 BEDDING AND COVER MATERIALS

A. Bedding: As specified in Section 31 2316.13.

B. Cover: As specified in Section 31 2316.13.

2.07 ACCESSORIES

A. Concrete for Thrust Restraints shall meet ASTM C94 with a 28-day compressive strength of at least 3000 psi. Reinforcement shall meet ASTM A615, Grade 60.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that correct location is being used for installation of water equipment and that approved equipment is on site.

3.02 PREPARATION

A. Remove scale and dirt on inside and outside before assembly.

B. Prepare pipe connections to equipment with flanges or unions.

3.03 TRENCHING

A. See the sections on excavation and fill for additional requirements.

B. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.04 INSTALLATION - VALVES AND HYDRANTS

A. Set valves on solid bearing. Comply with manufacturer's instructions and any details in the Drawings.

B. Center and plumb valve box over valve. Set box cover flush with finished grade.

C. Operate valves fully open and fully close to check proper operation.

D. Set hydrants plumb; locate pumper nozzle perpendicular to and facing roadway.

3.05 SERVICE CONNECTIONS

A. Provide water service to utility company requirements with reduced pressure backflow preventer and water meter with by-pass valves and sand strainer.

3.06 FIELD QUALITY CONTROL

A. See 33-1300 for Disinfection requirements.

END OF SECTION

SECTION 33 1300

DISINFECTING OF WATER UTILITY DISTRIBUTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Disinfection of Water Utility Distribution Piping, fittings, valves, and other appurtenances in contact with potable water.

B. Testing and reporting results.

1.02 RELATED REQUIREMENTS

A. Section 33 11 13 - Water Utility Distribution Piping

B. Section 33 12 00 - Water Utility Distribution Equipment

1.03 REFERENCE STANDARDS

A. Seal Rock Water Distribution Design Standards, Section 8 - Water System Disinfection.

B. Use current adopted addition(s).

1.04 SUBMITTALS

A. See Section 01 3323 - Shop Drawings, Product Data, Samples for submittal procedures.

B. Test Reports: Indicate results comparative to specified requirements.

C. Disinfection report:
   1. Type and form of disinfectant used.
   2. Date and time of disinfectant injection start and time of completion.
   3. Test locations.
   4. Initial and 24 hour disinfectant residuals (quantity in treated water) in ppm for each outlet tested.
   5. Date and time of flushing start and completion.
   6. Disinfectant residual after flushing in ppm for each outlet tested.

D. Bacteriological report:
   1. Date issued, project name, and testing laboratory name, address, and telephone number.
   2. Time and date of water sample collection.
   3. Name of person collecting samples.
   4. Test locations.
   5. Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
   6. Coliform bacteria test results for each outlet tested.

PART 2 PRODUCTS

2.01 DISINFECTION CHEMICALS

A. Chemicals: AWWA B300, Hypochlorite, AWWA B301, Liquid Chlorine, AWWA B302, Ammonium Sulfate, and AWWA B303, Sodium Chlorite.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping system has been cleaned, inspected, and pressure tested.

B. Schedule disinfecting activity to coordinate with start-up, testing, adjusting and balancing, demonstration procedures, including related systems.

3.02 DISINFECTION

A. All potable water distribution lines installed or modified under this Contract shall be sterilized prior to connection to the existing system, in accordance with the following procedure, AWWA Standards C651 through C654, and current OAR 333-61-050 (Disinfection or Facilities).

B. Flushing and passing hydrostatic testing must be accomplished prior to disinfection.

C. The Contractor shall have the option of utilizing either a liquid chlorine gas-water mixture, direct fed chlorine gas, or a calcium hypochlorite and water mixture for disinfection.

D. Disposal of chlorinated water from the pipelines shall be performed in conformance with the most recent draft or edition of Best Management Practices for the Disposal of Chlorinated Water by the Oregon Department of Environmental Quality. Chlorinated water used for disinfection of waterlines and service lines shall not be directly disposed of into or impair the waters of the State (i.e. lakes, creeks, streams and wetlands).

E. The Contractor shall provide all equipment, materials, and workmanship required to complete the flushing and disinfection of waterlines and appurtenances. Engineer shall be notified 2 working days in advance of planned disinfection procedures.

F. Disinfection Procedure
   1. The Contractor shall inject chlorine solution into the waterline. Solution shall have a free chlorine residual of at least 25 mg/L, but not more than 100 mg/L. All entrapped air shall be discharged from the line and all surfaces shall be wetted. Chlorinated water shall be retained in the pipe for at least 24-hours. A free residual of not less than 10 mg/L shall be found in all parts of the line after the 24-hour period has elapsed.
   2. After the 24-hour period, all valves in the mainline shall be operated and all hydrants flushed with a free residual of at least 10 mg/L being found. If the residual concentration within any part of the chlorinated section is found to be less than 10 mg/L, the Contractor shall flush, rechlorinate, and retest all sections until a 10 mg/L minimum residual is obtained.
   3. Upon obtaining the minimum 10 mg/L free residual following the 24-hour disinfection period, the Contractor shall flush the section with potable water until the chlorine residual is equivalent to the residual of the existing system water. A minimum of one sample shall then be collected from the pipe for microbiological analysis.

G. Microbiological Sampling and Analysis
   1. The Contractor is responsible for collecting and submitting samples to a certified independent testing laboratory for microbiological analysis.
   2. The Engineer or District representative shall be present to witness the collection of the water samples for testing. Chain of custody procedures shall be utilized during the collection and transport of samples to the laboratory.
   3. The Contractor shall bear all costs associated with the required testing, including laboratory fees, materials required, and transportation costs. The Contractor also shall pay for all additional tests required as a result of failing to meet the bacterial limits.
   4. If the results of the microbiological analysis indicates that the water is free of coliform organisms, the waterline may be put into service.
   5. If the results of the microbiological analysis indicate that coliform organisms are present, then the waterline shall be flushed, rechlorinated, and retested until a coliform-free sample is obtained.

H. A minimum of one sample from each separable structure or pipeline shall be obtained for analysis. The presence of coliform organisms shall be determined using the Colilert 24-hour test, Method MMO-Mug, or other methods approved by the Oregon State Drinking Water Program.

3.03 FIELD QUALITY CONTROL

A. Notify Engineer prior to testing for opportunity to witness.

B. Test samples in accordance with AWWA C651.

PART 4 PAYMENT

END OF SECTION

SECTION 33 4113

STORM DRAIN PIPE AND FITTINGS

PART 1 GENERAL

1.01 SUMMARY

A. This item shall include furnishing and installing the storm drain, perimeter footing drain, roof drain, retaining wall drain piping, and fittings as identified on the Drawings.

B. The Contractor shall provide manufacturer's certifications, including test results for all piping, fittings and appurtenances supplied. All submittals shall be in conformance with the requirements of Section 01 33 00.

C. All work shall conform to the latest version of the Oregon Standard Specifications (OSS) Part 00400, except as specified herein and shown on the Plans.

1.02 RELATED REQUIREMENTS

A. Section 31 23 16 - Excavation: Excavating of trenches.

B. Section 31 23 16.13 - Trenching: Excavating, bedding, and backfilling.

C. Section 31 23 23 - Fill: Bedding and backfilling.

D. Section 33-0513 - Cleanouts.

E. Section 33 44 00 - Storm Drain Structures and Appurtenances

1.03 REFERENCE STANDARDS

A. ASTM D1784 - Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds; 2011.

B. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2012.

C. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications; 2011.

D. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings

E. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2008.

F. ASTM D3212 - Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals

G. ASTM F1417 - Standard Practice for Installation Acceptance of Plastic Non-pressure Sewer Lines Using Low-Pressure Air; 2011a

H. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

I. Oregon Standard Specifications (OSS) – The Oregon Department of Transportation, ODOT/APWA Oregon Chapter Standard Specifications for Construction; 2018.

PART 2 PRODUCTS

2.01 PIPE MATERIALS

A. All pipe, fittings and appurtenances shall be new and unused.

B. PVC Storm Drain Pipe (4" through 15")
   1. Storm drain pipe shall be PVC meeting ASTM D3034, SDR 35
   2. Pipe compound shall meet ASTM D1784 Cell Class 12454 or 12364.
   3. Pipe shall be formed with integral bell joints meeting ASTM D3212 with rubber gaskets meeting ASTM F477.
   4. PVC fittings shall be provided as required including tee-wyes, wyes, elbows, caps, plugs, couplings, etc. Fittings shall be as manufactured by the pipe manufacturer or as approved by the pipe manufacturer. Fittings shall have same gasketed bell and spigot design as the pipe.

5. Pipe and fittings shall be Ring-Tite PVC Gravity Sewer Pipe and Fittings as manufactured by JM Eagle; or approved equal.

C. PVC Roof Drain Piping
   1. Roof drain pipe and fittings shall be Schedule 40 PVC, ASTM D2665 and ASTM D1785, Drain, Waste, and Vent (DWV) pipe.
   2. Solvent Weld Schedule 40 fittings as required. Utilize primer and glue as recommended by manufacturer.

D. PVC Perimeter Footing and Retaining Wall Drain Piping
   1. Piping and fittings shall be Schedule 40 PVC, ASTM D2665 and ASTM D1785 drain, waste and vent (DWV) pipe.
   2. Solvent weld Schedule 40 fittings as required. Utilize primer and glue as recommended by Manufacturer.
   3. Use perforated pipe at footing and behind retaining wall. Perforations shall consist of two rows of 1/2 inch diameter holes, 5 inches on center spacing. The two rows shall be 120 degrees on center.

2.02 MISCELLANEOUS MATERIALS

A. Concrete shall conform to Oregon Standard Specifications Section 00440, Commercial Grade Concrete. Compressive field strength shall not be less than 3,000 psi at 28 days. Maximum aggregate size shall be 1½-inches. Slump shall be between 2 and 4 inches.

B. Non-Shrink Grout. Grout shall be Sika 212, Euco N-S, Five Star, or approved equal nonmetallic cementitious commercial grout exhibiting zero shrinkage per ASTM C827. Grout shall not be amended with cement or sand and shall not be reconditioned with water after initial mixing. Nonshrink grout shall be placed and packed only with the use of an approved commercial bonding agent. Unused grout shall be discarded after 20 minutes.

C. Tracer Wire. Provide detectable tracer wire along all non-metallic water pipes.
   1. Tracer wire shall be 12 AWG minimum, solid copper.
   2. Insulation for tracer wire shall be 0.030-inch thick HDPE designed for direct bury.
   3. Insulation shall be green in color.
   4. Wire shall be placed along pipe and taped every 5 feet with a small amount of slack to keep the wire straight along the pipe.

D. Warning Tape. Provide warning tape in trench over all installed pipelines.
   1. Underground warning tape shall be 6-inch wide, 4-mil thick, APWA standard green color, reading: "Caution - Sewer Line Below."
   2. Warning tape shall be placed over the pipe zone material, approximately 15 to 18 inches below finish grade. Lay tape flat and untwisted, centered over pipe with wording facing upwards.

E. Geotextile fabric as specified in Section 31-2323 - Fill.

F. Backfill as specified in Section 31 23 16.13.

PART 3 EXECUTION

3.01 PIPE INSTALLATION

A. All pipe and fittings shall be installed in accordance with the manufacturer's recommendations and APWA standards.

B. Comply with Sections on Trenching, Shoring and Dewatering.

C. Lay pipe to slope gradients noted on Drawings; with maximum variation from true slope of 1/8 inch in 10 feet.

D. Install pipe couplings.

E. Place aggregate in maximum 6-inch lifts, consolidating each lift.

F. Refer to Section 31 23 23 - Fill for compaction requirements. Do not displace or damage pipe when compacting.

G. Connect to storm sewer system with unperforated pipe.

H. Place perforated perimeter footing and retaining wall drain pipe with perforations down unless otherwise directed.

END OF SECTION

SECTION 33 4400

STORM DRAIN STRUCTURES AND APPURTENANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Catch Basins.

B. Area Drains.

C. Slot Drain(s) - Traffic Rated.

D. Cleanout(s) - Roof and Storm.

1.02 RELATED REQUIREMENTS

A. Section 01-5713 - Temporary Erosion and Sedimentation Control.

B. Section 33-0513 - Manholes and Structures

C. Section 33-4113 - Storm Drain Pipe and Fittings

1.03 REFERENCE STANDARDS

A. Oregon Standard Specifications (OSS) – The Oregon Department of Transportation, ODOT/APWA Oregon Chapter Standard Specifications for Construction; 2018.

1.04 SUBMITTALS

A. See Section 01 3323 - Shop Drawings, Product Data, Samples for submittal procedures.

B. Product Data: Provide submittal data for all items in this Section as required to determine compliance..

PART 2 PRODUCTS

2.01 CATCH BASINS

A. Precast concrete catch basins with cast iron or steel grate as indicated on the Drawings.

B. Catch basins shall be ODOT Type G-2 with Type 2 grate as detailed in OSS Drawing No. RD 364.

C. Catch basins shall be ODOT Type CG2 RD366.

D. Frames and grates shall be tested for tight fit without rocking. Maximum amount of rocking deviation allowed shall be 1/16".

E. Mortar shall conform to ASTM C387 and shall be mixed to a consistency that will provide good adhesion to precast concrete.

F. Concrete shall conform to ASTM C94 utilizing Type II Portland Cement. Compressive strength shall not be less than 3000 psi at 28 days.

G. HDPE oil/debris shall be manufactured by Rhino USA of Oregon or approved equivalent.

2.02 AREA DRAINS

A. Materials:

1. Area Drains shall be prefabricated and manufactured from PVC pipe stock utilizing a thermo-molding process that meets or exceeds the pressure requirements of the ASTM D3212 standard for connections joining drainage pipes utilizing flexible elastomeric seals conforming to ASTM F477 to ensure consistent watertight seal throughout the structure body and the outlet stubs. The raw material used to manufacture this PVC pipe stock shall conform to ASTM D1784 cell class 12454. PVC Field Drains shall be abrasion and corrosion resistant. The Field Drains may require adapting to multiple pipe types and diameters, changes in direction and elevation, as shown on the Plans.
2. Area Drain grates and frame assemblies shall be constructed of ductile iron and load rated H10 for pedestrian and medium-duty loads.
3. Area Drains shall be as manufactured by Harco, Nyloplast/ADS, or approved equal.

2.03 SLOT DRAIN(S) - TRAFFIC RATED

A. Materials:

1. Slotted Drain - Traffic Rated shall be an H20 traffic rated pre-cast trench drain manufactured using polyester polymer concrete consisting of pre-sloped channels with standard 4 inch nominal inside width with trapezoidal bottom as shown on the plans. Channels shall be 39.37” nominal length utilizing tongue and grove connections for channel alignment and sealing. Channel joints shall be sealed with PolySeal II -two part epoxy or equal.
2. Monolithic polymer concrete shall be made from a composition of aggregate and polyester resin and shall have the following properties when tested as specified below:

PROPERTY	TEST METHOD	VALUE
Compressive Strength	ASTM C579	14,000 psi Minimum
Bending Strength	ASTM C580	4,000 psi Minimum
Tensile Strength	ASTM C307	2,000 psi Minimum
Moisture Absorption	ASTM D570	0.1% Maximum
Chemical Resistance	ASTM C267	Pass
Freeze/Thaw w/o Weight Loss	ASTM C666	1600 Number of Cycles Minimum
Resistance to Fungi Growth	ASTM G21	Zero (0) Rating Mold Growth
UL/ULC Listed-Flame Spread	UL-723	Class A

3. The grating shall be uncoated ductile iron conforming to ASTM A 536-84 with a minimum inlet area of 0.29ft2/lineal foot and shall have omni directional openings and conform to the requirements of the Americans with Disabilities Act Handbook, Section 4.5.4 and be heel proof. Grates shall meet a minimum vertical proof load of 1235 psi by utilizing a 6” x 9” centered contact area without failure. Grates shall comply with all the requirements of AASHTO M306.
4. Frames and rails shall be post fabrication black polymer coated steel angle rails 2.0” x 2.0” x .188” steel angle frames conforming to ASTM A36. Standard headed concrete anchor studs bisect rail-anchoring device a minimum every 12”. Grate frames to provide a minimum of 1.44 square inches concrete bearing area with 3.44 square inches of concrete contact per inch of trench length on each side. Grates are retained to frame/rail with appropriate toggle locking device.
5. Slotted Drain - Traffic Rated shall be PolyDrain® PDX 8, as manufactured by ABT, ®Inc. www.abtdrains.com <http://www.abtdrains.com/>, or approved equal.

2.04 CLEANOUT(S) - ROOF AND STORM

A. Materials:

1. Cleanouts (Roof Drain Cleanouts and Storm Drain Cleanouts) shall be constructed from PVC pipe and fittings meeting the requirements of Section 33 41 13.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Verify that finish grade elevations are set properly for catch basin lids and other such items..

B. Field Drains: Verification of Conditions: Verify that finish grade elevations are set properly for field basin grates.

C. Slot Drains: Verification of Conditions: Verify that finish grade elevations are set properly for slot drain grates.

D. Cleanouts: Verification of Conditions: Verify that finish grade elevations are set properly for cleanouts.

3.02 PREPARATION

A. Prepare and compact subgrade in accordance with applicable Sections on Trenching and Excavation.

B. Install Aggregate Base under structures as indicated on the Drawings or 6-inch minimum compacted thickness if not shown in Drawings.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions and the project Drawings.

B. Catch Basin Installation
   1. Place catch basin on prepared, leveled, and compaced aggregate base. Ensure pipe penetrations are at proper invert elevations and flush with bottom of basin unless a sump is specified or required.
   2. Use non-shrink grout to seal pipe penetrations and to form sloping bottom as required.
   3. Verify grate is properly positioned with finish grade requirements.
   4. Clean catch basin of all debris after completion.

C. Area Drain Installation
   1. Install in accordance with manufacturer's instructions and the Plans.
   2. Excavate to width and depth required for Field Drain being installed as per the requirements of Section 31 23 16.
   3. Comply with Sections on Trenching, Shoring and Dewatering.
   4. Level and compact bedding as required to support drain basin and pipes.
   5. Set Field Drain in place and level prior to pipe installation. Backfill so basin is stable during pipe install.
   6. Place backfill material under and around pipe and drain basin outlets in lifts and compact following Section 31 23 23.
   7. Adjust height of the grate or cover to finish grade elevation. Use riser sections as required to raise to finish elevation.

D. Slotted Drain(s) - Traffic Rated Installation
   1. Install in accordance with manufacturer's instructions and the Plans. Securely support all channel units at the correct line and grade during the concrete pour. Texture the surface of concrete with a broom or burlap drag to produce a skid-resistant surface.
   2. Excavate to width and depth required for Slotted Drain being installed as per the requirements of Section 31 23 16.
   3. Comply with Sections on Trenching, Shoring and Dewatering.
   4. The Slotted Drain - Traffic Rated shall be installed as per Manufacturer's recommendations. Do not vary from establish line and grade by more that 1/32 inch per inch of inside trench drain width, subject to the following limitations:
      a. The variation does not result in a level or reverse sloping invert.
      b. The variation in the invert elevation between adjoining sections of trench drain does not exceed 1/64 inch per inch of inside trench drain width.
   5. Place backfill material under and around pipe and drain basin outlets in lifts and compact following Section 31 23 23.
   6. Adjust height of the grate to finish grade elevation.

E. Cleanouts Installation
   1. Install in accordance with manufacturer's instructions and the Plans.
   2. Excavate to width and depth required for Cleanout being installed as per the requirements of Section 31 23 16.
   3. Comply with Sections on Trenching, Shoring and Dewatering.
   4. Level and compact bedding as required to support drain basin and pipes.
   5. Set Cleanout components in place and level prior to pipe installation.
   6. Place backfill material under and around pipe and fittings in lifts and compact following Section 31 23 23.
   7. Adjust height of the cover to finish grade elevation.

END OF SECTION

SECTION 34 4113.20

SIGNS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Furnish all labor, materials, equipment and performing all work specified herein for furnishing, fabricating and erecting traffic signs of the types shown.

1.02 RELATED SECTIONS

A. Section 34-4113.10 - Metal Sign Supports

B. Section 34-4113.30 - Sign Materials

1.03 RELATED REFERENCES

A. Oregon Department of Transportation/American Public Works Association (ODOT/APWA) Standard Specifications for Construction, 2008 Edition.
   1. 00930 - Metal Sign Supports
   2. 00940 - Signs
   3. 02910 - Sign Materials

B. Manual on Uniform Traffic Control Devices, latest Edition.

1.04 TYPE OF SIGNS

A. ADA Parking - One (1) each required.
   1. White, retroreflective sheeting (background).
   2. Green, retroreflective sheeting (legend).
   3. White on blue, retroreflective sheeting (symbol).
   4. Sign blank - sheet aluminum.
   5. Size: 12" X 18", handicap reserved parking.

B. Van Accessible Parking - Sign, one (1) each required.
   1. White, retroreflective sheeting (background).
   2. Green, retroreflective sheeting (legend).
   3. Sign blank - sheet aluminum.
   4. Size: 18" X 9", van accessible.

1.05 QUALITY ASSURANCE

A. Conform to ODOT/APWA, Section 00940 of the Standard Specifications for Construction, 2018 Edition.

1.06 SUBMITTALS

A. See Section 01 3323 - Shop Drawings, Product Data, Samples, for submittal procedures.

B. Manufacturer's Product Data: Submittals shall consist of the appropriate combination of catalog sheets, material lists, brochures, bulletins, diagrams, storage and handling requirements and recommendations, installation instructions, maintenance information, specifications or samples necessary to describe a system, product, or item.

C. Selection Samples: Submit manufacturer's samples of materials, finishes, and colors. Color selections shall be made from the manufacturer's brochure representing manufacturer's full range of available colors, styles, textures, and patterns

D. Shop Drawings: Submit manufacturer's shop drawings: Indicated plans for each unit or groups of units, elevations with model number, overall dimensions; construction, and anchorage details, as required.

PART 2 - PRODUCTS

2.01 MATERIALS FOR SIGNS

A. Materials for signs shall conform to ODOT/APWA, Section 02910 of the Standard Specification for Construction, 2018 Edition.

PART 3 - EXECUTION

3.01 GENERAL

A. Conform to ODOT/APWA, Section 00940 of the Standard Specifications for Construction, 2018 Edition.

END OF SECTION