Conduit Installation Specifications

GENERAL

- This specification describes the requirements for the installation of conduit for use with electric underground cables.

SITE CONDITIONS

- The ground area along the route for the conduit installation shall be clear of obstructions that may impact safety.
- Sufficient area shall be allowed for excavated material to be set back from the excavation or material shall be removed from the immediate area.
- Sufficient area shall be provided for safe and unimpeded access by workers installing the conduit.

EXCAVATION SIZE AND CLEARANCE

- The excavation shall allow for the overall dimensions of the specified conduit spacing or duct bank. When determining the dimensions, space for workers and bedding material shall be included.
- The excavation shall comply with safety standards for slope and worker access as necessary. Shoring shall be provided when required to meet safety codes or regulations.

BORING

- Drilling methods shall generally consist of drilling a pilot hole the length of the bore, followed by reaming and pullback of the pipeline. Ream borehole multiple times, as necessary. The equipment and methods used to complete the bore and install piping shall be determined by the Contractor.
- The drill staging area shall be kept neat and orderly and disturb as little area as possible. The pipe staging area shall disturb as little area as needed to accommodate workers and equipment, and to string, fuse, and inspect the pipe.
- Install all pulleys, rollers, bumpers, alignment control devices and other equipment required to support and protect the new pipe from damage during installation.
- Utilize a drilling fluid cleaning/recycling system. Entry and exit pits shall be sized and constructed to completely contain drilling fluid.

- Borehole survey instrumentation shall be used to monitor line and grade of the pilot hole. Contractor shall maintain records documenting the line and grade of the pilot hole.
- The depth of the conduit shall be identified by a stake with the depth every 10 feet along the route in unpaved areas and by the depth written in marker paint every 10 feet along the route in paved areas.
- Pilot hole shall be back-reamed to accommodate pipe. Contractor shall select the reamer size and number of passes required.
- Monitor tension forces on pipe during pullback. Do not exceed maximum stresses recommended by the pipe supplier.

TRENCHING

- Construction shall be arranged so that trenches may be left open for the shortest practical time to avoid creating a hazard to the public and to minimize the likelihood of collapse of the trench due to other construction activity, rain, accumulation of water in the trench, etc.
- All trench depths are at a minimum as measured from final grade to the top of the conduit. The routing shall be as shown on the staking sheets and drawings, unless approved by the OWNER. If rock or other difficult digging is involved, the CONTRACTOR shall determine the nature and difficulty, and the OWNER shall determine whether re-routing, rock trenching, plowing, or other changes are necessary. Loose soil or crumbly rock shall not be considered as difficult digging. The trench widths, if specified, are at a minimum and should be increased as necessary to obtain the required depth in loose soils.
- Where multiple facilities are to be installed in one trench, extra width and depth shall be provided to accommodate proper separation and allow for soil falling into the trench during the installation of the first facility.
- Care shall be exercised to minimize the likelihood of water flow since this may cause trench damage and reduction in trench depth. If water flow occurs, the trench shall be cleared to the specified depth before installing any facilities.
- All trenches shall follow straight lines between staked points to the greatest extent possible. The trenches shall be dug so that the bottom has a smooth grade. Large rocks, stones, and gravel in excess of one inch shall be removed from the bottom of the trench. Where this cannot be accomplished, bedding material shall be placed in the bottom of the trench.
- Conduit shall be installed a minimum of 42" below grade with 48" as the preferred depth, unless otherwise noted.

BEDDING MATERIAL AND PREPARATION

- Bedding material shall be sand, crushed rock less than 1.5 inches, pea gravel or, when approved by the OWNER's representative, native soil.
- Bedding material shall be installed to cover the entire bottom of the excavation to a depth of two inches and be graded level.
- Bedding material shall be graded level and compacted.

CONDUIT INSTALLATION

- Care shall be taken to ensure the conduit is not damaged during installation.
- Conduit shall be protected from site materials or water entering ends of the conduit.
- Joints shall be made in accordance with the manufacturer's specifications. Glue and adhesives shall be uniformly distributed along the surface of the conduit joint. Care shall be taken to prevent excessive glue or adhesives from being left on the interior surface of the conduit.
- Conduit shall be inserted the full length of couplers. Threaded joints shall be fully threaded onto the conduit ends.
- Spacing between conduits within the trench shall be maintained in a uniform manner.
- When parallel with or crossing other utility lines or culverts, spacing shall be maintained as specified on the drawings.

BACKFILLING

- HBefore any backfilling operations commence, the CONTRACTOR and the OWNER's representative shall jointly inspect all trenches, cable placement, risers, pedestals, and other construction that will not be accessible after backfilling, and an inventory of units shall be taken. If corrections are required, a second inspection shall be made after completion of the changes.
- Trenches shall be backfilled only after the conduit is completely assembled.
- Backfill material up to a level of six inches above the top of the largest conduit shall be free of rocks and debris larger than one inch.
- Backfill material shall be sand, pea gravel, crushed rock, or native soil when approved by the OWNER's representative.
- Backfill material shall not be saturated with water.
- Trenches shall be backfilled and compacted such that in the top 2 feet, horizontal layers shall not exceed 4 inches in depth before compaction. No layer below the top 2 feet shall exceed 8 inches in depth before compaction. See WSDOT Std Spec 2-03.3(14)C, Method C compaction.

WARNING TAPE

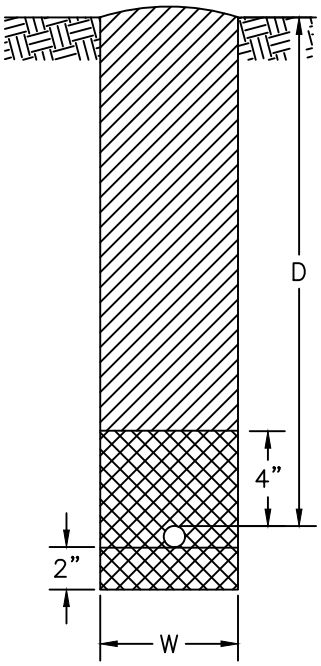
- Red warning tape, three inches wide with a locating strip, shall be installed six inches above all conduit, cable, or duct, if placed by trenching, or plowing.

PULL TAPE

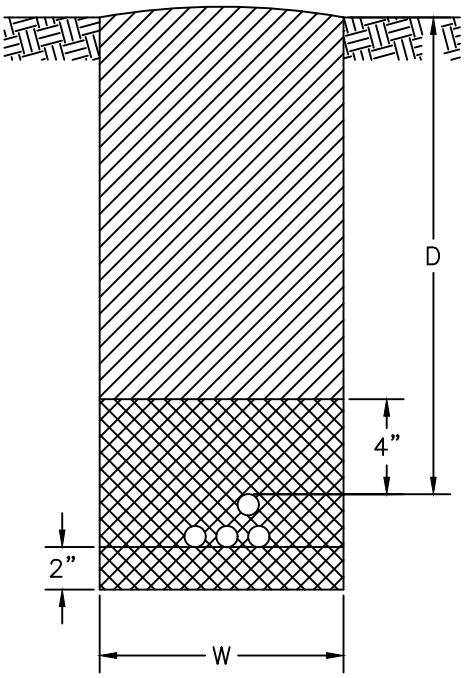
- Upon completion of the conduit installation, a pull tape shall be installed by use of compressed air and a mandrel. The integrity of the conduit must be demonstrated.
- The pull tape ends shall be secured in a vault or at a pole riser so as to be available for conductor installation at a later time.
- Rated strength of the pull tape (mule tape) shall be 2,500 pounds minimum.

FINISHING

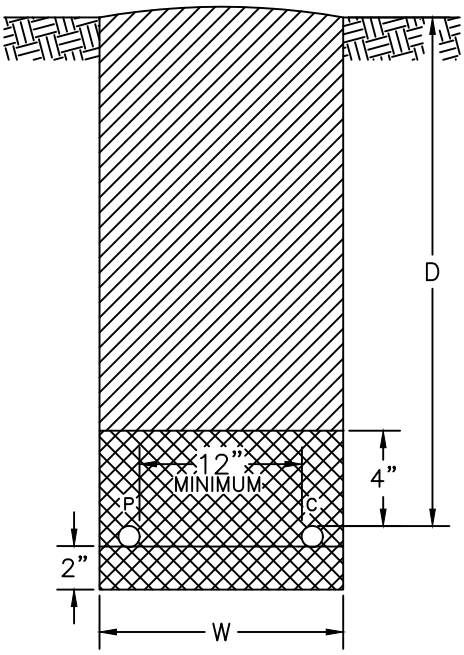
- All exposed ends of conduit shall be plugged to prevent the entrance of foreign matter and moisture into the conduit. Burrs or sharp projections which might damage cable shall be removed. End bells shall be installed on the ends of all conduits.
- All installed conduits shall be "proofed" using the appropriate mandrel, and have a 2500 pound, 3/4" sequentially numbered, continuous "mule tape" installed for future cable pulling. Certification of the test mandreling shall be provided to OWNER acceptance



UR2 (D x W)
TRENCHING UNIT
ONE CONDUIT



UR2–1 (D x W)
TRENCHING UNIT
MULTIPLE POWER CONDUITS
PRIMARY, SECONDARY OR SERVICE



UR2–2 (D x W)
TRENCHING UNIT
POWER AND COMMUNICATION CONDUIT
OR OTHER UTILITY

Joint trench at least 2' W

LEGEND

SAND OR CLEAN SOIL

COMPACTED BACKFILL UNLESS OTHERWISE SPECIFIED

UNDISTURBED EARTH

NOTES:

1) DEPTH (D) IS TO BE A MINIMUM OF 36” TO TOP OF POWER CONDUIT FOR PRIMARY (HIGH VOLTAGE) AND 24” FOR SECONDARY AND WIDTH (W) IS A MINIMUM OF 12”.

2) DEPTHS SPECIFIED ARE TO FINISHED GRADE.

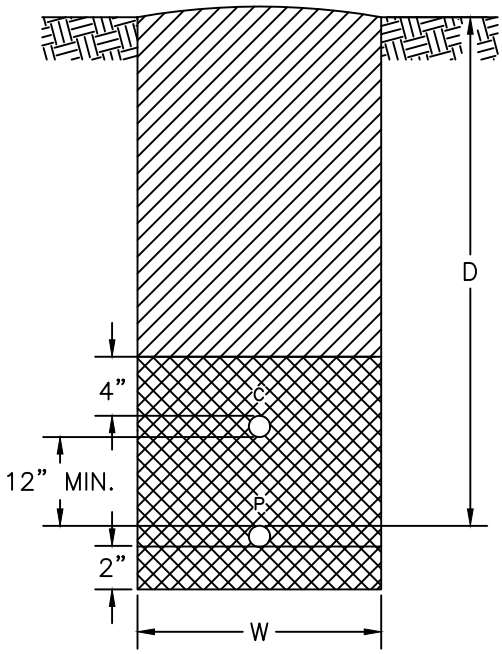
3) SAND BEDDING IS NOT PART OF THESE UNITS AND WILL BE SPECIFIED AS NEEDED.

4) BACKFILLING IS PART OF ALL TRENCHING UNITS INCLUDING JOINT–USE TRENCHES.

5) AREA DISTURBED BY TRENCHING SHALL BE LANDSCAPED TO PRE–EXISTING CONDITION.

6) OTHER UTILITIES MAY REQUIRE DIFFERENT TRENCH DEPTHS AND SPACING. COORDINATE WITH THE OTHER UTILITIES FOR THEIR REQUIREMENTS.

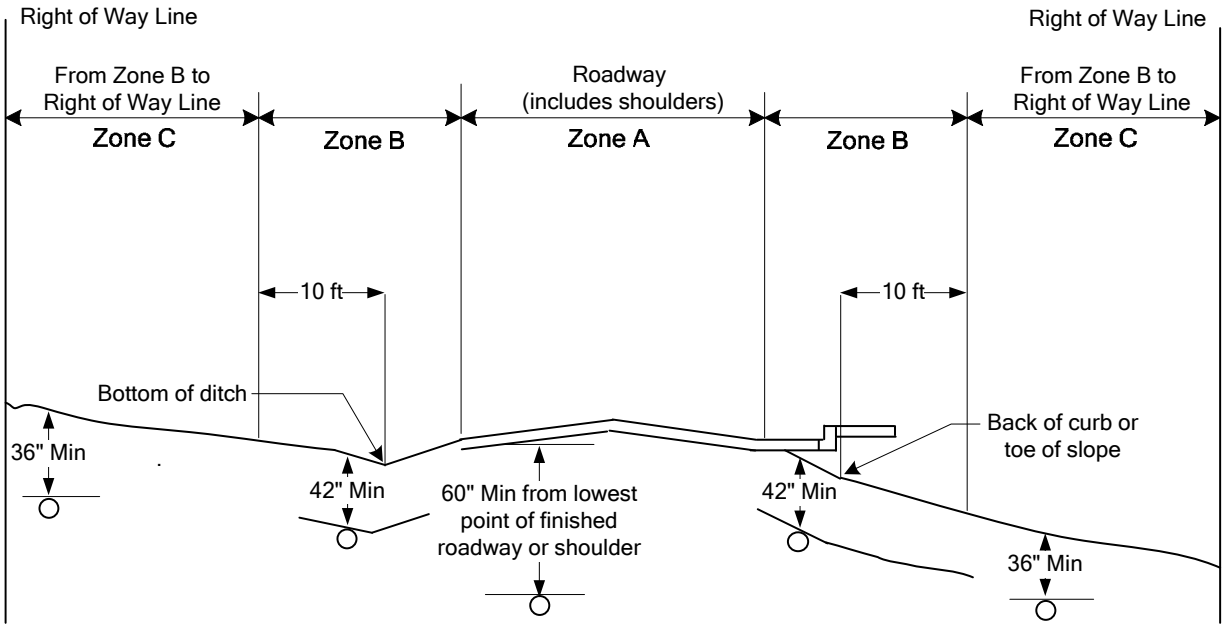
9) PUD TO INSPECT TRENCH AND CONDUIT PRIOR TO BACKFILL.



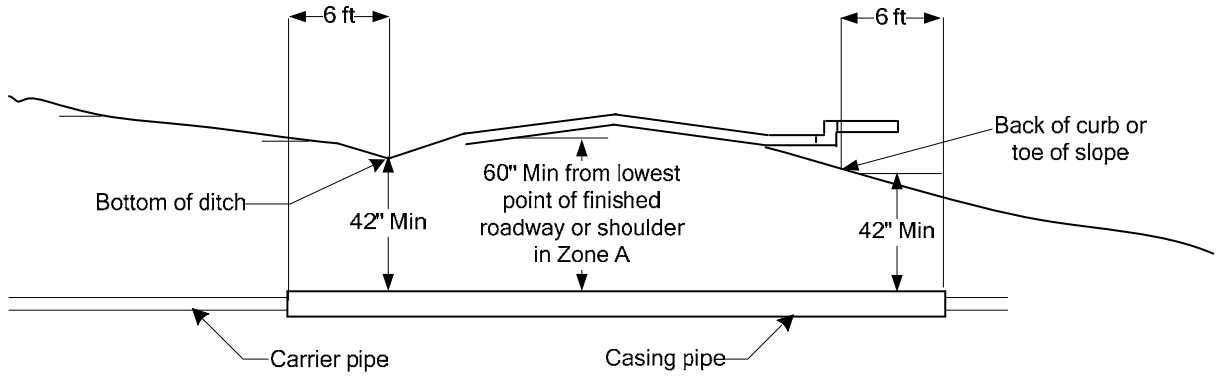
UR2–2 (D x W)
TRENCHING UNIT
POWER AND COMMUNICATION CONDUIT
(OPTIONAL CONDUIT LAYOUT)

MASON COUNTY PUD 1

TRENCH DETAIL(S)



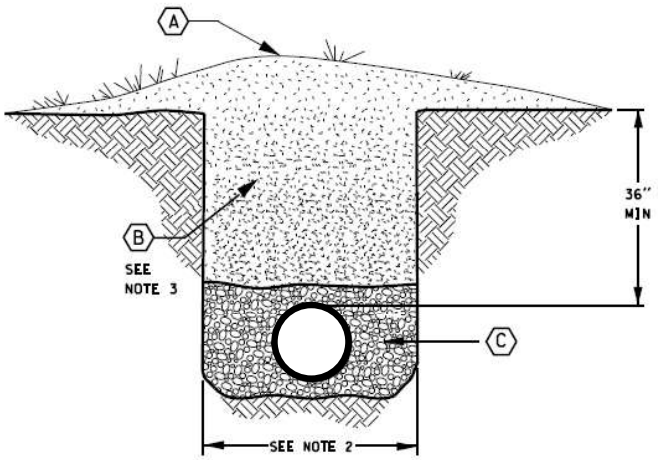
Longitudinal Coverage Detail



Note:
Casing pipes shall extend a minimum of 6 feet beyond the toe of fill slopes, or bottom of ditch line, or outside curb.

Crossing Coverage Detail

Minimum Cover for Pipe Installation
Figure 120-3



CROSS SECTION
NTS

LEGEND

A Surface treatment to restore existing to match adjacent (seeding, bark, etc.).

B Native material or as directed by WSDOT.

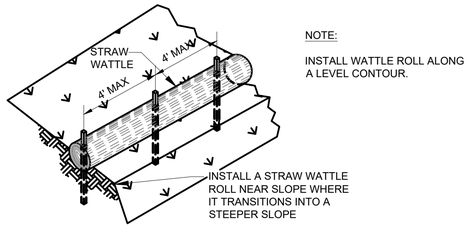
C Bedding material. Bedding material depth over and beneath pipe casing shall be half the diameter of pipe casing or 6 inches, whichever is less.

GENERAL NOTES

1. Trenching and pipe installation shall meet the requirements of WSDOT Standard Specification 7-08.
2. Maximum trench width shall be outside casing pipe width plus 1 foot either side of casing pipe.
3. Compaction shall be method _____ per Standard Specification Section 2-03.3 (14) C.
4. When connecting to an existing facility under the pavement, pavement restoration may, at the department's discretion, include the full lane width and encroached shoulder.
5. Casing pipes shall extend a minimum of six (6) feet beyond the toe of fill slopes, bottom of ditchline, or outside of curb.

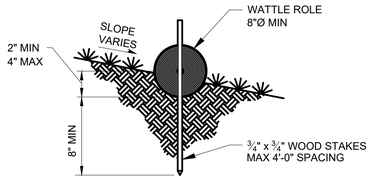
Open Trench Detail

Figure 120-4b

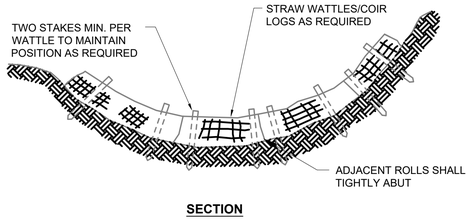


NOTE:

INSTALL WATTLE ROLL ALONG A LEVEL CONTOUR.



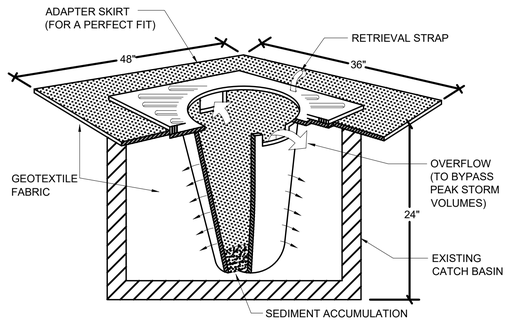
SECTION



SECTION

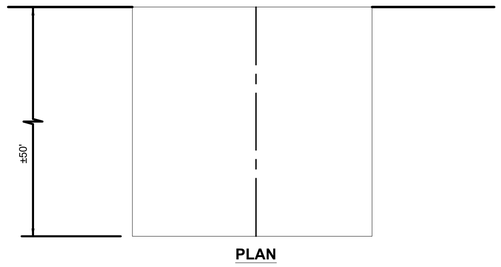
1 TYP **STRAW WATTLE ROLL DETAIL**

NOT TO SCALE

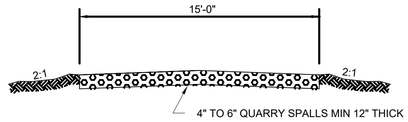


2 TYP **INLET PROTECTION DETAIL**

NOT TO SCALE



PLAN



SECTION

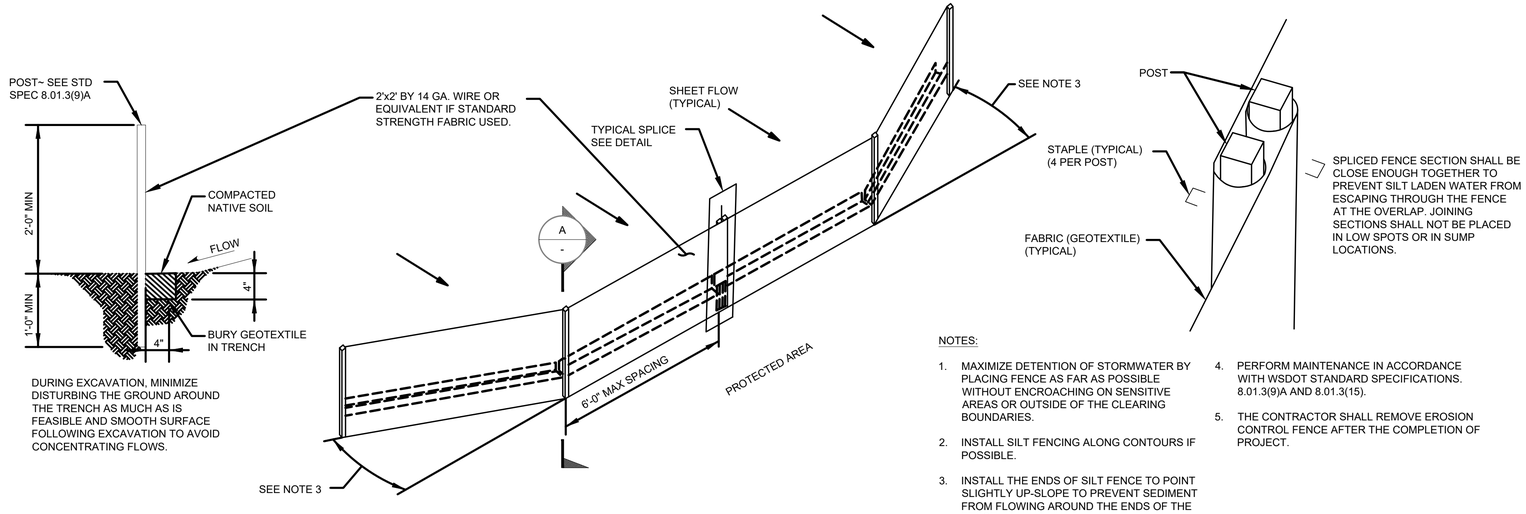
3 TYP **CONSTRUCTION ENTRANCE DETAIL**

NOT TO SCALE

EROSION/SEDIMENTATION CONTROL NOTES:

THE CONTRACTOR SHALL PROVIDE EROSION CONTROL METHODS ACCORDING TO THE WASHINGTON STATE DEPARTMENT OF ECOLOGY'S (WSDOE) "STORMWATER MANAGEMENT MANUAL FOR WESTERN WASHINGTON", VERSION 2012 AND 2014 AMENDMENTS. THE FOLLOWING ARE A FEW OF THE MINIMUM REQUIREMENTS AND SHOULD NOT BE INTERPRETED TO EXCLUDE ANY EROSION CONTROL PRACTICES AS SPECIFIED IN THE WSDOE STORMWATER MANUAL.

1. ALL LIMITS OF CLEARING AND AREAS OF VEGETATION PRESERVATION SHALL BE OBSERVED DURING CONSTRUCTION.
2. ALL REQUIRED SEDIMENTATION/EROSION CONTROL FACILITIES MUST BE IN OPERATION PRIOR TO LAND CLEARING AND/OR OTHER CONSTRUCTION TO INSURE THAT SEDIMENT LADEN WATER DOES NOT ENTER THE DRAINAGE SYSTEM. ALL EROSION AND SEDIMENT FACILITIES SHALL BE MAINTAINED IN A SATISFACTORY CONDITION UNTIL SUCH TIME THAT CLEARING AND /OR CONSTRUCTION IS COMPLETED AND THE POTENTIAL FOR ON-SITE EROSION HAS PASSED. THE IMPLEMENTATION, MAINTENANCE, REPLACEMENT AND ADDITIONS TO EROSION/SEDIMENTATION CONTROL SYSTEMS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
3. THE EROSION AND SEDIMENTATION CONTROL SYSTEMS DEPICTED ON THE DRAWINGS ARE IDENTIFIED IN SENSITIVE AREAS. NOT ALL EROSION CONTROL MEASURE ARE DEPICTED ON THE DRAWINGS. THE CONTRACTOR SHALL FOLLOW THE REQUIREMENTS OF THE BMPS THROUGHOUT THE ENTIRE PROJECT. AS CONSTRUCTION PROGRESSES AND AS UNEXPECTED OR SEASONAL CONDITIONS DICTATE, THE CONTRACTOR SHOULD ANTICIPATE THAT MORE EROSION AND SEDIMENTATION CONTROL FACILITIES WILL BE NECESSARY TO INSURE COMPLETE SILTATION CONTROL ON THE PROPOSED SITE. DURING THE COURSE OF CONSTRUCTION, IT SHALL BE THE OBLIGATION AND RESPONSIBILITY OF THE CONTRACTOR TO ADDRESS ANY NEW CONDITIONS THAT MAY BE CREATED BY HIS ACTIVITIES AND TO PROVIDE ADDITIONAL FACILITIES, OVER AND ABOVE THE MINIMUM REQUIREMENTS, AS MAY BE NEEDED TO PROTECT ADJACENT PROPERTIES AND THE WATER QUALITY OF THE RECEIVING DRAINAGE SYSTEM.
4. AT NO TIME SHALL MORE THAN ONE FOOT OF SEDIMENT BE ALLOWED TO ACCUMULATE WITHIN A CATCH BASIN INLET PROTECTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVING AND PROPERLY DISPOSING OF THE SEDIMENT. ALL CATCH BASINS, CONVEYANCE LINES AND DITCHES ALONG CIVIC DRIVE SHALL BE CLEANED PRIOR TO PAVING.
5. THE CONTRACTOR SHALL REMOVE MATERIAL DROPPED, WASHED OR TRACKED FROM VEHICLES ONTO THE CITY RIGHT-OF-WAY OR INTO THE EXISTING STORM DRAINAGE SYSTEM. DEBRIS SHALL NOT BE WASHED INTO THE STORM DRAINAGE SYSTEM ON CIVIC DRIVE.
6. TEMPORARY EROSION CONTROL FACILITIES SHALL BE INSPECTED WEEKLY AND MAINTAINED WITHIN 24 HOURS FOLLOWING A STORM EVENT. SEDIMENT SHALL BE REMOVED TO INSURE THE FACILITIES WILL FUNCTION PROPERLY. THE FACILITIES SHALL BE SATISFACTORILY MAINTAINED UNTIL CONSTRUCTION IS COMPLETED AND THE POTENTIAL FOR ON-SITE EROSION HAS PASSED.
7. ALL STORM DRAIN INLETS MADE OPERABLE DURING CONSTRUCTION SHALL BE PROTECTED SO THAT STORMWATER RUNOFF SHALL NOT ENTER THE CONVEYANCE SYSTEM WITHOUT FIRST BEING FILTERED OR OTHERWISE TREATED TO REMOVE SEDIMENT.
8. NO DISTURBED SOIL SHALL REMAIN UNSTABILIZED FOR MORE THAN TWO DAYS.
9. SEDIMENT TRAP/POND BAFFLES SHALL BE EMBEDDED IN SIDE SLOPES.



DURING EXCAVATION, MINIMIZE DISTURBING THE GROUND AROUND THE TRENCH AS MUCH AS IS FEASIBLE AND SMOOTH SURFACE FOLLOWING EXCAVATION TO AVOID CONCENTRATING FLOWS.

NOTES:

1. MAXIMIZE DETENTION OF STORMWATER BY PLACING FENCE AS FAR AS POSSIBLE WITHOUT ENCROACHING ON SENSITIVE AREAS OR OUTSIDE OF THE CLEARING BOUNDARIES.
2. INSTALL SILT FENCING ALONG CONTOURS IF POSSIBLE.
3. INSTALL THE ENDS OF SILT FENCE TO POINT SLIGHTLY UP-SLOPE TO PREVENT SEDIMENT FROM FLOWING AROUND THE ENDS OF THE FENCE.
4. PERFORM MAINTENANCE IN ACCORDANCE WITH WSDOT STANDARD SPECIFICATIONS. 8.01.3(9)A AND 8.01.3(15).
5. THE CONTRACTOR SHALL REMOVE EROSION CONTROL FENCE AFTER THE COMPLETION OF PROJECT.

4 TYP **SILT FENCE DETAILS**

NOT TO SCALE

MASON COUNTY PUD 1

EROSION CONTROL DETAILS

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