

**DIVISION 2 EARTHWORK****SECTION 2-01 CLEARING, GRUBBING, AND ROADSIDE CLEANUP****2-01.1 DESCRIPTION****2-01.1(1) GENERAL**

Section 2-01 describes work consisting of clearing, grubbing, and roadside cleanup including protecting from harm all trees, bushes, shrubs, or other objects identified in the Contract and/or the approved Tree, Vegetation and Soil Protection Plan (TVSPP) to remain.

**2-01.1(2) CLASSIFICATION**

**Clearing:** removing and disposing of trees under 6 inches in diameter, vegetation or other unwanted materials from the ground surface.

**Grubbing:** removing and disposing of the same materials from below the ground surface.

**Roadside cleanup:** cleaning and maintaining the roadside to an attractive appearance.

**2-01.2 CLEARING AND GRUBBING DISPOSAL**

Disposal of clearing and grubbing waste and debris shall be as specified in Section 1-07.3.

Borrow sites shall be as specified in Section 2-10.2.

Unless otherwise specified in the Contract, the Contractor shall be allowed to sell all usable material such as timber, chips or firewood produced by clearing and grubbing. The Contractor shall not allow the public to fell trees.

**2-01.3 CONSTRUCTION REQUIREMENTS****2-01.3(1) CLEARING**

Clearing shall consist of removing and disposing of all unwanted material from the surface including, but not limited to, trees 6 inch and less in diameter measured at a point one foot above the ground, brush, downed timber and rotted wood, rubbish, etc.; removing building sheds, fences, and other obstructions interfering with the Work when removal and disposal of such surface obstructions are not specifically provided for in Section 2-02; and protecting from all harm any trees, bushes, shrubs, or other existing improvement which are to remain. Trees greater than 6 inch in diameter measured one foot above the ground shall remain unless marked for removal on the Drawings or approved for removal in conjunction with the approved TVSPP (See Sections 1-07.16(2), 2-03.3(3)I, 8-01 and 8-02).

If pruning is approved in conjunction with approval of the TVSPP or otherwise deemed necessary to perform the Work included in the Contract, it shall be done in accordance with Section 1-07.16(2).

Trees marked for removal shall be felled within the area to be cleared. Removal of trees greater than 6" diameter shall include stump grinding or removal per 2-02.3(3)I unless otherwise approved in conjunction with approval of the TVSPP. Where the tree or tree limb structure interferes with or is in close proximity to overhead wires, or near METRO or Street Car overhead wires, the Contractor shall make the advance notifications specified in Section 1-07.28.

All buildings, fences, lumber piles, trash, and obstructions, except utility poles, within the area to be cleared shall be removed and disposed of by the Contractor. Burning will not be allowed.

The refuse resulting from the clearing operation shall be disposed of by the Contractor at an approved disposal site per Sec. 1-07.3. Refuse material shall not be left on the Project Site, shoved onto abutting properties, or be buried in embankments or excavations on the Project Site. See Sections 1-04.11, 1-07.3, 1-07.5, 1-07.15, 1-07.24, and 8-01 regarding prevention of pollution, cleanup, and stormwater and erosion control.

**2-01.3(2) GRUBBING**

The work shall consist of removing and disposing of all unwanted vegetative matter from below the surface including, but not limited to, stumps, roots, buried logs and timber, etc.; and removing and disposing of drains, culverts, wood catch basins, foundations, stairways, steps, and such other obstructions that interfere with the Work but whose removal and disposal are not specifically provided for in Section 2-02.

All stumps, roots, foundations and planking embedded in the ground within the limits described in the Contract shall be removed to a minimum depth of 2 feet below subgrade or 2 feet below existing ground level, whichever is lower. Disposal requirements for grubbing shall be the same as those described for clearing.

Removal of tree stumps in improved areas as part of grubbing operations shall comply with Section 2-02.3(3)I.

**2-01.3(3) LIMITS OF CLEARING AND GRUBBING**

The limits of clearing and grubbing shall be as indicated in the Contract and/or identified in the approved TVSPP.

**2-01.3(4) ROADSIDE CLEANUP**

See Section 1-04.11.

**2-01.3(5) PROTECTION OF EXISTING IMPROVEMENTS**

See Section 1-07.16.

**2-01.4 MEASUREMENT**

Bid items of Work completed pursuant to the Contract will be measured as provided in Section 1-09.1, Measurement of Quantities, unless otherwise provided for by individual measurement paragraphs herein this Section.

Measurement for "Clearing", for "Grubbing", and for "Clearing and Grubbing" will be by lump sum or by the square foot as indicated in the Bid Form.

**2-01.5 PAYMENT**

Compensation for the cost necessary to complete the work described in Section 2-01 will be made at the Bid item prices bid only for the Bid items listed or referenced as follows:

1. "Clearing", per square foot, or per lump sum.
2. "Grubbing", per square foot, or per lump sum.
3. "Clearing and Grubbing", per square foot, or per lump sum.

The Bid item prices for "Clearing", for "Grubbing", and for "Clearing and Grubbing" shall include all costs for the specified work.

**4. Other payment information.**

If the Bid Form does not include a Bid item pertaining to the work of "Clearing", "Grubbing", or "Clearing and Grubbing", then this work shall be considered included in the Bid item prices of the various Bid items and no separate or additional payment will be made.

Payment for "Remove Tree" will be as specified in Section 2-02.5.

All costs involved in securing, operating and maintaining any waste or borrow site, including related final cleanup, and any erosion or anti-pollution controls required in related permit(s), related property owner agreements, related grading regulations, or other related Contract requirements, shall be considered included in the Bid item prices for the Work and no separate or additional payment will be made.

**SECTION 2-02 REMOVE, ABANDON, OR RELOCATE STRUCTURES AND OBSTRUCTIONS**

**2-02.1 DESCRIPTION**

Section 2-02 describes work consisting of removing and disposing of, or salvaging or abandoning, selected items identified in the Contract located within a Right of Way or an area of existing improvement. The work also involves backfilling of trenches, holes or pits resulting from the removal of such existing improvements.

For projects within the City of Seattle, actual pavement and related restoration may be modified by the extended limits of restoration required to meet the current version of the "Street and Sidewalk Pavement Opening and Restoration Rules" at the date of advertisement. This document may be obtained at The Street Use Counter, Room 2300, 23<sup>rd</sup> Floor, Seattle Municipal Tower, 700 Fifth Avenue, Seattle, Washington 98104 or found at:

[http://www.seattle.gov/transportation/stuse\\_pavementopen.htm](http://www.seattle.gov/transportation/stuse_pavementopen.htm)

Any modifications to the Contract based upon the "Street and Sidewalk Pavement Opening and Restoration Rules" are subject to approval by the Engineer.

All removal operations included in this section within the dripline of existing trees to be protected shall be in accordance with 1-07.16(2).

For projects outside the City of Seattle, local jurisdiction requirements shall apply.

**2-02.2 MATERIAL**

Materials shall meet the requirements of the following Sections:

Cement Concrete Pavement	6-02
Aggregates	9-03

Concrete for plugging pipe ends and for filling inlets shall be Class 3000 .

Backfill Material for filling structure voids and Structures (other than inlets) shall be either Mineral Aggregate Type 9 or Type 17 meeting the requirements of Section 9-03; selected Material excavated on the Project Site; or such other Material as designated in the Contract.

**2-02.3 CONSTRUCTION REQUIREMENTS****2-02.3(1) GENERAL REQUIREMENTS**

With certain exceptions, the Contractor shall demolish, remove, and dispose of all buildings and foundations, structures, fences, and other obstructions that lie wholly or partially within the Right of Way. The exceptions are public and private utility-owned equipment, and other items identified in the Contract.

The Contractor shall:

1. Remove foundations to a depth of at least 5 feet below finished ground elevation or at least 2 feet below subgrade elevation for the roadway, structure or utility unless otherwise described in the Contract or by the Engineer.
2. Break up basement floors to promote drainage.
3. Fill basements or other cavities left by the removal of Structures. The fill shall match the level of surrounding ground. Backfilling shall be in accordance with Section 2-10.
4. Notify the Engineer of construction near existing survey monumentation, or removal of pavement containing existing survey monumentation, as required in Sections 1-07.16(1)A and 1-07.28 item 17.
5. Provide protective systems in accordance with Section 2-07 when the removal of structures creates voids greater than 4 feet in depth.

When salvageable material is to remain Owner property, the Contract will identify the material and removal requirements. Such material shall be either stored on the Project Site or delivered to a location identified in the Contract.

Any material not named in these Specifications or in the Contract as Owner property will belong to the Contractor.

The Contractor shall dispose of surplus material or debris per Section 1-07.3.

When limits are not shown on the Drawings, utility cuts and other openings in Seattle's streets, alleys and other public places for construction or other activities shall comply with the current edition of the "Street and Sidewalk Pavement Opening and Restoration Rules"; see Section 2-02.1. Utility cuts and other openings are subject to approval by the Engineer.

Joints and cracks referenced within this section shall include, but are not limited to, the abutment between differing surface materials (including but not limited to asphalt, concrete, brick, or cobblestones), asphalt or concrete surfaces roadway surface and curb, non-monolithic curb and sidewalk, separately placed cement concrete slabs (including but not limited to sidewalk, driveways, and bus shelter foundations), separately placed rigid pavement slabs without overlay, and separately placed rigid pavement base slabs with overlay that are distinguishable.

When working adjacent to a signalized intersection, contact Signal Operations prior to removing or sawcutting asphalt overlay, pavement or sidewalk; see section 1-07.28.

**2-02.3(2) REMOVAL OF BRIDGES, BOX CULVERTS AND OTHER DRAINAGE STRUCTURES**

In salvaging any steel or wooden bridge that will remain Owner property, the Contractor shall prevent unnecessary damage to the material. Steel members shall be match-marked.

Any blasting shall be subject to the requirements of Section 1-07.22. The Contractor shall complete all blasting before the placement of new work.

**2-02.3(3) REMOVAL OF EXISTING STREET IMPROVEMENTS****2-02.3(3)A REMOVE NON-RIGID PAVEMENT AND UNTREATED ROADWAY SURFACES**

Non-rigid pavements are defined as streets, driveways, alleys, parking lots, sidewalks or other surfaces constructed from a bituminous mix, or any combination of bituminous mixes or surface treatments, placed directly upon the subgrade, or over a base material composed of treated or non-treated, granular or selected Materials. Non-rigid pavement does not contain cement concrete, brick, or cobblestones.

The thickness of a non-rigid pavement will be considered as the thickness of the bituminous mix, or any combination of bituminous mixes and surface treatments.

Non-rigid pavement shall be precut full depth prior to removal by sawcutting to ensure a neat straight line. Full depth precut may be performed using an asphalt cutting wheel at the discretion of the Engineer.

When asphalt is removed by planing, edges shall be vertical along a neat straight line. Sawcutting is not required.

Required sawcutting on the perimeter of full depth non-rigid pavement openings will be paid as "Saw Asphalt Concrete, Full Depth". All other sawcutting associated with removal of non-rigid pavement shall be considered incidental to the removal bid item. Pavement openings will be as indicated on the Drawings or as determined by the Engineer. Adjacent openings shall be considered one opening regardless of the method of Work.

No sawcutting is required where pavement removal limits extend to joints or cracks.

Untreated roadway surfaces are defined as oil mat, crushed rock, and gravel surfaces. Untreated roadway surfaces shall not be considered pavements.

**2-02.3(3)B REMOVE ASPHALT OVERLAY**

When removing an asphalt overlay from a rigid base pavement, the Contractor shall use methods and equipment that do not structurally damage the existing rigid base.

If the asphalt overlay is removed by planing, and edges are vertical along a neat straight line, sawcutting is not required.

Required sawcutting on the perimeter of an asphalt overlay removal area will be paid as "Saw Asphalt Concrete, Full Depth". All other sawcutting associated with removal of asphalt overlay shall be considered incidental to the removal bid item. Areas of asphalt overlay removal shall be as indicated on the Drawings or as determined by the Engineer. Contiguous asphalt overlay removal areas shall be considered one regardless of the method of work.

No sawcutting is required where pavement removal limits extend to joints or cracks.

Planing bituminous pavement is addressed in Section 5-04.3(3)D.

**2-02.3(3)C REMOVE RIGID PAVEMENT**

Rigid pavements are streets, driveways, alleys, parking lots and other pavement structures including cement concrete, brick, cobblestone, or any combination of these materials and may or may not incorporate an asphalt overlay.

The thickness of a rigid pavement will be considered the thickness of the cement concrete, brick, cobblestone, or any combination of cement concrete, brick, or cobblestone. Overlaying asphalt depth will not be included in determination of the thickness of the rigid pavement.

In trenching operations, rigid pavement shall be removed at locations as indicated on the Drawings, or if not shown on the Drawing as indicated on Standard Plan no. 404a or 404b.

Rigid pavement shall be sawcut, or with the approval of the Engineer line drilled unless otherwise specified; see section 2-02.3(6).

Required sawcutting on the perimeter of rigid pavement openings will be paid as "Saw Cement Concrete, 2 Inch Minimum Depth" or "Saw Cement Concrete, Full Depth", and sawcutting for neat edge removal of the asphalt overlay 12-inch step-back as shown on Standard Plan nos. 404a and 404b will be paid as "Saw Asphalt Concrete, Full Depth". All other sawcutting associated with removal of rigid pavement shall be considered incidental to the removal bid item. Pavement openings will be as shown on the Drawings or as determined by the Engineer. Adjacent openings shall be considered one opening regardless of the method of Work.

No sawing or line drilling is required where pavement removal limits extend to joints or cracks.

Use of a "headache ball" or other methods that generate excessive vibrations to break concrete pavement will not be permitted.

Removal of former street car foundation, abandoned railroad track foundation, or other thickened slabs may be required. Street car foundation may include rails and ties. These foundations may extend over 14 inches in rigid pavement depth.

**2-02.3(3)D REMOVE CATCH BASIN, SANDBOX, VALVE CHAMBER, MAINTENANCE HOLE, OR INLET**

The Contractor shall excavate and completely remove the structure including casting and outlet trap, concrete encasement, and bricks, as applicable to each removal Bid item.

Connecting pipes shall be plugged in accordance with Section 2-02.3(5)B. Backfilling shall be in accordance with Section 2-10.

**2-02.3(3)E CURB REMOVAL AND CLASSIFICATION, AND REMOVE CURB AND GUTTER**

There are four types of curb; doweled curb (includes mountable and other curb attached to underlying pavement structure), full depth curb, curb and gutter, and monolithic curb (cement concrete). Monolithic curb will be considered the first six (6) inches of cement concrete along the curb-line monolithically poured with the existing sidewalk. Unless the Drawings indicate otherwise, doweled curb, full depth curb, curb and gutter, or monolithic curb removal adjacent to pavement removal paid as "Remove Pavement" will be considered to be part of the pavement removal paid as "Remove Pavement". If doweled curb, full depth curb, curb and gutter, or monolithic curb removal is isolated from full depth pavement removal, removal of doweled curb, full depth curb, and monolithic curb will be considered curb removal, and removal of curb and gutter will be considered curb and gutter removal.

Curb shall be sawcut perpendicular to the curb line at the neat line limits of removal, or removed to the nearest joint as indicated on the Drawings or as directed by the Engineer. Sawcutting at the limits of removal (end points of removal segments) will be paid as "Saw Cement Concrete Sidewalk, Full Depth" for doweled curb paid as remove curb," Saw Rigid Pavement, Full Depth" for all other cement concrete curb removal including doweled curb paid as remove rigid pavement, and "Saw Asphalt Concrete, Full Depth" for all asphalt concrete curb. Sawcutting between limits of curb removal, and all other sawcutting associated with removal of curb shall be considered incidental to the removal Bid item. See Section 2-02.3(7)E for additional requirements when salvage is applicable.

**2-02.3(3)F REMOVE SIDEWALK**

Sidewalk removal, both asphalt and concrete, shall be as indicated on the Drawings. Sawcut shall comply with the requirements of Section 2-02.3(6) and shall leave straight edges and vertical faces. The minimum width of sidewalk removal

measured longitudinally shall be two (2) feet, or to the nearest score line as indicated on the Drawings or as directed by the Engineer.

Required sawcutting on the perimeter of sidewalk removal will be paid as "Saw Asphalt Concrete, Full Depth" or "Saw Cement Concrete, Full Depth"; except for sidewalk removal for curb ramp and driveway installations. Sawcutting on the perimeter of new curb ramps, new driveways, and all other sawcutting associated with removal of sidewalk shall be considered incidental to the removal bid item. Sidewalk removal areas will be as shown on the Drawings or as directed by the Engineer. Adjacent sidewalk removal areas shall be considered one area regardless of the method of work.

No sawing is required where sidewalk removal limits extend to joints or cracks.

Unless the Contract specifies otherwise, removal of parking pay stations, D-22 signage ("Pay L", "Pay R", "Pay H", and "Pay LR" signs and posts), and "numbered" base plates, and parking meters, will be by SDOT. Unless the Contract specifies otherwise, removal of bus stop signs and bus shelter will be by METROKOC. See Section 1-07.28 for notification requirements.

### **2-02.3(3)G REMOVE ELECTRICAL AND TRAFFIC CONTROL DEVICES**

The Contractor shall show in the Critical Path Method (CPM) schedule and in weekly three-week look-ahead a schedule for removing the existing traffic control and electrical systems. The Contractor shall notify and coordinate with the Engineer at least 5 Working Days prior to proceeding with the removal.

The Contractor shall remove equipment from the span wire before the span wire is disconnected from the poles. Existing span wire shall not be cut without first releasing the tension in the span.

Removal of any part of a loop detector system, whether or not in conjunction with pavement, curb, or sidewalk removal, requires the Contractor make the notification in Section 1-07.28 item 16.

### **2-02.3(3)H REMOVE GUARD RAIL**

Removal of the various types of guardrail and anchors shall include removal of the rail, cable elements, hardware, posts, concrete bases, and steel tubes. All holes resulting from the removal shall be filled in accordance with Section 2-10. The removed guardrail items, if reusable as determined by the Engineer, shall be delivered either to the Charles Street Facility or to the Haller Lake Facility whichever facility is nearest the guardrail to be removed. Damaged and unusable items shall be disposed of by the Contractor.

### **2-02.3(3)I REMOVE TREE**

Trees which are greater than 6 inch in diameter at one foot above the ground and marked for removal will be indicated on the Drawings and/or identified in the approved TVSPP.

The Contractor shall notify the Engineer at least 2 weeks in advance of tree removal and shall post Engineer provided placards on trees prior to removal. The Contractor shall comply with Section 1-07.16(2) whenever tree trimming or removal is near overhead wires.

In unimproved areas, removal of the tree shall not include complete removal of the stump unless otherwise directed by the Engineer.

In improved areas and/or areas to be paved, stump removal shall be by grinding and removing the stump to a 2.5 foot depth below finished grade, unless specified otherwise in the Contract.

Tree removal not identified in the Drawings proposed for removal by the Contractor shall be subject to approval by the Engineer.

### **2-02.3(3)J REMOVE PAVEMENT MARKING**

Pavement paint and thermoplastic stripes and markings, traffic buttons, and lane markers to be removed as indicated in the Contract shall be obliterated until blemishes caused by the pavement marking removal conform to the coloration of the adjacent pavement. Grinding to remove painted markings is not allowed. Grinding to remove plastic markings is allowed to a depth just above the pavement surface, then water blasting or shot blasting shall be required to remove the remaining markings. Traffic button and lane marker removal shall be incidental to pavement marking removal. If the pavement is materially damaged by pavement marking removal, such damage shall be repaired by the Contractor in accordance with Section 1-07.13. Sand or other material deposited on the pavement as a result of removing pavement markings shall be removed as the work progresses to avoid hazardous conditions. See Section 1-07.5 regarding pollution control requirements.

### **2-02.3(3)K REMOVE SIGN AND POST**

Unless the Contract specifies otherwise, removal of parking pay stations, D-22 signage ("Pay L", "Pay R", "Pay H", and "Pay LR" signs and posts), and "numbered" base plates, and parking meters, will be by SDOT. Unless the Contract specifies otherwise, removal of bus stop signs will be by METROKOC. See Section 1-07.28 for notification requirements.

Removal of the various types of signs, posts, and hardware shall include patching the holes with a suitable material flush with existing surface. Holes created by removal of posts in earth shall be filled in accordance with Section 2-10. Removal of posts and concrete foundations from sidewalk or other improvement shall include the removal and replacement of surrounding improvements necessary to reasonably accommodate the removal. The Engineer may direct additional removal to

a joint or score line. The replacement of improvements shall be in accordance with the Bid items in the Bid Form; if Work is not specified in the Bid Form, replacement of improvements shall be in accordance with applicable Specifications or in-kind to the satisfaction of the Engineer, and incidental. Damaged and unusable items shall be disposed of by the Contractor. Salvage of useable Material shall be in accordance with Section 2-02.3(7).

#### **2-02.3(3)L REMOVAL OF EXISTING STREETLIGHT EQUIPMENT**

Removal of streetlight equipment, wiring or the disconnection of power from street light equipment shall require a submittal to the Engineer. The submittal shall include the scope of the Work and the schedule for the Work to be performed. The submittal shall be submitted to the Engineer 10 Working Days prior to the planned activities per Section 1-05.3.

#### **2-02.3(4) ABANDON CATCH BASIN, VALVE CHAMBER, MAINTENANCE HOLE, OR INLET**

As applicable to each structure designated on the Drawings to be abandoned, the Contractor shall remove the casting and debris; dewater; break down the structure to a depth of the cone sections or 4 feet below the surface, whichever is greater; plug the outlet pipe as specified in Section 2-02.3(5); and fill the remaining structure and void with Mineral Aggregate or concrete as follows.

The Contractor shall not abandon any existing water service unless the Contract so specifies. When abandonment of an existing water service is required, the Contractor shall first make the notification as specified in Section 1-07.28 item 7.

Valve chambers, catch basins, and maintenance holes shall be filled in accordance with Section 2-10. Old Type 164 inlets shall be filled with Class 3000 concrete (see Section 6-02). Inlet grates shall be delivered to the Owner.

The upper portion of abandoned structure shall be replaced with Material matching the existing pavement structure unless indicated otherwise in the Contract.

#### **2-02.3(5) ABANDON AND FILL, AND PLUG PIPE**

##### **2-02.3(5)A ABANDON AND FILL PIPE**

Pipes designated on the Drawings to be abandoned and filled shall be filled with a pumpable, flowable cement slurry completely filling the pipe (See section 9-05.15).

##### **2-02.3(5)B PLUG PIPE**

At each end of pipe designated on the Drawings as "abandon and fill" or "plug", the pipe end shall be completely plugged with Cement Concrete, Class 3000 (Section 6-02) for a minimum length of 12 inches with no voids.

#### **2-02.3(6) SAWING AND LINE DRILLING**

##### **2-02.3(6)A REMOVAL**

When sawcutting cement concrete pavement, cement concrete driveway, cement concrete sidewalk, or other cement concrete slabs, with or without asphalt overlay for removal, the sawcut shall be full-depth of the concrete material (or rigid pavement) unless the Drawings indicate otherwise or the Engineer directs or allows otherwise. Rigid pavements may consist of mortared decorative or other type special pavement units, such as brick, cobblestone or paver block, as well as cement concrete pavement. See Section 2-02.3(3)C. Rigid pavements may also include an asphalt overlay.

Curb removal shall be sawcut full height and width of curb.

Use diamond blades for sawing concrete where a full-depth cut face adjoins new concrete. As an alternate, the contractor may use carbide cutting wheels to saw concrete that will be overlaid or for full-depth cuts where the cut face does not join the new concrete. Limit penetration of wheel into the subbase to a maximum of 1/2-inch. Do not allow the wheel to cut into pavement that is remaining in place. Discontinue using a wheel saw if unsatisfactory results are obtained as determined by the Engineer.

Asphalt removal shall be sawcut full depth, straight, and the surface shall be generally vertical over its full depth.

When line drilling, spacing of drilled holes center to center shall be 6 inches maximum and hole diameters shall be 1-1/2 inches minimum. Holes shall be perpendicular to the surface and shall penetrate completely through the pavement.

Sawcutting shall be the required method for removals:

1. Unless otherwise noted in the Contract.
2. Unless otherwise noted in the permit for work in the street Right of Way.
3. Unless otherwise allowed in writing at the discretion of the Engineer.

To thoroughly clean sawcut, the Contractor shall employ non-polluting methods using, or as effective as using, high pressure water (water under at least 1400 psi.) to thoroughly flush the sawcut. See Section 1-07.5(2) Water Quality, "Sawcutting, Planing, and Grinding By-Products:" for sawcutting water quality requirement and considerations.

##### **2-02.3(6)B PAVEMENT JOINTS**

See Standard Plans and Section 5-05 when sawcutting concrete pavement for contraction joints.

**2-02.3(7) SALVAGE****2-02.3(7)A GENERAL**

Unless otherwise indicated in the Contract, all materials identified as salvageable by the Engineer to be removed from the project shall be carefully salvaged in its existing condition as amended in the following paragraph. Delivery of salvageable material shall be as specified in Sections 2-02.3(7)B through 2-02.3(7)F. Delivery of salvageable guardrail components shall be in accordance with Section 2-02.3(3)H. Materials deemed not salvageable by the Engineer shall be removed by the Contractor and disposed of.

All castings and other materials removed from the project which are not to be re-used on the project, and which in the opinion of the Engineer are suitable for salvage, shall have excess concrete, debris and dirt removed.

**2-02.3(7)B WATER MAINS AND APPURTENANCES**

The Contractor shall excavate and completely remove hydrants, valves, and any appurtenance where new Water Main and appurtenance is to be installed. Items designated for salvage will be indicated in the Contract with specific direction on who to contact, lead time advance notice, how to handle, and where to deliver. Removed Water Main and appurtenance shall be disposed of by the Contractor. Backfilling shall be in accordance with Section 2-10.

**2-02.3(7)C ILLUMINATION, SIGNALS, ELECTRICAL, AND SIGNS**

Electrical and traffic control items to be salvaged shall include the following:

1. High pressure sodium, Induction and Light Emitting Diode (LED) luminaires, lamps and photoelectric cells.
2. Aluminum bracket arms.
3. Aluminum lighting poles.
4. Wood and metal lighting poles.
5. Traffic poles, including joint lighting and traffic poles.
6. Mast arms.
7. Pedestals.
8. Traffic signal cabinets.
9. Signal heads.
10. Illuminated signs.
11. Handholes.
12. Junction and Terminal boxes.
13. Traffic signs - overhead.
14. Traffic sign.
15. Signal appurtenances identified in the Contract.
16. Miscellaneous channelization items.

Items 1 through 4 shall be delivered by the Contractor to City Light South Service Center at 4th Avenue South and South Spokane Street. Call 206-386-1766 prior to delivery of wood poles, or 206-386-1704 prior to delivery of metal poles, high pressure sodium, induction and LED luminaires, lamps, photoelectric cells, and aluminum bracket arms.

Items 5 through 16 shall be returned to SDOT Traffic Shops at 4200 Airport Way South. Call 206-386-1206 a minimum 2 Working Days prior to delivery.

**2-02.3(7)D REINSTALLING SALVAGED ELECTRICAL MATERIAL**

See Section 8-30.3(4).

**2-02.3(7)E GUTTER BRICK, PAVEMENT BRICK AND COBBLESTONE, AND GRANITE CURB**

When the Bid item description includes "with salvage", the Contractor shall exercise reasonable care in the removal and salvage of existing gutter brick, pavement brick, cobblestone, and granite curb encountered during removal operations. The method of removal shall not damage the brick, cobblestone, or granite curb. If necessary, the Contractor shall hand excavate to ensure these materials are not damaged. The Contractor shall coordinate the loading operations with the SDOT Pavement Supervisor, see Section 1-07.28. The Contractor shall be responsible for loading of the salvaged material.

**2-02.3(7)F DRAINAGE AND SEWER MATERIALS**

Inlet, catch basin, maintenance hole, and other Sewer and drainage materials, such as castings, grates, hoods, ladders, and related materials, deemed salvageable by the Engineer shall be delivered to the Haller Lake facility, weekdays between the hours of 8:00 AM and 3:00 PM. Contact 206-684-7507 at least 1 Working Day in advance for arrangement of delivery.

**2-02.3(8) STREET SADDLES AND STEEL PLATES****2-02.3(8)A GENERAL**

When excavations or other openings in the Right of Way cannot be completely backfilled at the end of the Day or as may be required, and traffic must be accommodated over the opening, street saddles or steel plates meeting the requirements that follow shall be used to temporarily cover the excavation or opening.

**2-02.3(8)B STREET SADDLES**

Saddle boards and irons shall be used only on those streets which have concrete pavement or other surface which can safely support them.

Saddle board shall be made of 4-inch or thicker roughcut, construction grade timbers with no warp. Saddle iron flanges shall have minimum dimensions of 6 inch width x 8 inch length. They shall be made of minimum thickness 3/4-inch steel and have chamfered edges. The support iron shall be of adequate size so that there is no significant deflection with traffic. At any time the saddle iron flanges do not get full bearing on the pavement surface, shims shall be used. Saddle boards and irons may be bolted together.

Saddle irons and boards shall be firmly wedged on sides and ends. The boards shall be flush with surrounding pavement. All holes shall be cut to provide a good fit and without excessive openings. Saddle boards shall be notched to receive the irons, or scabbing shall be added to the sides of the board so that the board is flush along the pavement opening. There shall be no more than 3 feet of unsupported board between irons.

Shims, where needed, shall comply with the requirements of Section 2-02.3(8)C.

Street saddles shall have a non-skid surface coating capable of providing slip resistance in wet and dry weather for the length of time the saddles are in-place. See Section 1-07.1(3) non-skid surfaces.

**2-02.3(8)C STEEL PLATES**

In general, where a steel plate covers an excavation or opening, the Contractor shall ensure the steel plate withstands the traffic loading, remains in-place over the opening, does not rock, does not generate noise, and is fully supported for the length of time the plate(s) are in-place.

Steel plates shall be capable of withstanding, at the minimum, HS-20 loading.

All bearing ends of steel plates shall overlap existing remaining pavement at least 12 inches. Flanges or angle irons shall be welded to the plate underside conforming basically to the size of the street opening to ensure the plate does not move relative to the opening. The edges of all plates shall be highlighted with 12 inch minimum width Safety Orange (Federal Standard 595 Color 595 FS 12246 or approved) paint.

All steel plates shall be bedded on temporary pavement patch Material or other suitable material that extends beyond the plate's edge to form a tapered transition (shim). The taper shall provide a smooth, gradual transition between pavement and the plate at least 12 inch in length to accommodate wheelchair, bicycle, and other traffic. The tapered transition shim shall be highlighted with paint stripes consisting of the color Safety Orange approximately 2 inches wide and located on 16 inch centers.

Where spans are excessively long or where multiple steel plates are required to cover a long span, adequate additional support beneath the plates shall be provided, such as braced steel beams. The space between the steel beam and the plate shall be covered with a material, such as an old carpet, to prevent rattling and noise.

When directed by the Engineer, the Contractor shall use steel pins welded at the corners of the plate. When pins are used, holes shall be drilled through an opening in the plate full depth into underlying pavement structure. The pins shall be long enough to be driven full depth of pavement and be of cross-section to be snug in the holes. The pin head shall be of sufficient area and mass to allow for welding the pin to the plate with sufficient strength of weld ensuring the pin does not popup, come loose, or separate from the plate at any time.

Steel plates shall have a permanent non-skid surface in both dry and wet conditions. See Section 1-07.1(3).

Non-skid coatings are not acceptable.

Any crosswalk containing steel plates or saddles may be closed at the discretion of the Engineer.

**2-02.4 MEASUREMENT**

Bid items of Work completed pursuant to the Contract will be measured as provided in Section 1-09.1, Measurement of Quantities, unless otherwise provided for by individual measurement paragraphs herein this Section.

Measurement for sawcutting when specified for payment in the Contract will be made by the linear foot along the slope of the surface cut. When acceptable full depth precut is performed using an asphalt cutting wheel where payment for sawcutting is specified, it will be measured as sawcutting. Sawcutting not specified for payment in the Contract will not be measured. No measurement will be taken for line drilling.

Unless otherwise specified, sawcutting of cement concrete pavement (or rigid pavement) at the limits of removal will be measured as "Saw Rigid Pavement, Full Depth".

Unless otherwise specified, sawcutting of cement concrete sidewalk at the limits of removal will be measured as "Saw Cement Concrete Sidewalk, Full Depth".

Unless otherwise specified, sawcutting of asphalt concrete at the limits of removal will be measured as "Saw Asphalt Concrete, Full Depth".



Unless otherwise specified, sawcutting of curb at the limits of removal (end points of removal segments) will be measured as "Saw Cement Concrete Sidewalk, Full Depth" for doweled curb paid as curb removal, "Saw Rigid Pavement, Full Depth" for all other cement concrete curb including doweled curb paid as rigid pavement removal, and "Saw Asphalt Concrete, Full Depth" for all asphalt concrete curb.

Measurement for openings in pavement structure will be based on the removal and replacement limits as indicated on the Drawings, as determined by the Engineer, or if not shown on the Drawing as indicated on Standard Plan no. 404a or 404b as modified by the extended limits of restoration required to meet the "Street and Sidewalk Pavement Opening and Restoration Rules".

Measurement for "Remove Asphalt Pavement" with an average thickness less than six inches will be measured by the square yard except when the removal is required to install underground utilities. There will be no measurement for asphalt pavement removal to install underground utilities.

Abandon pipe will not be measured.

Measurement for "Abandon and Fill Pipe" will be by the linear feet of pipe abandoned and filled.

Measurement for "Remove Pavement Marking" and "Remove Pavement Marking, Thermoplastic" will be by the actual linear foot. Unpainted skips in pavement marking removal, and removal of traffic buttons and lane markers incidental to pavement marking removal, will not be measured.

Measurement for "Remove Pavement Marking Legend/Symbol" and "Remove Pavement Marking Legend/Symbol, Thermoplastic" will be measured per each.

Measurement for removal of cement concrete sidewalk will be measured by the square yard excluding the monolithic curb (the six (6) inches adjacent the roadway).

Unless the Drawings indicate otherwise curb and gutter, doweled curb and full depth curb, and monolithic curb removal adjacent to pavement removal paid as "Remove Pavement" will be considered to be part of the pavement removal paid as "Remove Pavement" and will be included in the surface area measurement.

Doweled curb, full depth curb, and monolithic curb isolated from pavement removal paid as "Remove Pavement" will be measured by the linear foot along the curb face as "Remove Curb".

Curb and Gutter isolated from pavement removal paid as "Remove Pavement" will be measured by the linear foot along the curb face as "Remove Curb and Gutter".

Measurement for "Abandon Existing Water Service" will be per each service permanently retired and disconnected from the existing Water Main.

Measurement for the removal of the former street car foundation or abandoned railroad track foundation will be per square yard using the Bid item "Remove Pavement, Over 14 Inch Depth, Including Rails and Railroad Ties" or "Remove Pavement, Over 14 Inch Depth, Including Railroad Ties". No separate measurement will be made for the removal of rails and railroad ties for "Remove Pavement, Over 14 Inch Depth, Including Rails and Railroad Ties" and railroad ties for "Remove Pavement, Over 14 Inch Depth, Including Railroad Ties".

Measurement for the removal of rigid pavement over 14 inches will be per square yard using the Bid item "Remove Pavement, Over 14 Inch Depth". No separate measurement will be made for the removal of overlaying asphalt.

For all pavement removal including rigid pavement, overlaying asphalt is excluded for the measurement of the pavement depth and incidental to the removal Bid item. "Average thickness" will be as determined by the Engineer using 3 to 7 randomly selected locations per sub-lot or representative area.

## 2-02.5 PAYMENT

Compensation for the cost necessary to complete the work described in Section 2-02 will be made at the Bid item prices Bid only for the Bid items listed or referenced as follows:

1. "Remove (Item)", per square yard.
2. "Remove (Item)", per linear foot.
3. "Remove (Item)", per each.
4. "Remove (Item)", per lump sum.

The Bid item price for "Remove (Item)" shall include all costs for the work required to completely remove and dispose of or salvage the item as applicable. The removal (item) will include "with salvage" when salvage of brick, cobblestone, granite curb or a combination of brick, cobblestone or granite curb is required. Salvage of other materials will not require the "with salvage" in the Bid item description.

Payment for removal of items not listed in the Bid Form and not specified in this Section shall be included in the Bid item prices of the various Bid items and no separate or additional payment will be made.

Removal of non-rigid pavement less than or equal to 6 inches in average thickness will be measured and paid as "Remove Asphalt Pavement", with the following exception: When excavating through non-rigid pavement less than or equal to 6 inches in average thickness to install underground facilities, the costs of removal of non-rigid pavement shall be considered as incidental to and included in the Bid item price of installing the new underground facility.

Payment for removal of rigid pavement, whether as a rigid base or as a surface course, averaging greater than 4 inches in thickness, or averaging greater than 6 inches in thickness when combined with the overlaying asphalt, will be paid as "Remove Pavement".

Removal of non-rigid pavement greater than 6 inches in average thickness will be measured and paid as "Remove Pavement".

Removal of non-rigid pavement without removal of any underlying rigid pavement base will be paid as "Remove Asphalt Overlay".

When rigid base is to be removed, the removal of the 12-inch asphalt overlay step-back as shown on Standard Plans 404a and 404b shall be considered included in the removal Bid item. Payment for removal of rigid base shall include the removal of the overlaying asphalt in the removal Bid item.

Payment for removal of rigid pavement, whether as a rigid base or as a surface course, averaging greater than 4 inches in thickness, or averaging greater than 6 inches in thickness when combined with the overlaying asphalt will be paid as "Remove Pavement".

Payment for removal of rigid pavement, whether as a rigid base or as a surface course, averaging 4 inches or less will be paid as "Remove Cement Concrete Sidewalk", unless the average thickness of the rigid pavement base combined with the overlaying asphalt is greater than 6 inches in average thickness.

Payment for removal of untreated roadway surfaces will be paid as "Common Excavation".

Removal, including stump grinding of trees 6 inches or greater in diameter as measured 1 foot above the ground surface will be paid as "Remove Tree". Removal of trees less than 6 inches in diameter as measured 1 foot above the ground surface will be paid as specified in Section 2-01.

Payment for all minor utility devices such as meter boxes, handholes, inlets, sandboxes and pipe marked for removal in the Contract and which are located within the excavation area between pipe trench neat lines or within the neat line area of a structural excavation shown on the Drawings, shall be considered as incidental to and included in the Bid item price for installation of pipe or for structural excavation. Removal of catch basin and maintenance hole will be paid for at the Bid item price Bid for their removal.

Costs for sidewalk thickened edge removal shall be incidental to and included in the cement concrete sidewalk removal Bid item price.

Payment for removal of traffic sign posts shall include all costs for the removal of the post, traffic sign, mounting hardware and restoration of the surface where sign posts were removed.

The Bid item price for; "Remove Pavement Marking", "Remove Pavement Marking, Thermoplastic", "Remove Pavement Marking Legend/Symbol" and "Remove Pavement Marking Legend/Symbol, Thermoplastic" shall include all costs for the work required to remove and dispose of pavement marking including traffic buttons and lane markers. Pavement materially damaged by Contractor removal methods requiring restoration of the damaged pavement shall be at the sole expense of the Contractor and no separate or additional payment will be made. No payment will be made for removal of pavement marking when the underlying pavement is removed.

The Bid item prices for "Remove Luminaire" and "Remove Luminaire and Bracket Arm" shall include all costs for the work required to remove the existing luminaire, or luminaire and bracket arm and its ballast, wiring and appurtenances.

The Bid item price for "Remove Pole, Metal" shall include all costs for the work required to remove and salvage the pole.

The Bid item price for "Remove Pole, Wood" shall include all costs for the work required to remove and salvage the pole, and to backfill and compact the void left after pole removal.

The Bid item price for "Remove Pole, Concrete or Fiberglass" shall include all costs for the work required to remove the pole, and if direct buried to backfill and compact the void left after pole removal.

The Bid item price for "Remove Foundation, (Type)" shall include all costs for the work required to remove and dispose of the foundation, and to backfill and compact the void left after removing the foundation.

5. "Sawcut Rigid Pavement, Full Depth", per linear foot.
6. "Sawcut Cement Concrete Sidewalk, Full Depth", per linear foot.
7. "Sawcut Asphalt Concrete, Full Depth", per linear foot.

The Bid item price for sawcutting shall include all costs for the work required to sawcut cement concrete or asphalt concrete. No payment will be made for sawcutting concrete or asphalt, which is done at the option of the Contractor, when

indicated or specified as incidental in the Contract, or when specified as being included in the payment of other Bid items. Sawcutting will only be paid at the limits of removal specified for payment in the Contract.

Sawcutting for neat edge removal of the 12-inch asphalt overlay step-back as shown on Standard Plans 404a and 404b, will be paid in accordance with the Bid item "Saw Asphalt Concrete, Full Depth".

No separate payment shall be made for sawcutting through asphalt overlay when the underlying rigid pavement is being removed.

8. **"Abandon (Item)"**, per each.

The Bid item price for "Abandon (Item)" shall include all costs for the work required to abandon the specified item.

9. **"Abandon and Fill Pipe"**, per linear foot.

The Bid item price for "Abandon and Fill Pipe", shall include all costs for the work required to plug the pipe where indicated on the Drawings and furnish and fill the pipe with cement slurry.

No payment will be made to abandon pipe or other subsurface items identified on the Drawings and for which no work is required. Plugging the exposed or open ends of pipes to be abandoned shall be considered incidental to and included in the Bid item price for the installation of new pipe.

10. **"Remove Signalization (Location)"**, per lump sum.

The Bid item price for "Remove Signalization (Location)" shall include all costs for the work required to complete the removal, disposal, and salvage work as specified in the Contract including salvaging, stockpiling and delivering equipment as determined by the Engineer and disposal of removed items not salvaged.

11. **Other payment information**

Removal of former street car foundation or abandoned railroad track foundation shall be paid for as "Remove Pavement, Over 14 Inch Depth, Including Rails and Railroad Ties" per square yard. No separate payment shall be made for sawcutting or removal of the overlying asphalt. Depth excludes overlying asphalt; see Section 2-02.3(3)C. If railroad ties are found to be Contaminated Material, ties shall be disposed of in accordance 1-07.30(3), the disposal costs shall be paid for separately in accordance with Section 1-04.4.

Removal of rigid pavement over 14 inches in depth shall be paid for as "Remove Pavement, Over 14 Inch Depth" per square yard. No separate payment shall be made for the removal of overlying asphalt. Depth excludes overlying asphalt; see section 2-02.3(3)C.

No payment will be made for the removal of the 12-inch asphalt overlay step-back as shown on Standard Plans 404a and 404b associated with pavement patching.

When existing old Type 164 Inlet is to be removed with the removal of concrete pavement, the removal of the inlet shall be considered incidental to the cost of "Remove Pavement".

Unless the Drawings indicate otherwise, full depth removal of traffic islands shall be considered included in the Bid item prices for "Remove Pavement", "Common Excavation", or "Remove Concrete Sidewalk" applicable to the underlying pavement structure combined with the traffic island being removed.

Traffic islands consisting of monolithic curb and sidewalk shall be paid as "Remove Cement Concrete Sidewalk", except the six (6) inches adjacent the curb-line will be paid as "Remove Curb" or "Remove Pavement" in accordance to this Section.

Traffic islands curb over pavement removal shall be considered "Remove Curb", or "Remove Curb and Gutter" when curb removal is not adjacent to or overlying pavement removal paid as "Remove Pavement".

All costs for coordination and delivery of salvageable material shall be included in the various Bid item prices.

All costs for disposal shall be included in the various Bid item prices for the Work.

## **SECTION 2-03 STRUCTURAL DEMOLITION**

### **2-03.1 DESCRIPTION**

This section describes work related to demolition of an existing structure as indicated on the Drawings. It is the Contractor's responsibility to determine the actual demolition quantities and limits of work. All removal operations included in this section within the dripline of existing trees to be protected shall be in accordance with 1-07.16(2).

### **2-03.2 RESERVED**

### **2-03.3 CONSTRUCTION REQUIREMENTS**

Demolition shall be done safely and in a manner such that portions of the structure that are to remain will not be damaged. Federal, local and state codes, including WAC 296-155 "Safety Standards for Construction Work" Part S

"Demolition", shall be observed at all times. Explosives shall not be used. The Contractor shall review all Drawings of the existing structure that are noted in the Contract.

Drawings for the existing structure may be available at:  
 Records Vault  
 Seattle Public Utilities – Seattle Municipal Tower  
 700 – 5th Avenue, 47th Floor  
 PO Box 34018  
 Seattle, Washington 98124-4018  
 FAX (206) 684-7396

For the purposes of this section "Competent Person" means one who is capable of identifying existing and predictable hazards in the surroundings and working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective action to eliminate them.

Prior to beginning demolition, the Contractor shall perform an engineering survey, by a Competent Person, of the structure to determine structural integrity and the possibility of unplanned collapse of any portion of the structure. Any adjacent structure that may be affected by the demolition shall also be similarly checked. The Contractor shall have in writing, evidence that such a survey has been performed.

Hazardous materials, including but not limited to, asbestos, lead or other heavy metals, flammable or explosive materials shall be removed or safely contained prior to beginning demolition.

Any material to be removed that will cause dust to be formed shall be sprinkled with water to keep dust controlled.

Demolition shall not proceed until electric, gas, water, steam and other utilities are located, relocated, shut-off, capped or otherwise controlled.

The Contractor shall demonstrate to the satisfaction of the Engineer that the methods and equipment for demolition are safe, adequate for the intended purpose and shall provide satisfactory results. Contractor shall submit to the Engineer for approval a demolition plan with Shop Drawings showing:

- (1) Each stage in the demolition required by the Contract.
- (2) Methods and equipment to be used in each stage of the demolition.
- (3) The area of influence for each stage of the demolition. The area of influence is that area of the Project Site where safety precautions must be taken to prevent injuries due to the demolition activities.
- (4) Methods and equipment to be used to contain any hazardous materials that are in the area of influence during demolition.
- (5) Methods and equipment used to contain, collect and dispose of debris.
- (6) Identify any adjoining structures that could be compromised by demolition activities and supply support system plan. The support system plan shall be prepared by a registered Professional Engineer and submitted to the Engineer for review and approval per section 1-05.3.
- (7) Communications protocol between all personnel working within the area of influence of the demolition.

A copy of the Competent Person's engineering survey of the demolition and the demolition plan shall be maintained on the Project Site.

Demolition shall not begin without the Engineer's written approval of the demolition plan and support system plan. Prior to beginning demolition, a meeting to review the demolition plan shall be held. Workers performing the demolition, others working within the sphere of influence of the demolition, Contractor's Competent Person and the Engineer shall be in attendance.

During demolition, the Contractor's Competent Person shall make continuing inspections, at least daily, to ensure the demolition plan is being followed and to assess all hazards resulting from demolition activities. If hazards are found, demolition shall stop until such hazards are corrected.

If hazardous materials not previously identified are found during demolition, then demolition shall stop until the newly identified hazards are safely contained or removed and are addressed in a revised demolition plan.

#### **2-03.4 MEASUREMENT**

Measurement for "Demolition (Structure Name)" will be by lump sum.

#### **2-03.5 PAYMENT**

The Bid Item price for "Demolition (Structure Name)" shall be full compensation for all labor, material, and equipment required to complete the removal, hauling, disposal, and salvage work as specified and as indicated on the Drawings.

All costs associated with the preparation and implementation of the demolition plan and the support system plan shall be included in the Bid item price of "Demolition (Structure Name)".

No adjustments other than for approved changes shall be made in Bid item price for "Demolition (Structure Name)", even though items not listed above may be indicated in the Drawings or elsewhere in these specifications, or encountered in field.

## **SECTION 2-04 EXCAVATIONS**

### **2-04.1 DESCRIPTION**

#### **2-04.1(1) GENERAL**

Section 2-04 describes work consisting of excavating, removing, and disposing of all formations, debris, and materials, natural or man-made, irrespective of nature or condition, encountered within the neat line limits defined in Section 2-04.4, such work being necessary for the construction of roadways, structures and utilities. This work also includes stockpiling suitable material and disposing of excess or unsuitable material.

This work shall be done in reasonable close conformity with the lines, grades, and dimensions indicated on the Standard Plans, Drawings, or as established by the Engineer.

#### **2-04.1(2) CLASSIFICATION**

Excavations shall be classified as solid rock excavation, unsuitable foundation excavation or common excavation.

Solid Rock Excavation consist of the removal and disposal of solid rock, i.e. ledge rock that requires systematic drilling and blasting for its removal and also boulders exceeding 1/2 cubic yard in volume as determined by the Engineer. Hard pan, hard clay or glacial till shall not be classified as solid rock excavation. Sandstone, siltstone, shale or other sedimentary rocks which are soft, weathered or extensively fissured shall not be classified as solid rock excavation. Soft rock is defined as an earth material that has a modulus of elasticity of less than 200,000 psi.

Unsuitable Foundation Excavation shall consist of the removal and disposal of unstable material including, but not limited to, peat, muck, swampy or other unsuitable materials such as buried logs and stumps, but only when the removal is specified in the Contract and included in the Bid Form or is specifically ordered in writing by the Engineer.

Common Excavation shall consist of all other material not classified as solid rock excavation, unsuitable foundation material excavation, or excavation which is considered to be incidental to other Bid items identified in other parts of the Contract. The widening of roadway cuts and ditches, and excavation below the designated subgrade elevation to an excavation depth of 3 feet or less below subgrade elevation when ordered by the Engineer, shall be considered as common excavation.

#### **2-04.1(3) PROTECTION OF EXISTING IMPROVEMENTS**

During excavation, the Contractor shall protect existing improvements including, but not limited to sidewalk, pavement, appurtenant Structure, adjacent improvement and underground installations in accordance with Section 1-07.16. For excavations more than 4 feet in depth, the Contractor shall construct and maintain protective systems in accordance with Section 2-07.

The Contractor shall insure stockpiled materials, debris from the Work area, and materials from roadway excavation are prevented from entering existing drainage structures and water courses as required in Sections 1-07.5, 1-07.15, and 8-01, and that these materials shall be removed, recycled, or disposed of as required in Sections 1-07.3 and 1-04.11.

All material stockpiled shall be in a manner to cause a minimum of inconvenience to public travel, and provision shall be made for merging traffic where necessary. Clear access shall be provided to all fire hydrants, water valves, and meters.

### **2-04.2 RESERVED**

### **2-04.3 CONSTRUCTION REQUIREMENTS**

#### **2-04.3(1) GENERAL REQUIREMENTS**

All excavations shall be performed in compliance with Chapter 296-155 WAC as well as all other applicable local, State, and Federal laws and regulations.

The excavation size in the Right Of Way within paved roadway, sidewalk, or other improved area and where near to a structure or underground installation or other improvement, shall not exceed the maximum neatline width as indicated on the Drawings or in the Standard Plans.

Outside the Right Of Way and in unimproved areas, the size of the excavation may at the Contractor's option exceed the excavation size indicated on the Drawings or on the Standard Plans by sloping or benching. However, all requirements for excavating, handling and disposing of excavated material, and placing and compacting replacement suitable backfill, outside of the neatline limits shall be at the Contractor's sole expense.

Grading and other activities nearby shall be controlled to prevent surface water from flowing into the excavations.

When any excavation is completed, the Contractor shall notify the Engineer, and no Material shall be placed therein until permission to proceed is given by the Engineer. When the Contractor places materials prior to the Engineer being able to inspect the subgrade, the Contractor shall bear all costs to remove the materials for inspection, and the costs to replace backfill following inspection.

**2-04.3(1)A STOCKPILING AND REUSE OF EXCAVATED MATERIAL**

If necessary, stockpiling of selected Material shall be at locations approved by the Engineer. Thereafter, such Material shall be removed from stockpile and used when needed. Excavated Material stockpiled for use as selected Materials shall be protected from contamination by other materials, be protected from damage by weather, and be prevented from producing sediment by covering with waterproof sheeting or such other means as the Contractor deems necessary. Selected materials stockpiled and later found unsuitable by the Engineer shall be disposed of and replaced with Material acceptable to the Engineer.

Selected Material shall be stockpiled at no more than a 1 to 1 (horizontal to vertical) slope, and the toe of the stockpile shall be no closer than 2 feet from the edge of any excavation. The material shall be protected from becoming unsuitable. Within Seattle City limits, stockpile height shall not exceed 10 feet, in accordance with current City of Seattle Storm Water, Grading and Drainage Control Code.

**2-04.3(1)B DISPOSAL OF SURPLUS AND UNSUITABLE MATERIAL**

Recycle or disposal of surplus and unsuitable material from other than the excavation shall be in accordance with Section 1-07.3.

Material obtained from all excavations within the Project Site shall not be wasted unless the excavated material is designated by the Engineer as unsuitable for use.

Reclamation of Contractor-supplied quarry, pit, and borrow sites shall conform to the requirements of Section 3-03.

**2-04.3(1)C WASTING MATERIAL**

If the Contractor wastes excavated material which is deemed suitable by the Engineer for reuse, and Material is later needed, the Contractor shall, at no cost to the Owner, replace the wasted material with Material meeting the Engineer's approval.

**2-04.3(1)D DEPOSIT OF ROCK FOR OWNER'S USE**

At the Engineer's direction, the Contractor shall deposit excavated rock at the Project Site or elsewhere. If this requires the Contractor to use Material that would otherwise have been used as backfill on the project, the Owner will pay for the extra cubic yards of excavation needed to complete the backfill. Any such rock deposit shall be Owner property. The Contractor shall be responsible for safe-keeping the deposit until the Owner has removed it or until the Contract is completed.

**2-04.3(1)E OVERBREAK**

Overbreak includes that part of any material excavated, displaced, or loosened outside the staked or reestablished slope or grade. Such material is considered overbreak whether its movement resulted from blasting, from the character of the material itself, or from any other cause. Overbreak, however, does not include material from slides as described in Section 2-04.3(1)F.

If the Engineer does not approve use of the overbreak, the Contractor shall remove, haul, and dispose of it, at no expense to the Owner. In this case, the Contractor shall follow the procedure for handling surplus Material described in Section 2-04.3(1)B.

If the Engineer approves, the Contractor may use overbreak to backfill when the excavated material unexpectedly falls short of the amount required.

**2-04.3(1)F SLIDES**

If a slide occurs on the Project Site or elsewhere as a result of construction activities, the Contractor shall notify the Engineer immediately before removing the slide material as removing the material could cause further sliding. The Contractor shall protect the area to prevent additional sliding.

The Contractor shall provide a plan to address the area affected by the slide for the Engineer's review.

**2-04.3(1)G EXCAVATIONS NEXT TO STREAMS**

When excavations are in or next to streams (including, lakes, or, the sound, or other waterways), the Contractor shall:

1. Comply with all applicable laws and regulations and regulatory permit requirements. Meet the requirements of Section 2-05.
2. Excavate inside cofferdams, caissons, or sheet piling unless dredging or open pit excavation is permitted.
3. Never disturb the natural stream bed next to the Structure.
4. Backfill after foundations are placed inside cofferdams and any open pit or dredged area behind sheet piling. This backfill shall be level with the original stream bed and shall prevent scouring.
5. Remove any excavation material that may have been deposited in or near the stream so that the stream bed is free from obstruction.
6. Maintain water depth and horizontal clearances required for traffic to pass on navigable streams, furnishing any channel signals or lights required during construction.
7. Place riprap around the outside of cofferdams to repair local scour.

**2-04.3(1)H SLUICING**

The Contractor shall not excavate by sluicing unless the Contract specifically calls for it.

**2-04.3(1)I UNSUITABLE FOUNDATION EXCAVATIONS**

Where the native subgrade is unsuitable as determined by the Engineer and is not already addressed in the Contract, the Engineer will provide direction on how to proceed.

All additional excavation directed by the Engineer or indicated in Contract which is beyond neatline limits indicated on the Standard Plan nos. 284, 285 and 350 will be considered "Extra Excavation".

The replacement of unsuitable material to bring the area back to grade shall be that which is specified in the Contract or as directed by the Engineer and shall be considered "Backfill Compaction" per Section 2-11.

Materials from the excavations will not be classified as unsuitable foundation excavation as defined by Section 2-04.1(2) unless the removal is accomplished by special excavation methods requiring different equipment from that used for roadway excavation, as determined by the Engineer.

**2-04.3(1)J OBJECTS ENCOUNTERED**

Objects encountered such as stumps, railroad ties, buried pavement, etc., encountered in the excavation shall be removed and disposed of by the Contractor. Removal of these objects will be considered incidental unless one or more of the following conditions are met:

1. The object(s) cannot be removed by the equipment or excavation method at hand; or
2. The excavation width or depth must be increased such as to cause extra work.

In the event the Contractor meets condition 1 or condition 2 or both conditions listed immediately above, removal of the object will be paid in accordance with Section 1-04.7.

**2-04.3(2) PERMANENT SLOPE TREATMENT**

The tops of all permanent excavated slopes, except in solid rock, shall be rounded in accordance with Standard Plan no. 140.

If a layer of earth covers a rock cut, the slope shall be rounded above the rock as if it were an earth slope.

When the Contractor removes stumps or any embedded Material from the rounded area, the void shall be backfilled and stabilized to prevent erosion.

**2-04.3(3) HILLSIDE TERRACES**

Unless the Contract specifies otherwise, the Contractor shall terrace the original ground or embankment on hillsides, on the sides of existing embankments and in transitions from cuts to fills. Each terrace shall penetrate the slope at least 5 feet and shall not be more than 5 feet high. The horizontal face of the terrace shall slope outward at approximately 0.05 foot per foot. The Engineer may order the Contractor to place gravel backfill, pipe drains or both to drain any seepage.

**2-04.3(4) SOLID ROCK EXCAVATION**

The Contractor shall take care not to break down, loosen, or damage the rock under the subgrade line. Normally, excavations shall be made from the top, lift by lift, to protect the rock bench that remains. The Contractor shall be responsible for methods used and for any damage caused to the subgrade, regardless of any previous approvals by the Engineer.

**2-04.3(4)A SCALING AND DRESSING**

To leave rock cuts in a safe, stable condition, the Contractor shall scale and dress them, removing all loose fragments and rocks not firmly fastened to the rock slope. The Contractor shall also remove any overhanging rock the Engineer sees as a hazard.

If the Engineer requires it, the Contractor shall remove loose fragments and rocks lying outside the slope stakes including loading and hauling. Such extra work shall be as provided in Section 1-04.4.

**2-04.3(4)B STEPPED SLOPE CONSTRUCTION**

When indicated on the Drawings, the Contractor shall shape slopes cut in soft rock to a stepped pattern conforming closely to the typical cross-section shown on the Drawings. Stepped slopes shall meet these requirements:

1. Each step shall be 1 to 2 feet high.
2. The horizontal depth of each step depends on its relationship to the staked slope ratio. The approximate midpoint of each horizontal tread shall occur on the staked slope line.
3. The treads shall be approximately level in all directions.
4. The ends of the steps shall be blended into the natural ground, with loose Material removed from transitional areas.
5. If the Contractor cannot rip a rock outcropping within a cut, the steps shall be blended into the rock.

6. Large rocks and Material that may fall into the ditch line or onto the roadway shall be removed, but scaling is not required.

The compaction for seeding requirements of Section 8-01.3(5)C shall not apply to stepped slope construction.

#### **2-04.3(5) STRUCTURE EXCAVATIONS**

The Contractor shall not begin excavating until after the stakes have been placed to locate and/or outline the structure and cross-sections to determine how much Material to remove. The Engineer will occasionally inspect material taken from and material remaining in the excavation.

With written approval of the Engineer, the Contractor may omit forms when the earthen sides of a footing excavation can stand vertically. In this case, the Contractor may excavate to the neat line dimensions of the footing and pour concrete against the undisturbed earth. If the hole is larger than neat line dimensions, the Contractor shall bear the entire cost of all extra Material and work.

The Engineer may stop the excavation to make bearing tests at any time. The Contractor shall assist with these tests in any way the Engineer requires.

During any test period, the Contractor shall, at no expense to the Owner, maintain ordinary working conditions at the bottom of the hole. A single bearing test will not exceed 72 hours.

#### **2-04.3(6) UTILITY EXCAVATIONS**

When utility invert or other elevations are indicated on the Drawings, the Contractor shall excavate to that depth plus any additional excavation as necessary to accommodate the Contract specified class of bedding. When no invert or other elevation is indicated in the Contract, the Contractor shall excavate to a depth, including additional excavation as necessary for the class of bedding when specified in the Contract, to provide the minimum cover as specified. When utility elevations are specified in the Contract, excavation below that which is needed to install the utility and bedding shall be backfilled with Material in accordance with Section 2-10 and compacted in accordance with Section 2-11.3(1) Method A at the Contractor's sole expense.

The length of trench excavation in advance of watermain installation operations shall be kept to a minimum, and in no case shall exceed 150 feet in urban areas.

The length of Storm Drain and Sewer trench excavation in advance of pipe installation shall be kept to a minimum and in no case shall exceed 150 feet.

The maximum trench width in the Right of Way shall not exceed the neatline trench width as shown on Standard Plan no. 284, 285 and 350.

The Contractor shall provide overexcavation for bells such that pipe barrels and bells along the utility are uniformly supported full length.

Excavation for valve chambers and other Water Main Structures shall be sufficient to provide a minimum of 12 inches between their exterior surfaces and the sides of the excavation.

All ledgerrock, boulders, stones, and any object larger than 3 inch in any dimension shall be removed within 6 inches in any direction from the pipe. The maximum size of aggregate within 6 inch of the pipe shall not exceed 1 inch per foot of pipe diameter and in no case shall exceed 3 inch.

#### **2-04.3(7) DRAIN PIPE EXCAVATIONS**

The clear width of trench measured at the springline of the pipe in place shall be 24 inches, or 1 foot greater than the outside diameter of the pipe, whichever is greater. Standard Plan no. 284 trench width is not applicable to drain pipe and subsurface drain pipe.

There shall be no mixing of filter Material with backfill Material.

#### **2-04.3(8) SNOW REMOVAL**

If snow is deep enough to interfere with the work that covers a cut or an embankment, the Contractor shall remove snow to outside the slope stakes. Snow removal shall be done at least 100 feet ahead of excavation and embankment work.

#### **2-04.4 MEASUREMENT**

Bid items of Work completed pursuant to the Contract will be measured as provided in Section 1-09.1, Measurement of Quantities, unless otherwise provided for by individual measurement paragraphs herein this Section.

Excavation will be measured by the cubic yard in its original position by cross sectioning or through the use of digital terrain-modeling techniques. Quantities will be computed to the neat lines of the cross sections as staked or thereafter modified by the Engineer, except where such modification is the result of excavating beyond the limits established to remove and replace Material which has become unsuitable because of the Contractor's neglect, negligence or method of operation.

The vertical neat line limits for measuring a structure excavation will be a vertical plane 1 foot (measured horizontally) outside of and parallel to the neat line of a pile cap, footing, or seal. No measurement as "Structure Excavation" will be made



for material removed (1) outside of vertical neat lines of a pile cap, footing, or seal, (2) more than 3 feet beyond the roadway side of a wing wall, and (3) more than 1 foot beyond the other sides and end of a wing wall.

Unsuitable foundation excavation will be measured by the cubic yard in its original position by cross sectioning.

Measurement for the amount of common excavation will be as specified in Section 2-04.1(2).

Measurement for extra excavation will be by the cubic yard of material actually removed beyond the standard trench neat lines shown on Standard Plan nos. 284, 285 and 350.

Measurement for stepped slope excavation will be by the cubic yard as defined by the staked slope line and the existing slope.

#### **2-04.5 PAYMENT**

Compensation for the cost necessary to complete the work described in Section 2-04 will be made at the Bid item prices Bid only for the Bid items listed or referenced as follows:

1. **"Common Excavation"**, per cubic yard.
2. **"Solid Rock Excavation"**, per cubic yard.

The Bid item prices for "Common Excavation" and for "Solid Rock Excavation" shall include all costs for the work described in Section 2-04 and not otherwise provided for hereinafter. Payment for such types and classes of excavation listed above shall be full compensation for excavating, loading, hauling, stockpiling, placing as backfill, or disposing of the material as specified herein.

Payment for earthwork or for solid rock excavation required by the Contract where a Bid item is not provided in the Bid Form will be in accordance with Section 1-04.1(2).

3. **"Unsuitable Foundation Excavation"**, per cubic yard.

The Bid item price for "Unsuitable Foundation Excavation" shall include all costs for the work required to excavate or displace unsuitable foundation material as described in Section 2-04.3(1)I. These costs shall include disposal of the unsuitable material, and leveling the upheaved Material outside the excavation when the unsuitable material is displaced. Replacement Materials will be paid for as a separate Bid item.

See Section 1-04.1(2) if the Bid Form does not have a Bid item for unsuitable foundation excavation.

4. **"Structure Excavation"**, per cubic yard

The Bid item price for "Structure Excavation" shall include all costs for the work required in Section 2-04.3(5) but not otherwise provided for in this payment section and which is necessary to complete the excavation within the neat line limits specified. Any additional excavation outside these limits, having been made for the Contractor's benefit, shall be considered incidental to the various Bid items comprising this improvement. All costs for preserving and protecting excavated Materials to be used for backfilling structure excavation and all costs for disposal (including haul) of material obtained from structure excavation which is not used for backfill shall be incidental to and included in the Bid item price for "Structure Excavation".

All costs for storing, protecting, rehandling, and placing stockpiled Material as specified in Section 2-04 shall be included in the Bid item price for "Structure Excavation".

5. **"Extra Excavation"**, per cubic yard.

The Bid item price for "Extra Excavation" shall include all costs for the work required to remove, haul and dispose of the excavated material.

6. **"Stepped Slope Construction"**, per cubic yard.

The Bid item price for "Stepped Slope Construction" shall include all costs for the work required to build stepped slopes including disposal of excess material.

7. **Other payment information**

All costs for excavation, backfill, and recompaction of sampling pits and utility trenches shall be considered included in the Bid item prices for the various Bid items and no separate or additional payment will be made.

Payment for overbreak Material used in lieu of borrow will be made at the Bid item price for the type of borrow specified.

If the Contractor has dressed a permanent excavation per Section 2-04.3(4)A before the Engineer orders it widened, the Owner will pay for the resloping as provided in Section 1-09.4.

Excavation below grade required to remove a portion of the subgrade made unsuitable by the Contractor's operations or failure to adequately protect the subgrade shall be at the Contractor's sole expense and at no additional cost to the Owner.

If a slide occurs in an open pit as described in Section 2-04.3(1)F, all costs related to removing slide material and restoring a slide area shall be at the Contractor's sole expense.

All work required to complete slope treatment, including excavation, haul, and slope rounding, shall be included in the Bid item price for roadway excavation.

All costs for building terraces as specified in Section 2-04.3(3) shall be included in the Bid item prices for other applicable Bid items.

All costs to remove, haul, and dispose of overbreak material which is deemed unsuitable for use by the Engineer shall be at the sole expense of the Contractor.

When excavated Material unexpectedly falls short of the amount required to complete an embankment, the Owner will pay the roadway excavation Bid item price for the volume of Material the overbreak replaces. However, no payment will be made if overbreak is used when other Material is available within the neat lines of the roadway prism.

If an undue amount of excavated Material deemed suitable by the Engineer is wasted by the Contractor, the Contractor shall provide replacement material of the type acceptable to the Engineer at the Contractor's sole expense.

The cost of any permits and approvals required in this Section shall be included in the Bid item prices for the applicable Bid items of Work and no separate or additional payment will be made.

All costs associated with hauling, storing, and reusing selected Material, except in backfill compaction, shall be included in the Bid item prices of the various applicable Bid items.

Payment for reconstruction of surfacing and paving within the limits of structure excavation will be at the applicable Bid item prices for the Bid items involved.

Whenever excavation is carried below the elevation shown on the Drawings without written approval from the Engineer, all costs for Materials, labor and equipment necessary to bring excavation back to the elevation shown on the Drawings, shall be at the sole expense of the Contractor. Replacement shall be made with concrete or other Material acceptable to the Engineer.

Snow removal shall be at the sole expense of the Contractor.

All labor and materials the Contractor provides for the bearing tests as specified in Section 2-04.3(5) will be paid in accordance with Section 1-04.1(2).

**SECTION 2-05 DITCH AND CHANNEL CONSTRUCTION**

**2-05.1 DESCRIPTION**

Section 2-05 describes work consisting of constructing and reshaping ditches and channels. This work may also include the installation of geotextile, filter blanket, riprap, streambed aggregate, weir, in-stream log, scour protection, and other construction. This work shall also include disposal of excess and unsuitable material.

**2-05.1A CLASSIFICATIONS**

**Ditch excavation:** Includes all excavation for the flow of surface water less than 8 feet wide at the bottom.

**Channel excavation:** Includes all excavation for the flow of surface water 8 or more feet wide at the bottom.

**2-05.2 MATERIALS**

Materials shall meet the requirements of the following Sections:

Streambed Aggregate	9-03.3
Filter Material	9-03.12(4)
Matting	9-14.5
In-stream Log	9-14.15
Geotextile	9-37

Erosion control, scour control, and ditch lining geotextile shall be as specified in the Contract.

The filter blanket shall meet the gradation requirements for the ballast as called out in the Contract.

**2-05.3 CONSTRUCTION REQUIREMENTS**

**2-05.3(1) GENERAL**

Work in ditches and channels over 4 feet deep are subject to the safety provisions of Section 2-07.

Prior to any ditch or channel construction, the Contractor shall have ESCBMPs in place and shall have completed necessary clearing and grubbing as specified in Section 2-01. The Contractor may use excavated material for temporary dikes and berms as addressed in the CЕСSР.

Ditch and channel excavation, shaping, and construction shall produce a finished product complying with the lines, grades, and shapes as shown on the Drawings, or as established by the Engineer, and shall accommodate in-stream installations as indicated in the Contract.

#### **2-05.3(2) IN-STREAM LOG**

In-stream logs of the size and shape indicated in the Contract shall be placed at the locations indicated on the Drawings, and may require additional excavation and shaping of the ditch or channel. Existing tree identified for re-use as in-stream log shall be cut, pruned and limbed to the size and shape indicated. The Contractor shall provide the Engineer at least one Working Day advance notice before removing a tree identified in the Contract for re-use as in-stream log, and before the placing of in-stream log.

#### **2-05.3(3) STREAMBED AGGREGATE**

Streambed aggregate of the type indicated in the Contract shall be placed at the locations and to the dimensions and thicknesses indicated on the Drawings. Additional excavation and shaping may be required to accommodate stream bed aggregate.

#### **2-05.3(4) GEOTEXTILE – DITCH LINING AND SCOUR CONTROL**

See Section 2-15.

#### **2-05.3(5) SCOUR CONTROL MATTING**

Scour control matting shall be in accordance with Section 8-01.3(7).

#### **2-05.3(6) IN-STREAM WEIR**

In-stream weir shall be constructed at the location and to the dimensions indicated in the Contract. Unless the Contract specifies otherwise, both wings of the weir shall slope gently toward the center section of the weir to allow fish passage over the weir during low flow. The Contract may require weir rock, ecology block, or other Material be placed to specified elevations and contours, and may require excavation for the base and use of a geotextile for scour control.

Placement of weir components shall provide non-rocking contact. As necessary, spacer rock or other suitable material shall be used to ensure interlocking of weir components and shall be sized and placed to resist the forces and scour of the design maximum stream flow. Openings within the weir Structure shall be plugged securely with shaped rock or other suitable material as necessary to minimize any flow through the weir below the top surface.

#### **2-05.3(7) IN-STREAM BYPASS**

To accommodate in-stream construction, the Contractor shall be prepared to install a stream bypass as indicated in the Contract. Such stream bypass shall be coordinated with fish bypass.

In general, the excavation of a trench and installation of a temporary bypass culvert may be required to divert the stream around the area of in-stream work. The culvert shall be sized to accommodate the maximum in-stream flow indicated in the Contract. The Contractor may need to make use of pumping with adequate capacity to ensure all stream flow is diverted through the bypass. The Contract may require non-pumping alternatives to accommodate the diversion of fish.

A temporary dam may be required to divert water into the stream bypass including excavation and shaping to allow for installation of the temporary dam. The dam shall have controls in-place for leakage, seepage, scour, and other Project Site specific needs. An impermeable barrier material may need to be installed and secured in front of and against the dam to ensure no passage of stream flow.

Unless the Contract specifies otherwise, when the stream bypass is no longer needed, the Contractor shall remove all bypass material, backfill with native material including compaction of backfill, and restore the areas to the finish grades indicated in the Contract.

Where a cofferdam or bypass channel is required, such will be addressed in the Contract.

#### **2-05.3(8) FISH BYPASS**

Channels, ditches, streams, and other surface flow channels containing fish where construction is required will be identified in the Contract. Such fish bypass shall be coordinated with stream bypass.

The Contractor shall first remove fish from the area of proposed work. The Contractor may need to install a fish screen on the upstream end to prevent the migration of fish into the proposed stream work area, and to divert the fish through the stream bypass returning the fish downstream to the original stream channel. The Contractor may need to have personnel travel from upstream to downstream splashing and using netting to coax fish to relocate downstream. The Contractor may use nets to capture fish in isolated pools and in the area of the downstream silt control, and relocate these fish farther downstream.

Straw bales or other means may be required at the downstream end of the proposed stream work area to prevent silt and other sediment from being transported beyond the work area. If the Contract does not specify the means, the Contractor shall submit to the Engineer at least 5 Working Days in advance, the means of preventing silt and other material and debris from going beyond the construction area.

The Contractor shall frequently monitor for fish and other creatures (conduct "critter patrol") to retrieve and relocate fish and other water creatures that may enter the work area.

#### **2-05.3(9) FISH SCREEN**

Fish screens shall be as specified in the Contract.

#### **2-05.3(10) MAINTENANCE REQUIRED DURING CONSTRUCTION**

In streams with fish, and where stream bypass, fish bypass, screen, or other measures are required, the Contractor shall perform the maintenance as specified in the Contract.

#### **2-05.3(11) SCOUR PROTECTION**

The streambank, stream bedding and invert, and other stream containing features shall be protected from erosion by measures that may be permanent or temporary and that may include groins, buried groins, barbs, engineered log jams, drop structures, and porous weirs.

When the Work includes such scour protection, the Contract will so specify.

#### **2-05.4 MEASUREMENT**

Bid items of Work completed pursuant to the Contract will be measured as provided in Section 1-09.1, Measurement of Quantities, unless otherwise provided for by individual measurement paragraphs herein this Section.

Measurement for ditch and channel excavation will be by the cubic yard in-place based on neat lines of staked cross-sections as determined by the Engineer. Other local excavation or shaping required to accommodate in-stream log, streambed aggregate, ditch lining and scour control, erosion control matting, in-stream weir, stream bypass, and fish bypass will not be measured and shall be included in their respective Bid items.

Measurement for in-stream log and for in-stream weir will be per each.

Measurement for streambed aggregate and for filter Material will be by the ton.

Measurement for geotextile and for ditch lining will be in accordance with Section 2-15.4.

Measurement for in-stream bypass and for fish bypass will be by lump sum.

Measurement for scour control will be by component Bid items in the Standard Specifications.

Measurement for scour control matting not part of a CESP, and used specifically for in-stream scour control will be measured as geotextile for ditch lining as specified in Section 2-15.4.

Measurement for safety systems in ditches and channels over 4 foot depth, not including Division 7 pipe installation, will be by lump sum.

#### **2-05.5 PAYMENT**

Compensation for the cost necessary to complete the work described in Section 2-05 will be made at the Bid item prices Bid only for the Bid items listed or referenced as follows:

1. "Ditch Excavation", per cubic yard.
2. "Channel Excavation", per cubic yard.

The Bid item prices for "Ditch Excavation" and for "Channel Excavation" shall include all costs for the work required for excavation, shaping, loading, placing, stockpiling, disposing, and as necessary for the applicable excavation.

3. "Safety Systems in Ditch and Channel Excavation", per lump sum.

The Bid item price for "Safety Systems in Ditch and Channel Excavation" shall include all costs for the work required to provide safety systems for ditch and channel excavation over 4 foot in depth. See Division 7 for payment of trench safety systems where ditch and channel work requires pipe and related Structure work.

4. "In-Stream Log (Number)", per each.

The Bid item price for "In-Stream Log (Number)" shall include all costs for the work required to furnish, to fell, and to cut, limb, and prune; to shape the area to receive the in-stream log; to place and anchor the log; and to remove and dispose of debris and material for each in-stream log as may be necessary.

5. "Streambed Aggregate (Type)", per ton.

The Bid item price for "Streambed Aggregate (Type)" shall include all costs for the work required to furnish and install the type streambed aggregate indicated in the Contract including excavating, shaping, and disposal of debris.

6. **“In-Stream Weir, (Type), (Number)”**, per each.

The Bid item price for “In-Stream Weir” shall include all costs for the work required to furnish and install a complete in-stream weir per the Drawings.

7. **“In-Stream Bypass”**, per lump sum.

The Bid item price for “In-Stream Bypass” shall include all costs for the work required to furnish, install, maintain, and remove a complete bypass including any necessary restoration work.

8. **“Fish Bypass”**, per lump sum.

The Bid item price for “Fish Bypass” shall include all costs for the work required to divert and relocate all fish around the work area including as necessary “critter patrol”.

9. **Other payment information**

Filter Material will be paid as “Mineral Aggregate, (Type)” in accordance with Section 4-01.5.

Unless the Contract specifies otherwise, payment for restorations beyond temporary constructions to accommodate in-stream work shall be incidental to the various Bid items and no separate or additional payment will be made.

Payment for geotextile of the type specified will be in accordance with Section 2-15.5.

No separate or additional payment will be made for additional excavation and shaping to accommodate in-stream log, streambed aggregate, ditch lining and scour control, erosion control matting, in-stream weir, in-stream bypass, and fish bypass.

**SECTION 2-06 HAUL****2-06.1 DESCRIPTION**

Section 2-06 describes work consisting of transporting excavated Material from its original site or borrow site to its final resting place on the Project Site or to a waste or recycle site.

**2-06.2 RESERVED****2-06.3 CONSTRUCTION REQUIREMENTS**

Off-highway earthmoving equipment shall not haul on or across any street not being improved in the Contract.

**2-06.4 MEASUREMENT**

Haul work will not be measured.

**2-06.5 PAYMENT**

Compensation for the cost necessary to complete the work described in Section 2-06 will be considered incidental to the various Bid items comprising the Work and no separate or additional payment will be made.

**SECTION 2-07 PROTECTIVE SYSTEMS****2-07.1 DESCRIPTION**

Section 2-07 describes Work consisting of sloping an excavation or shoring an excavation to protect workers and the public from being injured and protecting nearby infrastructure from being damaged as a result of the excavation.

**2-07.2 RESERVED****2-07.3 CONSTRUCTION REQUIREMENTS****2-07.3(1) GENERAL**

Where excavations are deeper than 4 feet, the Contractor shall construct and maintain safety systems that meet the requirements of the Washington Industrial Safety and Health Act (RCW Chapter 49.17) including compliance with WAC Chapter 296-155.

Protective systems for use in excavations more than 20 feet in depth shall be designed by a registered professional engineer (see Section 1-05.3(12)).

Sloping or benching as a means of stabilizing excavations will not be permitted within paved roadway, sidewalk, or other improved areas.

In unimproved areas, the size of the excavation may at the Contractor's option exceed the excavation size indicated on the drawings or on the Standard Plans by sloping or benching. However, all requirements for excavating, handling and disposing of excavated material, and placing and compacting replacement suitable backfill, outside of the neatline limits shall be at the Contractor's sole expense

**2-07.3(2) SAFETY SYSTEMS**

The Contractor's safety system shall be a protective system designed and maintained by a competent person and shall meet accepted engineering requirements or practices. This safety system may require the use of a support system in locations not designated in the Contract as requiring a support system.

The safety system shall provide safe working conditions in the excavation. The Contractor may use a shield system for trenches. All Work required by the Engineer outside neatline limits, including but not limited to:

- 1) handling and disposal of excavated material;
- 2) additional backfill beyond neatline limits;
- 3) additional surface restoration beyond limits indicated in the Contract; and/or
- 4) repair of damage to adjacent structure, improvement, or underground installation, caused by the

Contractor's operations shall be at the sole expense of the Contractor and at no additional or separate cost to the Owner. Neatline limits for trenches are as indicated on Standard Plan no. 284 and 350. For structural excavation neatline limits see Section 2-04.4.

The Contractor shall control water to protect employees from potential hazards posed by water.

The protective system shall be removed from the trench or structural excavation, once the work in the excavation is complete, in a manner which provides an acceptable means of reconsolidating the bedding, backfill, or side support Material without disturbance to structures or utilities.

The use of horizontal strutting below a pipe barrel or the use of a pipe as support for trench bracing will not be permitted.

**2-07.3(3) SUPPORT AND SAFETY SYSTEMS**

In addition to worker safety requirements specified in Section 2-07.3(2) Safety Systems, where trench or structural excavations are to be laterally supported as required in the Contract at locations indicated on the Drawings, the lateral support shall be as defined in WAC 296-155-650. Support systems may consist of underpinning, bracing, shoring, sheeting, or any other protective system or combination of protective systems which provides support to an adjacent structure, underground installation, and the sides of an excavation. The support system shall also include the control of groundwater as specified in Section 2-08. The Contractor shall employ methods of installing, maintaining, and removing the system causing the least disturbance. During installation of the system, and when the system is installed, the Contractor shall fill all voids behind the support system as necessary and when necessary to prevent loss of native soils or loss of soil support. When removing the support system, the Contractor shall coordinate reconsolidation of bedding as necessary, and with backfilling to minimize disturbance.

All costs for this work will be paid by the Bid item "Support and Safety System".

The Contractor shall submit Shop Drawings (Section 1-05.3) and design calculations (Section 1-03.5(12)) of the proposed support system including loading calculations, structural member and system calculations, and sufficient details of installation, maintenance, and removal concurrent with excavation, installation, removal, and backfilling.

The Contractor shall remove any protective system in such a manner as to not disturb bedding or backfill. Where bedding or backfill is disturbed, the Contractor shall recompact the material as specified.

The Contractor shall submit Shop Drawings prepared by a professional engineer in accordance with Section 1-05.3 showing proposed methods and construction details of shoring or cofferdams. The Contractor shall not begin construction until the submittal has been returned by the Engineer. The Contractor shall be responsible for acceptable results. Calculations supporting the shoring or cofferdam design shall be submitted with the Shop Drawings. The Shop Drawings shall contain details such as member sizes, plate thickness, weld details, bolted connections, etc. and shall be based on AASHTO specifications.

**2-07.4 MEASUREMENT**

Measurement for "Safety Systems in Trench Excavation, Minimum Bid = \$0.80 per Square Foot" will be by the square foot. The square foot quantity equals the area of a vertical plane through the pipe centerline, calculated by multiplying the average of the trench end depths by the length of trench between points four or more feet deep. Depth is measured from existing surface grade at the time of excavation to pipe invert.

Measurement for "Support and Safety System" will be by the square foot. The square foot quantity equals the area of a vertical plane through the pipe centerline, calculated by multiplying the average of the trench end depths by the length of trench. Depth is measured from existing surface grade at the time of excavation to pipe invert. No measurement will be made for support and safety system beyond designated locations indicated in the Drawings.

Measurement for "Safety Systems in Structural Excavation" will be per lump sum.

No measurement will be made for "Extra Excavation" associated with installing and removing protective systems beyond the neat lines as shown on Standard Plan nos. 284 and 350 or as shown on the Drawings.

**2-07.5 PAYMENT****1. "Safety Systems in Trench Excavation, Minimum Bid = \$0.80 per Square Foot".**

The Bid item price for "Safety Systems in Trench Excavation, Minimum Bid = \$0.80 per Square Foot" shall include all costs for the work required to provide, construct, maintain and remove safety systems in trench excavations equal to or exceeding a depth of 4 feet as specified in Section 2-07; and all costs for excavation, backfill and compaction beyond the neat lines as shown on Standard Plan nos. 284, 350 or as shown on the Drawings.

No additional payment for "Extra Excavation" as described in Section 2-04 will be allowed for Work described in Section 2-07 Protective Systems.

The minimum Bid item price for "Safety Systems in Trench Excavation, Minimum Bid = \$0.80 per Square Foot" shall be eighty cents (\$0.80) per square foot. The Contractor's Bid shall equal or exceed that amount. If the Contractor's Bid is less than the minimum specified amount, the Owner will unilaterally revise the Bid amount to the minimum specified amount and recalculate the Contractor's total Bid amount. The corrected total Bid amount will be used by the Owner for Award purposes and to fix the amount of the Payment and Performance Bond.

**2. "Support and Safety System", per square foot.**

The Bid item price for "Support and Safety System" shall include all costs for the work required to design, provide construct, maintain, and remove the support and safety system at the designated locations on the Drawings as specified in Section 2-07; and all costs for excavation, backfill and compaction beyond the neat lines as shown on Standard Plan nos. 284, and 350.

No additional payment for "Extra Excavation" as described in Section 2-04 will be allowed for Work described in Section 2-07 Protective Systems.

There will be no separate or additional payment for "Support & Safety System" outside of the locations specified on the Drawings. No payment for "Safety Systems in Trench Excavation" will be made for locations where payment is made for "Support and Safety System."

**3. "Safety Systems in Structural Excavation" , per lump sum.**

The Bid item price for "Safety Systems in Structural Excavations" shall include all costs for the work required to design, provide, construct, maintain and remove the safety system in the structural excavation at the designated locations shown on the Drawings as specified in Section 2-07 and all costs for excavation, backfill and compaction beyond the neat lines as described in Section 2-04.

There will be no separate or additional payment for "Safety Systems in Structural Excavation" outside of the locations specified on the Drawings. No payment for "Safety Systems in Trench Excavation" will be made for locations where payment is made for "Safety Systems in Structural Excavation."

**SECTION 2-08 DEWATERING****2-08.1 DESCRIPTION**

Section 2-08 describes Work consisting of maintaining a dry excavation by diverting or removing both groundwater and surface water.

**2-08.2 RESERVED****2-08.3 CONSTRUCTION REQUIREMENTS****2-08.3(1) GENERAL REQUIREMENTS FOR DEWATERING**

Excavations shall be kept free of water. The Contractor shall control surface run-off and groundwater so as to prevent entry or collection of water in excavations and to maintain the undisturbed state of the native subgrade.

At least 10 Working Days before dewatering is started, the Contractor shall submit to the Engineer, the method and installation including details of the dewatering system indicating number and type of equipment and pipelines including capacity(ies), dewatering pits and locations, water discharge locations, an estimate of advance time to dewater the excavation prior to work in the excavation when necessary, and such other information to verify acceptable control and performance.

The Contractor shall furnish, install, and operate all necessary equipment to keep excavations free from water during construction. The control of groundwater shall prevent softening of the bottom of excavations, or formations of "quick" or heaving conditions, or "boils". Dewatering systems shall be designed and operated so as to prevent any removal or flowing of native soils. In the event the native subgrade is compromised as a result of the Contractor's dewatering methods, the Contractor shall be fully responsible for restoring the integrity of the subgrade to preexisting conditions.

Disposal of the water shall not cause injury to public or private property, or nuisance to the public. Sufficient pumping and power equipment in good working condition shall be available at all times for all emergencies, including power outage, and competent personnel shall be available at all times for the operation of the dewatering system. Water discharge locations shall

comply with required permits from the City of Seattle and/or King County, other local jurisdictions, State and Federal agencies as appropriate, and in accordance with Section 8-01.

The dewatering system shall be designed to prevent loss of foundation support to adjacent structure, underground installation, improvement, or the sides of an excavation, and may require recharging the groundwater outside the excavation.

The dewatering system shall be installed and operated so that the groundwater level outside the excavation is not drawn down to the extent that would damage or endanger adjacent structure, underground installation, sidewalk, pavement, other improvement, or property.

The release of groundwater to its static level shall be performed in such a manner as to maintain the undisturbed state of the natural foundation soils and supported soils, prevent disturbance of compacted bedding and backfill, and prevent flotation or movement of Structures, pipelines, Sewers, and Storm Drains.

All costs associated with dewatering the excavation and controlling groundwater shall be included in the various Bid Items provided the groundwater can be controlled using dewatering equipment from within the excavation. Therefore, no separate or additional payment will be made unless the Contract specifies otherwise.

The Contractor is fully responsible for controlling groundwater.

### **2-08.3(2) COFFERDAMS**

The Contractor may elect to use cofferdams as a means of groundwater cut off in lieu of dewatering the excavation.

Cofferdams shall be classified as any watertight enclosure that surrounds the excavated area and which is used in conjunction with a concrete footing seal. Within the protection of the cofferdam, the excavation is carried to the desired level and the concrete seal is poured, the enclosure is dewatered.

If the Contract requires cofferdam and should water conditions at the time of construction be such that in the opinion of the Engineer, seals are not required, the Engineer may specify that seals be omitted.

Excavation outside the cofferdam shall not continue below the elevation of the top of the seal, or if no seal is used, below the top of the footing. The Contractor shall anchor or otherwise hold the cofferdam in place and secure it against tipping or displacement.

Cofferdams shall be constructed so as to protect newly placed concrete against damage from sudden rising of the water and to prevent damage to the foundation by scour, erosion, or uplift. No timber or bracing shall be left in the cofferdams in such a way as to extend into the substructure.

The Contractor shall submit Shop Drawings prepared by a professional engineer in accordance with Section 1-05.3 showing proposed methods and construction details of cofferdams. The Contractor shall not begin construction until the submittal has been returned by the Engineer. The Contractor shall be responsible for acceptable results. Calculations supporting the shoring or cofferdam design shall be submitted with the Shop Drawings. The Shop Drawings shall contain details such as member sizes, plate thickness, weld details, bolted connections, etc. and shall be based on AASHTO specifications.

### **2-08.3(3) PLACING CONCRETE IN FOUNDATION SEALS**

If the Drawings require a concrete seal, the Contractor shall place the concrete underwater inside a watertight cofferdam, tube, or caisson. Seal concrete shall be placed in a compact mass in still water. It shall remain undisturbed and in still water until fully set. While seal concrete is being deposited, the water elevation inside and outside the cofferdam shall remain equal to prevent any flow through the seal in either direction. The cofferdam shall be vented at the vent elevation shown in the Drawings. The thickness of the seal is based upon this vent elevation.

The seal shall be at least 18-inches thick unless the Drawings show otherwise.

To place seal concrete underwater, the Contractor shall use a concrete pump or tremie. The tremie shall have a hopper at the top that empties into a watertight tube at least 10 inches in diameter. The discharge end of the tube on the tremie or concrete pump shall include a device to seal out water while the tube is first filled with concrete. Tube supports shall permit the discharge end to move freely across the entire Work area and to drop rapidly to slow or stop the flow. One tremie may be used to concrete an area up to 18 feet per side. Each additional area of this size requires 1 additional tremie.

Throughout the underwater concrete placement operation, the discharge end of the tube shall remain submerged in the concrete and the tube shall always contain enough concrete to prevent water from entering. The concrete placement shall be continuous until the Work is completed, resulting in a seamless, uniform seal. If the concreting operation is interrupted, the Engineer may require the Contractor to prove by core drilling or other tests that the seal contains no voids or horizontal joints. If testing reveals voids or joints, the Contractor shall repair them or replace the seal at no expense to the Owner.

Concrete Class 4000W shall be used for seals, and it shall meet the consistency requirements of Section 6-02.3(4)C.

### **2-08.3(4) DEWATERING CONCRETE SEALS AND FOUNDATIONS**

After a concrete seal is constructed, the Contractor shall pump the water out of the cofferdam and place the rest of the concrete in the dry. This pumping shall not begin until the seal has set enough to withstand the hydrostatic pressure (3-Days for gravity seals and 10-Days for seals containing piling or shafts). The Engineer may extend these waiting periods to ensure structural safety or to meet a condition of the operating permit.



If weighted cribs are used to resist hydrostatic pressure at the bottom of the seal, the Contractor shall anchor them to the foundation seal. Any method used (such as dowels or keys) shall transfer the entire weight of the crib to the seal.

No pumping shall be done during or for 24-hours after concrete placement unless done from a suitable sump separated from the concrete Work by a watertight wall. Pumping shall be done in a way that rules out any chance of concrete being carried away.

#### **2-08.4 MEASUREMENT**

Concrete, when used in the seals of underwater cofferdams, will be measured by the cubic yard, on the basis of the actual volume deposited as determined by the average cross-sectional area of the inside of the cofferdam except that no measurement will be made for the volume so determined which is outside of an area bounded by vertical planes 1 foot outside of the neat lines of the seal. The limiting vertical planes shall be parallel to the location of the neat lines based upon the traverse and longitudinal centerlines of the seal as shown on the Drawings.

#### **2-08.5 PAYMENT**

##### **1. "Cofferdam", per lump sum.**

The Bid item price for "Cofferdam" shall include all costs for the work required to furnish, install, maintain, and remove the cofferdam including dewatering.

##### **2. Other Payment Information**

Concrete that is placed in water for foundation seals, and that upon testing as required by the Engineer reveals void(s) or joint(s), shall be repaired or shall be replaced by the Contractor at no additional cost to the Owner.

All costs associated with dewatering the excavation and controlling groundwater shall be included in the various Bid Items provided the groundwater can be controlled using dewatering equipment from within the excavation. Therefore, no separate or additional payment will be made unless the Contract specifies otherwise.

### **SECTION 2-09 SUBGRADE PREPARATION AND PROTECTION**

#### **2-09.1 DESCRIPTION**

Section 2-09 describes Work consisting of preparation and protection of the subgrade for pavements, structures and utilities. All subgrade preparation Work shall be in accordance with the Contract and in close conformity with the lines, grades, and typical cross sections indicated on the Standard Plans, Drawings, or as established by the Engineer.

Subgrade preparation for sidewalk shall be in accordance with Section 8-14.3(2). All removal operations included in this section within the dripline of existing trees to be protected shall be in accordance with Section 1-07.16(2).

#### **2-09.2 RESERVED**

#### **2-09.3 CONSTRUCTION REQUIREMENTS**

##### **2-09.3(1) GENERAL**

Upon completing any excavation, the Contractor shall notify the Engineer. No material may be placed until the Engineer has accepted the prepared subgrade.

Once exposed, the subgrade shall be protected by the Contractor from adverse weather, the Contractor's operations, and public traffic. The Contractor shall be responsible for all costs of subgrade protection, and any other costs resulting from insufficient protection; this includes but is not limited to the cost of soft spot repair, over excavation, material replacement and compaction.

The Contractor shall maintain the subgrade by blading and compacting as frequently as may be necessary. All cuts, ruts, and breaks in the surface of the subgrade shall be repaired in a manner acceptable to the Engineer prior to placing any Materials.

Subgrade protection measures may include, but are not limited to, the use of plastic polyethylene sheeting (visqueen) to protect the subgrade from inclement weather, planking to protect the subgrade from the Contractor's equipment, and the placing of paving Materials or base Materials from an adjacent lane in lieu of operating equipment over the prepared subgrade.

Hauling over the finished subgrade shall be limited to that which is essential for construction purposes. Equipment used for transporting Materials over the prepared subgrade shall be equipped with pneumatic tires. Equipment used for hauling over the prepared subgrade which, in the opinion of the Engineer, causes undue damage to the subgrade or to the underlying Materials shall be removed from the Work upon request of the Engineer. If approved by the Engineer, the Contractor may plank the subgrade before hauling Materials or operating equipment over it.

During extended periods of seasonal inclement weather in which the Engineer deems it impractical or infeasible to protect the prepared subgrade with plastic sheeting or planking and where the Contractor is required to operate equipment over the prepared subgrade, the Engineer may order the use of a ballast Material to stabilize and protect the subgrade. The ballast shall be either Mineral Aggregate Type 2 or Type 14, whichever is designated by the Engineer. Ballast shall be used for subgrade stabilization only when designated by the Engineer.

**2-09.3(2) SUBGRADE FOR ROADWAY SURFACING**

In preparing the roadbed for surfacing, the Contractor shall:

1. Remove from the roadbed, immediately before placing surfacing Materials, all brush, weeds, vegetation, grass and other debris.
2. Dispose of all debris.
3. Drain water from all low spots or ruts.
4. Shape the entire subgrade to a uniform surface running true to the line, grade, and cross-section per the Contract Documents or as established by the Engineer.
5. If necessary, the Contractor shall process the subgrade in cut areas to remove materials too coarse for mechanical trimming and recompaction.
6. Compact the subgrade to a depth of 6 inches. Compaction shall achieve 95 percent of maximum density determined by tests described in Section 2-11. All portions of the surface on the subgrade which are inaccessible to large compactor units shall be thoroughly compacted with smaller compactor units or mechanical tampers.
7. Remove excess Material that does not drift to low spots during blading and shaping. The Contractor shall dispose of this excess by placing it where the subgrade lacks Material or by wasting it.
8. Add Materials where the subgrade needs more to bring it up to grade. The Contractor shall water and compact these added Materials as needed to produce a true finished subgrade.
9. Underground work in the area of the subgrade shall be completed and properly backfilled and compacted before subgrade work is started. This shall include the Work and work performed by the Owner or others.
10. If the underlying subgrade is soft, spongy, or yielding and does not permit proper compaction, the Contractor shall stabilize the subgrade at the direction of the Engineer.
11. Where normal crown sections are being constructed, stakes will be set at convenient offsets at intervals not to exceed 50 feet and at closer intervals where necessary, such as at street and alley intersections. It shall be the responsibility of the Contractor to set centerline grades which may be needed.
12. The full width of the roadway shall be kept well sprinkled with water before and during process of rolling the subgrade.
13. Grade and line, throughout the stages of constructing the subgrade, shall be secured from the reference stakes. The subgrade shall be maintained in the finished condition until the first course of surfacing is placed upon it.

If the Contract requires trimming equipment, the equipment shall:

1. Maintain the grade and transverse slopes automatically through sensors that respond to reference lines on both edges of each roadway.
2. Create a smooth, uniform surface free from chatter and ripples.
3. Be subject to the Engineer's approval.

**2-09.3(3) SUBGRADE FOR PAVEMENT**

When Drawings call for concrete pavement to be placed directly on the subgrade, the Contractor shall prepare the subgrade as outlined in Section 2-09.3(2). This work shall include:

1. Removal of subgrade for increased thickness of pavement, for pavement headers, and for increased thickness at pavement edges. This may be done just before the concrete is placed.
2. When the pavement is to be constructed over an old subgrade composed of gravel and macadam, the old gravel or macadam shall be scarified and the Material shall be uniformly spread and thoroughly compacted.
3. Compaction of subgrade shall extend to at least 1 foot beyond the pavement edge or to a width that accommodates the paving machine without visible distortion of the subgrade.
4. Thoroughly wetting the subgrade with water from 12 to 48 hours before the concrete is to be placed and maintaining this wet condition until the concrete is placed.
5. The subgrade shall be compacted both before and after the forms are set.

**2-09.3(4) SUBGRADE IN ROCK**

When the Contractor encounters rock or other hard Material at the subgrade elevation of roadways and utilities, it shall be excavated the full width of the roadbed or excavation to at least 6 inches below subgrade, then backfilled with rock fragments, gravel, or other free-draining Material of size not more than 4 inches in diameter.

If the Contractor uses a subgrade trimmer, the backfill shall be rock, gravel, or other free-draining Material not more than 2 inches in diameter. The Contractor shall save the finer granular Material from excavations or borrow pits to use in backfilling the top 6 inches of the subgrade. All such Material shall be approved by the Engineer.

When a structure foundation is to rest on rock, the Contractor shall cut the bottom of the excavation to a firm surface, level, stepped, or serrated as indicated in the Contract, and remove all loose Material.

**2-09.3(5) SUBGRADE FOR STRUCTURE**

For an arch abutment, the back face shall be trimmed to true lines so that concrete can be poured against undisturbed material.

If concrete is to rest on any excavated surface other than solid rock, the Contractor shall not disturb the bottom of the excavation. The Contractor shall also remove all loose or soft Material just before pouring the concrete.

**2-09.4 MEASUREMENT**

No measurement will be made for the Work required by Section 2-09.

**2-09.5 PAYMENT**

Unless otherwise specified in the Contract, all costs for the subgrade preparation shall be included in the Bid item prices Bid for the various Bid items included in the Contract.

Mineral Aggregate backfill of the Type ordered by the Engineer used in lieu of native material will be paid as "Mineral Aggregate, (Type)" in accordance with Section 4-01.

**SECTION 2-10 BACKFILLING****2-10.1 DESCRIPTION**

Section 2-10 describes Work consisting of backfilling or filling for pavements, structures and utilities. All backfilling work shall be in accordance with the Contract and in close conformity with the lines, grades, and typical cross sections indicated on the Drawings, in the Standard Plans, or as established by the Engineer.

**2-10.2 MATERIALS**

Mineral Aggregate (Type) shall meet the requirements of Section 9-03.

**2-10.2(1) SELECTED MATERIAL**

Selected Material shall be considered as that Material designated by the Engineer as suitable for fill applications. Selected Material is obtained from the excavations on the Project Site and shall be used first before new borrow Material is imported.

Excavated Material will be considered suitable for general fill applications which do not require a Material meeting specific Mineral Aggregate Type Specifications found in Section 9-03 if it:

- (1) Is capable of attaining the degree of compaction specified in Section 2-11;
- (2) Is within  $\pm 3$  percent of optimum moisture content as determined in accordance with ASTM D 1557;
- (3) Is free from deleterious Material and does not contain more than 5% total by volume of organic Material, clay, frozen lumps, and rocks, concrete, asphalt, or other debris and rubble having a dimension greater than 6 inches.

Selected Material shall be used for any of the following purposes as determined by the Engineer:

1. Embankment construction.
2. In lieu of Mineral Aggregate (Type); shall meet the requirements of Section 9-03.
3. Trench backfill.
4. Planting soil; shall meet the requirements of Section 8-02.3(2).
5. Other uses.

Excavated material which is in excess of the needs of the project shall be recycled or disposed of in accordance with Section 1-07.3.

Selected Material shall be placed and compacted in accordance with the requirements for the type of work for which the Material is being used.

Unless the Contract specifies otherwise, the Engineer may identify any Material excavated within the Project Site as "Selected Material", including the excavation of local borrow. Where the Contract specifies Material excavated from the Project Site to be labeled as Reused Amended Site Soil, the requirements of Section 8-02.3(2)C shall apply.

**2-10.2(2) BORROW**

Borrow is imported Material obtained from sources other than the Project Site. When suitable native excavated Material is insufficient, borrow shall be used to the neat lines shown on the Drawings.

Borrow shall be classified as "Unclassified Borrow" or "Borrow (Type)" as follows:

Unclassified Borrow: an imported soil which meets the suitability requirements set forth in Section 2-10.2(1)

Borrow (Type): an imported soil which meets the suitability requirements set forth in Section 2-10.2(1) and in addition, meets all gradation and other requirements listed in Section 9-03 for the Mineral Aggregate Type specified (e.g., "Borrow, Mineral Aggregate Type 17", etc.).

**2-10.2(2)A BORROW SITES**

Sources of borrow Material, the selection of borrow sites and their operation, and the borrow Material shall at all times be subject to the approval of the Engineer. No borrow site shall be utilized by the Contractor until the proper grading permits and property owner agreements have been obtained by the Contractor and copies submitted to the Engineer. Utilization of a site without a legal grading permit, a consent Agreement from the property owner, and approval of the Engineer will be considered unauthorized.

Borrow sites located within the City limits of Seattle are subject to the rules and regulations set forth in Seattle Grading Ordinance No. 123107 or as otherwise provided in the Seattle Municipal Code Chapter 22.170 and shall require a grading permit issued to the property owner by the Director of Planning and Development.

Borrow sites located outside the City limits of Seattle but within unincorporated King County, shall be subject to the rules and regulations set forth in the King County Grading Ordinance (Ord. No. 1488). Sites may also be subject to rules and regulations of a local governmental authority if located within its jurisdiction.

**2-10.2(3) CONTROLLED DENSITY FILL**

When specified in the Contract or when approved by the Engineer, the Contractor shall supply controlled density fill (CDF) as backfill Material. The Engineer may also require the Contractor to use CDF.

**2-10.2(3)A CONTROLLED DENSITY FILL (CDF)**

For filling pipe and for filling the annular space between 2 pipes, see Section 9-05.15.

CDF Materials shall meet the requirements of the following sections:

- |     |  |         |
|-----|--|---------|
| (1) | Portland and Hydraulic Cement                | 9-01    |
| (2) | Aggregates for Portland Cement Concrete      | 9-03.1  |
| (3) | Curing Materials and Admixtures              | 9-23    |
| (4) | Fly Ash                                      | 9-23.9  |
| (5) | Ground Granulated Blast Furnace Slag (GGBFS) | 9-23.10 |
| (6) | Water  | 9-25    |

The volume of water and fine aggregate for CDF may be adjusted as required to provide the desired workability within the specified limits. The specific gravity of mixing water shall not exceed 1.03.

**2-10.2(3)A1 CONTROLLED DENSITY FILL FOR PIPE BEDDING**

For pipe bedding, the following CDF mix design shall be used:

PIPE BEDDING CDF	
MATERIAL	QUANTITY/CUBIC YARD
Portland Cement Type I-II	94 pounds
Fly Ash Cl. F; or Fly Ash Cl. C	2.2 cubic feet 1.1 cubic feet
Mineral Aggregate Type 7 w/ Cl. F Fly Ash	16.8 cubic feet 17.9 cubic feet
Mineral Aggregate Type 7 w/ Cl. C Fly Ash	
Water	4.8 cubic feet
Air Entrainment	2.7 cubic feet

Slump shall not exceed 7 inches.

**2-10.2(3)A2 CONTROLLED DENSITY FILL FOR TRENCH BACKFILL**

For trench backfill, the following CDF mix design shall be used:

TRENCH BACKFILL CDF	
MATERIAL	QUANTITY/CUBIC YARD
Portland Cement Type I-II	30 pounds
Fly Ash Cl. F, or Fly Ash Cl. C	2.2 cubic feet 1.1 cubic feet
Mineral Aggregate Type 7 w/ Cl. F Fly Ash	17.1 cubic feet 18.2 cubic feet
Mineral Aggregate Type 7 w/ Cl. C Fly Ash	
Water	4.8 cubic feet
Air Entrainment	2.7 cubic feet

Slump shall not exceed 7 inches.

**Alternate CDF formulation:** The Contractor may propose an alternate formulation and shall make a submittal on the alternate formulation in accordance with Section 1-05.3(5). This submittal shall include the following information:

1. Reason for alternate formulation and impact on application;
2. Mix design components and component quantities for a 1 cubic yard batch;
3. Strength data at 24 hours, 7 days and 28 days. The strength at 24 hours shall be not less than 15 psi when tested in accordance with ASTM D 4832.
4. Slump shall not exceed 7 inches;
5. The mixture shall not produce excessive bleed water; and
6. The 28 day strength shall be a minimum 50 psi and a maximum 100 psi when tested in accordance with ASTM D 4832.

An exception to one or more of items 3, 4, 5, and 6 immediately above may be allowed if the reason provided in item 1 confirms no harm may result from the use of the alternate CDF mix formulation. Use of such alternate CDF formulation will not be allowed unless the Engineer provides written acceptance of the alternate formulation submittal.

#### 2-10.2(3)A3 CONTROLLED DENSITY FILL FOR STRUCTURE BACKFILL

For structural backfill, the following CDF mix design shall be used:

STRUCTURE BACKFILL CDF	
MATERIAL	QUANTITY/CUBIC YARD
Portland Cement Type I-II	50 pounds
Fly Ash Cl. F, or Fly Ash Cl. C	2.2 cubic feet 1.1 cubic feet
Mineral Aggregate Type 6 or Type 7	17.2 cubic feet w/ fly ash class F, or 18.1 cubic feet w/ fly ash class C
Water	4.8 cubic feet
Air Entrainment	2.7 cubic feet

#### 2-10.2(3)A4 CONTROLLED DENSITY FILL MANUFACTURER'S CERTIFICATE OF COMPLIANCE

For all CDF materials, the producer shall provide a Manufacturer's Certificate of Compliance for each truckload of controlled density fill. The Manufacturer's Certificate of Compliance shall verify that the delivered Material is in compliance with the mix design and shall include:

- (1) Project Contract number,
- (2) Date,
- (3) Truck number,
- (4) Batched weights of each ingredient, and
- (5) Signature of the Supplier affirming the accuracy of the information provided

### 2-10.3 CONSTRUCTION REQUIREMENTS

#### 2-10.3(1) GENERAL REQUIREMENTS

During all phases of the backfilling operations and testing as outlined herein, the Contractor shall protect infrastructure, provide for the maintenance of traffic as may be necessary, and provide for the safety of property and person.

If water is present and prevents the Contractor from properly placing and compacting backfill as determined by the Engineer, it shall be removed in accordance with Section 2-08.

Excavations shall be backfilled as soon as possible. Backfill shall not be placed against any concrete Structure until the concrete has attained 90 percent of its design strength and has cured for at least 14 Days. However, the Contractor may backfill footings and columns as soon as forms have been removed, so long as the backfill is brought up evenly on all sides.

Prior to backfilling, all form lumber and debris shall be removed. The protective system used by the Contractor shall be systematically removed to allow for acceptable backfilling.

Where it is required that a blanket of selected Material or bank run gravel be placed on top of the native backfill, the backfill shall be placed to such elevation as shown on the Drawings, and shall be leveled to provide for a uniform thickness of the selected Material. Compaction is required, and it shall be performed prior to placing the selected Material.

Backfill shall be compacted in accordance with Section 2-11.

#### **2-10.3(2) FILLING ABANDONED STRUCTURES**

Structures, valve chambers, catch basins, maintenance holes, etc. shall be filled with Mineral Aggregate Type 9 or Type 17 or crushed concrete or other selected Material approved by the Engineer and compacted in accordance with Section 2-11.

#### **2-10.3(3) UTILITY BACKFILL**

Where Class D bedding is required, backfill up to 6 inches over the top and both sides of the utility shall be evenly and carefully placed, but not until all Material, such as rock not capable of passing a 3 inch sieve or similar objectionable Material, capable of damaging the pipe or its coating or its electrolysis monitoring system have been removed from the backfill Material.

In backfilling, the Contractor shall take all necessary precautions to protect the pipe from any damage or shifting. The Contractor shall backfill to a uniform depth of 1 foot above ductile iron pipe before starting compaction and to a uniform depth of 2 feet above concrete pipe before starting compaction.

Walking on the pipe shall not be allowed until at least 1 foot of cover has been placed upon the pipe.

#### **2-10.3(4) STRUCTURE BACKFILL**

Unless otherwise stated in the Contract, structure backfill is the material within a one horizontal to one vertical slope from the base of the structure to the ground surface.

Special precautions shall be taken to prevent any wedging action against structures. If the excavation has sloping sides, the slopes shall be broken up by stepping or serrating to prevent wedge action before the backfill is placed. Fill placed around Culverts, piers or underground utilities shall be deposited on both sides to approximately the same elevation at the same time.

Unless otherwise specified, gravel backfill Material for foundations shall be Class A or Class B per Section 9-03.12(1). When not specified by Class or Type in the Contract, gravel backfill Material for foundations shall be Mineral Aggregate Type 2 per Section 9-03.12(1)A.

Unless otherwise specified, gravel backfill Material for walls (non- Mechanically Stabilized Earth) shall be Mineral Aggregate Type 17 per Section 9 03.12(2).

#### **2-10.3(5) BACKFILLING AT BRIDGE AND TRESTLE ENDS**

This work consists of filling around the ends of trestles and bridges. The Contractor shall begin and complete this work as soon as possible after each bridge is completed or when the Engineer requires.

To prevent the bridge from being distorted or displaced, the Contractor shall place Material evenly around all sides and parts of the Structure. The Contractor shall not backfill any abutment prior to placing the superstructure. After the superstructure is in place, small compactors may be required. Embankments shall be layered and compacted concurrently at either end of the Structure. The difference in embankment height from one end to the other shall not exceed 2 feet.

The Contractor shall build the embankment under the bridge to the dimensions shown in the Contract.

#### **2-10.3(6) END SLOPES**

The Engineer will determine when and where to build end slopes, whether these occur at the beginning or end of a project, at the borders of excavation or embankments, at bridge ends, or elsewhere. The Contractor shall build end slopes not detailed on the Drawings to the line and grade as established by the Engineer regardless of center line limits shown on the Drawings. All work to complete and maintain these end slopes shall be considered as work to be performed under the Contract.

#### **2-10.3(7) CONTROLLED DENSITY FILL**

Compaction of controlled density fill will not be required. If water is present and prevents the Contractor from properly placing controlled density fill as determined by the Engineer, it shall be removed by pumping or other means.

Special precautions shall be taken to prevent any wedging action against abutments and wing walls. If the excavation has sloping sides, the slopes shall be broken up by stepping or serrating to prevent wedge action before the

backfill is placed. Fill placed around culverts, piers or underground utilities shall be deposited on both sides to approximately the same elevation at the same time.

#### **2-10.4 MEASUREMENT**

"Selected Material" will be measured by the cubic yard for the quantity placed.

"Borrow (Type)" and "Unclassified Borrow" will be measured by the ton at the point of delivery in accordance with Section 1-09.1.

"Controlled Density Fill" will be measured by the cubic yard for the quantity of Material placed except when Controlled Density Fill is specified as pipe bedding per Section 7-17.4.

Compaction will not be measured.

See Divisions 7 and 8 for measurement information associated with excavation, backfill and compaction of utility trenches.

#### **2-10.5 PAYMENT**

1. **"Selected Material"**, per cubic foot

The Bid item price for "Selected Material" shall be used for the all costs associated with the placement and compaction of this material when the costs are not included in other various bid items elsewhere in this specification. Payment for excavation backfill and compaction of utility trenches shall be in accordance with Divisions 7 and 8.

2. **"Unclassified Borrow"**, per ton.

3. **"Borrow (Type)"**, per ton.

The Bid item prices for "Unclassified Borrow" and for "Borrow (Type)" shall include all costs for the work required to excavate, haul, stockpile, place and compact the Material as indicated in the Contract.

4. **"Controlled Density Fill"**, per cubic yard.

The Bid item price for "Controlled Density Fill" shall include all costs for the work required to furnish and place the CDF as specified. Payment for Controlled Density Fill used as bedding for utility trenches will be paid in accordance with Section 7-17.5.

5. **Other Payment Information**

If the Contract does not include a Bid item for Mineral Aggregate (Type) for rock embankment construction, any payment will be as provided for in Section 1-04.4.

Stockpiled excavated Material for use as backfill that is intermingled with unsuitable Material and/or weather damaged shall be disposed of and replaced with sound, untainted fill Material at the Contractor's sole expense.

When ordered by the Engineer to use controlled density fill in backfilling around piers and in front of abutments and walls, any payment will be as provided for in Section 1-04.4.

Costs related to all bridge embankment and trestle work described in Section 2-10.3(5) shall be incidental to the Work and shall be included in the Bid item prices for applicable Bid items.

All costs not defined in Section 2-10 that relate to providing, placing, and compacting backfill shall be included in the Bid item prices of the applicable Bid items.

See Divisions 7 and 8 for payment information associated with excavation, backfill and compaction of utility trenches.

### **SECTION 2-11 COMPACTION**

#### **2-11.1 DESCRIPTION**

Section 2-11 describes Work consisting of compacting material used for backfilling or filling for pavements, structures and utilities. All compaction Work shall be in accordance with the Contract and in close conformity with the lines, grades, and typical cross sections indicated on the Standard Plans, Drawings or as established by the Engineer.

#### **2-11.2 RESERVED**

#### **2-11.3 CONSTRUCTION REQUIREMENTS**

##### **2-11.3(1) GENERAL REQUIREMENTS**

The Contractor shall not operate tractors or other heavy equipment within 2 feet of a structure or utility. Where compaction is required within 2 feet of a structure or utility, or is inaccessible by large equipment, the Contractor shall use smaller, lighter equipment and smaller lifts to achieve the required compaction so as not to damage the structure or utility.

The Contractor shall determine the lift thickness, and compaction effort based on the equipment being used for compaction and the material being compacted so that the compaction standard is met. At no time should the lift thickness be greater than 12 inches.

Should excessive moisture threaten the stability of backfill, the Engineer may order the Contractor to alter the operation.

The Contractor shall use one of the following two methods (A and B) when backfilling. The Contractor shall use Method A when the Contract does not specifically specify another method.

**Method A.** Within 2 feet of pavement or a structure, the backfill shall be compacted to 95 percent of the maximum density as determined by the compaction control tests described in Section 2-11.3(2). All Material beyond this 2-foot range shall be compacted to 90 percent of the same maximum density.

**Method B.** All of the material shall be compacted to 95 percent of the maximum density as determined by the compaction control tests described in Section 2-11.3(2).

If the required compaction density has not been obtained, the Contractor shall remove the backfill and recompact using an improved technique, thinner lifts, heavier compaction equipment or more effort. This process shall be repeated until the Contractor has established a procedure that provides the required degree of compaction. The Contractor will then be permitted to proceed with backfilling and compacting under the approved compaction procedure.

**Moisture content.** The moisture content shall not vary more than 3 percent above or more than 3 percent below the optimum moisture content as determined by test method ASTM D1557.

The Engineer may permit the Contractor to place Materials having higher moisture content than specified in this Section if the Contractor can indicate that the compaction standard can still be met. However, the Engineer may at any time require the Contractor to return to specified moisture-content levels.

The Owner will consider all costs of drying Material to be incidental to other Work and at no additional cost to the Owner.

If weather prevents drying excavation or borrow Materials to the required moisture content, the Engineer may order the Contractor to alter normal procedures or equipment.

The Contractor shall repair any partial or complete backfilled area that loses stability because of continued hauling across it. Evidence of lost stability shall include pumping or rutting. The Contractor shall also alter hauling equipment or procedures to prevent further damage.

If it appears that rain or snow is likely to soak an area that has been aerated, the Contractor shall temporarily seal it against the weather. Should the Contractor fail to do so, any additional aeration required to restore the area to its previous condition shall be done at no expense to the Owner.

### **2-11.3(2) COMPACTION CONTROL TESTS**

Maximum density and optimum moisture content for materials placed shall be determined by one of the following methods:

1. Materials less than 30-percent retained on the ¾-inch sieve shall be determined by ASTM D 1557 (AASHTO T 180 Method D).
2. Materials with 30-percent or more retained on the ¾-inch sieve may be determined by rolling pattern using in place density determined using ASTM D6938 (AASHTO T 310).

In place density will be determined using ASTM D6938 (AASHTO T 310).

The determination of which test procedure to use will be made solely by the Engineer.

The Contractor shall provide the Engineer a minimum 2 Working Days advance notification when field soil or Mineral Aggregate density reading or compaction testing is required.

In the event routine in place densities show the specified compaction is not being attained, the Contractor shall reestablish the compaction procedure. In no case will placement of Material be allowed to proceed until the specified compaction is attained.

Water settling will not be allowed as a method for compaction.

### **2-11.4 MEASUREMENT**

Compaction will not be measured.

### **2-11.5 PAYMENT**

When the Engineer directs a change in construction, the Owner will not increase the Bid item price, but will increase the Bid item quantity at the Bid item prices for the Bid items that apply in accordance with Section 1-04.6.

Density testing by Owner forces will be performed at no charge to the Contractor for the first test series at each Engineer designated location. If these tests indicate a failure to achieve required densities, re-testing shall take place after recompaction. Engineer expenses related to retesting will be charged to the Contractor as specified in Section 1-05.7.

All costs and expenses involved in drying Materials with whatever method is appropriate shall be considered incidental to the various Bid item prices and at no additional cost to the Owner.

See Divisions 7 and 8 for payment information associated with excavation, backfill and compaction of utility trenches.



**SECTION 2-12 WATERING****2-12.1 DESCRIPTION**

Section 2-12 describes work consisting of furnishing, hauling, and applying water for settling, constructing subgrade, placing of crushed surfacing, dust control, flushing, testing, and as the Contract requires.

**2-12.2 RESERVED****2-12.3 CONSTRUCTION REQUIREMENTS****2-12.3(1) GENERAL**

The Contractor shall apply water upon streets by means of tank trucks equipped with spray bars. Spray controls shall ensure that the water is applied uniformly and at a rate of coverage for the intended purpose. When the source of water is hydrants within the Work area, the Contractor may, with approval of the Engineer, apply water by means of a hose and reduced pressure principle backflow assembly (see Section 9-30.16(5)) approved by the Washington State Department of Social and Health Services ("WSDSHS certification") directly connected to the hydrant. The Contractor shall have a copy of the "WSDSHS certification" on board the vehicle drawing water from the hydrant. Before drawing water, the Contractor shall first obtain approval of the assembly and hook-up by making the advance notification specified in Section 1-07.28 item 7D. Contractor shall furnish hose, equipment, or tank truck necessary to do the required watering, and strictly comply with the provisions of the permit.

**2-12.3(2) SOURCE OF WATER SUPPLY, REQUESTING HYDRANT PERMIT, AND REGULATIONS PERTAINING TO HYDRANT USE**

Within the SPU Water Operations direct service area, the source of water to be used on a project is subject to approval by the Engineer. When the source of water is to be a hydrant, a hydrant use permit shall be obtained from, and use fees paid, when applicable, to SPU Customer Service.

The Contractor shall use only those water sources or hydrants approved by the Engineer, and shall be in strict accordance with the requirements of City of Seattle Ordinance 65877 and the conditions of the permit.

Information on SPU hydrant use permits can be obtained at 206-684-5800, option 2, or by visiting the 31st floor, Seattle Municipal Tower, 700 Fifth Avenue, Seattle, Washington.

Outside of the SPU Water Operations direct service area, the Contractor shall adhere to the requirements of that local jurisdiction.

**2-12.4 MEASUREMENT**

Bid items of Work completed pursuant to the Contract will be measured as provided in Section 1-09.1, Measurement of Quantities, unless otherwise provided for by individual measurement paragraphs herein this Section.

Water used in conjunction with work involving the water distribution system will not be measured.

Water used in conjunction with work other than the water distribution system will be measured.

**2-12.5 PAYMENT**

All costs associated with obtaining a hydrant use permit and providing and applying water to Work not involving the water distribution system shall be considered incidental to the various Bid items comprising the improvement and no separate or additional payment will be made. See Section 4-07.5 for an exception where the Owner will pay for water.

All costs associated with providing and applying water to Work involving the water distribution system will be borne by the Owner including the hydrant use permit fee.

Where the Work involves both water distribution work and other work, no reimbursement of the hydrant permit fee will be made. Costs for City non-water distribution work shall be incidental to the various non-water distribution Bid items and no separate or additional payment will be made except as specified in Section 4-07.5.

Water costs will be based on the prevailing rates as listed in Seattle Public Utilities' current standard charges.

**SECTION 2-13 ROCK FACING****2-13.1 DESCRIPTION**

Section 2-13 describes work consisting of constructing, rebuilding, and relocating rock facings used for erosion control or the containment of cuts and embankments. Work shall be performed in accordance with Standard Plan no. 141, and as designated in the Contract. Rock facing used for fire hydrant wall requirements as indicated on Standard Plan no. 313 shall comply with the requirements of Section 2-13.3(5).

**2-13.2 MATERIALS**

Materials shall meet the requirements of the following Sections:

Rock Facing Material	9-03.17
2" to 4" Quarry Spall	9-13.7
Geotextile	9-37

Crushed gravel with at least 90% of the total required quantity having two or more fractured surfaces each piece and also meeting the grading requirements of quarry spalls may be used in lieu of ledge rock.

Where needed, the Geotextile between the native soil behind the rock facing and the quarry spall backfill shall meet the requirements of a geotextile for separation on Table 3 of Section 9-37.

**2-13.3 CONSTRUCTION REQUIREMENTS**

**2-13.3(1) ROCK FACING**

**2-13.3(1)A GENERAL**

Rock facings for other than fire hydrant wall requirements per Standard Plan no. 313 shall be constructed, rebuilt, or relocated at the locations and to the limits indicated on the Drawings. Walls higher than 8 feet shall require a design by a Professional Engineer in accordance with Section 1-05.3 and shall be submitted to the Engineer. The subgrade elevation and location of the rock facing shall be indicated on the Drawings or as established by the Engineer.

**2-13.3(1)B ROCK FACING KEYWAY**

The first step in rock facing construction for rock facing, after clearing and general site preparation, is to excavate a keyway for the base course of rock facing. The keyway shall be 3 to 12 inches deep (as shown on Standard Plan no. 141) extending over the entire length of the rock facing, and shall incline slightly downward toward the face of the cut or fill being protected by an approximate 4 horizontal to 1 vertical slope. The keyway width shall be at least 40% of the height of the proposed rock facing.

**2-13.3(1)C ROCK SELECTION**

The Contractor shall have sufficient working space so individual rock selection from a number of stockpiled rocks can satisfy the needs of the project. The stockpile area shall not be placed on traffic lanes or driveways. Rocks shall be of a generally cubical, tabular or rectangular shape, as opposed to rounded or tetrahedral forms, and shall be placed to match as closely as possible the spaces afforded by the next lower course of rocks. One-man rocks shall not be used on rock facings more than 3 feet high.

**2-13.3(1)D ROCK PLACEMENT**

The thickness of the rock facing, including the filter layer behind it, shall be approximately 40% of its height. Where required in the Contract, a 6-inch subsurface drain pipe shall be installed in a keyway behind the rock facing, with sufficient gradient to initiate flow, and be piped to an approved discharge point as shown on the Drawings: surface, ditch, curb above inlet or CB grate, or separate CB with no roadway discharge.

The Contractor shall place the first course of rock on firm, unyielding soil (having a minimum load bearing capacity of 2000 pounds per square foot) at base elevations specified in Standard Plan no. 141. There shall be full contact between the rock and soil. This may require shaping of the ground surface, or slamming or dropping the rocks into place when appropriate, so that the soil foundation conforms to the shape of the rock face bearing on it. As an alternative, it may be necessary to place and compact crushed rock into the subgrade to increase its load bearing capacity. Before placing the next level of rock facing, the Contractor shall place and compact filter Material behind and to the top of the rocks previously placed.

The Contractor shall use rock sizes as specified in Section 9-03.17, using the largest rocks at the bottom and progressively smaller rocks toward the top. The rocks shall be placed so that there are no continuous joint planes in either the vertical or lateral direction. Each rock shall bear on at least two rocks below it, shall have at least 3 contact surfaces, and shall be set stable with no rocking.

Rocks shall be placed in a manner that there is some bearing between flat rock faces rather than on joints. Horizontal joints between rock courses shall slope downward towards the embankment being protected.

The batter of the rock facing shall be 1:4 (horizontal to vertical) and shall be uniformly the same throughout the length of the rock facing. The face of individual rocks may vary no more than 3 inches from the batter or slope line of the rock facing.

Where voids, greater than four inches in dimension, exist in the face of the rock facing, they shall be visually examined to determine if contact between the rocks exists within the thickness of the rock facing. If there is contact, no further action is required. But if there is no rock contact within the rock facing thickness, some resetting is required. If there is a void measuring six inches or more near the inside face of the rock facing, the void shall be "chinked" with a smaller piece of rock. This filler rock shall be placed with the longest dimension perpendicular to the face.

If stability of an unprotected cut slope is of concern, the rock facing shall be constructed in short lengths. The final course shall be an even appearance and shall be placed so as to minimize erosion of the protected embankment.

**2-13.3(1)E FILTER MATERIAL**

The Contractor shall place a drainage filter of 2 inch to 4 inch quarry spall between the face of the embankment and the rear of the rock facing. The drainage filter shall be a minimum 6 inches in thickness.

**2-13.3(1)F GEOTEXTILE**

A separation geotextile meeting the requirements in Table 3 of Section 9-37 shall be placed between the filter material and the native soil if water that could cause erosion of the native soil is expected during the life of the rock facing. The water could be either groundwater seeping from the slope or surface water.

**2-13.3(1)G SLOPE ABOVE ROCK FACING**

The slope of the terrain above the rock facing shall be no steeper than 3:1 (horizontal to vertical) to minimize an earth surcharge on the rock facing. Additional surcharge (such as a building, parking area, other traffic area, and other loading above the rock facing, shall require a rock facing design by a licensed civil engineer in accordance with Section 1-05.3 and be submitted to the Engineer. The unimproved area above the rock facing shall be hydroseeded for erosion control.

**2-13.3(2) REBUILD ROCK FACING**

This work shall consist of dismantling an existing rock facing and reconstructing the facing in the same location. Reconstruction work shall be in accordance with the requirements of Section 2-13.3(1). Rock dismantled from the existing facing may be used in reconstructing the rebuilt rock facing if the rock is approved by the Engineer as meeting the rock quality requirements of Section 9-03.17. Additional rock ordered by the Engineer to complete the facing shall be furnished by the Contractor meeting the requirements of Section 2-13.2. Existing drainage rock behind the existing rock facing shall be replaced with 2 inch to 4 inch quarry spall for the rebuilt rock facing.

The Contractor shall sequence the removal and rebuild in such a manner as to limit the length of exposed slope. Each Working Day, a length of up to twice the height of the existing rock facing may be removed. Each Working Day, rebuilding the rock facing shall proceed in a manner providing the shortest length of unfinished rock facing full height. The removal and rebuild shall be coordinated as to limit the exposure of unrocked embankment.

**2-13.3(3) RELOCATE ROCK FACING**

This work shall consist of dismantling an existing rock facing and rebuilding a similar rock facing in a different location using the rock obtained from the dismantled facing. Work shall be in accordance with the requirements of Sections 2-13.3(1) and 2-13.3(2). Additional rock ordered by the Engineer to complete the facing shall be furnished by the Contractor meeting the requirements of Section 2-13.2. Existing drainage rock behind the existing rock facing shall be replaced with 2 inch to 4 inch quarry spall for the relocated rock facing.

**2-13.3(4) CONTRACTOR QUALIFICATIONS**

The rock facing Contractor or Subcontractor shall furnish written evidence of at least 5 rock facing constructions within the 2 years preceding the date of Advertisement for Bids and shall invite inspection of at least two of these rock facings which are similar to the proposed rock facing(s) in the Contract as determined by the Engineer.

**2-13.3(5) ROCK FACING FOR HYDRANTS**

Where rock facings are required as wall requirements for fire hydrants as indicated on Standard Plan no. 313, the rock facing construction shall be as specified in Sections 2-13.3(1) with the following exceptions:

1. The depth of the keyway shall be 1' – 0" minimum;
2. The filter Material behind the rock facing shall be Mineral Aggregate Type 2 with a minimum thickness of 6 inches.
3. The maximum height of rock facing shall not exceed 5 feet as measured from finished grade to top of rock facing.
4. The sizes of rock facing shall meet the requirements of the Table listed on Standard Plan no. 141 with "h" measured from finished grade to top of rock facing.
5. The maximum slope behind the rock facing shall be no steeper than 2 horizontal to 1 vertical.
6. Finished grade in front of the rock facing shall be with a minimum 6 inch compacted depth of Mineral Aggregate Type 2.
7. No weep holes and no subsurface drain are required behind the rock facing.
8. Each rock facing rock shall bear on at least 3 points without rocking. Voids greater than 4 inch on either the outside face or inside face shall be chinked with a smaller rock ensuring stability of the rock facing.

**2-13.4 MEASUREMENT**

Bid items of Work completed pursuant to the Contract will be measured as provided in Section 1-09.1, Measurement of Quantities, unless otherwise provided for by individual measurement paragraphs herein this Section.

Measurement for "Rock Facing" and for "Relocate Rock Facing" will be by the square foot of rock face for the new rock facing or for the relocated rock facing.

Measurement for "Rebuild Rock Facing" will be by the square foot based on measurement of the finished rock facing.

Measurement will include the entire front face of the constructed rock facing including the keyway.

Quarry spall drainage Material will be measured by the ton.

Filter Material other than quarry spall will be measured by the cubic yard in accordance with Section 4-01.4.

### **2-13.5 PAYMENT**

Compensation for the costs necessary to complete the work described in Section 2-13 shall be made at the Bid item prices Bid only for the Bid items listed or referenced as follows:

1. **"Rock Facing"**, per square foot.

The Bid item price for "Rock Facing" shall include all costs for the work required to furnish and place the rock and geotextile, excavation of keyway and of embankment.

Payment for drainpipe, when called for in the Contract, shall be paid as "Subsurface Drain" per Section 7-01.

2. **"Rebuild Rock Facing"**, per square foot.

3. **"Relocate Rock Facing"**, per square foot.

The Bid item prices for "Rebuild Rock Facing" and for "Relocate Rock Facing" shall include all costs for the work required to dismantle and reconstruct the rock facing as specified using the existing rock. It also includes temporary stockpiling of the rock, such excavation as may be necessary to rebuild or relocate the rock facing, disposal of existing rock or drainage aggregate, and furnishing additional drainage aggregate and geotextile as necessary.

Costs required to import and place additional rock, or replace existing rock in order to rebuild or relocate rock facing shall be addressed per Section 1-09.4.

4. **Other payment information**

Payment for quarry spall or other filter Material specified for drainage filter Material will be in accordance with Section 8-15.

## **SECTION 2-14 TRIMMING AND CLEANUP**

### **2-14.1 DESCRIPTION**

Section 2-14 describes work consisting of dressing and trimming the roadway(s) indicated in the Contract, including frontage roads, connecting ramps, auxiliary lanes, and approach roads. This work extends to shoulders and ditches.

### **2-14.2 RESERVED**

### **2-14.3 CONSTRUCTION REQUIREMENTS**

The Contractor shall:

1. Trim shoulders and ditches to produce smooth surfaces and uniform cross-sections that conform to the grades set by the Engineer.
2. Open and clean all channels, ditches, and gutters to ensure proper drainage.
3. Dress the back slope of any ditch or borrow pit that will remain adjacent to the roadway. Round off the top of the back slope and distribute the Material evenly along its base.
4. Remove and dispose of all weeds, brush, refuse, and debris that lie on the roadbed, shoulders, ditches, and slopes.
5. Remove from paved shoulders all loose rocks and gravel.
6. Distribute evenly along the embankment any Material not needed to bring the shoulders to the required cross-section.
7. Restoration shall be in accordance with the project Drawings and the requirements in Section 8-02.

The Contractor shall not:

- 1) Use heavy equipment (tractors, graders, etc.) to trim the shoulders of an existing or new bituminous surface.
- 2) Drag, push, or scrape shoulder Material across completed surfacing or pavement.

When the Contract requires the Contractor to rebuild part of a roadway, only the rebuilt areas shall be trimmed and cleaned up.

Trimming and cleanup in ditch and channel over 4 feet deep shall require safety systems as specified in Section 2-07.

### **2-14.4 MEASUREMENT**

Work described in Section 2-14 will not be measured.

Measurement for safety systems related to cleanup of ditch and channel over 4 foot depth will be as specified in Section 2-07.4.

**2-14.5 PAYMENT**

All costs for the work required for trimming and cleanup shall be incidental to the various Bid items comprising the Work and no separate or additional payment will be made.

Payment for safety systems related to ditch and channel cleanup will be as specified in Section 2-07.5.

**SECTION 2-15 CONSTRUCTION GEOTEXTILE****2-15.1 DESCRIPTION**

Section 2-15 describes work consisting of furnishing and placing construction geotextile as indicated in the Contract.

**2-15.2 MATERIALS**

Materials shall meet the requirements of the following Section:

Construction Geotextile	9-37
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Geotextile roll identification, storage, and handling shall comply with ASTM D 4873. During periods of shipment and storage, the geotextile shall be stored off the ground. The geotextile shall be covered at all times during shipment and storage such that it is fully protected from ultraviolet radiation including sunlight, site construction damage, precipitation, chemicals that are strong acids or strong bases, flames including welding sparks, temperatures in excess of 160 °F, and any other environmental condition that may damage the physical property values of the geotextile.

Geotextile required for underground drainage shall be "Moderate Survivability" and "Drainage Class C" and geotextile for permanent erosion control shall be "High Survivability" and "Drainage Class C".

**2-15.3 CONSTRUCTION REQUIREMENTS****2-15.3(1) GENERAL**

The area to be covered by the geotextile shall be graded to a smooth, uniform condition free from ruts, potholes, and protruding objects such as rocks or sticks. The geotextile shall be spread immediately ahead of the covering operation. The geotextile shall not be left exposed to sunlight during installation for a total of more than 14 calendar days. The geotextile shall be laid smooth without excessive wrinkles. Under no circumstances shall the geotextile be dragged through mud or over sharp objects which could damage the geotextile. The cover material shall be placed on the geotextile such that the minimum initial lift thickness required remains between the equipment tires or tracks and the geotextile at all times. Construction vehicles on the first lift above the geotextile will not be permitted.

Soil piles or the manufacturer's recommended method, shall be used as needed to hold the geotextile in place until the specified cover material is placed.

Should the geotextile be torn, punctured, or the overlaps or sewn joints disturbed, as evidenced by visible geotextile damage, subgrade pumping, intrusion, or roadbed distortion, the backfill around the damaged or displaced area shall be removed and the damaged area repaired or replaced by the Contractor at no expense to the Owner. The repair shall consist of a patch of the same type of geotextile placed over the damaged area by the minimum required overlap for the application.

If geotextile seams are to be sewn in the field or at the factory, the seams shall consist of one row of stitching unless the geotextile where the seam is to be sewn does not have a selvage edge. If a selvage edge is not present, the seams shall consist of two parallel rows of stitching, or shall consist of a J-seam, Type SSn-1, using a single row of stitching. The two rows of stitching shall be 1.0 inch apart with a tolerance of plus or minus 0.5 inch and shall not cross except for restitching. The stitching shall be a lock-type stitch. The minimum seam allowance, i.e., the minimum distance from the geotextile edge to the stitch line nearest to that edge, shall be 1-1/2 inches if a flat or prayer seam, Type Ssa-2, is used. The minimum seam allowance for all other seam types shall be 1.0 inch. The seam, stitch type, and the equipment used to perform the stitching shall be as recommended by the manufacturer of the geotextile and as approved by the Engineer.

The seams shall be sewn in such a manner that the seam can be inspected readily by the Engineer or a representative. The seam strength will be tested and shall meet the requirements stated herein.

**2-15.3(2) UNDERGROUND DRAINAGE**

See Section 7-01.2 and 7-01.3(2) for geotextile type and construction requirement for subsurface drain pipe.

Trench walls shall be smooth and stable. The geotextile shall be placed in a manner which ensures intimate contact between the soil and the geotextile (i.e., no voids, folds, or wrinkles).

The geotextile shall either be overlapped a minimum of 12 inches at all longitudinal and transverse joints, or the geotextile joints shall be sewn for medium survivability drainage applications. In those cases where the trench width is less than 12 inches, the minimum overlap shall be the trench width.

In moderate survivability geotextile underdrain applications, the minimum overlap shall be 12 inches, or the geotextile joints shall be sewn, except where the geotextile is used in area drains. An area drain is defined as a geotextile layer placed over or under a horizontal to moderately sloping layer of drainage aggregate. For area drains, the geotextile shall be

overlapped a minimum of 2 feet at all longitudinal and transverse joints, or the geotextile joints shall be sewn together. The minimum initial lift thickness over the geotextile in the area drain shall be 12 inches.

In all cases, the upstream geotextile sheet shall overlap the next downstream sheet.

### **2-15.3(3) SEPARATION**

The geotextile shall either be overlapped a minimum of 2 feet at all longitudinal and transverse joints, or the geotextile joints shall be sewn together. The initial lift thickness shall be 6 inches or more.

### **2-15.3(4) SOIL STABILIZATION**

The geotextile shall either be overlapped a minimum of 2 feet at all longitudinal and transverse joints, or the geotextile shall be sewn together. The initial lift thickness shall be 12 inches or more. Compaction of the first lift above the geotextile shall be by Method A (Section 2-11.3). No vibratory compaction will be allowed on the first lift.

### **2-15.3(5) PERMANENT EROSION CONTROL AND DITCH LINING**

Unless otherwise specified in the Contract, the geotextile shall either be overlapped a minimum of 2 feet at all longitudinal and transverse joints, or the geotextile joints shall be sewn together. If overlapped, the geotextile shall be placed so that the upstream strip of geotextile overlaps the next downstream strip. When placed on slopes, each strip shall overlap the next downhill strip.

Placement of aggregate and riprap or other cover material on the geotextile shall start at the toe of the slope and proceed upwards. The geotextile shall be keyed at the top and the toe of the slope as shown on the Drawings. The geotextile shall be secured to the slope, but shall be secured loosely enough so that the geotextile does not tear when the riprap or other cover material is placed on the geotextile. The geotextile shall not be keyed at the top of the slope until the riprap or other cover material is in place to the top of the slope.

All voids in the riprap or other material that allow the geotextile to be visible shall be backfilled with quarry spalls or filter material as designated in the Contract, so that the geotextile is completely covered. When an aggregate cushion between the geotextile and the riprap or other cover material is required, it shall have a minimum thickness of 12 inches.

An aggregate cushion shall be placed on the geotextile when hand placed riprap or sack riprap is specified.

Grading of slopes after placement of the riprap or other cover Material will not be allowed if grading results in stone movement directly on the geotextile. Under no circumstances shall stones with a weight of more than 100 pounds be allowed to roll downslope. Stones shall not be dropped from a height greater than 3 feet above the geotextile surface if an aggregate cushion is present, or 1 foot if an aggregate cushion is not present. Lower drop heights may be required if geotextile damage from the stones is evident, as determined by the Engineer. If the geotextile is placed on slopes steeper than 2H:1V, the stones shall be placed on the slope without free-fall for moderate survivability, high survivability, and ditch lining geotextiles.

### **2-15.3(6) TEMPORARY SILT FENCES**

See Section 8-01.3(10).

## **2-15.4 MEASUREMENT**

Bid items of Work completed pursuant to the Contract will be measured as provided in Section 1-09.1, Measurement of Quantities, unless otherwise provided for by individual measurement paragraphs herein this Section.

Construction geotextile, with the exception of temporary silt fence geotextile and underground drainage geotextile used in trench drains, will be measured by the square yard for the ground surface area actually covered. No additional measurement will be made for overlap.

Underground drainage geotextile used in trench drains will be measured by the square yard for the perimeter of drain actually covered. No additional measurement will be made for overlap.

## **2-15.5 PAYMENT**

Compensation for the cost necessary to complete the work described in Section 2-15 will be made at the Bid item prices Bid only for the Bid items listed or referenced as follows:

1. "Construction Geotextile for Underground Drainage", per square yard.
2. "Construction Geotextile for Separation", per square yard.
3. "Construction Geotextile for Soil Stabilization", per square yard.
4. "Construction Geotextile for Permanent Erosion Control", per square yard.
5. "Construction Geotextile for Ditch Lining", per square yard.

The Bid item prices for "Construction Geotextile (Use)" shall include all costs for the work required to furnish, install, maintain, and remove the geotextile for the use as specified.

### **6. Other payment information.**

Additional geotextile ordered by the Engineer will be addressed in accordance with Section 1-04.4.

**SECTION 2-16 DIRECTIONAL DRILLING (PREVIOUSLY PUBLISHED AS SECTION 7-22)****2-16.1 GENERAL**

For underground construction or trenchless construction other than directional drilling, see Section 7-17.3(2)J.

Directional drilling is an underground excavation method using a steerable system for installing pipe, conduit and cable using a surface launched drill rig. A fluid-filled pilot bore is drilled using a fluid-driven motor, and the bore is then enlarged by pre-reaming when necessary, and back reaming to the size required for product pipe installation. The drill head steers the pilot boring. The location, depth, and dimension of existing underground facilities, including appurtenances as may exist, within and near the proposed bore path are identified and located, and the bore path alignment and profile through these underground facilities is planned. The location and depth of the drill head following this planned bore path is monitored and known at all times. Notifications and coordination with others whose underground facilities exist along the bore path are pre-arranged and timely made.

**2-16.2 MATERIALS**

Product pipe, and casing pipe when required, shall be as specified in the Contract.

The tensile strength of product pipe joints, and of casing pipe joints when casing is required or proposed, shall be of sufficient strength to withstand installation stresses and frictional resistances for the size, length, and curvature of the bore.

**2-16.3 CONSTRUCTION REQUIREMENTS****2-16.3(1) EXPERIENCE AND QUALIFICATIONS**

See the submittal requirement of Section 2-16.3(6)B.

In addition to requirements listed elsewhere in the Contract, the directional drilling crew, whether Contractor or Subcontractor, shall have acceptable training; operational experience; a thorough understanding and working knowledge of all functions of the drilling operation; the ability to promptly identify and correct anything out of the ordinary when it becomes obvious; experience in coordinating drilling operations with facility owners whose facilities may be near or along the bore path; and knowledge of all legal and regulatory requirements that apply to the entire drilling operation.

Acceptable experience shall be interpreted as the operator, and the locator tracking the drill head, each having no less than three (3) full years current directional drilling experience including working knowledge of any industry upgrades related to directional drilling. The crew shall have in-place a coordinated communications system and method of operations to, at all times, maintain control, and readily and promptly recognize and respond to problems.

The drilling Contractor or Subcontractor shall have written guidelines and procedures defining all crew members duties and responsibilities including procedure for identifying and avoiding "strikes" on any type underground facility including appurtenance. Such procedure may include a description of partnering with owners of underground facilities to prevent underground "strikes".

Acceptable training shall be interpreted as the following:

1. In possession of and following the "Horizontal Directional Drilling Good Practices Manual" as developed by a consortium of six (6) industry associations including the North American Society for Trenchless Technology (NASTT), or having and practicing directional drilling guidelines as developed by a consortium of designated and recognized industry organizations having expertise in horizontal directional drilling, drilling equipment, Supplies associated with drilling, and as may be applicable to directional drilling.
2. Attendance at seminars, meetings, and training sessions specific to, or including directional drilling.

The Contract may require additional evidence of experience be provided where drilling is required in sensitive areas (such as but not limited to critical habitat area with threatened or endangered species, wetland, under a river or stream, etc.); where existing underground infrastructure is dense or critical; and as may apply.

**2-16.3(2) DRILLING EQUIPMENT**

All drilling equipment, whether direct or supporting, shall be well maintained, kept reasonably clean, and have fresh oil, good working parts and packings. Hoses and hose connectors shall be in good working order and have no flaws, and hose connections shall be as recommended by the manufacturer. Flow meters and pressure reading gauges shall be calibrated in accordance with manufacturer's recommendations.

The drilling Contractor or Subcontractor shall have a preventative maintenance program in-place. Such a program shall address regular inspecting and maintaining the drill head, drill frame, engine, hydraulic system, drilling fluid pump, drill pipe and downhole tools, and walk-over tracking system. The drilling Contractor or Subcontractor shall also have a maintenance log showing dates and types of maintenance for the various components. This log shall also show repairs, if and when needed, which equipment part or parts were repaired, what the repair consisted of, and when the repair occurred.

A competent crew member shall inspect and verify each segment of drill string as structurally sound with no cracks, no excessive wear, continuous threads, and no flaws whatsoever before incorporating for use in the drilling operation. Defective drill string will not be allowed and will be considered unauthorized work.

The drilling Contractor or Subcontractor shall be qualified to perform necessary and reliable equipment operation and inspection including the reliability of the drill head locating system. The driller shall also be qualified or have ready access to qualified expertise as may be necessary, in maintaining and repairing the equipment.

**2-16.3(3) PROPOSED BORE PATH - PREPARATORY REQUIREMENTS****2-16.3(3)A GENERAL**

Before any directional drilling activity begins, the Contractor shall make preparatory measures as applicable and as described in Section 2-16.3(3) and as may be specified in the Contract.

The proposed bore path alignment and profile shall be shown on a plan and profile Shop Drawing including showing drill head and drill string clearances from all identified underground facilities (see Section 2-16.3(20) re: As-Built Drawings).

**2-16.3(3)B EXISTING UNDERGROUND FACILITIES**

The Contract will identify along and near the proposed bore path, the plan and profile locations of known existing underground facilities and their appurtenances, and other underground features and improvements as they relate to the proposed bore path.

When the Contract specifies a minimum depth of bore and indicates the proposed bore path is below existing underground facilities identified in the Contract, such information provided in the Contract will also identify locations, dimensions, depths, and lengths of permanent ground anchors and deadman systems as may exist.

**2-16.3(3)C ONE NUMBER LOCATOR SERVICE – ADDITIONAL REQUIREMENTS**

In addition to the requirements of Section 1-07.17, the excavator in its notification to One Number Locator Service, shall provide the following information:

1. the type of excavation is directional drilling,
2. a brief description of the proposed bore path location full length, including its start and finish locations, and range of proposed depths of bore,
3. that the proposed bore path will be adequately surface marked its entire length to aid One Number Locator Service utility locators, and
4. as may be applicable, request "marking" of service laterals and appurtenance, as may be near or along the proposed bore path.

Before notifying One Number Locator Service, the proposed borepath shall be surface marked at regular and frequent intervals unless surface features require increasing or decreasing an interval spacing. These surface markings shall be in accordance with the APWA Uniform Color Code. In areas where surface markings cannot be accommodated or may not be allowed, stakes shall be used and the excavator shall alert One Number Locator Service of such staking.

**2-16.3(3)D EXPOSING EXISTING UNDERGROUND FACILITIES**

The Contractor shall be prepared to expose underground facilities along the proposed bore path, if the location and depth of facility is indicated near the proposed bore path as can reasonably be done. Such exposure may include a sufficiently sized excavation to allow adequate visual inspection of the underground facility and its environment including the determination of the utility's depth, dimensions, type bedding, appurtenances, and foundation support.

In addition, the Contractor shall be prepared to expose any portion of select underground facilities to a dimension to accommodate examination for damage as law may require.

Such exposure may be required in advance of the drill head reaching the vicinity of the facility such that the drill head can be visually verified complying with a specified clearance.

**2-16.3(3)E UNDERGROUND FACILITIES – NO DEPTH INFORMATION OR UNLOCATABLE**

For identified but unlocatable underground facilities, and where a facilities depth or its dimensions or appurtenances associated with the facility are unknown, the Contractor shall request the facility owner to provide the best available information.

Where an underground facility is identified and its depth or its dimension or appurtenances associated with the facility are unknown, the Contractor shall request the facility owner to provide the best available information.

The Contractor shall be prepared to expose by excavation, such facilities to verify as needed, location, depth, dimension of facility, appurtenance as may exist, and any bedding rigid and otherwise as they relate to the proposed bore path.

**2-16.3(3)F SERVICE LATERAL CONSIDERATIONS**

The Contractor shall be aware that an owner of underground facilities is not required to indicate the presence of existing service laterals or appurtenances if the presence of existing service laterals or appurtenances on the site of the construction project can be determined from the presence of other visible facilities, such as buildings, maintenance holes, or meter and junction boxes on or adjacent to the construction site.

The Contract will show the existence of service laterals known to exist by the Engineer at the Project Site.

Proposed directional drilling shall require that identified service lateral facilities be visually identified if near the bore path (see Section 2-16.3(3)C).

The Contract may require advance notification and coordination with public and private underground facility owners with service laterals in the vicinity of proposed bores. In addition, underground facility owners may also require the excavator provide advance notification, coordination, and exposure of facility.



**2-16.3(3)G SELECT UNDERGROUND FACILITIES – SPECIAL REQUIREMENTS**

Unless the Contract specifies otherwise, in preparing for drilling and when advancing the drill head, it may be necessary that the following underground facilities, and appurtenance as may apply, be adequately exposed to verify the drill head safely clears the underground facility. These exposure locations shall be in alignment with the proposed borepath or advancing drill head. In addition, other underground facility owners may also request this exposure. Such exposure may also apply to service laterals.

Clearance requirements listed in this Specification may be greater than those listed in Section 1-07.17(2) and if such be the case, these listed clearances shall take precedence. If no clearance is specified in this Specification, the clearances specified in Section 1-07.17(2) shall apply.

Select underground facilities that may require such visual verification include, but not limited to, the following:

1. Seattle City Light electrical transmission and distribution facilities: No directional drilling will be allowed within the clearance limits of a Seattle City Light underground electrical facility as specified in Section 1-07.17(2) unless SCL has pre-approved such in writing. Should drilling be within or have the appearance of possibly being within said clearance, the Contractor shall make the notification required in Section 1-07.28 item 8C at least 10 Working Days in advance of entering said clearance. Unless the Contract specifies otherwise, the Engineer may require an Electrical Safety Observer be present when the drill head is within said clearance (see Section 1-05.2(2)).
2. Fiber optic and other communications facilities: Owners of fiber optic and other communication underground facilities will specify any clearance, notification, and other requirement when such facilities exist at the Project Site. Such communication facilities also include data transmission and control systems that may exist as appurtenance associated with pump stations, electrical stations, Water Main valves, and other type facilities.
3. Gas facilities: Other than "pipeline" or "pipeline system", the owner of underground gas facilities may specify clearance, notification, and other requirements regarding their facilities at the Project Site. Also see Sections 1-07.17(1), 1-07.17(2)D and 1-07.28 item 18 for Puget Sound Energy gas facility clearances and notifications, respectively.
4. MetroKC Sewer and Storm Drain: MetroKC will specify any clearance, notification, and other construction requirement when MetroKC Storm Drain, or Sewer exist at the Project Site.
5. "Pipeline" or "pipeline system": The Contractor shall comply with Ch 19.122 RCW.
6. Water Main: Clearance from Water Main, appurtenance, and surrounding bedding shall be a minimum three (3) feet beyond the neatline dimensions as indicated on the 300 series Standard Plans.
7. Underground ground support systems: Ground support systems and deadman anchor systems may exist within the Project Site and may be in the vicinity of a proposed bore path. Such ground support systems may be tiebacks, ground anchors, soil nails, deadperson systems, and other similar type systems. Such ground support systems are used for permanent and for temporary purposes, and may be loaded or unloaded. The Contractor shall plan the bore path to avoid such ground support systems. Permanent ground support systems known by the Owner to exist at the Project Site will be shown in the Contract.

The Contract may specify clearances, notifications, and other requirements for other underground facilities not listed above.

The Contractor shall also be prepared to accommodate any request of the owner of an underground facility the Contract does not address where the proposed or actual bore path crosses or is within a clearance as defined by that facility owner. When such happens, the Contractor shall promptly notify the Engineer.

**2-16.3(3)H VERIFICATION OF FACILITIES - EXISTING AND AS INDICATED IN THE CONTRACT**

In preparing a drilling bore path alignment and profile, the Contractor shall verify and compare the as indicated in the Contract underground facility locations, depths, dimensions, and appurtenances, with the actual facility locations, depths, dimensions, and appurtenances, and with the proposed bore path alignment and profile.

Where conflict is indicated, such conflict shall be resolved before drilling can begin.

**2-16.3(4) PROGRESS SCHEDULE CONSIDERATION**

The Contractor's Progress Schedule shall take into consideration the two (2) phases of directional drilling as follows:

- |         |  |
|---------|--|
| Phase 1 | This preparatory phase shall accommodate exploration and discovery, and may require possible suspension for this portion of Work, or suspension of the Work to address a safe and coordinated, drilling operation and bore path alignment and profile, and |
| Phase 2 | The actual drilling operation.   |

Drilling shall be completed in one continuous and uninterrupted operation, unless conditions arise that require interruption. Such conditions include, but are not limited to, health and safety, damage or the potential for damage, environment, permit, and "frac outs".

**2-16.3(5) ACTIVE AND PASSIVE INTERFERENCES AND DRILLING EQUIPMENT**

In preparing for the drilling, the Contractor shall "walk the proposed bore path" with locating equipment as it relates to tracking the drill head, and shall identify areas of active interferences and passive interferences that may impact location readings of the drill head by the Contractor's locating equipment.

Such interference areas shall be identified on the proposed bore path alignment and profile Shop Drawing.

The Contractor shall be prepared to discuss how the actual drill head location, depth, and direction shall be determined, and be kept on the proposed alignment and along the proposed profile where such interferences exist.

The Contractor locator shall "locate" the drill head in all indicated interference areas and shall record the readings in the Daily Log and as-Built Drawings.

**2-16.3(6) SUBMITTAL**

**2-16.3(6)A GENERAL**

Unless the Contract specifies otherwise, the submittal on Qualifications shall be returned from the Engineer to the Contractor (Section 2-16.3(6)B), before the Contractor submits the Preparations Required Before Beginning Drilling (Section 2-16.3(6)C). (NOTE – the Qualifications Submittal may be required as part of the pre-award information process (Section 1-03.1(4) and shall not be a substitute for this submittal requirement.)

**2-16.3(6)B SUBMITTAL – QUALIFICATIONS**

At least 10 Working Days in advance of beginning preparatory requirements, the Contractor shall submit information describing qualifications of crew, equipment, and drill head tracking, as follows:

1. Identify the directional drilling crew members including operator and locator, and mudperson as may apply, and include a description of directional drilling experience, training, and qualifications to perform a safe and acceptable installation. Unless the Contract specifies otherwise, a list of the most recent three (3) directional drilling projects for these crew members shall be included showing:
  - 1) each project's name and total price paid by the project owner for the drilling;
  - 2) the project owner, an owner contact person knowledgeable of the drilling, current contact phone number, and e-mail address;
  - 3) type and size of pipe installed, and if casing used, size and type of casing including annular space filler if used;
  - 4) length and range of depths of bore, and if any curvature in the bore path, why and what were the circumstances;
  - 5) site conditions for each project including underground infrastructure density and types, active and passive interferences and how dealt with, groundwater and controls, and a description of drill head depth and location verification procedure as it related to the proposed bore path alignment and profile;
  - 6) any specific constraints required of the drilling, such as drilling on a slope or in a critical habitat area or under a body of water or in a very dense underground infrastructure environment or near critical underground infrastructure, and how addressed; and
  - 7) problems encountered including whether they were identified before the drilling began or were encountered during the drilling, and how resolved.

In particular, 1 of these projects shall be similar to site conditions and contractual constraints similar for this project to assist the Engineer in evaluating qualifications.

2. List and describe the equipment and Supplies as they relate to the directional drilling. The submittal shall indicate that all equipment is safe, fully operational, maintained as recommended by the equipment manufacturer, and is in a condition to acceptably and safely perform the drilling. Describe how the operator maintains control of the drill head and how the operator knows the condition and status of all associated with the drill head to maintain the proposed bore path alignment and profile. The submittal shall include the manufacturer, make, model, and year purchased for the drill rig, and parts thereof if not of the same manufacturer. The submittal shall also include the drilling equipment manufacturer's recommended as well as the actual maintenance and repair program.
3. Describe the "locate" equipment and procedure used by the locator to track the drill head. Describe how the Contractor ensures the "located" drill head location and depth readings match the actual location and depths in areas of passive interference, in areas of active interference, and in non-interference areas. Describe equipment or portion of equipment used by the operator to know the location, depth and attitude of the drill head, and how the drill head's projected bore path relates to avoiding identified underground facilities including clearances and appurtenances as may apply. Describe the type and strength of battery used in the drill head, the calibration of drill head transmitter with Contractor locator receiver, and how the Contractor evaluates these needs for Project Site conditions and proposed bore.

**2-16.3(6)C SUBMITTAL - PREPARATIONS REQUIRED BEFORE BEGINNING DRILLING**

After the Engineer returns the qualifications submittal to the Contractor without requiring resubmittal, and before beginning drilling, the Contractor shall submit to the Engineer at least 10 Working Days in advance, the following information indicating a well-planned and safe drilling operation:

- 1) A plan and profile Shop Drawing of the proposed bore path alignment and profile full length showing all existing underground facilities as they relate to the drilling including appurtenance as may exist, clearances as may be required, areas of active and passive interference, locations of launch and receiving locations or pits, and safe working zone.  
Also see Section 2-16.3(20)C for As-Built Drawing requirements.
- 2) In areas of active and passive interference, explain how these interferences may impact knowing where the drill head is, where the drill head is going, what the attitude of the drill head is, the degree of uncertainty, and

- explain how the Contractor intends to compensate for these interferences and uncertainty ensuring the drill head follows the proposed bore path alignment and profile.
- 3) Describe the bend radius Capability and limitations of the drilling equipment, including drill head, drill string, product pipe, casing if required, product pipe joints, and drill string joints. Also describe how the Contractor ensures stresses at pipe joints do not exceed joint strengths recommended by the drill string and product pipe manufacturer.
  - 4) List all underground facilities' owners where notification, coordination, and uncovering arrangements have been arranged including who the contact is, how contact is made, and any pre-arranged requests of these owners.
  - 5) Describe the drilling mud and component parts, and in particular, how monitor the mud quality, filter the mud, and how adjust the mud for filter cake and gel strength needs as the drill head advances and mud conditions indicate.
  - 6) Describe the controls to prevent environmental pollution, to stay within environmental constraints where specified in the Contract (such as drilling under bodies of water or in wetlands or in critical habitat area or other area as defined in SMC 25.05.098, etc.), and how containment of drill waste is proposed in the launch and receiving locations or pits. If groundwater is indicated and may exit at the launch or receiving areas, describe proposed treatment facilities and how discharge.
  - 7) Describe controls to maintain safe working conditions and conditions safe where the public may be at risk, such as at the launch location and receiving location.
  - 8) If drilling on a slope, see Section 2-16.3(17).
  - 9) Provide MSDS for all Supplies and materials as may be used.
  - 10) If the proposed bore path is deep to avoid underground utilities, describe and show the locations of permanent ground support systems, underpinnings, and deadman systems, and how the proposed bore path does not interfere with or damage such ground support systems.
  - 11) Provide copies of all permits required and obtained for the drilling operation if not required by other Specifications.

No drilling will be allowed until the Engineer has reviewed and has returned this submittal, with no requirement for resubmittal.

#### **2-16.3(7) SUBMITTAL – REQUIRED AFTER COMPLETION OF DRILLING**

Within 5 Working Days of completing the installation of product pipe in the bore, the Contractor shall submit a copy of the Daily Log and As-Built Drawing as specified in Section 2-16.3(20).

#### **2-16.3(8) PRE-DRILL MEETING AND OTHER MEETINGS**

Before the Contractor begins directional drilling, and on each day of directional drilling as may apply, a pre-drill meeting shall be held with the Contractor, drill operator and locator, and the Engineer. Such meeting may include the briefing/tailgate conference with the Electrical Safety Observer as specified in Section 1-05.2(2), and may include other utility owners.

The intent of the meeting is to verbally walk through the proposed bore path and drilling operation; notifications and coordinations; location specific controls and monitoring; open communication channels between the driller, Contractor and Engineer; required entries to the Daily Log and updating of the As-Built Drawings; ensuring the drilling is conducted safely and is under control; that the actual drilling alignment and profile matches the proposed submitted bore path alignment and profile; as the Engineer may determine; and as the Contractor may need to be made known.

#### **2-16.3(9) MONITORING THE BORE**

The Contractor shall verify to the Engineer that the Contractor's directional drilling results in the following:

1. the actual bore path of the drill head follows the proposed bore path in both alignment and profile, and
2. the indicated readings of depth and location of the drill head by the Contractor's locator match the actual location and depth of the drill head as verified by exploratory or other type excavation, and
3. all underground facilities are identified and that there locations are confirmed, and the bore path indicates clearances with all underground facilities.

Unless the Contract specifies otherwise, the Contractor shall within the first 50 feet of the launch location or pit and at additional locations determined by the Engineer, make a surface locate reading of the drill head location and depth, and shall then mark the surface directly over the indicated drill head location with the read location and read depth.

At locations of active interference and at locations of passive interference, the Contractor shall make surface readings of the drill head location and depth, and shall then mark the surface directly over the indicated drill head with the locator indicated location and depth.

At any time and at any location, the Engineer may require the Contractor to locate the drill head and read its depth, and mark the surface as described in the previous two paragraphs.

At any of these drill head reading locations and as the depth of the drill head may allow, the Engineer may require the Contractor to provide exploratory or other type excavation in advance of the drill head to enable visual verification of the drill head passing through the excavation including verifying drill head depth.

Should a discrepancy be identified including, but not limited to:

- 1) the indicated reading of the location or the depth of the drill head differing from the proposed bore path alignment or proposed profile.
- 2) the indicated reading of the drill head's location or depth differ from the actual visual verification of drill head location or depth,

then such a situation may be considered defective work or unauthorized work.

Directional drilling discrepancy that reasonably appears to potentially create an unacceptable condition, including, but not limited to:

- (1) an unsafe or potentially unsafe condition, or
- (2) that may result in damage or the potential for damage, or
- (3) that may be in violation of law, regulation, code, or other condition of the Contract,

may be cause for the Engineer to order the drilling operation be stopped in its entirety.

When such a condition occurs, the Contractor shall submit a remedy that addresses, as applicable:

- a. controls or adjustment of controls that indicate the drill head shall proceed with the attitude of staying on the proposed alignment and profile,
- b. correction of the current drill head attitude to return the drill head to the proposed alignment and profile,
- c. controls or adjustments to locating and tracking equipment ensuring locator indicated drill head location and depth actually match actual drill head location and depth,
- d. if the difference in actual location or depth of the drill head and the proposed alignment and depth of the drill head is significant, and underground facilities are indicated near or in the path of the advancing drill head, then the Contractor may be allowed to propose a corrected bore path alignment and profile from its existing location to return to the submitted bore path alignment and profile, and shall indicate both where that return location shall be and that the attitude of the drill head at the proposed return location is aligned with the proposed bore path alignment and profile. Such remedy may require additional applicable preparatory work as may be necessary in accordance with Section 2-16.3(3) ensuring clearance with all underground facilities.
- e. if the difference in actual location or depth of the drill head and the proposed alignment and depth of the drill head is significant, and underground facilities are indicated near or in the path of the advancing drill head, then the Contractor may be allowed to propose pullback and redrill. See Section 2-16.3(21).

The Contractor may resume drilling after the Engineer returns the proposed remedy without requiring resubmittal.

Should the Contractor not be able to restart drilling, this will be considered defective work.

All Contractor located drill head location and depth readings, and actual visually verified depth and location readings, shall be shown on the plan and profile Shop Drawing as it relates to the proposed bore path, and shall be recorded in the Daily Log.

As necessary and where necessary, the Contractor shall also "step outside the proposed bore path" to aid in making more accurate locate readings of actual depth and actual location of the drill head where interferences exist.

#### **2-16.3(10) LOCATE TRACKING SYSTEM**

The drill head locate system shall be of the strength and type for tracking with the greatest confidence, the drill head following the intended bore path alignment and profile including providing readings in areas of indicated active and passive interferences. The batteries in the transmitter and receiver shall be fresh, and shall be of the strength and type required for the conditions expected of the proposed bore path and Project Site conditions. The transmitter at the drill head shall be adequately calibrated with the receiver to overcome indicated interferences including obtaining readings that may be required on either side of the bore path where such information increases confidence of the readings.

At the beginning of each shift, and at the beginning of each day, the tracking and locating equipment shall be calibrated.

Locator readings, exploratory and other type excavation verification, and the status of batteries and locating equipment including any repair shall be recorded in the Daily Log and on the As-Built Drawings as applicable (see Section 2-16.3(20)).

#### **2-16.3(11) LAUNCH AND RECEIVING LOCATIONS AND PITS**

Unless the Contract specifies otherwise, the Contractor shall select the locations of the launch (entry) and the receiving (exit) locations best suited for all necessary for the directional drilling operation. Such entry and exit locations may be pits or excavations. As necessary and where necessary, such locations shall include adjacent area for safe working zone (Section 2-16.3(19)); support, staging, and related needs; bend radius considerations (Section 2-16.3(13)); bore path alignment and profile and clearances with existing underground infrastructure (Section 2-16.3(3)); depth of the launch pit and the receiving pit to allow for entry and exit angles; entry and exit pipe elevation; containment of drill waste (spoils), groundwater treatment and discharge, and as may be identified for safe and acceptable performance.

#### **2-16.3(12) MATCH SITE CONDITIONS**

The Contractor shall match the drill equipment and Supplies to the soils and Project Site conditions.

#### **2-16.3(13) BEND RADIUS**

The Contractor shall take into consideration the allowable bend radius capabilities of drill string, product pipe, casing pipe when applicable, and the drilling equipment. Bending at any joint of drill string or any pipe shall be within that product manufacturer's recommended tolerances.

These bend radius considerations shall be taken into consideration in proposing the bore path alignment and profile including expected directional adjustments along bore path. The allowable bend radius of product pipe, of casing pipe when applicable, of drill string, and of drill equipment shall be compatible and shall not present a condition for overstressing pipe, joint, casing when applicable, drill string, and equipment.

#### **2-16.3(14) PRERREAMING AND BACK REAMING**

Prereaming may be necessary to incrementally enlarge a pilot bore to a size to accommodate acceptable product pipe installation. Backreaming enlargement of the bore hole shall allow for minimizing frictional resistance during installation of the product pipe, and for allowing removal of spoils while installing the product pipe. Pipe joint tensile and bend strengths shall not be exceeded during product pipe installation.

#### **2-16.3(15) DRILLING MUD**

For the drilling mud, the Contractor shall maintain and adjust "filter cake" and "gel strength" needs; shall have adequate monitoring equipment and Supplies in-place to clean mud for re-use; shall amend mud with additives as progress and conditions dictate; and shall maintain adequate quantity of mud as the bore progresses and as the mud quality indicates.

The Contractor shall continuously monitor mud quality and spoils content as they relate to "filter caking" and "gel strength".

When excessive spoils content in the mud is indicated for a relatively short length of bore progress, the Contractor shall note such in the daily log including the location and depth of the drill head when such condition is noticed, any underground facilities that are near or over or under the drill head, the type spoils or description of spoils to indicate the material being "lost", and the date and time of day this occurs. The Contractor shall also immediately notify the Engineer of this condition and shall be prepared to stop the drilling if a condition exists where an excessive loss of soil may have detrimental impacts to surface or other underground improvements. The Contractor shall confirm that excessive loss of soil is not occurring and is not adversely impacting any existing facility or improvement.

The Contractor shall identify locations of "frac outs" or "uncontrollable loss of mud" along the bore path as they are indicated. This information shall be entered into daily log and shall include location of drill head, depth of drill head; time of day; date; estimated amount of lost mud; and if a surface loss, how contained and cleaned up.

#### **2-16.3(16) ENVIRONMENTAL CONTROL**

The Contractor shall employ environmental controls in containing and handling spoils, mud, waste, additives, and other pollutants of any kind that are in compliance with law, code, regulation, and as may be required in the Contract.

The Contractor shall also have on-call and shall be able to respond within very short notice, a vector truck with a minimum two (2) cubic yard storage capacity and with adequate ability to extract, any drill waste or mud that may appear at any location at any time, such as a "frac out". Other Supplies that absorb and contain mud and as may be associated with the drilling shall be readily available. Also see Section 1-07.5 for required environmental controls.

The Contract may specify additional constraints when proposed drilling is within environmentally critical areas, critical habitat areas, other sensitive areas, and as required by permit.

#### **2-16.3(17) SLOPE DRILLING AND SUBMITTAL REQUIREMENTS**

When drilling on slopes, and in particular on landslide prone slopes, the Contractor shall have controls in-place to control the flow and release of groundwater and any resulting buildup of hydraulic head, the flow and release of drilling mud and any resulting buildup of hydraulic head, and the influence and control of vibrations resulting from any part of the directional drilling operation and product pipe installation.

The Contractor shall promptly cease drilling and shall promptly alert the Engineer of any condition where excessive groundwater is indicated and where the stability of the slope or any part of the slope may become questionable.

Unless the Contract specifies otherwise, prior to the start of any directional drilling on any slope, the Contractor shall include in its submittal to the Engineer, a detailed drawing and a description of controls of how the Contractor proposes to drill on the slope. The following shall be addressed in this submittal as may apply:

- 1) Direction of drilling all pilot holes, any pre-reaming, and the backreaming – upslope, downslope, or crossing the slope;
- 2) The control of drilling mud and groundwater hydraulic head build-up including how prevent the potential for sudden loss of fluid on the slope;
- 3) The influence of vibrations generated by any part of the directional drilling operations on the stability of the slope or parts of the slope including minimizing adverse impacts of vibrations;
- 4) Installation of any temporary subsurface drain to assist in the relief of hydraulic build-up;
- 5) If drilling uphill, installation of any controlled outlet at the launch location or pit that captures and controls groundwater and drilling mud that may follow the drill string, any required treatment and how discharge;
- 6) If drilling uphill, how lubricate the drill head;
- 7) If drilling downhill, how the build-up of hydraulic head along the drill string and at the drill head due to drilling mud and any groundwater is kept under control;
- 8) If drilling downhill, how remove spoils;
- 9) How the drill head location and depth will be tracked and verified on the proposed bore path alignment and profile, and the proposed frequency of locator tracking of the drill head;
- 10) How the Contractor shall reduce hydraulic head in any and all boring holes where pullback of the drill head has occurred and redrilling a new bore path is initiated. Also address how the abandoned bore path(s)

is(are) backfilled, how hydraulic head build-up is prevented, and how stability of the slope is not reduced. See Section 2-16.3(21).

### **2-16.3(18) PERSONAL PROTECTIVE EQUIPMENT (PPE)**

The Contractor shall comply with all applicable safety rules and standards including those recommended by designated and recognized directional drilling and trenchless technology industry organizations. All equipment shall be grounded. The operator's station shall be electrically isolated and protected. Boots, gloves and other as necessary clothing shall provide protection from potential hazards associated with directional drilling including contact with underground facilities.

### **2-16.3(19) SAFE WORKING ZONE**

The area surrounding the launch location or pit and the receiving location or pit shall be secured as a safe working area to protect the public from potential hazards associated with directional drilling.

### **2-16.3(20) DAILY LOG AND AS-BUILT DRAWING**

#### **2-16.3(20)A GENERAL**

The Contractor shall keep daily written records (a "Daily Log") of all daily progress and events, and a copy of the proposed bore path updated to reflect the actual bore path (As-Built Drawing).

The Daily Log shall be coordinated with and shall reference the As-Built Drawings, and the As-Built Drawings shall reference entries in the Daily Log where appropriate.

The Daily Log and As-Built Drawings shall be kept at the Project Site and shall be made available to the Engineer upon request.

See Section 2-16.3(7)C for submittal requirements.

#### **2-16.3(20)B DAILY LOG**

Entries to appear in the Daily Log shall be recorded as they occur, or if unable, a brief entry shall be made in the diary stating that additional explanation shall be provided at end of Working Day. Typical entries to the Daily Log shall reference entries on the As-Built Drawings as applicable and shall include, but are not limited to, the following:

1. notifications made to utility owners including date notified and a summary of any requirement made by the utility owner beyond a simple notification.
2. utility owners on-site visits including name of individual(s), phone and e-mail contact information, date, time of visit, and a summary of any requirement and observation made by the utility owner.
3. communications made by utility owners to the Contractor beyond those in items 1 and 2, and a summary of any request made by the utility owner.
4. for locations shown on the As-Built Drawings of locator tracking of the drill head and the indicated depth of drill head at that location, and if exploratory or other type excavation was used to verify location and depth of drill head, state the results. See Sections 2-16.3(9) and 2-16.3(10).  
If in an area of active or passive interference, so state which interference and describe additional measures used to verify locator indicated drill head location and depth. See Section 2-16.3(5).
5. for As-Built Drawings showing exploratory and other type excavation's location and depth not addressed in preceding item 4, include a description of the purpose of the excavation and state the findings. Reference the As-Built Drawings where exploratory or other type excavation was used or was required to verify drill head clearance with underground facility, and state results including identifying which underground facility.
6. describe mud status including changes in, adjustments made to mud content or quality, and reasons for adjustment. State the distance of the drill head from the launch location or pit where adjustment to mud content was required. Also state the location of the drill head when a significant loss of mud is indicated. See Section 2-16.3(15) for Daily Log entry requirements.
7. describe daily progress made. Start with time of day beginning drilling and list how far drill head advanced at each succeeding hour. Also list time of day of drill head reaching exit location, and state the time of day for items 1, 2, 3, 4, 5, and as applicable, 6, 9, and 10 of this Specification subsection.
8. describe how groundwater that flowed into any launch or receiving location or pit, and any dewatering that may have been done, was treated including how discharged or disposed of. See Section 2-16.3(11).
9. if pullback and re-drill was performed, describe why such a condition occurred, the reasons for the revised bore path, and how the abandoned bore void was filled including description of void filling material.
10. describe pre-reaming and back-reaming as may be applicable, and the installation of product pipe. If casing was used, include this in the description, and include a description of annular space filler and how installed, if applicable.
11. other information as may be required by the Engineer (Section 2-16.3(8)), by the Contract, or as may be necessary by the Contractor for documentation purposes.

#### **2-16.3(20)C AS-BUILT DRAWINGS**

The As-Built Drawing shall be the proposed plan and profile bore path alignment and profile and shall show existing underground facilities, including their dimension, depth, any appurtenance, and proposed and required clearances.

Unless the Contract specifies otherwise, As-Built Drawings shall be Shop Drawings on 24 inch by 36 inch 20 pound bond paper. Horizontal scale shall be 1" = 20' and vertical scale shall be 1" = 10'. The Contractor may provide a continuous sheet (any length greater than 36 inch) with a 24 inch minimum width and same horizontal and vertical scales.

As the bore progresses, the following shall be shown on the As-Built Drawing as applicable:

- 1) locations of entrance and exit locations, and details of pits if used. Identify safe working zone(s), locations of equipment and Supplies, and as may be used for the drilling. See Section 2-16.3(11).
- 2) locations of locator tracking of the drill head and the indicated depth of drill head at that location, and note that the surface was marked as specified in Section 2-16.3(9). If exploratory or other excavation was used to verify locator indicated reading, show the location of the exploratory or other type excavation performed in advance of the verification reading. Reference the Daily Log entry as to status of visual verification.
- 3) locations of active and passive interference, if applicable (Section 2-16.3(5)). Show locations and depth of exploratory or other type excavations verifying locator drill head readings (Sections 2-16.3(9)) and 2-16.3(10)).
- 4) locations of underground infrastructure including depth to facility, dimension of facility, special bedding as may exist, and appurtenance associated with a facility. Clearly identify exploratory or other type excavation locations and depths as required by Section 2-16.3(3).  
Clearly identify exploratory or other type excavation locations and depths that were performed during the drilling, and reference the entry in the Daily Log, including "pipeline" and "pipeline system".
- 5) clearly label proposed bore path alignment and profile (Section 2-16.3(6)C), and actual bore path alignment and profile if different. Show entry location and exit location angles for product pipe installation including size pipe and invert elevations at entrance and exit locations.

If the actual bore path alignment or profile or both differ from as shown in the Contract or as proposed (Section 2-16.3(6)C), the Contractor shall show both actual and proposed bore paths and shall clearly identify and label each.

#### **2-16.3(21) PULLBACK AND REDRILL**

Should a condition occur that requires pull back and redrilling, before attempting any pull back and redrill, the Contractor shall submit to the Engineer, the reasons for pulling back and redrilling; a procedure for the pull back describing in detail how the resulting void shall be filled with a suitable material; and shall indicate the new bore path alignment and profile.

Should the drilling be "frozen" or a condition arise where progress cannot be made, such a condition will be considered defective work or unauthorized work.

#### **2-16.3(22) TESTING**

The Contract may specify testing of the installed pipe or conduit, such as a test specified in Section 7-17.3(4).

#### **2-16.4 MEASUREMENT**

Measurements for "Casing Pipe, (Material), (Class), (Size), (Directional Drilling)", and for "Pipe, (Material), (Class), (Size), (Directional Drilling)" will be by the linear foot of pipe and casing pipe actually installed and successfully tested. Measurement will be from end of pipe to end of pipe whether a pipe end is within a structure or not. No measurement will be made for pit whether an entry pit or an exit pit.

Measurement for "Preparation Required Before Directional Drilling" will be per lump sum.

Measurement for "Exploratory Or Other Type Excavation, (Directional Drilling)" will be per lump sum for all exploratory and other type excavation directly related to directional drilling.

#### **2-16.5 PAYMENT**

Compensation for the cost necessary to complete the work described in Section 6-02 will be made at the Bid item prices Bid only for the Bid items listed or referenced as follows:

1. **"Preparation Required Before Directional Drilling"**, per lump sum.

The Bid item price for "Preparation Required Before Directional Drilling" shall include all costs for the work necessary to perform investigatory requirements including necessary exploratory and other type excavation, and to provide preparations required to complete the information in Section 2-16.3(6)C.

2. **"Casing Pipe, (Material), (Class), (Size), (Directional Drilling)"**, per linear foot.

The Bid item price for "Casing Pipe, (Material), (Class), (Size), (Directional Drilling)", per linear foot, shall include all costs for the work required to furnish and install casing pipe. All cost for filling the annular space when required in the Contract shall be incidental to this Bid item and no separate or additional payment will be made therefore.

3. **"Pipe, (Material), (Class), (Size), (Directional Drilling)"**, per linear foot.

The Bid item price for "Pipe, (Material), (Class), (Size), (Directional Drilling)", per linear foot, shall include all costs for the work required to directional drill all required by Section 2-16 except for other Bid items in this Section.

4. **"Exploratory or Other Type Excavation, (Directional Drilling)"**, per lump sum.

The Bid item price for "Exploratory Or Other Type Excavation, (Directional Drilling)" shall include all costs for the work required to perform exploratory or other type excavation to accommodate the requirements of Section 2-16.

Payment for exploratory and other type excavation related to preparation required before directional drilling shall be included in the Bid item "Preparation Required Before Directional Drilling" and no separate or additional payment will be made therefore.

5. **Other payment information.**

Payment for all cost for the Electrical Safety Observer shall be in accordance with Section 1-05.2(2).

Payment for all cost for backfilling exploratory or other type excavations within paved areas of the Right-of-Way that are associated with directional drilling shall be incidental to the various Bid items and no additional or separate payment will be made therefore.

Payment for all costs for surface restorations associated with directional drilling shall be in accordance with the various Bid items in the Contract.

All costs for daily log shall be included in the various Bid items and no separate or additional payment will be made therefore.

All cost for submittals shall be as specified in Section 1-05.3.