Technical Specifications

For

Delano Farms Culvert Replacement Project

Prepared for
Clackamas Soil and Water Conservation District

100% Submittal

May 2, 2019

EXPIRES: 6/30/2019

FOR USE IN CONNECTION WITH

STATE OF OREGON, DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR CONSTRUCTION , MAY 2018

Delano Farms Culvert Replacement Project
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MOBILIZATION

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SECTION 015000
TEMPORARY FACILITIES AND CONTROLS
(a.k.a. Mobilization & Demobilization)

1. GENERAL

1.1 DESCRIPTION

A. The work covered by this section consists of the construction facilities and temporary controls, including mobilization and demobilization, as specified, as shown on the Drawings, or as otherwise directed by the Engineer. Work includes traffic control, temporary fencing – type ESA, and erosion control items not specifically addressed under other pay items.

B. Mobilization shall consist of preparatory work and operations, including, but not limited to, those necessary for the movement of personnel, equipment, supplies, and incidentals to the site; for the establishment of all offices, and other facilities necessary for work on the project; and for all other work and operations which must be performed, or costs incurred prior to beginning work, on the various items on the project site.

C. Demobilization shall consist of work and operations necessary to disband all mobilized items and cleanup the site. The removal of all temporary crossings, ramps, access ways, roads, signs, and fencing; dewatering facilities; and temporary facilities or works, and the restoration of surfaces to an equal or better than existing condition shall also be included as part of demobilization.

1.2 RELATED SECTIONS

1. Section 015626, Temporary Fence – Type ESA

2. PRODUCTS – NOT USED

3. EXECUTION

3.1 CONTRACTOR'S PLANT AND EQUIPMENT

A. Security. Contractor shall, at all times, be responsible for security of their plant and equipment. Owner shall not be responsible for missing or damaged equipment, tools, or personal belongings.

B. Construction Power and Communication Facilities. Contractor shall be responsible for providing sufficient electrical power and communication facilities to construct the work.

C. Storage Facilities.

1. Provide storage facilities for the protection of materials and supplies from weather, and shall keep the facilities clean and in proper order at all times.
2. Provide a storage area for lubricants, oils, and hazardous materials with sufficient means to contain spills. Facilities, handling, and any required cleanup will comply with all current local, state, and federal standards. Petroleum products stored on the site shall be secured from vandalism.

D. Sanitary Facilities. Maintain adequate toilet facilities at or near the work site.

E. Solid Waste Handling. Provide sufficient solid waste handling facilities to maintain site in a clean, orderly condition.

F. Water. Contractor shall provide all water necessary for construction and maintenance as specified.

3.2 MOBILIZATION AND DEMOBILIZATION

A. General. Perform mobilization and demobilization activities in accordance with the Drawings, and as specified.

3.3 EXCAVATION

A. The Contractor, and any subcontractor, is required to notify U.S.A. forty-eight hours in advance of performing excavation work, by calling the toll free number (800) 332-2344.

3.4 PROTECTIVE BARRIERS

A. Protective barriers shall be erected around sensitive areas as designated on the Drawings or as directed by the Engineer. Barriers shall be constructed using bright orange plastic safety fencing (type ESA), per Section 015626, Temporary Fence – Type ESA.

B. Temporary fencing shall be maintained during construction. Except as directed by the Engineer, barriers shall be removed after completion of work.

3.5 STAGING AREAS

A. General. Staging areas at the project site are provided for the Contractor's use. By making this area available to the Contractor, the Engineer, and any other person or agency connected with the properties shall in no way be responsible or liable for any activity of the Contractor, subcontractors, or any individual or organization connected with the project.

B. Alternative Staging Areas. Alternative sites must be acceptable to Owner, and the Contractor must make all arrangements for their use at the Contractor's expense, and in accordance with all local, State and Federal regulations.

C. Additional Storage Areas. Should the Contractor require space in addition to that available on-site, the Contractor shall make arrangements for storage of materials and equipment in locations off the construction site, and shall provide the Engineer a copy of the letter of authorization for storage from the Owner.

3.6 DUST CONTROL

A. General. The Contractor shall be responsible for the control of dust within the limits of the project at all times. The Contractor shall take whatever steps are necessary to eliminate the nuisance of blowing dust. Responsibility for any damage to property, crops, or orchards from dust caused by the Contractor's operations shall be borne by the Contractor.

B. Dust Control. Periodically, water or otherwise treat access roads and haul roads, as required to suppress dust. Trucks transporting fill material to and from the Project site must be tarped from the point of origin. After clearing, grading, earth moving or excavation is completed, the entire area of disturbed soil must be treated to prevent wind pickup of soil. This may be accomplished by: spreading soil binders; sufficiently wetting the area to form a crust on the surface, with repeated soakings as necessary to maintain the crust and prevent dust pickup by the wind; or other methods approved in advance by the Air Pollution Control District and the Engineer.

C. Cleanup. The Contractor shall keep all streets, roadways, and easements, as well as all ground adjacent to the project site, clean and free of dust, mud and debris resulting from the

Contractor's operations. Daily cleanup throughout the project shall be required as the Contractor progresses with the work. Spillage of earth, gravel, concrete, asphalt, or other materials resulting from hauling operations along or across any public street or private driveway or access road shall be removed immediately by the Contractor.

3.7 HAZARDOUS MATERIALS CONTROL AND SPILL PREVENTION PLAN

A. General. Before starting work on the project, the Contractor shall submit for acceptance by the Engineer a Hazardous Materials Controls and Spill Prevention Plan. The Plan shall include provisions for preventing hazardous materials from contaminating soil or entering water courses and shall establish a Spill Prevention and Countermeasure Plan.

B. Facilities. Provide staging and storage areas for equipment, as required to contain contaminants away from water courses. Provide a contained, locked storage facility for fuels, lubricants, construction chemicals and other hazardous materials and supplies stored at site. Provide a lined pit for concrete washdown, located where spills or overflow cannot enter nearby watercourses or storm drains. The pit shall be located a minimum of 150 feet from any flowing watercourse.

C. Equipment Maintenance. Clean and maintain equipment to prevent any leakage of fuel and lubricants. Establish a designated equipment refueling area. All fueling and maintenance of vehicles and other equipment and staging area shall occur at least 75 feet from any riparian habitat or water body.

D. Spills Countermeasures. Isolate work areas during in-water construction activities by using oil containment booms. Maintain a supply of oil booms, sorbent pads and other supplies to contain and clean spills. Contain and cleanup any hazardous material spills immediately and notify Engineer.

3.8 CONSTRUCTION SITE HOUSEKEEPING

A. Remove rubbish, trash, and debris from site on a regular basis. Transport and dispose of all rubbish and debris in accordance with all local regulations. Maintain staging area in an orderly manner. Regularly clean mud and debris, resulting from work at the site, from roadways. Cleanup and dispose of all concrete debris and washings when concrete work is complete.

3.9 PROTECTION OF EXISTING IMPROVEMENTS

A. Existing facilities, utilities, and property shall be protected from damage resulting from the Contractor's operations. Roadways and other improved surfaces shall be protected from damage by vehicles with tracks or lugs. Any damage resulting from the Contractor's operations shall be repaired by the Contractor to the condition which existed prior to the damage, and to the satisfaction of the Engineer, at no additional cost to the Owner.

3.10 RESTORATION OF STRUCTURES AND SURFACES

A. Structures, Equipment, and Pipework. The Contractor shall remove such existing structures, equipment, and pipework as may be necessary for the performance of the work, and shall rebuild, or replace, the items thus removed in as good a condition as found. Contractor shall repair any existing structures that were damaged as a result of the Work.

B. Roads and Streets. Roadways used by the Contractor for hauling materials, equipment, supplies, etc., shall be cleaned and repaired if the condition of the roadway is damaged, or otherwise affected, due to the Contractor's operations.

C. Curbs, Gutters, Driveways, and Sidewalks. All curbs, gutters, driveways, sidewalks, and similar structures that are broken, or damaged, by the installation of the work shall be reconstructed by the Contractor. Reconstruction shall be of the same kind of materials with the same finish, and in not less than the same dimensions as to original work. Repairs shall be made by removing and replacing the entire portions between joints or scores, and not merely refinishing any damaged part. All restoration work shall match the appearance of the existing improvements, as nearly as possible.

D. Cultivated Areas and Other Surface Improvements. All cultivated and natural areas, either agricultural or lawns, and other surface improvements which are damaged by actions of the Contractor, shall be restored, including roadside drainage ditches, as nearly as possible, to their original conditions.

3.11 STORAGE OF MATERIALS AND EQUIPMENT

A. Materials and equipment shall be stored so as to ensure the preservation of their quality and fitness for the work. Stores of equipment and materials shall be located so as to facilitate inspection. The Contractor shall be responsible for all damages that occur in connection with the care and protection of all materials and equipment, supplied by the Contractor, until completion and final acceptance of the Work by the Owner.

3.12 TRAFFIC CONTROL

A. General. The Contractor shall be responsible for public safety and traffic control at all times.

B. The Contractor shall furnish, install, and maintain temporary construction warning signs, flaggers, barricades, and other devices necessary to safeguard the general public and the work, and to provide for the safe and proper routing of all vehicular and pedestrian traffic within and through the limits of the project during the performance of the work.

C. Traffic Control Plan. The Contractor will provide a traffic control plan to the Engineer for review and approval prior to project construction including: staging areas, dump sites, operating hours, project duration, scheduling and phasing, and total number of construction vehicles and their respective haul routes, per project phase.

4. MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Work under this section will be measured for payment on a lump sum basis.

4.2 PAYMENT

A. The lump sum contract price for Construction Facilities and Temporary Controls, also known as Mobilization and Demobilization**,** will include full compensation for the furnishing of all labor, materials, tools, equipment, administrative costs, and incidentals for mobilization; demobilization; and temporary facilities and controls.

B. Payment will be made under:

Pay Item	Pay Unit
Mobilization & Demobilization	Lump Sum

END OF SECTION

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SECTION 015626
TEMPORARY FENCE – TYPE ESA

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SECTION 015626
TEMPORARY FENCE – TYPE ESA

1. GENERAL

1.1 DESCRIPTION

A. Work under this section includes furnishing all labor, materials, equipment, and incidentals to install, maintain, and remove Temporary Fence – Type ESA , as shown on the Drawings, as specified, or as otherwise directed by the Engineer.

1.2 RELATED SECTIONS

1. Section 015000, Mobilization
2. Section 311100, Clearing and Grubbing
3. Section 312316, Stripping and Excavation

1.3 REFERENCES

A. State of Oregon, Department of Transportation (ODOT) State Standard Specifications, current edition

1.4 SUBMITTALS

A. Submit to the Engineer, for review, the following:

1. Manufacturer's data for proposed fencing fabric.
2. Manufacturer's data or descriptive literature for proposed fence posts.

2. PRODUCTS

2.1 MATERIALS

A. High Visibility Fabric. High visibility fabric shall be machine produced, orange colored mesh manufactured from polypropylene or polyethylene. High visibility fabric may be made of recycled materials. Materials shall not contain biodegradable filler materials that can degrade the physical or chemical characteristics of the finished fabric. High visibility fabric shall be fully stabilized ultraviolet resistant and a minimum of four feet in width with a maximum mesh opening of 2" x 2". High visibility fabric shall be furnished in one continuous width and shall not be spliced to conform to the specified width dimension.

B. Posts. Posts for temporary fence (Type ESA) shall be of one of the following:

1. Wood posts shall be fir or pine, shall have a minimum cross section of 2" x 2", and a minimum length of 5.25 feet. The end of the post to be embedded in the soil shall be pointed. Wood posts shall not be treated with wood preservative.
2. Steel posts shall have a "U," "T," "L," or other cross sectional shape that resists failure from lateral loads. Steel posts shall have a minimum weight of 0.75 pounds per linear foot and a minimum length of 5.25 feet. One end of the steel post shall be pointed and the other end shall have a high visibility colored top.

C. Fasteners. Fasteners for attaching high visibility fabric to the posts shall be as follows:

1. The high visibility fabric shall be attached to wooden posts with commercial quality nails or staples, or as recommended by the manufacturer or supplier.
2. Tie wire or locking plastic fasteners shall be used for attaching the high visibility fabric to steel posts. Maximum spacing of tie wire or fasteners shall be 24 inches along the length of the steel post.

D. Used materials may be installed provided the used materials conform to these Specifications.

3. EXECUTION

3.1 INSTALLATION

A. All fence construction activities shall be conducted from the work side of the ESA as shown on the Drawings or as flagged in the field by the Engineer.

B. Posts shall be embedded in the soil a minimum of 16 inches. Post spacing shall be eight feet maximum from center to center and shall at all times support the fence in a vertical position.

C. Temporary fence (Type ESA) shall be constructed prior to clearing and grubbing work, shall enclose the foliage canopy (drip line) of protected plants, and shall not encroach upon visible roots of the plants.

D. Temporary fence (Type ESA) shall be located so that it is clearly visible, as determined by the Engineer.

3.2 MAINTENANCE

A. Temporary fence (Type ESA) that is damaged during the progress of the work shall be repaired or replaced by the Contractor the same day the damage occurs.

3.3 REMOVAL

A. When Type ESA fence is no longer required, as determined by the Engineer, it shall be removed, except when reused as provided in this section.

4. MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Temporary Fence – Type ESA will not be separately measured for payment.

4.2 PAYMENT

A. No separate payment will be made for Temporary Fence – Type ESA. Full compensation for all costs associated with this work shall be included in the contract price Mobilization and Demobilization in accordance with Section 015000.

END OF SECTION

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SECTION 015713.01
FIBER ROLL

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SECTION 015713.01
FIBER ROLL

1. GENERAL

1.1 DESCRIPTION

A. Work under this Section includes furnishing all labor, materials, equipment, and incidentals to install, maintain, remove and dispose of Fiber Roll, as shown on the Drawings, as specified herein, or as otherwise directed by the Engineer.

B. Fiber Roll shall be furnished, installed, and maintained at the locations shown on the Drawings and as specified. Fiber Roll shall be installed on excavation and embankment slopes and other disturbed soil areas, active or non-active.

C. Related Sections

1. Section 015000, Mobilization and Demobilization
2. Section 329200, Seeding

1.2 SUBMITTALS

A. Submit to the Engineer, for review, the following manufacturer's data and Certification's:

1. A certificate stating the name of the Fiber Roll manufacturer, product name, style compositions of filaments or yarns and other pertinent information to fully describe the geotextile, along with the manufacturer's certification of compliance with the material specifications contained herein.

2. PRODUCTS

2.1 MATERIALS

A. Fiber Roll. Fiber Roll shall be:

1. A pre-manufactured roll made from 100% weed free rice straw and wrapped in a 100% biodegradable tubular 7 oz. Plain Burlap liner. The burlap is Medium Weight Natural Burlap with a 9 X 8 Warp & Fill, and a minimum weight of 7 oz. per square yard. Plastic netting will not be accepted as an alternate.
2. 9-inch rolls shall have a minimum weight of approximately 1.6 pounds per foot.
3. 12-inch rolls shall have a minimum weight of approximately 3.8 pounds per foot.

B. Stakes. Wood stakes shall be a minimum of 2" x 4" x 24" (ripped diagonally). Wood stakes shall be untreated fir, redwood, cedar, or pine and cut from sound timber. They shall be straight and free of loose or unsound knots and other defects which would render them unfit for the purpose intended. Metal stakes shall not be used.

3. EXECUTION

3.1 INSTALLATION

A. Fiber Roll shall be installed as directed in the drawings.

B. The bedding area for the Fiber Roll shall be cleared of obstructions including rocks, clods, and debris greater than one inch in diameter before installation.

C. Fiber Roll shall be installed prior to seeding where used without slope protection fabric.

3.2 MAINTENANCE

A. The Contractor shall inspect all Fiber Roll immediately after each rainfall, and at least daily during prolonged rainfall. Any deficiencies shall be immediately corrected by the Contractor.

B. The Contractor shall also make a daily review of the location of Fiber Roll in areas where construction activities have altered the natural contour and drainage runoff to ensure that the Fiber Rolls are properly located for effectiveness. Where deficiencies exist as determined by the Engineer, additional Fiber Rolls shall be installed as directed by the Engineer.

C. Damaged or otherwise ineffective Fiber Roll shall be repaired or replaced promptly. Fiber Roll shall be maintained to disperse concentrated water runoff and to reduce runoff velocities. Split, torn, or unraveling rolls shall be repaired or replaced. Broken or split stakes shall be replaced. Sagging or slumping Fiber Roll shall be repaired with additional stakes or replaced. Locations where rills and other evidence of concentrated runoff have occurred beneath the rolls shall be corrected. Fiber Roll shall be repaired or replaced within 24 hours of identifying the deficiency.

3.3 REMOVAL

A. Fiber Rolls shown on the Drawings shall remain in place after project completion, unless otherwise specified, and be allowed to naturally degrade.

4. MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Fiber Roll will be measured by the linear foot of Fiber Roll installed at the locations indicated on the Drawings, as specified, or as directed by the Engineer

B. Fiber Roll that the Contractor installs for the implementation of temporary erosion control measures, in addition to that shown on the Drawings, shall not be separately measured for payment.

4.2 PAYMENT

A. Fiber Roll will be paid for at the contract price per linear foot, which price will be payment in full for furnishing all labor, materials, tools, equipment, and incidentals necessary to install, maintain throughout the construction, and, where specified, to remove Fiber Roll after site stabilization.

B. Fiber Roll that the Contractor installs for temporary erosion control measures, in addition to that shown on the Drawings, shall be paid for under Mobilization and Demobilization, Section 015000.

C. Fiber Rolls required or used on a short term basis that are not permanently staked in place or are anticipated to be moved on a daily or routine basis (such as areas immediately adjacent to trench excavations, temporary stockpiles, active areas for soil processing/screening operations, spill containment devices, etc.) shall be considered as included in prices paid for the various contract items of work involved, and no additional compensation will be allowed.

D. Payment shall be made under:

Pay Item	Pay Unit
Fiber Roll	Linear Foot

END OF SECTION

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SECTION 017123.16
CONSTRUCTION SURVEYING

SECTION 017123.16
CONSTRUCTION SURVEYING

1. GENERAL

1.1 DESCRIPTION

A. The work required under this Section shall include, but is not limited to, all labor, tools, materials, equipment and incidentals required to perform construction surveying necessary to establish the lines and grades of the proposed work, as shown on the Drawings, as specified, or as directed by the Engineer.

1.2 WORK INCLUDED

A. The Contractor shall be responsible for procuring professional land surveying services as necessary to construct this project. An Oregon licensed Land Surveyor, or Civil Engineer authorized to practice land surveying, shall be in responsible charge of all survey work to be performed in conjunction with the scope of work of this project.

B. The Contractor shall preserve and protect all project survey control and reference points shown on the Drawings and located outside the limits of disturbance. Monuments disturbed by the Contractor shall be reestablished by the Contractor at his sole expense.

C. The Contractor shall be solely responsible for the protection and maintenance of all existing and Contractor-established survey marks and monuments, and all constructed lines and grades.

1.3 SUBMITTALS

A. The Contractor shall provide the name, license number, and documentation for the required minimum qualifications of the Land Surveyor to be employed by the Contractor for the Project, prior to any work being completed by the Contractor or Surveyor.

1.4 REFERENCES

A. Oregon Standard Specifications for Construction, Oregon Department of Transportation (current edition).

1.5 QUALITY ASSURANCE

A. All Work shall be performed to the satisfaction of the Engineer.

B. The Engineer may, at his sole discretion, perform his own surveys for: verification of project control points, verification of lines and grades, and inspection of survey monument preservation. Contractor shall provide unrestricted access for the Engineer to spot-check the work. This does not relieve the Contractor of their responsibility to perform additional independent surveying, as need to complete the work.

C. In the event that the construction staking reveals a design inconsistency or error, Contractor shall notify the Engineer immediately and shall not proceed with the work until directed by the Engineer.

2. PRODUCTS (Not Used)

3. EXECUTION

A. The Engineer will establish a minimum of three survey control monuments, as shown on the Drawings. The Contractor's surveyor will be provided with the northing, easting and elevation of the control points existing in the field as shown on the Drawings. In addition the Engineer of Record will also provide the Contractor's surveyor with the final linework file developed in AutoCAD Civil 3D. The Contractor's surveyor will be required to access AutoCAD in order to use the electronic files. Civil 3D information does not transfer to base AutoCAD or older versions of AutoCAD and therefore will not be available to Land Surveyors who do not have this program.

B. From this information, the Contractor shall establish the baseline control points and reference points for horizontal and vertical control and make all additional detailed surveys and measurements and establish markings or monuments necessary for the construction of the work as dimensioned on the Drawings.

C. At a minimum, construction staking shall include the following:

1. Proposed clearing and grubbing limits,
2. Proposed channel alignment (centerline),
3. Proposed grading and contours for earthwork,
4. Proposed channel treatments, structures, and modifications,
5. Any other items required for a full, complete and accurately built project

D. All stakes and survey markers will be conspicuously marked with flagging tape or paint by the Contractor. The Contractor shall be responsible for protecting and maintaining all stakes from destruction.

4. MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Construction Surveying shall not be independently measured for payment.

4.2 PAYMENT

A. No separate payment will be made for the work covered under this section. Full compensation for all costs in connection with Construction Surveying shall be included in the contract price for related work.

B. The cost of resetting and verifying control points disturbed by the Contractor will be borne by the Contractor. The cost of any such verification or replacement of bench marks and/or control survey points will be deducted from any monies due to the Contractor. The Contractor will not be allowed any adjustment in working days for such verification or replacement of survey control points.

END OF SECTION

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SECTION 311100
CLEARING AND GRUBBING

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SECTION 311100
CLEARING AND GRUBBING

1. GENERAL

1.1 DESCRIPTION

A. The work covered by this section consists of furnishing all labor, equipment, and materials necessary to perform the clearing and grubbing, the removal or disposal of all cleared and grubbed materials, and the filling of all grubbing holes, as specified, as shown on the Drawings, or as directed by the Engineer.

B. Related Sections

1. Section 015000, Mobilization
2. Section 312316, Stripping and Excavation
3. Section 312323, Engineered Fill

1.2 REFERENCES

A. Oregon Standard Specifications for Construction, Oregon Department of Transportation (current edition).

2. PRODUCTS - Not Used

3. EXECUTION

3.1 CLEARING

A. All trees, stumps, down timber, snags, brush, vegetation, old piling, stone, concrete rubble, abandoned structures, and similar debris shall be cleared within the limits of the construction extents, unless otherwise shown on the Drawings or directed by the Engineer.

B. In areas where grubbing is not required, the clearing operations shall consist of the complete removal of all obstructions above the ground surface.

C. Contractor shall use hand-operated equipment for clearing and grubbing within the creek channel, (except where mechanized equipment access is provided, as shown on the Drawings) and at any protected natural resource area or tree protection zone per sub-Sections Environmentally Sensitive Area (ESA) Fencing Installation and Tree Protection Zone Fencing Installation.

D. Trees. Where trees are shown in the Drawings for removal, trees shall be felled in such a manner as to avoid damage to trees left standing, to the existing structures and installations, as well as with due regard for the safety of employees and others. Stumps shall be removed to minimum depth of 4 feet, or to a point where remaining roots are less than 1.5 inches in diameter, whichever depth is greater. Trees located beyond the limits for clearing and grubbing that are not marked for removal, shall be protected from damage, as indicated on the Drawings and as specified.

E. Vegetation. Vegetation to be removed shall consist of all heavy growth of brush and woody vegetation, unless shown otherwise on the Drawings or directed by the Engineer.

F. Debris Removal. Abandoned foundations, rip rap, drainage materials, debris, and other unsuitable material and any other debris designated for removal on the Drawings shall be removed and disposed of in accordance with this section. Buried unsuitable debris encountered during excavations shall be removed and disposed of in accordance with Section 312316, Stripping and Excavation.

3.2 GRUBBING

A. General. Grubbing shall consist of the removal of all stumps, roots, buried logs, old piling, old paving, concrete, abandoned utilities, timbers, fencing, and other objectionable matter encountered.

B. Limits. Except as noted on the Drawings, the entire area within the limits of the footprint of proposed stream repair work, shall be thoroughly grubbed.

C. Filling of Holes. All holes caused by grubbing operations, except in borrow areas, shall be excavated with 3 to 1 (horizontal to vertical) side slopes in conformance with Section 312316, Stripping and Excavation. The excavation shall then be backfilled with compacted embankment material in conformance with Section 312323, Engineered Fill.

3.3 DISPOSAL OF DEBRIS

A. Cleared and Grubbed Materials. Except as hereinafter specified or otherwise indicated on the Drawings, all logs, brush, strippings, timbers, slash, and other organic debris shall be disposed of on-site at the direction of the land owner. Concrete, asphalt, metal, plastic, and other non-organic debris which are the products of the clearing and grubbing operations shall be disposed of off-site. Remove any or all of the products of clearing and grubbing operations from the site and dispose of the material at other locations or through other sources arranged for, by, and at the expense of the Contractor, in accordance with applicable laws and ordinances.

4. MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Clearing and Grubbing will be measured as a lump sum pay item.

4.2 PAYMENT

A. No separate payment will be made for the work covered under this section. Full compensation for all costs in connection with Clearing and Grubbing shall be included in the contract price for Unclassified Excavation, Section 312316, Stripping and Excavation.

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SECTION 312316
STRIPPING AND EXCAVATION

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SECTION 312316
STRIPPING AND EXCAVATION

1. GENERAL

1.1 DESCRIPTION

A. The work covered by this section consists of furnishing all labor, equipment, materials, and performing all operations necessary to complete Stripping and Excavation, as specified, as shown on the Drawings, or as directed by the Engineer. Work includes, but is not limited to the following:

1. Stripping for removal of vegetation and surface organics.
2. Excavation for removal of unsuitable material.
3. Channel Excavation
4. Stockpiling
5. Construction Staking
6. Other miscellaneous excavation incidental to the construction of the improvements.

B. Over-excavation for placement of RSP, stormwater drainage utilities, and the culvert are not included within this section, but is considered incidental to the work for which it is required.

C. Related Sections

1. Section 311100, Clearing and Grubbing
2. Section 312323, Engineered Fill

1.2 REFERENCES

A. Oregon Standard Specifications for Construction, Oregon Department of Transportation (current edition).

B. Surveys. All construction staking shall be performed by the Contractor, in accordance with Section 017123.16, Construction Surveying. The Owner shall provide control points at the locations shown on the Drawings. Control points disturbed by the Contractor shall be replaced by the Contractor, at his sole expense

1.3 QUALITY ASSURANCE

A. Comply with all applicable permits and regulations.

B. Contractor shall provide necessary construction staking and references points, as required to meet the specified tolerances for the work.

2. PRODUCTS

A. Materials - Section not used.

3. EXECUTION

3.1 GENERAL

A. The Contractor shall protect existing utilities in performing any excavation work.

B. The Contractor shall comply with all permit conditions in performing any excavation work.

C. Contractor shall perform an independent earthwork estimate for the purpose of preparing bid prices for earthwork. Quantities indicated on the Drawings are approximate estimates provided only for permitting purposes and are not suitable for bidding purposes.

D. The bid price shall include costs for any necessary export and proper disposal of excess or unsuitable earth materials to an on-site location approved by the landowner.

3.2 STRIPPING

A. Stripping. Strip surfaces of excavations and fill foundations of heavy growth of crops, grass, weeds and other vegetation as specified in Section 311100, Clearing and Grubbing. Greater depths of stripping may be necessary in selected areas to remove vegetation, as determined by the Engineer.

B. Unless otherwise specified, the stripped materials shall be disposed of on-site, at on-site location approved by the landowner.

3.3 EXCAVATION

A. General. Excavations shall extend into firm, undisturbed native soils. Excavation shall consist of removal of material for embankment foundation preparation, mass excavation and finish grading of the channel and slope improvements, and other miscellaneous excavations to the lines and grades shown on the Drawings, or as directed by the Engineer. In the event that organic materials, yielding sub-grade (pumping) or other deleterious materials are encountered during foundation excavations, they shall be removed as directed by the Engineer.

B. Control of Water. Water control shall be performed in accordance with project permit conditions and Dewatering, Section 312319 of these Specifications. When water is encountered, either ground water or surface runoff, the Contractor shall furnish, install, maintain, and operate all necessary machinery and equipment required to keep the excavation reasonably free from water, as approved by the Engineer, until the placement of concrete or backfill material has been completed, inspected, and approved, and all danger of flotation and

other damage is removed. Water pumped from the excavation shall be disposed of in such manner as will not cause injury to public or private property, or constitute a nuisance or menace to the public, and the disposal method shall be subject to the approval of the Engineer. Water shall be controlled until work is complete.

C. Excess Excavation. Care shall be exercised by the Contractor not to excavate below the grades shown on the Drawings, except as specified herein, and as directed by the Engineer. All excavations in excess of the grades shown on the Drawings which are not directed by the Engineer shall be backfilled with compacted embankment at the Contractor's expense, per Section 312323, Engineered Fill.

D. Temporary Excavations. With exposure and drying, on-site soils may experience progressive sloughing if excavated near vertical and left un-shored during construction. Engineer suggests that the soils on-site should be considered Type C when applying OSHA regulations.

E. Tolerances. The excavation tolerance shall typically be +0.1 feet to -0.2 feet from the grades shown on the Drawings, except within the low flow channel, where excavation tolerance shall be +0.1 feet to -0.1 feet from the elevations shown on the Drawings.

3.4 UNCLASSIFIED EXCAVATION.

A. Unclassified Excavation. Unclassified excavation shall consist of the excavation and disposal of all material, regardless of its nature, which is not otherwise classified and paid for under Excavation of Unsuitables or Rock Excavation described below. Unclassified Excavation includes excavation required to reach finished grade. Over-excavation for the placement of materials (e.g. Engineered Streambed Material, stormwater drainage utilities, culvert) or the removal of unsuitables, as described below under Excavation of Unsuitables, is not included in Unclassified Excavation.

3.5 EXCAVATION OF UNSUITABLES.

A. Excavation of Unsuitables. Areas of unsuitable in-place soils, as determined by the Engineer, may also be encountered. Material shall not be classified as unsuitable solely based on moisture content. Material within the limits of Excavation, as described above under Unclassified Excavation, or within the limits of over-excavation for the placement of materials (e.g. Engineered Streambed Material, stormwater drainage utilities, culvert) shall not be classified as unsuitable. The Contractor shall anticipate having to over-excavate areas of unsuitables as directed by the Engineer and dispose of materials. The actual locations of these excavations will be determined in the field by the Engineer. The side slopes of the excavations shall be no steeper than 1 to 1 (horizontal to vertical). The over-excavations shall be backfilled with embankment materials in accordance with Section 312323, Engineered Fill.

B. Disposition of Unsuitable Materials. The excavated materials that are considered unsuitable based solely on moisture content shall be processed as necessary to meet specification requirements for suitability and used as embankment material.

3.6 ROCK EXCAVATION

A. Rock Excavation. Rock excavation consists of the removal of hard igneous, metamorphic, and/or sedimentary rock in solid beds or masses in original or stratified position which can be removed only by continuous drilling, blasting or the use of pneumatic tools, and all boulders of 5 cubic yards in volume or larger. Material which can be loosened with a pick, frozen materials, soft laminated shale and hardpan, which for convenience or economy is loosened by drilling, blasting, wedging or the use of pneumatic tools, removal of concrete pavement and retaining walls, shall not be classified as rock excavation. When rock is encountered within the limits of the excavation, immediately notify the Owner and Engineer and do not proceed further until instructions are received and measurements made for the purpose of establishing the volume of rock excavation. Contractor shall note that blasting is not approved for this project. The need for specialized rock excavating equipment should be anticipated if rock is encountered.

3.7 SOIL OFF-HAUL

A. All excess material excavated at the project site shall be hauled and disposed of at an on-site location approved by the landowner . This includes material generated to reach finished grade and excess material generated during any over-excavation required for project construction.

B. Adequately cover haul trucks to protect against the generation of dust and spillage onto private or public roadways.

4. MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Stripping. Stripping will not be separately measured for payment.

B. Unclassified Excavation. Excavation will not be separately measured for payment.

C. Excavation - Unsuitable Materials. Excavation to remove materials that are designated by the Engineer as unsuitable for reuse will be measured by the cubic yard from the stripped foundation. Measurement will be based on the calculated neat-line quantity from surveyed cross sections before and after the excavation.

D. Rock Excavation. Rock Excavation will be measured by the cubic yard of rock excavation, as determined by cross sections surveyed before and

E. Other Miscellaneous Excavations. All other excavations will not be measured for payment.

F. Surveys: Construction staking will not be separately measured for payment.

4.2 PAYMENT

A. Stripping. No separate payment will be made for stripping. All costs in connection with this work will be considered incidental to the contract price per cubic yard for Excavation.

B. Unclassified Excavation will be paid for at the contract lump sum price, which price will be payment in full for furnishing all labor, materials, tools, equipment and incidentals, and doing all work necessary to complete excavation, as specified, including mass excavation and finish grading of channel banks and low flow channel, to the lines and grades shown on the Drawings, and disposing of excess soil on-site at a location approved by the landowner.

C. Excavation - Unsuitable Materials, measured as specified above, will be paid for at the contract unit price per cubic yard, which price will be payment in full for furnishing all labor, materials, tools, equipment and incidentals, and doing all work necessary to complete the excavation as specified, including dewatering, all handling of materials, and disposal of unsuitable materials.

D. Rock Excavation, measured as specified above, will be paid for at the contract unit price per cubic yard, which price will be payment in full for furnishing all labor, materials, tools, equipment and incidentals, and doing all work necessary to complete the Rock Excavation as specified, including dewatering, all handling of materials, and disposal of unsuitable materials.

E. No separate payment will be made for other miscellaneous grading incidental to the work. All costs in connection with this work will be considered incidental to the cost of construction of associated improvement.

F. Surveys: No separate payment will be made for surveys or construction staking. All costs in connection with this work will be considered incidental to the contract price per cubic yard for Excavation.

G. Mixing and transport of suitable materials for reuse shall be paid for under Engineered Fill, Section 312323.

H. Payment will be made under:

Pay Item	Pay Unit
Unclassified Excavation	Lump Sum
Excavation – Unsuitable Materials	Cubic Yard
Rock Excavation	Cubic Yard

END OF SECTION

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SECTION 312319
DEWATERING

Paragraph **Page**

SECTION 312319
DEWATERING

1. GENERAL

1.1 DESCRIPTION

A. Furnish all labor, materials, equipment, and incidentals necessary to design, construct, operate, maintain, and remove all cofferdams, flumes shoring, diversions, filtration systems and/or other measures, including pumping, to dewater the construction site and to divert streamflow and other surface waters through or around the project area 24 hours a day during the entire field construction period, as shown on the Drawings, as specified, or as directed by the Engineer.

B. Dewatering details on the Drawings (if provided) are schematic. The design and implementation of the Dewatering Plan is solely the responsibility of the Contractor. Contractor shall make their own independent evaluation of water sources (surface and groundwater) in preparing their Dewatering Plan.

C. Dewatering shall comply with all project permit conditions, applicable laws and local ordinances.

1.2 RELATED SECTIONS

1. Section 312316, Stripping and Excavation
2. Section 312323, Engineered Fill
3. Section 330527.33, Corrugated Metal Arch Pipe
4. Section 354237, Rock Slope Protection

1.3 SUBMITTALS

A. The Contractor shall submit the following for review and approval of the Engineer:

1. Dewatering Plan listing materials, method of work, equipment to be used, methods for disposal of pumped water, provisions to prevent scour and erosion, and the proposed schedule shall be submitted to the Engineer. Approval of the Engineer shall be required before the Contractor proceeds with water control measures.
2. Product data for:
    a) pumps
    b) silt control filter fabric
    c) washed rock
    d) impervious liners
    e) cofferdam material
    f) other materials used in dewatering

1.4 QUALITY ASSURANCE

A. Comply with approved Hazardous Materials Control and Spill Prevention Plan, in accordance with Section 015000.

B. Notify Owner 2 weeks in advance of installation of temporary cofferdam(s) or diversion.

C. Notify Engineer 48 hours in advance of removal of temporary cofferdam(s) or diversion.

2. PRODUCTS

2.1 MATERIALS

A. General. The Contractor shall be responsible for sizing and design of temporary cofferdams, well points, pumps, drains, pipes and other diversion and dewatering facilities. Comply with Drawings and regulatory requirements.

B. Imported Rock. Use only clean washed gravel. Sand will not be allowed.

C. Dewatering Facilities. Provide and operate dewatering facilities of suitable size and capacity. The use of equipment shall be consistent with the manufacturer's recommendations.

3. EXECUTION

3.1 GENERAL

A. Contractor is solely responsible for the design, construction, and maintenance and monitoring of the diversion and dewatering facilities. Comply with the Drawings, Specifications, and applicable permit conditions.

3.2 FISH REMOVAL

A. Fish relocation to be provided by others (NIC). Provide the Owner 2 weeds notice prior to dewatering operations to allow for removal of fish from the project area. Coordinate work with fish relocation experts.

3.3 SEDIMENT CONTROL

A. General. Comply with Section 401 Water Quality Certification.

B. Materials. Earthen materials shall not be used within the flowing channel, with the exception of clean, washed rock.

C. Cofferdam Construction. During construction of the cofferdam, install silt barrier(s) along the water side of the installation, as necessary to minimize mobilization and entrainment of disturbed soils within the active flowing channel, to a level in accordance with the permit conditions.

D. Discharge of diverted flow. Unless otherwise specified, a diversion must discharge into the same natural drainage way in which its headworks are located. Where feasible, discharge to existing pools or onto bedrock or otherwise erosion resistant surfaces. Construct energy dissipators at diversion outlets, where necessary to prevent scour at point of discharge.

E. Discharge of Seepage/Groundwater. Discharge water from the dewatered construction site either by gravity or pumping in a manner to prevent excessive turbidity from entering the receiving waters and to prevent scour and erosion outside of the construction site. Pumped water should be pre-filtered with a gravel pack around sumps for subsurface flows and a silt fence or hay bales around pumps for surface flow.

F. Discharge pumped water into adjacent gravel bars, isolated local depressions, or temporary sediment basins. Where discharging water into the river will create excessive turbidity, route water through a sediment interceptor or other facilities to remove sediment from water.

3.4 HAZARDOUS MATERIAL CONTROL

A. General. Comply with the approved Hazardous Materials Control and Spill Prevention Plan (HMC&SPP) in accordance with Construction Facilities and Temporary Controls, Section 01500.

B. Equipment and Lubricants. Steam-clean all equipment prior to its use. Inspect all equipment for cleanliness and fluid leaks prior to use and monitor during its use. Maintain equipment as required. Equipment refueling shall only take place in a designated, contained area.

C. Isolation of Construction Area. Prior to performing work within flowing water, outside of cofferdams, install oil containment booms downstream of the work area. Maintain booms until completion of the work within the channel is complete.

D. Spills. Maintain a supply of oil spill booms, sorbent pads, and other supplies to contain and clean spills. Comply with approved HMC&SPP should spills occur.

3.5 COFFERDAMS

A. General. The Contractor is solely responsible for the design, construction, maintenance, and monitoring of cofferdams, dikes and other isolation facilities. Cofferdams with an exposed height greater than 10 feet shall be designed by a Professional Engineer registered in the State of California, based on available soil data.

B. Configuration. Cofferdam alignments, as shown on the Drawings, reflect the maximum allowable encroachment into the channel. Construct cofferdam alignments as shown or the Drawings, unless otherwise approved by Engineer. Provide cofferdams high enough to account for water surface fluctuations.

C. Secondary Dikes/Seepage Control. Secondary dikes within the isolated construction area can be used to control seepage and groundwater around excavations, provided all dike materials are removed from the exposed channel upon completion, prior to re-watering the work area.

3.6 FLOW BYPASS

A. Flow bypass using pumps will only be allowed as directed by the Oregon Department of Fish and Wildlife at the time of construction based on creek flow levels. In the event that pumped flow bypass is not allowed, the Contractor shall install a gravity bypass system for downstream fish migration as shown on the plans. Gravity flow bypass pipe shall have a minimum diameter of 10 inches.

B. Capacity. Bypass water around construction site using a cofferdam and bypass pipe as shown on the Drawings or equivalent facility, as approved by the Engineer. The bypass system shall be capable of passing the flows present at the time construction begins, with a minimum of 12 inches of freeboard (measured vertically from water surface to lowest point on dam). Bypass pipes shall have a minimum diameter of 10 inches to minimize the likelihood of clogging by debris.

C. Storm Events. During the designated period for instream work, the Contractor shall be solely responsible for the integrity of the dewatering system. If rain is predicted, the Contractor shall perform flood fighting activities as directed by the Engineer and regulatory agencies.

D. The diversion system may require adjustment to accommodate the sequence of work. No additional compensation shall be provided for any adjustments, revisions, or reinstallations of diversion elements.

E. The diversion shall result in conditions that allow the required compaction to be achieved and shall prevent sediment-laden water that exceeds the effluent discharge limits from entering the drainage ways.

F. Unless otherwise specified, a diversion must discharge into the same natural drainage way in which its headworks are located.

3.7 DEWATERING

A. General. Remove water from construction area using pumping, well points, drains, or other approved methods. Discharge of water shall comply with 3.3.D. Construction water shall be segregated from seepage water and routed through sediment interceptors or other facilities to remove contaminants and sediment. Excavated slopes in the saturated soils may need to be retained, tied back, or otherwise stabilized.

B. Well Points. Well points shall be designed to preclude the loss of fine soil by gravel packing or other suitable means.

C. Pumping Facilities. All pump intakes shall be screened to prevent the entrainment of fish, in accordance with project permit conditions. Pumps and discharge piping shall be suitable for the type of service provided and shall be a sufficient size and capacity to satisfactorily dewater work areas. Engines shall be muffled to avoid excess noise and pump intakes shall be fitted with screens as required.

D. Power Supply. Consider the availability and reliability of power sources for dewatering operation in dewatering system design and make provisions for temporary or backup power supply as deemed necessary. Where the primary diversion is operated by pumping, provide a backup system with automatic controls capable of starting the backup upon failure of the primary system.

E. Groundwater. Dewatering shall maintain water surfaces below the base of temporary excavations or trenches, to allow for visual inspection of the work, if requested by the Engineer. Lower groundwater tables within excavations for structures to a minimum of two (2) feet below foundations or as otherwise required to establish a firm, stable foundation. Control groundwater within excavation until completion of backfill operations.

3.8 WATER LEVELS DURING THE CONSTRUCTION PERIOD

A. The Contractor shall be responsible for making an independent evaluation of site conditions. The Contractor's dewatering plan shall address all potential sources of surface and groundwater, including but not limited to streamflow (natural or managed), backwatering of the channel from downstream blockages, domestic water lines, storm drain outfalls, irrigation tailwater, industrial discharges, seepage, and direct rainfall.

3.9 CLEANUP

A. Thoroughly clean up area to remove debris and contaminated materials. Remove fine sediments and restore disturbed area prior to removal of the dewatering facilities. Clean and round river run gravels or cobbles, if used in cofferdam construction, may be spread in the creek channel in lieu of removal, provided grading will not interfere with facility operation.

3.10 REMOVAL OF DEWATERING FACILITIES

A. Prior to removal of the dewatering facilities, complete the following activities:

1. Complete required tests and inspections.
2. Thoroughly cleanup work site.
3. Perform final walkthrough with Engineer.

B. Prior to removal of cofferdams and diversion, equalize the water surface levels on both sides of the dams.

3.11 REMOVAL OF BLOCK NETS

A. Block Nets shall be removed by the fisheries biologist after the dewatering facilities are removed and the in channel work area is re-watered.

4. MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Dewatering will not be separately measured for payment.

B. Gravity Flow Bypass will not be separately measured for payment.

4.2 PAYMENT

A. Dewatering will be paid for at the lump sum contract price for Dewatering, which price will include payment in full for furnishing all labor, materials, tools, equipment, and incidentals necessary to complete the dewatering operations, as specified, including temporary cofferdams, pumping, silt control, filter fabric, sediment control, erosion control, removal of muck, disposal of materials, and removal of dewatering facilities.

B. Gravity Flow Bypass will be paid for at the lump sum contract price for Gravity Flow Bypass, which price will include payment in full for furnishing all labor, materials, tools, equipment, and incidentals necessary to complete the Gravity Flow Bypass operations, as specified, including installation pipes and removal of dewatering facilities, as directed by the Engineer.

Pay Item	Pay Unit
Dewatering	Lump Sum
Gravity Flow Bypass	Lump Sum

END OF SECTION

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SECTION 312323
ENGINEERED FILL

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SECTION 312323
ENGINEERED FILL

1. GENERAL

1.1 DESCRIPTION

A. The work covered by this section consists of furnishing all plant, labor, and materials, and performing all operations necessary for the construction of Engineered fills (unless separately designated elsewhere), including surveying, subgrade preparation, furnishing, loading, and on-site and off-site hauling of materials, processing, screening placement and compaction of Engineered Fill materials, construction of ramps, and other incidental earthwork as may be necessary to complete the Engineered Fills, , as shown on the Drawings, as specified, or as otherwise directed by the Engineer.

B. All grading shall comply with Section 00300 of the Standard Specifications. It shall be the responsibility of the Contractor to visit the site and make his own interpretations with regard to materials, methods and equipment necessary to perform the work required for this project.

C. The Contractor is responsible to locate, identify, and protect all existing utilities from damage.

1.2 RELATED SECTIONS

1. Section 311100, Clearing and Grubbing
2. Section 312316, Stripping and Excavation
3. Section 330527.33, Corrugated Metal Arch Pipe

1.3 REFERENCES

A. American Society for Testing of Materials (ASTM) Standards:

D1556	Test Method for Density of Soil in Place by the Sand Cone Method
D1557	Test Method for Moisture-Density Relations of Soils and Soil-Aggregate Moistures Using 10 lb (4.54 kg) Rammer and 18-inch (457 mm) Drop
D2974	Test Method for the Organic Content of Soils
D2922	Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth)
D3017	Test Method for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shall Depth)
D4318	Test Method for the Liquid Limit and Plastic Limit of Soils
D422C	Particle-Size Analysis of Soils

B. Oregon Standard Specifications for Construction, Oregon Department of Transportation, current edition.

C. Surveys. All construction staking shall be performed by the Contractor. Survey control points are shown on the Drawings.

2. PRODUCTS

2.1 MATERIALS

A. Engineered Fill Materials. To the extent they are needed, all suitable materials from the specified excavations shall be used in the construction of required permanent engineered fill. The suitability of materials for specific purposes will be subject to the approval of the Engineer, in conformance with these specifications. Materials used for engineered fill shall conform to the quality and gradation requirements as follows:

1. less than 3% organic material;
2. shall contain no rock or clods greater than 6 inches in diameter;
3. The material should be predominantly granular
4. shall contain no sod, brush, roots, or other perishable or unsuitable material, and
5. shall be approved by the Engineer prior to use.

B. Surplus Materials. All surplus or unsuitable excavated materials will be designated as waste and shall be disposed in accordance with Section 312316, Stripping and Excavation.

C. Imported Engineered Fill. Importing of Engineered Fill material, if necessary or required to meet the grades and elevations shown on the plans, shall be considered included in the Contractor's bid for the various items of work involved and no additional compensation will be made therefore. Should such imported material be required, the Contractor shall notify the Engineer of the borrow site location at least 72 hours in advance, and provide an adequate sample size so the Engineer can verify the suitability of the material. All imported materials shall be proposed by the Contractor in writing in accordance with the submittal requirements of these Special Provisions and the Standard Specifications. The Contractor shall perform and/or submit all material testing reports and other data as necessary to provide the Engineer with established laboratory values for optimum moisture and maximum dry density, for any imported material requiring density testing. Any proposed engineered fill that deviates from the criteria stated herein, shall have written acceptance from the Engineer and geotechnical engineer prior to import or placement in the work.

D. If a disagreement between the Contractor and the Engineer occurs over the suitability of materials, the Contractor shall perform laboratory testing to demonstrate compliance with the specifications. The failure of the Contractor to perform the testing shall not relieve the Contractor from the obligation to provide suitable materials.

3. EXECUTION

3.1 ENGINEERED FILL CONSTRUCTION

A. General. Compacted Engineered Fill in Engineered Fills shall be placed in the dry and compacted as specified herein.

B. Subgrade Preparation. Following Clearing and Grubbing, the subgrade surfaces shall be graded to remove surface irregularities and shall be scarified parallel to the axis of the fill and loosened to a minimum depth of 2 inches. The moisture content of the loosened material shall be controlled as specified for the Engineered Fill, and the surface materials of the subgrade shall be compacted and bonded with the first layer of Engineered Fill.

C. Earth abutment surfaces shall be free of loose, uncompacted earth in excess of two inches in depth normal to the slope and shall be at such a moisture content that the Engineered Fill can be compacted against them to ensure a good bond between the fill and the abutments. Subgrade and abutment surfaces shall not be steeper than 1 horizontal to 1 vertical. The sites of the borrow area shall be stripped to sufficient depth to remove all vegetation, roots, brush, sod and other objectionable material. Clearing and disposal methods shall be in accordance with applicable state and county laws with due regards to the safety of persons and property. Fill shall not be placed until the required excavation and subgrade preparation has been completed.

D. Fill shall not be placed on or in standing water, nor upon a frozen surface, nor shall snow, ice, or frozen material be incorporated in the fill.

E. If soft, wet, or pumping subgrade soils are present, the required minimum level of compaction for the initial fill lift may be adjusted to eighty-five percent (85%) of the soil's maximum dry density as determined in accordance with ASTM D 1557, subject to approval of the Engineer. The intent of the reduction is to limit the amount of construction traffic that could lead to further deterioration and destabilization of the exposed subgrade and to build a more stable pad upon which to place subsequent fill lifts.

F. Horizontal Layer Construction. The compacted Engineered Fill shall be constructed to a sufficient section so as to achieve the required compaction throughout the finished section. Materials to be compacted shall be placed or spread in layers not more than eight (8) inches in loose thickness prior to compaction. Materials excavated to form keyways or over-excavations, and suitable for use as Engineered Fill, shall be blended uniformly with other excavated soils or disposed of. If the surface of any layer becomes too hard and smooth for proper bond with the succeeding layer, it shall be scarified parallel to the axis of the fill to a depth of not less than 2 inches before the next layer is placed. Fill placed around structures will be brought up at approximately uniform height on all sides of the structure.

G. Compaction. When, in the opinion of the Engineer, the surface of any compacted layer is too smooth to bond properly with the succeeding layer, it shall be scarified to a depth of 6 inches before the succeeding layer is placed thereon. The degree of compaction required is expressed as a percentage of the maximum dry density, based on laboratory test procedure, ASTM D 1557. The Engineered Fill shall be compacted to a minimum of 90% of the maximum dry density, unless otherwise specified herein or directed by the Engineer. Construction equipment shall be operated over each layer of fill to ensure that the required compaction is obtained. Special equipment shall be used if needed to obtain the required compaction. Heavy compaction equipment shall not be operated within 2 feet of any structure. Fill adjacent to structures, pipe, conduits, and anti-seep collars shall be compacted to a density equivalent to that of the surrounding fill by means of hand tampers or plate vibrators. Hand directed tampers or compactors shall be used on areas not accessible to heavy compaction equipment, fills compacted in this

manner shall be placed in layers not greater than 4 inches in thickness before compaction, and shall meet the same density requirement as for the adjacent area.

H. At the discretion of the Engineer, the top 18 inches of fill, within areas specified to receive revegetation treatments, may be compacted to between 80% and 85% of the maximum dry density, to facilitate plant establishment. Prior to seeding, the surface shall be prepared as specified in Section 329200, Seeding.

I. Compaction of backfill adjacent to structures shall not be started until after the expiration of the following minimum time interval after placement of the concrete:

1.	Counterforts, vertical or near-vertical	
2.	walls with earth loading on one side only	14 days
3.	Walls and counterforts, backfilled on both	
4.	sides simultaneously	7 days
5.	Anti-seep, collars, conduits,	
6.	and cantilever outlet bents	3 days

J. Moisture Control. The moisture content required is expressed as a percentage, based on laboratory test procedure ASTM D 1557. The moisture shall be uniformly distributed throughout the layer prior to compaction and shall be at least 1% above the optimum moisture content. If the material is not within the required moisture content, the Contractor will be required to moisture condition the soil. The moisture conditioning of fill materials shall be performed prior to placement in the section. The final minor moisture conditioning may be made on the fill, as required. Harrowing, or other approved methods will be required to work the moisture into the material until a uniform distribution of moisture is obtained. Water applied on a layer of fill shall be accurately controlled in amount and distribution so that free water will not appear on the surface during or subsequent to rolling. If the material is too wet for proper compaction or soft and yielding sub-grade is experienced (pumping), the Contractor will be required to aerate the material to a moisture content within the desired limits prior to compaction. If the top surface of the preceding layer of compacted fill or a subgrade or abutment surface in the zone of contact with the fill becomes too dry to permit suitable bond, it shall either be removed or scarified and moistened to an acceptable moisture content prior to placement of the next layer of fill.

K. Dressing. Engineered Fill slopes shall be dressed by over-building and cutting back to the required grade. The Contractor may compact the shoulder of each lift during the placement of fill materials to assist in the subsequent dressing of the slopes.

3.2 CROSS SECTIONS AND ZONING OF MATERIALS

A. Standard Engineered Fill Sections. The dimensions, slopes, and zoning of materials shall conform to the sections shown on the Drawings and specified herein.

B. Zoning of Materials. Unless otherwise specified, the Engineered Fill materials shall be homogeneous. The Engineered Fill shall be free of pockets, lenses, streaks, layers, etc. of different materials.

3.3 FINISH

A. The finished grades shall transition naturally into adjacent existing grades to provide a functional and naturalistic finished surface. Due to the complex nature of the project and the desired aesthetic and functional features, not all details can be accurately

represented on the Drawings. As a result, the Contractor may be directed by the Engineer to make minor adjustments to finish grades to best achieve these results. These adjustments may include smoothing or rounding conforms, or changing slope angles or daylight points as necessary to conform to the variable geometry inherent in natural topography. Compensation for this work shall be considered as included in the price paid for the various contract items of work involved, and no additional compensation will be allowed.

B. After the placement of the engineered fills and spoils, the sides and top shall be dressed by final passage of compaction equipment or by dragging to give a smooth surface. The surface area shall be graded to provide surface drainage to flow to desired locations.

3.4 ROADS AND RAMPS

A. Maintain Access. At locations where access roads to existing facilities are destroyed because of the work required under this contract, the Contractor shall provide temporary roads, if directed by the Engineer, to give access to fields and buildings during the construction period. Such facilities shall be removed to the extent required by the Engineer.

B. Temporary Haul Roads. Temporary haul roads shall be constructed as required to transport materials from borrow source or excavation to Engineered Fill site. Temporary ramps to be constructed for the Contractors convenience need not comply with these foundation preparation and Engineered Fill construction requirements. Unless otherwise directed by the Engineer, temporary ramps shall be removed prior to completion of the work.

3.5 GRADE TOLERANCES

A. Engineered Fill:

1. General. Engineered Fills shall be constructed to the net grade and cross section shown on the Drawings.
2. Grade Tolerances. At all points a tolerance of 0.2 (two-tenths) foot above, and 0.1 (zero) foot below the prescribed grade will be permitted in the final dressing, provided that any excess material is so distributed that the crown of the Engineered Fill drains in the desired direction and that there are no abrupt humps or depressions in surfaces. However, this tolerance above grade may be modified at locations where, in the opinion of the Engineer, such modifications will not impair the design or appearance of the project.

3.6 SLIDES

A. In the event of the sliding of any part of the Engineered Fill during its construction, or during the one year period after acceptance, the Contractor shall, upon written order of the Engineer, cut out and remove the slide and then rebuild that portion of the Engineered Fill.

3.7 SPECIAL MEASURES

A. Measures and construction methods shall be incorporated as needed and practical that enhances fish and wildlife values. Special attention shall be given to protecting visual resources and maintaining key shade, food, and den trees.

4. MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Engineered Fill. Engineered Fill will not be separately measured for payment.

4.2 PAYMENT

A. Engineered Fill, measured as specified above will be paid for at the contract lump sum price, which price will be payment in full for furnishing all labor, materials, tools, equipment and incidentals, and doing all work necessary to construct compacted Engineered Fills as specified, including hauling of excavated materials from the source.

B. No separate payment will be made for incidental grading beyond the projected toe of the Engineered Fill cross section. The cost for this work shall be included in contract unit price for compacted Engineered Fill.

C. No payment will be made for construction or removal of temporary roads or ramps.

D. No additional payment will be made for costs associated with stabilizing unstable materials. The cost for this work shall be included in contract Lump Sum price for compacted Engineered Fill.

E. Payment will be made under:

Pay Item	Pay Unit
Engineered Fill	Lump Sum

END OF SECTION

INDEX
SECTION 321123
AGGREGATE BASE

Paragraph **Page**

SECTION 321123
AGGREGATE BASE

1. GENERAL

1.1 DESCRIPTION

A. The work covered by this section consists of furnishing all plant, labor, and material and performing all operations necessary for placing aggregate base as specified, as shown on the Drawings, or as otherwise directed by the Engineer.

1.2 RELATED SECTIONS

1. Section 017123.16, Construction Surveying
2. Section 312316, Stripping and Excavation
3. Section 312323, Engineered Fill
4. Section 330527.33, Corrugated Metal Arch Pipe

1.3 REFERENCES

A. Oregon Standard Construction Specifications for Construction, Oregon Department of Transportation, current edition.

B. American Association of State Highway and Transportation Officials ("AASHTO"):

1. T27 – Sieve Analysis of Fine and Coarse Aggregates
2. T335 – Determining the Percentage of Fracture in Coarse Aggregate

1.4 SUBMITTALS

A. Submit to the Engineer, for review, the following:

1. Source of aggregates
2. Test results, performed within the last six (6) months, showing that the aggregates conform to all the material requirements specified herein.
3. Certified weights of aggregate base rock delivered to the site.

1.5 PROJECT CONDITIONS

A. Base courses shall be placed when the atmospheric temperature is above 35 degrees Fahrenheit. Areas of completed base course that are damaged by freezing, rainfall, or other weather conditions shall be corrected to meet specified requirements.

2. PRODUCTS

2.1 MATERIALS

A. Aggregate Base Material shall be 3" aggregate, conforming to grading requirements in Table 321123-1.

Table 321123-1
Grading Requirements
Separated Sizes

Sieve Size	3" – 0
	Percent Passing (by Weight)
3"	100
2 1/2"	95-100
1 1/4"	55-75
1/4"	30-45
No. 4[1]	-
No. 10	[2]

1. Report percent passing sieve when no grading requirements are listed
2. Of the fraction passing the ¼" sieve, 40 percent to 60 percent shall pass the No. 10 sieve.

B. Fracture of Rounded Rock – Fracture of rounded rock shall be determined according to AASHTO T 335. Provide at least one fractured face based on the following percentage of particles retained on the 1/4 inch sieve for the designated size:

Minimum Percent of Fractured Particles
(by Weight of Material)

Designated Size	Retained on 1/4 inch Sieve
1 1/2" – 0 and larger	50
Smaller than 1 1/2" -0	70

C. Durability. The produced aggregates shall meet the following requirements:

Test	Test Method	Requirements
Abrasion	AASHTO T 96	35.0 % maximum
Degradation (coarse aggregate) passing No. 20 sieve	ODOT TM 208	30.0 % maximum
Sediment Height	ODOT TM 208	3.0" maximum

D. Sand Equivalent – Aggregate shall be tested according to AASHTO T 176, and shall have a sand equivalent of not less than 30.

3. EXECUTION

3.1 PLACING, COMPACTING, AND FINISHING

A. Preparation of Subgrade. Prior to constructing the aggregate base course, the sub-grade shall be cleaned of all foreign substances. The sub-grade then shall be scarified to a depth of 6 inches, moisture conditioned, and compacted to a minimum of ninety-five percent (95%) relative compaction, based in accordance with Section 00640 of the Standard Specifications. Ruts or soft, yielding spots shall be corrected by loosening and removing soft or unsatisfactory material and by adding approved material, reshaping to line and grade, and recompacting.

B. Grade Control. During construction, the lines and grades including crown and cross slope indicated for the aggregate base course shall be maintained by means of line and grade stakes placed by the Contractor.

C. Placing. The mixed material shall be placed on the prepared subgrade in layers of uniform thickness with a suitable spreader. No layer shall exceed 6 inches or be less than 3 inches when compacted. The layers shall be so placed that when compacted they will be true to the grades or levels required with the least possible surface disturbance. Such adjustments in placing procedures or equipment shall be made as may be directed to obtain true grades, to minimize segregation and degradation, to adjust the water content, and to insure an acceptable base course.

D. Compaction. The layer of aggregate base course, including shoulders, shall be compacted to a minimum of ninety-five percent (95%) relative compaction, in accordance with Section 00640 of the Standard Specifications. Water content shall be maintained during the compaction procedure such that the water content is within plus or minus two percent (2%) of optimum water content. In all places not accessible to the rollers, the aggregate base course material shall be compacted with mechanical tampers.

E. Finishing. The surface of base course shall be finished after final compaction by cutting any overbuild to grade and rolling with a steel-wheeled roller. In no case shall thin layers of material be added to the top layer of base course to meet grade. If the elevation of top layer of base course is one inch or more below the grade, the top layer of base shall be scarified to a depth of at least three inches, new material shall be added, and the layer shall be blended and recompacted to bring to grade. Adjustments in rolling and finishing procedures shall be made as may be directed to obtain grades, to minimize segregation and degradation of aggregate base coarse material, to adjust the water content, and to insure an acceptable aggregate base course. Material found unacceptable shall be removed and replaced, with acceptable material.

3.2 FIELD QUALITY CONTROL

A. Smoothness. The surface of the aggregate base course shall not deviate more than one inch when tested with a ten-foot straightedge applied parallel with and at right angles to the centerline of the area covered. Deviations exceeding 2 inch shall be corrected as directed.

B. Thickness. The completed thickness of the aggregate base course shall be within one half inch of the thickness indicated on the Drawings. The thickness of the aggregate base course will be measured at intervals providing at least one measurement for at least each 150 linear feet of aggregate base course. The depth measurement will be made by test holes at least three inches

in diameter. Where the measured thickness of the aggregate base course is more than one half inch deficient, such areas shall be corrected by excavating and placing with additional material.

C. Compaction. Field density test of the in-place soils will be performed at random locations. However, the maximum interval between tests shall be 500 linear feet of aggregate base course placed.

D. Rework. Where tests indicate the base course does not meet specified relative compaction, the material represented by the test shall be reworked and recompacted to the specified relative compaction. Reworked areas will be retested until they meet the specified relative compaction. The costs of all retests will be deducted from monies due or to become due the Contractor.

4. MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Aggregate Base will be measured for payment by the ton, to the nearest 1.0 ton. Quantities to be paid for by the ton will be calculated on the basis of the dimensions shown on the Drawings, adjusted by the amount of any change ordered by the Engineer. Weights will assume 1.48 tons per cubic yard.

4.2 PAYMENT

A. Aggregate Base will be paid for at the contract price per ton, which price will be payment in full for furnishing all labor, materials, tools, equipment and incidentals, and for doing all work involved in constructing Aggregate Base including subgrade preparation and subgrade compaction, as shown on the Drawings, and as specified, and as directed by the Engineer.

B. Payment will be made under:

Pay Item	Pay Unit
Aggregate Base	TON

END OF SECTION

INDEX
SECTION 329200
SEEDING

Paragraph **Page**

SECTION 329200
SEEDING

1. GENERAL

1.1 DESCRIPTION

A. Work covered under this section consists of furnishing all labor, tools, materials, equipment and incidentals required to perform Seeding, as specified, as shown on the Drawings, or as directed by the Engineer.

1.2 RELATED WORK

A. The work described under this section is related to the following sections of the Specifications:

1. Section 015713.01, Fiber Rolls
2. Section 312316, Stripping and Excavation

1.3 SUBMITTALS

A. Submit to the Engineer, for review, the following:

1. List of origin/collection location for each seed species
2. A representative one-ounce sample of each seed mixture supplied for the job, labeled as to content, purity, and germination percentage.
3. Duplicate copies of invoices for all materials. Invoices for fertilizer shall show the grade furnished.

1.4 QUALITY ASSURANCE

A. Seed which has become wet, moldy, or otherwise damaged in transit or in storage, will not be acceptable.

2. PRODUCTS

2.1 MATERIALS

A. Quantities shown on the Drawings represent pure live seed (pls).

B. Seed shall be mixed on-site in the presence of the Engineer. At no time shall the seed mix contain noxious weed seed. Seed shall be maintained in optimal health and be protected at all times from animal damage; vandalism; inclement weather conditions, including drought, wind, and frost; toxic water; sunlight; moisture; or contact with vehicles, equipment, and tools and any other conditions that would damage or reduce the viability of the seed.

C. Seed Mix. The seed mix and application rates are as shown on the Drawings. No substitutions are allowed without written consent of the Engineer.

D.

E. Straw Mulch. Straw mulch shall be derived from wheat or barley. Straw that has been used for stable bedding shall not be used. Straw shall be free of mold. Straw shall be cured and dry with no water added after baling. Source must meet or exceed state certification standards for “weed free”.

3. EXECUTION

3.1 PREPARATION

A. General. Seed the areas disturbed by construction activities, as specified herein or as directed by the Engineer.

B. Debris Removal. Prior to ground surface preparation operations remove and dispose of all wire, rubbish, stones, and other material which might hinder proper grading, and subsequent maintenance.

C. Surface Preparation. Surfaces which are too hard or smooth to accept the seeding, as determined by the Engineer, shall be broken up to a minimum depth of 3 inches, by disking or other methods approved by the Engineer, until the condition of the soil is acceptable. When conditions are such, by reason of excessive moisture or other factors, that satisfactory results are not likely to be obtained, the work shall be stopped and shall be resumed only when directed. Slopes in excess of 25% shall be prepared by track-walking or equivalent method approved by the Engineer.

3.2 APPLICATION OF SEED

A. Existing Features. During seeding operations, care shall be taken to avoid damaging existing facilities, vegetation to remain, or any other items on or around the planting areas.

B. Seeding Areas: Apply seed to areas indicated on the Drawings, or as directed by the Engineer

C. Time of Seeding: Perform all seeding between September 15th and October 1st of the year construction begins. The seeding operation shall be halted when, in the opinion of the Engineer, conditions of high winds, excessive moisture or other factors are not conducive to satisfactory results. Upon written request of the Contractor, and upon written approval of the Engineer, seeding may be done during off seasons provided that:

1. The resulting stand of grass shall be at least equal to the stand that might be expected from planting during the normal season; and
2. The establishment period shall be lengthened, as required, to produce the above specified stand at no additional cost to the Owner.

D. Method of Seeding: Seeding may be performed mechanically in a dry condition or with hydro-seeding equipment, at the Contractor's option.

E. Hydro-seeding. The seed shall be mixed with cellulose fiber and water to form a slurry. Mix the slurry in tanks having continuous agitation so that a homogeneous mixture is discharged hydraulically through hoses on the area to be seeded. Seed species shall be added to the hydro-seeder in the Engineer's presence to ensure a seeding rate and quality as specified on Drawings. Seed shall be discharged within 2 hours. If mixture remains in tank for more than 2 hours, it shall be removed from the job site and replaced at the Contractor's expense. The Contractor shall employ the following two-step Hydro-seeding process.

F. Broadcast Seeding. Broadcast seeding may be used in lieu of hydro-seeding or to reseed any previously hydro-seeded areas disturbed during planting operations. Seed shall be dry-applied by the following method:

1. Broadcast seed and fertilizer (if specified), at the rates specified on the Drawings, uniformly by hand, mechanical hand seeder, combination seed spreader and cultipacker, or other approved equipment. Where seed is broadcast by hand or mechanical hand seeder, half the seed shall be sown with the sower moving in one direction, and the remainder sown

with the sower moving at right angles to the first sowing. Broadcast seeding shall not be done during windy weather.

2. Rake seed into the soil to achieve a sowing depth of approximately 1/8 inch to 1/4 inch.
3. Following the application of seed, straw mulch shall be pneumatically applied or hand broadcast at the rate of 3,000 pounds per acre (typically 1.5 to 2 tons/acre).

3.3 REPAIR

A. General. When any portion of the ground surface becomes gullied or otherwise damaged following seeding within the period of Contractor's responsibility, repair the affected portion to re-establish the condition and grade of the soil prior to planting and then reseed as specified for initial planting, all at no cost to the Owner.

B. Reseeding. When it becomes evident that the seeding has been unsuccessful, the Engineer will require that these areas be reseeded with the same seed and quantity as specified for the initial seeding. Complete reseeding within fifteen (15) days following notification and these areas shall be maintained by watering, as specified above, until the successful grass is established. Prepare the area to be reseeded as directed by the Engineer, to receive the reseeding.

3.4 FIELD QUALITY CONTROL

A. During the course of work or upon completion of the project, a check of the quantities of materials will be made against the areas treated, and if the minimum rates of application have not been met, the Engineer will require the distribution of additional quantities of those materials to make up the minimum applications specified.

4. MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Seeding will not be separately measured for payment.

B. Straw Mulch will not be separately measured for payment.

C. Areas disturbed by the Contractor and requiring seeding outside the designated limits of disturbance shall not be measured for payment.

4.2 PAYMENT

A. Seeding will be paid for at the contract lump sum price, which price will include furnishing all labor, materials, tools, equipment, and incidentals necessary to complete the Seeding as specified, as shown on the Drawings, or as directed by the Engineer.

B. No separate payment will be made for Straw Mulch. The cost associated with this work shall be included in the cost for Seeding.

C. The cost of seeding areas outside the designated limits of disturbance shall be solely borne by the Contractor.

D. Payment will be made under:

Pay Item	Pay Unit
Seeding	Lump Sum

END OF SECTION

INDEX
SECTION 330527.33
CORRUGATED METAL ARCH PIPE

Paragraph **Page**

SECTION 330527.33
CORRUGATED METAL ARCH PIPE

1. GENERAL

1.1 Description

A. Work included within this section includes:

1. Provide steel pipe, complete, in place, as specified, as shown on the Drawings, and as otherwise directed by the Engineer.
2. Perform all related excavation, foundation placement, engineered fill, and structural fill within the roadway prism.

B. All steel pipe materials and installation shall comply with the notes and details on the Drawings.

1.2 Submittals

A. Submit to the Engineer, for review, the following:

1. Manufacturer's product data sheets for pipe materials.
2. Product data sheet on Controlled Low Strength Fill material.

1.3 References

A. Oregon Standard Specifications for Construction, Oregon Department of Transportation (current edition).

B. American Association of State Highway and Transportation Officials:

	Standard Specifications for Highway Bridges, Section 26 (Division II)
M274	Steel Sheet, Aluminum-Coated (Type 2), for Corrugated Steel Pipe
T99	Moisture-Density Relations of Soils Using a 2.5-kg (5.5lb) Rammer and a 305-mm (12-in.) Drop

1.4 Product Handling

A. General. Comply with notes on the Drawings and manufacturer's recommendations.

1.5 Quality Assurance

A. Inspection. Comply with the manufacturer's recommendations. Contractor to inspect all materials upon delivery and prior to removal from truck. Once removed from the truck, Contractor shall be deemed to have "Accepted" the structure, and is responsible for any damage or missing components.

B. Testing. Comply with the manufacturer's recommendations.

2. PRODUCTS

2.1 Materials

A. The structure shall meet the dimensions shown on the drawings and consist of a 10 gauge, Steel Arch Pipe conforming to the requirements of AASHTO M 274/ASTM A 929 as manufactured by Pacific Corrugated Pipe Co., or approved equal.

B. Controlled Low Strength Material (CLSM) shall conform to section 00442 of the Oregon Standard Specifications.

C. Pipe Zone Material shall conform to Section 321540, Aggregate Base.

3. EXECUTION

3.1 General

A. Comply with the manufacturer's installation guidelines.

B. Verify all measurements and take all necessary field measurements before delivery of pipe to site. Provide additional materials and parts, not specifically specified, but as required for a complete and proper installation.

C. Where cited references contain duplicate information, the most stringent shall apply, as determined by the Engineer.

3.2 Installation

A. Comply with the notes and details on the Drawings and the manufacturer's installation guidelines.

B. Assemble the structure in accordance with the shop drawings provided by the manufacturer and per the manufacturer's recommendations.

C. Install the structure in accordance with the AASHTO Standard Specifications for Highway Bridges, Section 26 (Division II) or ASTM A 798.

D. Bed pipe per section 00405.12 of the State Standard Specifications using CSLM. Pipe bedding shall conform to the lower section of the structure and be constructed to avoid distortions that may create undesirable stresses in the structure.

E. Backfill the structure using pipe zone material as show on the drawings. Place backfill symmetrically on each side of the structure in 6 to 8 inch lifts. Compact each lift to a minimum of 90 percent density per AASHTO T 99.

F. Comply with manufacturer's guidelines for allowable loads on structure during construction.

G. Construction loads that exceed highway loads are not allowed on the structure.

4. MEASUREMENT AND PAYMENT

4.1 Measurement

A. Corrugated steel pipe will not be independently measured for payment.

4.2 Payment

A. Corrugated Metal Arch Pipe will be paid for at the lump sum contract price for Corrugated Metal Arch Pipe, which price will be considered payment in full for furnishing all labor, materials, tools, equipment, and incidentals necessary for the complete installation of the culvert, including but not limited to delivery and installation of culvert, excavation and fill for culvert and roadway work, placement of pipe bedding, placement of structural backfill and miscellaneous work as shown on the Drawings as specified, and as directed by the Engineer.

B. Payment will be made under:

Pay Item	Pay Unit
Corrugated Metal Arch Pipe	Lump Sum

END OF SECTION

INDEX
SECTION 334200
STORMWATER CONVEYANCE UTILITIES

Paragraph **Page**

SECTION 334200
STORMWATER CONVEYANCE UTILITIES

1. GENERAL

1.1 DESCRIPTION

The work covered by this section consists of furnishing and installing the stormwater conveyance utilities as shown on the Drawings, as specified herein, or as otherwise directed by the Engineer.

1.2 RELATED SECTIONS

1. Section 312319, Dewatering
2. Section 312316, Stripping and Excavation
3. Section 312323, Engineered Fill
4. Section 354237, Rock Slope Protection

1.3 REFERENCES

A. Oregon Department of Transportation (ODOT) Standard Specifications for Construction, current edition

1.4 SUBMITTALS

A. Submit to the Engineer, for review the following:

1. HDPE Pipe. Manufacturer's catalog data and installation instructions for pipe materials. A Certificate of Compliance(s) for each type of plastic pipe furnished and proposed for installation. The certificate shall also certify that the plastic pipe and joints comply with the requirements of the specifications, and shall include the resin material cell classification, unit weight of pipe, average pipe stiffness, joint property requirements, and date of manufacture. Submit the manufacturer's certification or copy of plant audits and test results from the National Transportation Product Evaluation Program (NTPEP) for the current cycle of testing for each pipe diameter furnished and its conformance with AASHTO minimum requirements.
2. Pipe slope anchors. Shop drawings of the pipe slope anchor assembly.
3. Ditch Inlet. Manufacturer's shop drawings.

2. PRODUCTS

A. Comply with the Drawings, and Section 00445 of the Standard Specifications.

B. HDPE Pipe. Pipe shall be Type S, conforming to the provisions in Section 02410.60 of the Standard Specifications and this Section. Pipe shall be dual-walled high-density polyethylene (HDPE) pipe with a smooth (non-corrugated) interior surface, and shall have a Manning's roughness coefficient of 0.035 or less.

C. HDPE Pipe Fittings. Fittings shall be water tight fittings manufactured by the same manufacturer as the HDPE pipe.

D. Pipe Slope Anchor. Pipe slope anchor assembly including the pipe stakes and hardware shall be galvanized after fabrication and shall conform to the dimensions and materials shown in Oregon Standard Drawing RD 330.

E. Pipe bedding/pipe zone material shall conform with Section 321540, Aggregate Base.

F. Ditch Inlet. Ditch Inlet shall conform to the dimensions and materials shown in Oregon Standard Drawing RD 370.

3. EXECUTION

3.1 GENERAL

A. The materials shall be installed in accordance with the manufacturer's recommendations, as shown on the Drawings, as specified herein, and in conformance with the provisions the Standard Specifications.

3.2 PLASTIC PIPE.

A. Plastic pipe, fittings, gaskets, and other components shall be stored in a way that protects materials from the weather, heat sources, and corrosive liquids, in addition to protection from direct sunlight by storing in containers and/or covering with tarpaulins or other suitable materials. To minimize the potential for pipe shrinkage after installation, the temperature of pipe to be laid must not be more than five (5) degrees Fahrenheit higher than the ambient temperature of the trench. Should the Contractor not provide adequate cover of the pipe or install during changes in temperature the Engineer will not accept the pipe and the Contractor will be required to replace the pipe which is deemed unacceptable by the Engineer. The Contractor will bare all costs associated with the replacement and no additional compensation will be allowed for.

B. Pipes shall be laid to the lines and grade shown on the Plans with the sections properly jointed, following generally accepted practices, the Manufacturer's recommendations, the Standard Specifications, these Special Provisions, and as directed by the Engineer. Care shall be taken not to damage pipe sections, joints, or gaskets during assembly. Contractor shall make use of pipe lubricant, installation stub, etc. and follow manufacture recommendations to ensure all pipe sections are pushed "home." A "come-along" or other similar method should be used; construction equipment such as an excavator bucket, etc. must not have direct contact with the plastic pipe end sections unless an installation stub and large timber or other suitable cushioning medium is utilized. The Contractor shall clean the interior of the pipeline as work progresses and the pipeline shall be clear and free of debris and sediment before acceptance by the Engineer.

C. Allowable joint deflection or longitudinal bending is dependent on pipe size and/or joint design, and shall not exceed the pipe manufacturer's published limits. No deflection in pipe shall be allowed without prior written acceptance by the Engineer.

D. Where pipes are installed in manholes, drainage inlets, junction boxes or other structures, the connection shall be at least equal to that of the pipe joint performance requirements. Soil-tight pipe joints are specified, the ends of the pipes shall be placed flush or cut off flush with the inside face of the structure, and be grouted in place with

hydraulic cement “non-shrink” grout, unless otherwise directed by the Engineer. Performance of the pipe, fittings, and connections is highly dependent on proper installation procedures. Installation shall be in conformance with all manufacture recommendations, the Project Plans and applicable details, the Standard Specifications, these Special Provisions, and as directed by the Engineer. The costs for these connections (including all materials, adapters, gaskets, seals, band clamps, couplings, grout, concrete collars, etc.) shall be included in the associated bid item of work and no additional compensation will be allowed for. There will be no separate payment for the connections required for a complete construction of the project.

3.3 PIPE SLOPE ANCHORS

A. Pipe slope anchors shall be installed at a minimum of spacing shown on the Drawings.

3.4 DITCH INLET

A. Ditch Inlets shall be installed per State Standard Specification section 00470.40.

4. MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Plastic (HDPE) Pipe shall not be separately measured for payment.

B. Pipe slope anchors shall not be independently measured for payment.

C. Ditch Inlet shall not be separately measured for payment.

4.2 PAYMENT

A. Stormwater Conveyance Utilities will be paid for at the lump sum contract price, which price will be payment in full for furnishing all labor, materials, tools, equipment, and incidentals necessary to complete the installation of the stormwater conveyance features (pipes, pipe slope anchors, ditch inlet), as specified, as shown on the Drawings, or as directed by the Engineer.

B. Payments will be made under:

Pay Item	Pay Unit
Stormwater Conveyance Utilities	Lump Sum

END OF SECTION

INDEX
SECTION 354237
ROCK SLOPE PROTECTION

SECTION 354237
ROCK SLOPE PROTECTION

1. GENERAL

1.1 DESCRIPTION

A. Work within this section shall include furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in placing, Engineered Streambed Material, where shown on the Drawings, as specified herein, or as otherwise directed by the Engineer. Stone protection, rock slope protection, and riprap are interchangeable in these Specifications and Drawings.

B. All loading, transport, temporary stockpiling, processing and mixing of stone materials to achieve designated gradations, washing, on-site hauling, excavation, preparation of sub-grade, placement, embedment, backfill, grading, compaction, finish grading, clean-up, and off-haul and disposal of excess materials needed to install all Rock Slope Protection work, where incorporated in the work, shall be considered as included in the applicable bid item unit price, and no additional compensation will be allowed.

C. The location, alignment, angles, elevations, grades, slopes, dimensions, etc. of the proposed creek channel improvements, treatments, and structures as described in this section are shown on the Project Plans to provide a basis for construction and bidding purposes. The Engineer is expected to make minor revisions and provide direction in the field to fit any varying field conditions. The Contractor shall include all costs for working under the direction of the Engineer in his/her bid for this work, as no additional compensation will be allow therefore.

D. The Contractor is hereby notified that the Engineer may direct the Contractor to place additional stone materials (not shown on the Plans) at select locations within the project work treatment areas to fit existing conditions at the time of construction. Any such additional stone materials and placement shall be considered as included in the unit prices paid for the designated stone materials as described elsewhere in these Technical Specifications and no additional compensation shall be allowed for.

E. Related sections:
   1. Section 312316, Stripping and Excavation
   2. Section 312319, Dewatering
   3. Section 330527.33, Corrugated Metal Arch Pipe

1.2 SUBMITTALS

A. Submit to the Engineer, for review, the following:
   1. A representative 5 cubic yard sample of each of the proposed Rock Materials specified herein shall be provided to the Engineer for approval, ten days prior to delivery of the remainder of material to the project site. The Engineer reserves to the right to reject said materials.

B. Sampling and Testing Assistance. Any difference of opinion between the Engineer and the Contractor shall be resolved by dumping and checking the gradation of the two random truck loads of rock. Mechanical equipment, a sorting site and labor needed to assist in checking gradation shall be provided by the Contractor at no additional cost to the Client.

1.3 QUALITY ASSURANCE

A. Tolerances. Place rock to a vertical tolerance of minus 2 to plus 3 inches.

B. Subgrade Preparation. Prior to placement of rock, Engineer shall verify subgrade preparation, and placement of fabric for rock. Where backing is shown on the Drawings, Engineer shall verify subgrade preparation and backing placement prior to placement of outer rock course.

2. PRODUCTS

2.1 MATERIALS

A. Salvaged Rock Material. Native rock found on site may be salvaged for reuse, subject to compliance with the material requirements for the intended use, and subject to the approval by the Engineer. The Engineer may require the Contractor to provide testing (e.g. gradation curve, hardness, etc.) to ensure that materials are suitable for reuse. Salvaged creek bed material shall be placed on a hardened surface or other suitable material (i.e. steel plate, pavement, filter fabric) in order to protect the said material from contamination or mixing with other soils, earthen material and debris. The Engineer may, at his sole discretion, waive certain testing requirements to facilitate the Contractor's use of locally salvaged materials.

B. Rock materials shall conform to Section 00390.11(b) of the State Standard Specifications. Stones shall be sound, durable, hard, resistant to abrasion and free from laminations, weak cleavage planes, and the undesirable effects of weathering. It shall be of such character that it will not readily disintegrate from the action of air, water, or the typical conditions experienced during handling and placing. All aggregate material shall be clean and free from deleterious impurities, including alkali, earth, clay, refuse, and adherent coatings.

C. Engineered Streambed Material. Engineered Streambed, and consist of dense, hard, durable non-friable stone free of organic debris and other deleterious substances. The rock shall have a minimum specific gravity of 2.5. Volcanic cinder material shall not be acceptable. The material shall be washed (at the point of supply) to reduce the percentage of fines (sieve #200 or less) and protected during all associated operations (i.e. loading, transport, stockpiling, on-site hauling, placement, etc.) to minimize or eliminate the potential for contamination.

D. Engineered Streambed Material shall conform to the gradation requirements of Table 1, below.

Table 1: Gradation requirements for Engineered Streambed Material, inches or sieve size

Percent of Mix (by volume)	Size Range (inches)
20	30-42
30	18-30
30	2-18
12	.08-2
8	< .08

3. EXECUTION

3.1 GENERAL

A. Rounded and smooth gravel, cobbles, and boulders shall not be placed on slopes steeper than 2:1 (horizontal: vertical) unless otherwise directed by the Engineer.

B. All rock materials shall be placed in such a manner as to smoothly conform with adjacent graded areas. Smaller rock shall be chinked into the margins of larger rock placements, as

necessary to conform to earthwork and prevent migration of fines from adjacent graded areas into the rock matrix.

3.2 ENGINEERED STREAMBED MATERIAL

A. Engineered Streambed Material shall be placed to the lines, grades and depths shown on the Drawings, or as directed by the Engineer. Uniformly distribute large stones to produce the required gradation of rock. Prevent contamination of rock materials by excavation and/or earth materials. Subgrade shall be uniform with no soil clumps or rocks greater than two inches. Where the specified depth of placement exceeds twelve inches, the material shall be placed in lifts not exceeding twelve inches depth and water jetted after each lift is placed, as outlined below.

B. Following placement of each ESM lift, rock surface shall be jetted with water to improve compaction and embed the fines within the mix. Jetting shall start at the upstream limits of placement and progress downstream. Jetting shall continue until water ponds at the surface, and until the turbidity levels of runoff produced from the jetting process have reached an acceptable level. All sediment-laden runoff generated by the jetting operations shall be pumped to a settling tank or similar device to reduce turbidity to acceptable levels, in compliance with permit conditions, prior to discharge to the creek. Comply with Section 312319, Dewatering.

C. In the event that the Engineered Streambed Materials are manipulated after placement, there is the potential for segregation by size class, which typically results in the larger fraction rising to the surface and fines being lost to the base of the lift. If in the opinion of the Engineer, there is excessive segregation of materials, the contractor shall remove all Engineered Streambed Materials, re-mix to a uniform gradation, and replace as specified.

4. MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Engineered Streambed Material. Engineered Streambed Material will be measured by the cubic yard of Engineered Streambed Material, based on the in-place dimensions shown on the Drawings. Where the dimensions of any portion of the work are revised by the Engineer, or a portion of the work is eliminated, the change will be measured by the cubic yard.

B. Volumetric measurements will be determined from the dimensions as shown on the Drawings or the dimensions constructed as directed by the Engineer. Materials placed in excess of these dimensions will not be included the measurement for payment. Surface areas will be measured to the horizontal limits parallel to the ground surface.

C. Excavation and backfill for rock slope protection will not be separately measured for payment.

4.2 PAYMENT

A. Engineered Streambed Material, measured as specified above, will be paid for at the contract unit price Cubic Yard, which price will be payment in full for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in placing the Engineered Streambed Material, complete in place, including subgrade preparation, processing work, excavation, and jetting, as shown on the Drawings, as specified herein, or as directed by the Engineer.

B. No separate payment will be made for excavation and backfill incidental to slope protection work. All costs in connection with this work will be considered incidental to the cost of construction of the associated slope protection work. Where embankment is shown to be

placed over completed rock slope protection, the embankment shall be considered incidental to the cubic yard price paid for associated Rock Slope Protection work.

C. Payment will be made under:

Pay Item	Pay Unit
Engineered Streambed Material	Cubic Yard

END OF SECTION