

**GRADING AND EROSION CONTROL NOTES:**

- CONSTRUCTION MAY NOT COMMENCE UNTIL A CONSTRUCTION PERMIT IS OBTAINED FROM DEVELOPMENT SERVICES AND A PRECONSTRUCTION CONFERENCE IS HELD WITH DEVELOPMENT SERVICES INSPECTIONS.
- STORMWATER DISCHARGES FROM CONSTRUCTION SITES SHALL NOT CAUSE OR THREATEN TO CAUSE POLLUTION, CONTAMINATION, OR DEGRADATION OF STATE WATERS. ALL WORK AND EARTH DISTURBANCE SHALL BE DONE IN A MANNER THAT MINIMIZES POLLUTION OF ANY ON-SITE OR OFF SITE WATERS, INCLUDING WETLANDS.
- NOTWITHSTANDING ANYTHING DEPICTED IN THESE PLANS IN WORDS OR GRAPHIC REPRESENTATION, ALL DESIGN AND CONSTRUCTION RELATED TO ROADS, STORM DRAINAGE AND EROSION CONTROL SHALL CONFORM TO THE STANDARDS AND REQUIREMENTS OF THE MOST RECENT VERSION OF THE RELEVANT ADOPTED EL PASO COUNTY STANDARDS, INCLUDING THE LAND DEVELOPMENT CODE, THE ENGINEERING CRITERIA MANUAL, THE DRAINAGE CRITERIA MANUAL, AND THE DRAINAGE CRITERIA MANUAL VOLUME 2. ANY DEVIATIONS TO REGULATIONS AND STANDARDS MUST BE REQUESTED, AND APPROVED, IN WRITING.
- A SEPARATE STORMWATER MANAGEMENT PLAN (SMMP) FOR THIS PROJECT SHALL BE COMPLETED AND AN EROSION AND STORMWATER QUALITY CONTROL PERMIT (ESQCP) ISSUED PRIOR TO COMMENCING CONSTRUCTION. DURING CONSTRUCTION THE SMMP IS THE RESPONSIBILITY OF THE DESIGNATED STORMWATER MANAGER, SHALL BE LOCATED ON SITE AT ALL TIMES AND SHALL BE KEPT UP TO DATE WITH WORK PROGRESS AND CHANGES IN THE FIELD.
- ONCE THE ESQCP HAS BEEN ISSUED, THE CONTRACTOR MAY INSTALL THE INITIAL STAGE EROSION AND SEDIMENT CONTROL BMPs AS INDICATED ON THE GEC. A PRECONSTRUCTION MEETING BETWEEN THE CONTRACTOR, ENGINEER, AND EL PASO COUNTY WILL BE HELD PRIOR TO ANY CONSTRUCTION. IT IS THE RESPONSIBILITY OF THE APPLICANT TO COORDINATE THE MEETING TIME AND PLACE WITH COUNTY DSD INSPECTIONS STAFF.
- SOIL EROSION CONTROL MEASURES FOR ALL SLOPES, CHANNELS, DITCHES, OR ANY DISTURBED LAND AREA SHALL BE COMPLETED WITHIN 21 CALENDAR DAYS AFTER FINAL GRADING, OR FINAL EARTH DISTURBANCE, HAS BEEN COMPLETED. DISTURBED AREAS AND STOCKPILES WHICH ARE NOT AT FINAL GRADE BUT WILL REMAIN DORMANT FOR LONGER THAN 30 DAYS SHALL ALSO BE MULCHED WITHIN 21 DAYS AFTER INTERIM GRADING. AN AREA THAT IS GOING TO REMAIN IN AN INTERIM STATE FOR MORE THAN 60 DAYS SHALL ALSO BE SEEDED. ALL TEMPORARY SOIL EROSION CONTROL MEASURES AND BMPs SHALL BE MAINTAINED UNTIL PERMANENT SOIL EROSION CONTROL MEASURES ARE IMPLEMENTED AND ESTABLISHED.
- TEMPORARY SOIL EROSION CONTROL FACILITIES SHALL BE REMOVED AND EARTH DISTURBANCE AREAS GRADED AND STABILIZED WITH PERMANENT SOIL EROSION CONTROL MEASURES PURSUANT TO STANDARDS AND SPECIFICATION PRESCRIBED IN THE DCM VOLUME II AND THE ENGINEERING CRITERIA MANUAL (ECM) APPENDIX I.
- ALL PERSONS ENGAGED IN EARTH DISTURBANCE SHALL IMPLEMENT AND MAINTAIN ACCEPTABLE SOIL EROSION AND SEDIMENT CONTROL MEASURES INCLUDING BMPs IN CONFORMANCE WITH THE EROSION CONTROL TECHNICAL STANDARDS OF THE DRAINAGE CRITERIA MANUAL (DCM) VOLUME II AND IN ACCORDANCE WITH THE STORMWATER MANAGEMENT PLAN (SMMP).
- ALL TEMPORARY EROSION CONTROL FACILITIES INCLUDING BMPs AND ALL PERMANENT FACILITIES INTENDED TO CONTROL EROSION OF ANY EARTH DISTURBANCE OPERATIONS, SHALL BE INSTALLED AS DEFINED IN THE APPROVED PLANS, THE SMMP AND THE DCM VOLUME II AND MAINTAINED THROUGHOUT THE DURATION OF THE EARTH DISTURBANCE OPERATION.
- ANY EARTH DISTURBANCE SHALL BE CONDUCTED IN SUCH A MANNER SO AS TO EFFECTIVELY REDUCE ACCELERATED SOIL EROSION AND RESULTING SEDIMENTATION. ALL DISTURBANCES SHALL BE DESIGNED, CONSTRUCTED, AND COMPLETED SO THAT THE EXPOSED AREA OF ANY DISTURBED LAND SHALL BE LIMITED TO THE SHORTEST PRACTICAL PERIOD OF TIME.
- ANY TEMPORARY OR PERMANENT FACILITY DESIGNED AND CONSTRUCTED FOR THE CONVEYANCE OF STORMWATER AROUND, THROUGH, OR FROM THE EARTH DISTURBANCE AREA SHALL BE DESIGNED TO LIMIT THE DISCHARGE TO A NON-EROSIVE VELOCITY.
- CONCRETE WASH WATER SHALL BE CONTAINED AND DISPOSED OF IN ACCORDANCE WITH THE SMMP. NO WASH WATER SHALL BE DISCHARGED TO OR ALLOWED TO RUNOFF TO STATE WATERS, INCLUDING ANY SURFACE OR SUBSURFACE STORM DRAINAGE SYSTEM OR FACILITIES.
- EROSION CONTROL BLANKETING IS TO BE USED ON SLOPES STEEPER THAN 3:1.
- BUILDING, CONSTRUCTION, EXCAVATION, OR OTHER WASTE MATERIALS SHALL NOT BE TEMPORARILY PLACED OR STORED IN THE STREET, ALLEY, OR OTHER PUBLIC WAY, UNLESS IN ACCORDANCE WITH AN APPROVED TRAFFIC CONTROL PLAN. BMP'S MAY BE REQUIRED BY EL PASO COUNTY ENGINEERING IF DEEMED NECESSARY, BASED ON SPECIFIC CONDITIONS AND CIRCUMSTANCES.
- VEHICLE TRACKING OF SOILS AND CONSTRUCTION DEBRIS OFF-SITE SHALL BE MINIMIZED. MATERIALS TRACKED OFFSITE SHALL BE CLEANED UP AND PROPERLY DISPOSED OF IMMEDIATELY.
- CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL OF ALL WASTES FROM THE CONSTRUCTION SITE FOR DISPOSAL IN ACCORDANCE WITH LOCAL AND STATE REGULATORY REQUIREMENTS. NO CONSTRUCTION DEBRIS, TREE SLASH, BUILDING MATERIAL WASTES OR UNUSED BUILDING MATERIALS SHALL BE BURIED, DUMPED, OR DISCHARGED AT THE SITE.
- THE OWNER, SITE DEVELOPER, CONTRACTOR, AND/OR THEIR AUTHORIZED AGENTS SHALL BE RESPONSIBLE FOR THE REMOVAL OF ALL CONSTRUCTION DEBRIS, DIRT, TRASH, ROCK, SEDIMENT, AND SAND THAT MAY ACCUMULATE IN THE STORM SEWER OR OTHER DRAINAGE CONVEYANCE SYSTEM AND STORMWATER APPURTENANCES AS A RESULT OF SITE DEVELOPMENT.
- THE QUANTITY OF MATERIALS STORED ON THE PROJECT SITE SHALL BE LIMITED, AS MUCH AS PRACTICAL, TO THAT QUANTITY REQUIRED TO PERFORM THE WORK IN AN ORDERLY SEQUENCE. ALL MATERIALS STORED ON-SITE SHALL BE STORED IN A NEAT, ORDERLY MANNER, IN THEIR ORIGINAL CONTAINERS, WITH ORIGINAL MANUFACTURER'S LABELS.
- NO CHEMICALS ARE TO BE USED BY THE CONTRACTOR, WHICH HAVE THE POTENTIAL TO BE RELEASED IN STORMWATER UNLESS PERMISSION FOR THE USE OF A SPECIFIC CHEMICAL IS GRANTED IN WRITING BY THE ECM ADMINISTRATOR. IN GRANTING THE USE OF SUCH CHEMICALS, SPECIAL CONDITIONS AND MONITORING MAY BE REQUIRED.
- BULK STORAGE STRUCTURES FOR PETROLEUM PRODUCTS AND OTHER CHEMICALS SHALL HAVE ADEQUATE PROTECTION SO AS TO CONTAIN ALL SPILLS AND PREVENT ANY SPILLED MATERIAL FROM ENTERING STATE WATERS, INCLUDING ANY SURFACE OR SUBSURFACE STORM DRAINAGE SYSTEM OR FACILITIES.
- NO PERSON SHALL CAUSE THE IMPEDIMENT OF STORMWATER FLOW IN THE FLOW LINE OF THE CURB AND GUTTER OR IN THE DITCHLINE.
- INDIVIDUALS SHALL COMPLY WITH THE "COLORADO WATER QUALITY CONTROL ACT" (TITLE 25, ARTICLE 8, CRS), AND THE "CLEAN WATER ACT" (33 USC 1344), IN ADDITION TO THE REQUIREMENTS INCLUDED IN THE DCM VOLUME II AND THE ECM APPENDIX I. ALL APPROPRIATE PERMITS MUST BE OBTAINED BY THE CONTRACTOR PRIOR TO CONSTRUCTION (NPDES, FLOODPLAIN, 404, FUGITIVE DUST, ETC.). IN THE EVENT OF CONFLICTS BETWEEN THESE REQUIREMENTS AND LAWS, RULES, OR REGULATIONS OF OTHER FEDERAL, STATE, OR COUNTY AGENCIES, THE MORE RESTRICTIVE LAWS, RULES, OR REGULATIONS SHALL APPLY.
- ALL CONSTRUCTION TRAFFIC MUST ENTER/EXIT THE SITE AT APPROVED CONSTRUCTION ACCESS POINTS.
- PRIOR TO ACTUAL CONSTRUCTION THE PERMITEE SHALL VERIFY THE LOCATION OF EXISTING UTILITIES.
- A WATER SOURCE SHALL BE AVAILABLE ON SITE DURING EARTHWORK OPERATIONS AND UTILIZED AS REQUIRED TO MINIMIZE DUST FROM EARTHWORK EQUIPMENT AND WIND.
- THE SOILS REPORT FOR THIS SITE HAS BEEN PREPARED BY TERRACON # 23055071 MAY 30, 2006. AND SHALL BE CONSIDERED A PART OF THESE PLANS.
- AT LEAST TEN DAYS PRIOR TO THE ANTICIPATED START OF CONSTRUCTION, FOR PROJECTS THAT WILL DISTURB 1 ACRE OR MORE, THE OWNER OR OPERATOR OF CONSTRUCTION ACTIVITY SHALL SUBMIT A PERMIT APPLICATION FOR STORMWATER DISCHARGE TO THE COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT, WATER QUALITY DIVISION. THE APPLICATION CONTAINS CERTIFICATION OF COMPLETION OF A STORMWATER MANAGEMENT PLAN (SMMP), OF WHICH THIS GRADING AND EROSION CONTROL PLAN MAY BE A PART. FOR INFORMATION OR APPLICATION MATERIALS CONTACT:

COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT  
 WATER QUALITY CONTROL DIVISION  
 WQCD - PERMITS  
 4300 CHERRY CREEK DRIVE SOUTH  
 DENVER, CO 80246-1530  
 ATTN: PERMITS UNIT

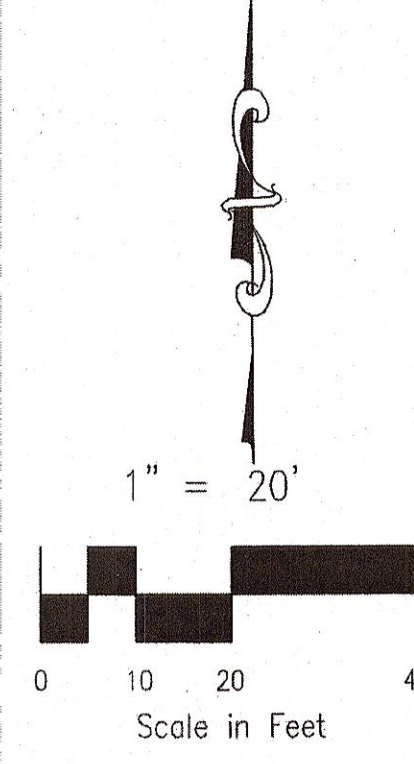
**MASTER BLASTER**

EL PASO COUNTY, STATE OF COLORADO  
 GRADING & EROSION CONTROL PLAN

LOT 35 OF CLAREMONT BUSINESS PARK FIL. NO. 2

**LEGEND**

- EX MAJ CONT
- EX MIN CONT
- PROP MAJ CONT
- PROP MIN CONT
- LOW POINT
- HIGH POINT
- EXISTING FLOWLINE
- TOP OF CURB
- FINISH GRADE
- FINISH FLOOR
- TOP OF FOOTING
- SILT FENCE
- VEHICLE TRACKING CONTROL
- CONCRETE WASH-OUT BASIN

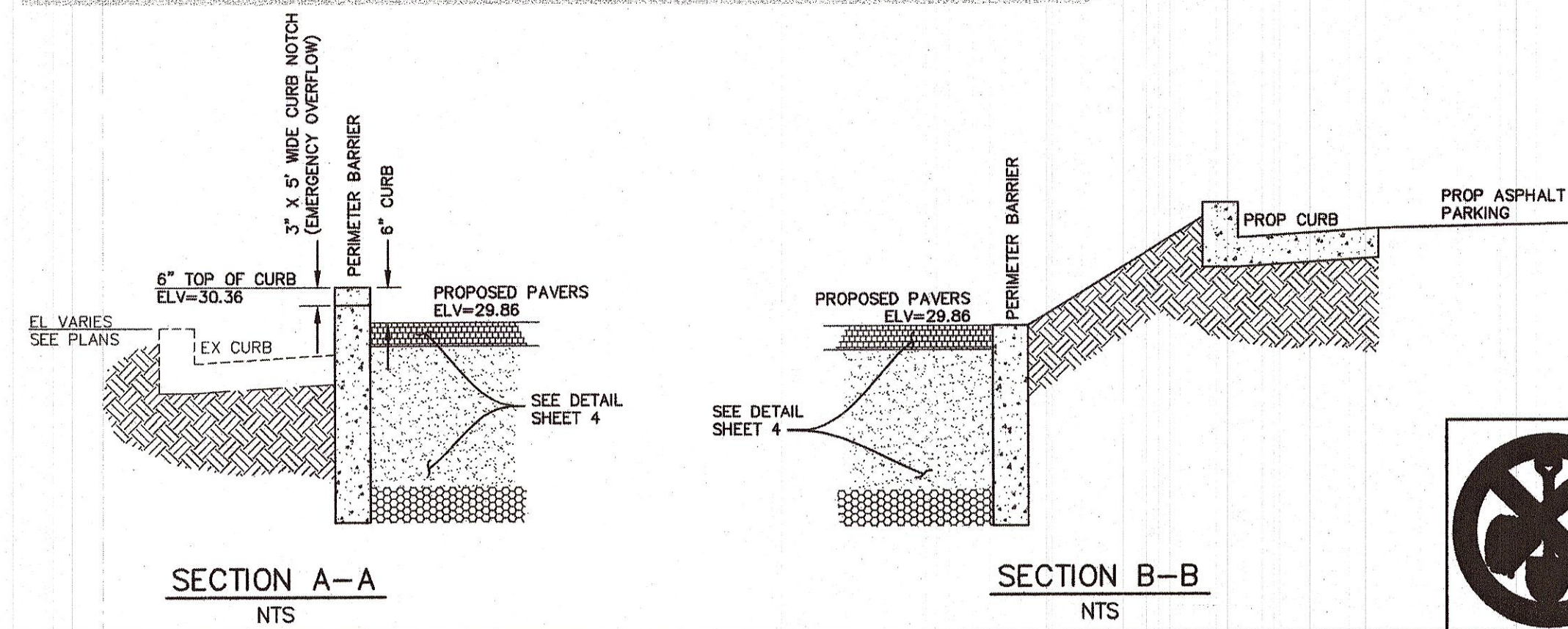


SEE PARTIAL INFILTRATION SECTION FOR PERMEABLE PAVEMENT SYSTEM W/ 6" PERIMETER CURB/BARRIER AROUND EDGE (750 SF)

**CONSTRUCTION NOTES:**

- Excavation of subgrade shall not commence until after the pre-construction meeting.
- Subgrade shall be excavated using low ground pressure (LGP) track equipment to minimize over compaction of the subgrade.
- Grading and compaction equipment used in the area of the permeable pavement should be approved by the engineer prior to use.
- Loose materials shall not be stored on the permeable pavement area.
- The contractor shall, at all times during and after system installation, prevent sediment, debris, and dirt from any source from entering the permeable pavement system.
- Placement of the wearing course shall be performed after fine grading and landscaping in adjacent areas is complete. If the wearing course becomes clogged due to construction activities, clean the surface with a vacuum machine to restore the infiltration rate after construction is complete.

For partial and full infiltration sections only.



- 8.5' TO 4' WIDE (VARIES) X 6.7' LONG, TYPE VL OR L RIPRAP, MIN 1.5' DEEP, FILL VOIDS WITH FILTER MATERIAL
- 7.5' TO 3.5' WIDE (VARIES) X 9.5' LONG, TYPE VL OR L RIPRAP, MIN 1.5' DEEP, FILL VOIDS WITH FILTER MATERIAL
- 5'X3' NOTCH IN CURB (EMERGENCY OUTFALL)
- INSTALL 2' WIDE CUTTER PAN @ 0.8% FROM EX CURB TO EX CURB

LOT 36

NOTE: ALL DOWNSPOUTS SHALL BE DIRECTED TO WATER QUALITY FACILITY

**DESIGN ENGINEER'S STATEMENT**

THIS GRADING AND EROSION CONTROL PLAN WAS PREPARED UNDER MY DIRECTION AND SUPERVISION AND IS CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF. SAID PLAN HAS BEEN PREPARED ACCORDING TO THE CRITERIA ESTABLISHED BY THE COUNTY FOR GRADING AND EROSION CONTROL PLANS. I ACCEPT RESPONSIBILITY FOR ANY LIABILITY CAUSED BY NEGLIGENT ACTS, ERRORS OR OMISSIONS ON MY PART IN PREPARING THIS PLAN.



VIRGIL A. SANCHEZ, COLORADO P.E. #37180  
 FOR AND ON BEHALF OF M & S CIVIL CONSULTANTS, INC. DATE

**OWNER/DEVELOPER'S STATEMENT:**

I, THE OWNER/DEVELOPER HAVE READ AND WILL COMPLY WITH ALL OF THE REQUIREMENTS SPECIFIED IN THESE DETAILED PLANS AND SPECIFICATIONS.

NAME: *Carroll J. Little* DATE: 4.24.18

DBA: HAMMERS CONSTRUCTION  
 ADDRESS: 1411 WOOLSEY HEIGHTS COLORADO SPRINGS, 80915

**EL PASO COUNTY:**

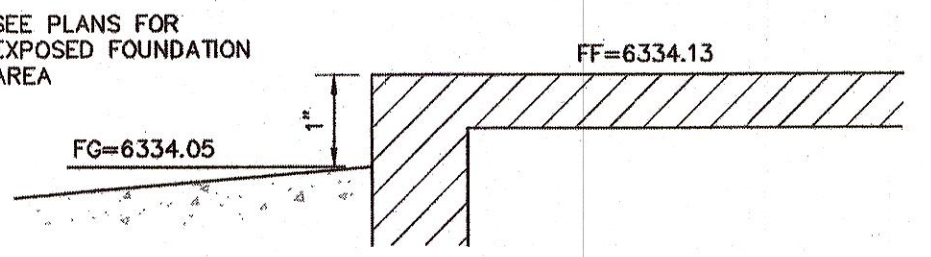
COUNTY PLAN REVIEW IS PROVIDED ONLY FOR GENERAL CONFORMANCE WITH COUNTY DESIGN CRITERIA. THE COUNTY IS NOT RESPONSIBLE FOR THE ACCURACY AND ADEQUACY OF THE DESIGN, DIMENSIONS, AND/OR ELEVATIONS WHICH SHALL BE CONFIRMED AT THE JOB SITE. THE COUNTY THROUGH THE APPROVAL OF THIS DOCUMENT ASSUMES NO RESPONSIBILITY FOR COMPLETENESS AND/OR ACCURACY OF THIS DOCUMENT.

FILED IN ACCORDANCE WITH THE REQUIREMENTS OF THE EL PASO COUNTY LAND DEVELOPMENT CODE, DRAINAGE CRITERIA, AND ENGINEERING CRITERIA MANUAL AS AMENDED.

IN ACCORDANCE WITH ECM SECTION 1.12, THESE CONSTRUCTION DOCUMENTS WILL BE VALID FOR CONSTRUCTION FOR A PERIOD OF 2 YEARS FROM THE DATE SIGNED BY THE EL PASO COUNTY ENGINEER. IF CONSTRUCTION HAS NOT STARTED WITHIN THOSE 2 YEARS, THE PLANS WILL NEED TO BE RESUBMITTED FOR APPROVAL, INCLUDING PAYMENT OF REVIEW FEES AT THE PLANNING AND COMMUNITY DEVELOPMENT DIRECTOR'S DISCRETION.

JENNIFER IRVINE, P.E.  
 COUNTY ENGINEER / ECM ADMINISTRATOR DATE

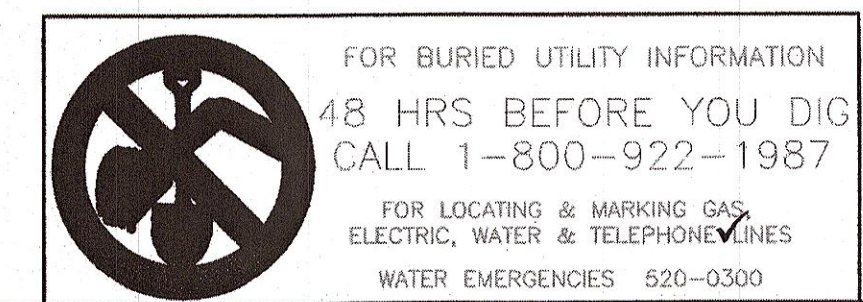
LOT 14



**BUILDING FINISH FLOOR DETAIL**



20 BOULDER CRESCENT, SUITE 110  
 COLORADO SPRINGS, CO 80903  
 PHONE: 719.955.5485



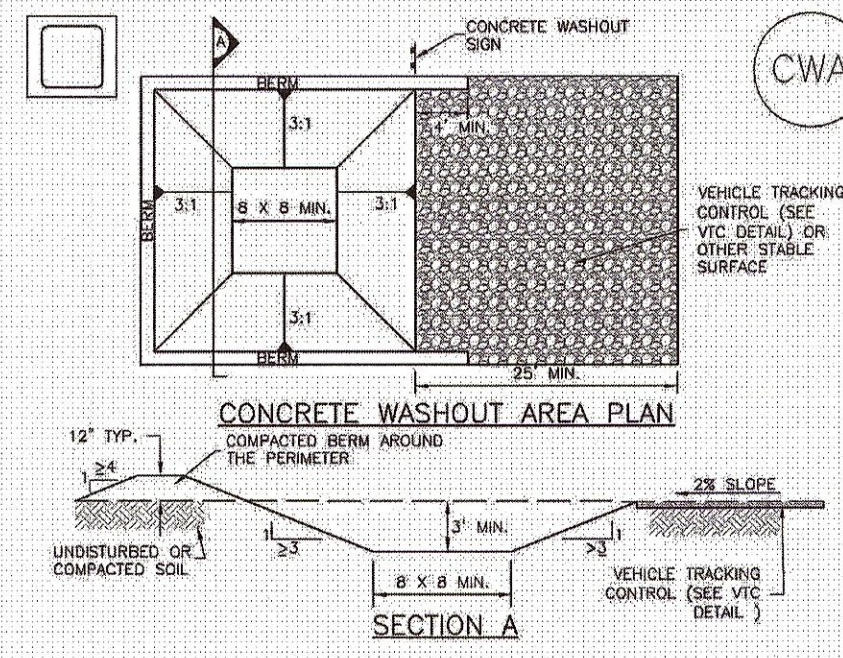
GRADING & EROSION CONTROL PLAN  
 MASTER BLASTER  
 JOB NO. 44-029  
 DATE PREPARED: NOVEMBER 2, 2017  
 DATE REVISED: FEBRUARY 13, 2018

EL PASO COUNTY FILE NO. PPR 17-056

SHEET 3 OF 8



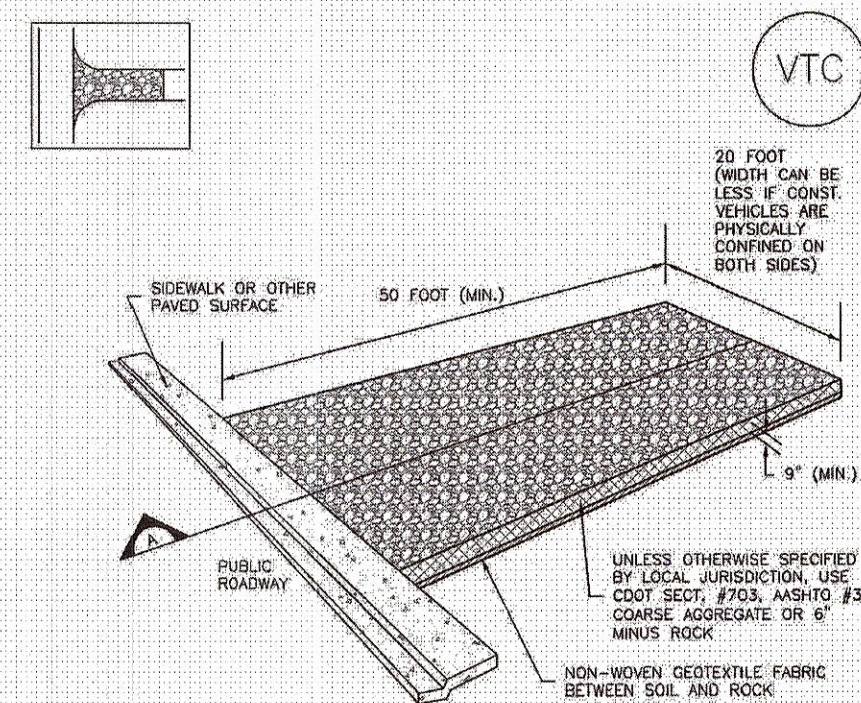
**Concrete Washout Area (CWA) MM-1**



- CWA-1. CONCRETE WASHOUT AREA**
- SEE PLAN VIEW FOR CWA INSTALLATION LOCATION.
  - DO NOT LOCATE AN UNLINED CWA WITHIN 400' OF ANY NATURAL DRAINAGE PATHWAY OR WATERBODY. DO NOT LOCATE WITHIN 1,000' OF ANY WELLS OR DRINKING WATER SOURCES IF SITE CONSTRAINTS MAKE THIS INFEASIBLE, OR IF HIGHLY PERMEABLE SOILS EXIST ON SITE. THE CWA MUST BE INSTALLED WITH AN IMPERMEABLE LINER (18 MIL THICKNESS) OR SURFACE STORAGE ALTERNATIVES USING PREFABRICATED CONCRETE WASHOUT DEVICES OR A LINED ABOVE-GROUND STORAGE ARE SHOULD BE USED.
  - THE CWA SHALL BE INSTALLED PRIOR TO CONCRETE PLACEMENT ON SITE.
  - CWA SHALL INCLUDE A FLAT SUBSURFACE PIT THAT IS AT LEAST 6" BY 6" SLOPES LEADING OUT OF THE SUBSURFACE PIT SHALL BE 3:1 OR FLATTER. THE PIT SHALL BE AT LEAST 3' DEEP.
  - BOTH SURROUNDING SIDES AND BACK OF THE CWA SHALL HAVE MINIMUM HEIGHT OF 1'.
  - VEHICLE TRACKING CONTROL SHALL BE SLOPED 2% TOWARDS THE CWA.
  - SEAMS SHALL BE PLACED AT THE CONSTRUCTION ENTRANCE, AT THE CWA, AND ELSEWHERE AS NECESSARY TO CLEARLY INDICATE THE LOCATION OF THE CWA TO OPERATORS OF CONCRETE TRUCKS AND PUMP TRUCKS.
  - USE EXCAVATED MATERIAL FOR PERIMETER BERM CONSTRUCTION.

November 2010 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 CWA-3

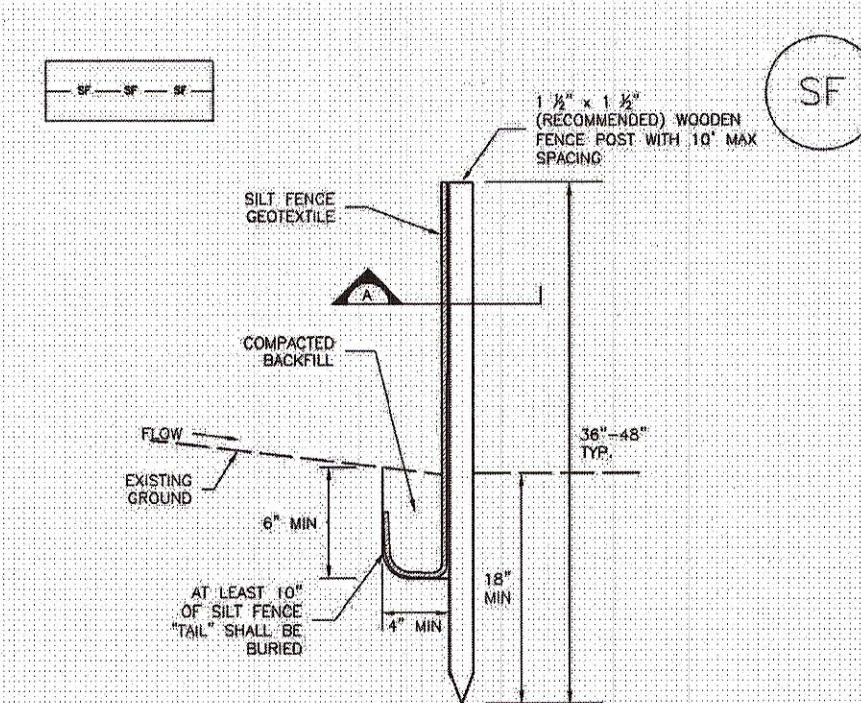
**Vehicle Tracking Control (VTC) SM-4**



- VTC-1. AGGREGATE VEHICLE TRACKING CONTROL**
- UNLESS OTHERWISE SPECIFIED BY LOCAL JURISDICTION, USE COOT SECT. #303, AGSHTO #3 COARSE AGGREGATE OR 4" MINUS ROCK.
  - INSTALL ROCK FLUSH WITH OR BELOW TOP OF PAVEMENT.
  - UNLESS OTHERWISE SPECIFIED BY LOCAL JURISDICTION, USE COOT SECT. #303, AGSHTO #3 COARSE AGGREGATE OR 4" MINUS ROCK.
  - NON-WOVEN GEOTEXTILE FABRIC SHALL BE BURIED.
  - POSTS SHALL OVERLAP AT JOINTS SO THAT NO GAPS EXIST IN SILT FENCE.
  - THICKNESS OF GEOTEXTILE HAS BEEN ENLARGED, TYP.

November 2010 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 VTC-3

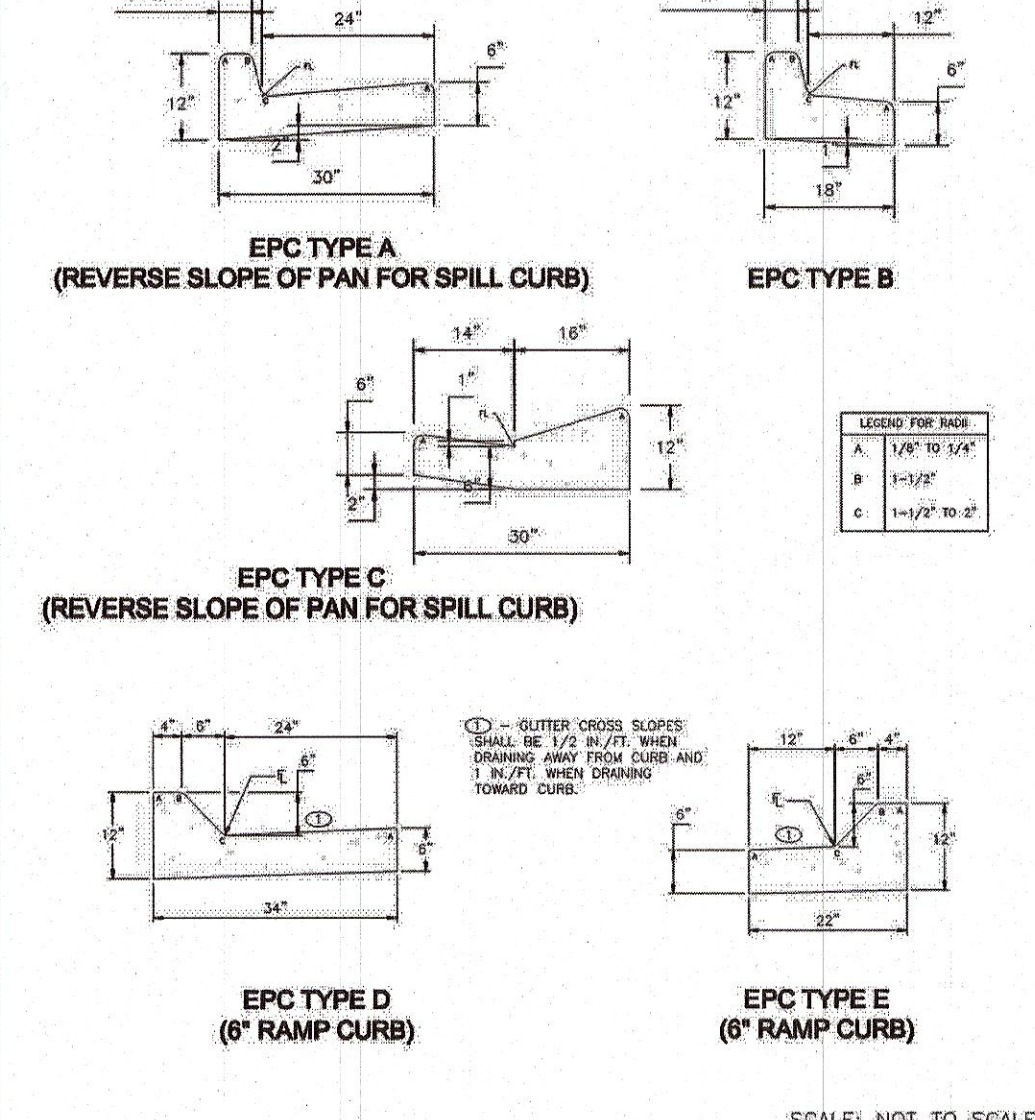
**Silt Fence (SF) SC-1**



- SF-1. SILT FENCE**
- POSTS SHALL OVERLAP AT JOINTS SO THAT NO GAPS EXIST IN SILT FENCE.
  - THICKNESS OF GEOTEXTILE HAS BEEN ENLARGED, TYP.

November 2010 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 SF-3

**Permeable Pavement Systems T-10**



- Figure PPS-5. Geomembrane Liner/Concrete Connection Detail**
- TEMPORARILY ATTACH FABRIC TO WALL USING BRICKS/PROCESSES (DO NOT MIX WITH ANCHOR BATTEN BAR)
  - 3/8" x 1/4" STAINLESS STEEL ANCHOR BOLT, USE A WIDER 1/2" GULF
  - 1/4" x 1/4" ALUMINUM STAINLESS STEEL OR GALVANIZED STEEL BATTEN BAR
  - GEOTEXTILE SEPARATOR FABRIC OF SUFFICIENT CONTAIN ANGLE ROCKS BY OTHER MATERIAL THAT COULD PUNCTURE THE LINER
  - PREPARED SUBGRADE
  - PROVIDE SLACK IN LINER PLACEMENT TO ENSURE PROPER INSTALLATION AND BACKFILL WITHOUT DAMAGE
  - NOTE: BOTTLE AND UNDERDRAIN SYSTEM NOT SHOWN

7/9/09 Typical Curb and Gutter Details Standard Drawing El Paso Logo.jpg 7/7/11 SD\_2-20

**Permeable Pavement Systems T-10**

**Table PPS-1. Gradation Specifications for Class C Filter Material (Source: CDOT Table 703-7)**

Sieve Size	Mass Percent Passing
19.0 mm (3/4")	100
4.75 mm (No. 4)	60 - 100
300 µm (No. 50)	10 - 30
150 µm (No. 100)	0 - 10
75 µm (No. 200)	0 - 3

**Table PPS-2. Dimensions for Slotted Pipe**

Pipe Diameter	Slot Length <sup>1</sup>	Maximum Slot Width	Slot Centers <sup>2</sup>	Open Area <sup>3</sup> (per foot)
4"	1-1/16"	0.032"	0.413"	1.90 in <sup>2</sup>
6"	1-3/8"	0.032"	0.516"	1.98 in <sup>2</sup>

- Some variation in these values is acceptable and is expected from various pipe manufacturers. Be aware that both increased slot length and decreased slot centers will be beneficial to hydraulics but detrimental to the structure of the pipe.
- Compact the filter layer using a vibratory drum roller or plate. The top of each layer below the leveling course must be uniform and should not deviate more than 1/8 inch from a 10-foot straight edge is laid on its surface. The top of the leveling course should not deviate more than 3/8 inch in 10 feet.
7. **Impermeable Geomembrane Liner and Geotextile Separator Fabric:** For no-infiltration sections, install a 30 mil (minimum) PVC geomembrane liner per Table PPS-4, on the bottom and sides of the basin, extending up at least to the top of the filter layer. Provide at least 9 inches (12 inches if possible) of cover over the membrane where it is attached to the wall to protect the membrane from UV deterioration. The geomembrane should be field-seamed using a dual track welder, which allows for non-destructive testing of almost all field seams. A small amount of single track and/or adhesive seaming should be allowed in limited areas to seam around pipe perforations, to patch seams removed for destructive seam testing, and for limited repairs. The liner should be installed with slack to prevent tearing due to backfill, compaction, and settling. Place CDOT Class B geotextile separator fabric, per Table PPS-3, above the geomembrane to protect it from being punctured during the placement of the filter material above the liner. If the subgrade contains angular rocks or other material that could puncture the geomembrane, smooth-roll the surface to create a suitable surface. If smooth-rolling the surface does not provide a suitable surface, also place the separator fabric between the geomembrane and the underlying subgrade. This should only be done when necessary because fabric placed under the geomembrane can increase seepage losses through pinholes or other geomembrane defects. Connect the geomembrane to perimeter concrete walls around the basin perimeter, creating a watertight seal between the geomembrane and the walls using a continuous batten bar and anchor connection (see Figure PPS-5). Where the need for the impermeable

August 2013 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 PPS-11

**EC-2 Temporary and Permanent Seeding (TS/PS)**

**Table TS/PS-2. Minimum Drill Seeding Rates for Perennial Grasses**

Common Name	Botanical Name	Growth Season <sup>1</sup>	Growth Form	Seeds/Pound	Pounds of PLS/acre
<b>Alkali Soil Seed Mix</b>					
Alkali salsola	<i>Sporobolus airoides</i>	Cool	Bunch	1,750,000	0.25
Basis wildrice	<i>Elymus cinereus</i>	Cool	Bunch	165,000	2.5
Solar streambank wheatgrass	<i>Agropyron riparianum</i> 'Soda'	Cool	Sod	170,000	2.5
Jose tall wheatgrass	<i>Agropyron elongatum</i> 'Jose'	Cool	Bunch	79,000	7.0
Arriba western wheatgrass	<i>Agropyron amabilis</i> 'Arriba'	Cool	Sod	110,000	5.5
<b>Total</b>					<b>17.75</b>
<b>Fertile Loamy Soil Seed Mix</b>					
Ephraim crested wheatgrass	<i>Agropyron cristatum</i> 'Ephraim'	Cool	Sod	175,000	2.0
Dural lucid fescue	<i>Festuca ovina</i> 'Arvensis'	Cool	Bunch	565,000	1.0
Lincoln smooth brome	<i>Bromus inermis</i> 'Lays'	Cool	Sod	130,000	3.0
Solar streambank wheatgrass	<i>Agropyron riparianum</i> 'Soda'	Cool	Sod	170,000	2.5
Arriba western wheatgrass	<i>Agropyron amabilis</i> 'Arriba'	Cool	Sod	110,000	7.0
<b>Total</b>					<b>15.5</b>
<b>High Water Table Soil Seed Mix</b>					
Meadow foxtail	<i>Allopecurus pratensis</i>	Cool	Sod	900,000	0.5
Rudop	<i>Agrostis alba</i>	Warm	Open sod	5,000,000	0.25
Reed canarygrass	<i>Phalaris arundinacea</i>	Cool	Sod	68,000	0.5
Lincoln smooth brome	<i>Bromus inermis</i> 'Lays'	Cool	Sod	130,000	3.0
Parlinder switchgrass	<i>Panicum virgatum</i> 'Parlinder'	Warm	Sod	389,000	1.0
Altair tall wheatgrass	<i>Agropyron elongatum</i> 'Altair'	Cool	Bunch	79,000	5.5
<b>Total</b>					<b>18.75</b>
<b>Transition Turf Seed Mix<sup>2</sup></b>					
Rubens Canadian bluegrass	<i>Poa compressa</i> 'Rubens'	Cool	Sod	2,500,000	0.5
Dural lucid fescue	<i>Festuca ovina</i> 'Arvensis'	Cool	Bunch	565,000	1.0
Citation perennial ryegrass	<i>Lolium perenne</i> 'Citation'	Cool	Sod	247,000	3.0
Lincoln smooth brome	<i>Bromus inermis</i> 'Lays'	Cool	Sod	130,000	3.0
<b>Total</b>					<b>7.5</b>

TS/PS-4 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 June 2012

**Temporary and Permanent Seeding (TS/PS) EC-2**

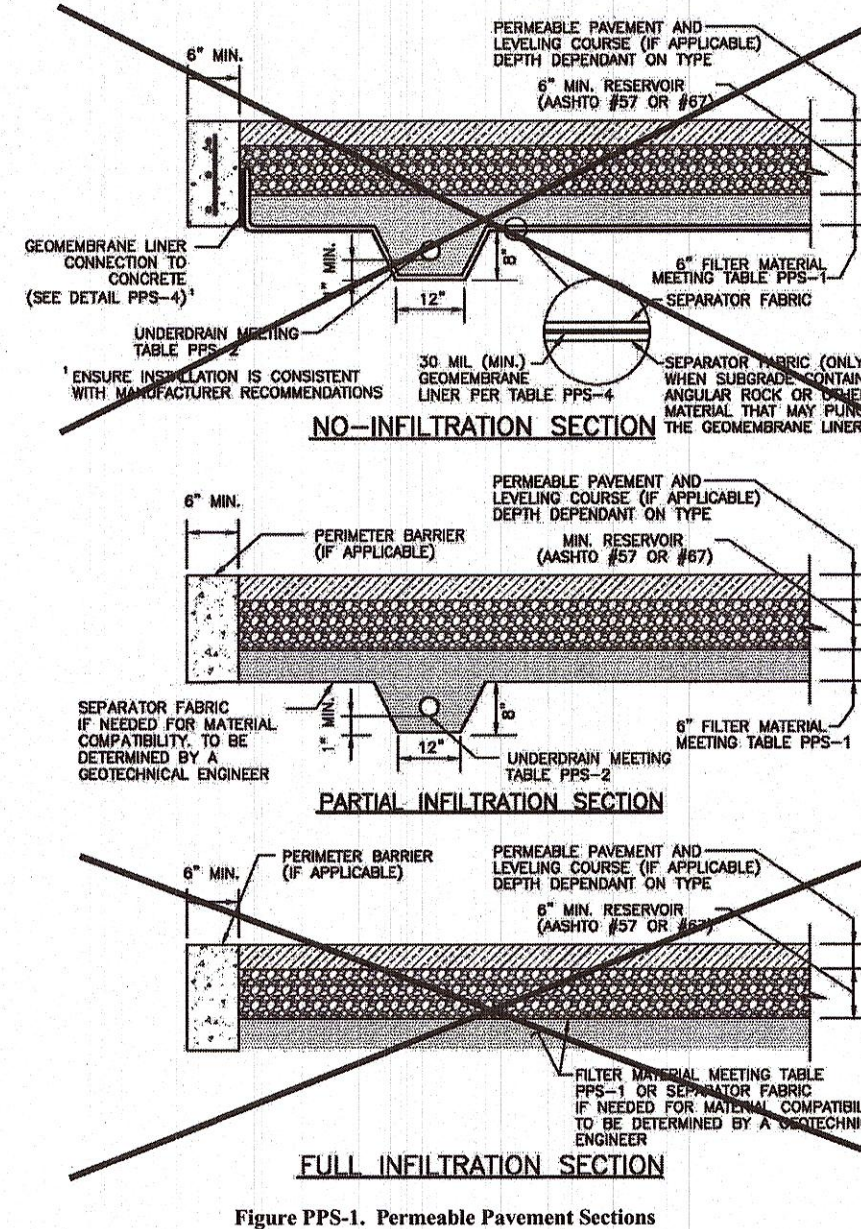
**Table TS/PS-2. Minimum Drill Seeding Rates for Perennial Grasses (cont.)**

Common Name	Botanical Name	Growth Season <sup>1</sup>	Growth Form	Seeds/Pound	Pounds of PLS/acre
<b>Sandy Soil Seed Mix</b>					
Blue grama	<i>Bouteloua gracilis</i>	Warm	Sod-forming bunchgrass	825,000	0.5
Claytonia bluegrass	<i>Scleropogon scoparium</i> 'Claytonia'	Warm	Bunch	240,000	1.0
Prairie sandreed	<i>Calamagrostis longifolia</i>	Warm	Open sod	274,000	1.0
Sand dropseed	<i>Sporobolus vaginifolius</i>	Cool	Bunch	5,290,000	0.25
Vaughn side oats grama	<i>Stipa capensis</i> 'Vaughn'	Warm	Sod	191,000	2.0
Arriba western wheatgrass	<i>Agropyron amabilis</i> 'Arriba'	Cool	Sod	110,000	5.5
<b>Total</b>					<b>16.25</b>
<b>Heavy Clay, Rocky Footwall Seed Mix</b>					
Ephraim crested wheatgrass <sup>3</sup>	<i>Agropyron cristatum</i> 'Ephraim'	Cool	Sod	175,000	1.5
Cuba intermediate wheatgrass	<i>Agropyron intermedium</i> 'Cuba'	Cool	Sod	115,000	5.5
Vaughn side oats grama <sup>4</sup>	<i>Stipa capensis</i> 'Vaughn'	Warm	Sod	191,000	2.0
Lincoln smooth brome	<i>Bromus inermis</i> 'Lays'	Cool	Sod	130,000	3.0
Arriba western wheatgrass	<i>Agropyron amabilis</i> 'Arriba'	Cool	Sod	110,000	5.5
<b>Total</b>					<b>17.5</b>

- All of the above seeding mixes and rates are based on drill seeding followed by crimped straw mulch. These rates should be doubled if seed is broadcast and should be increased by 50 percent if the seeding is done using a friction Drill or as applied through hydraulic seeding. Hydraulic seeding may be substituted for drilling only where slopes are steeper than 3:1. If hydraulic seeding is used, hydraulic mulching should be done as a separate operation.
- See Table TS/PS-3 for seeding dates.
- If site is to be irrigated, the transition turf seed rates should be doubled.
- Created wheatgrass should not be used on slopes steeper than 6:1 to 1:1.
- Can substitute 0.5 the PLS of blue grama for the 2.0 lbs PLS of Vaughn side oats grama.

June 2012 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 TS/PS-5

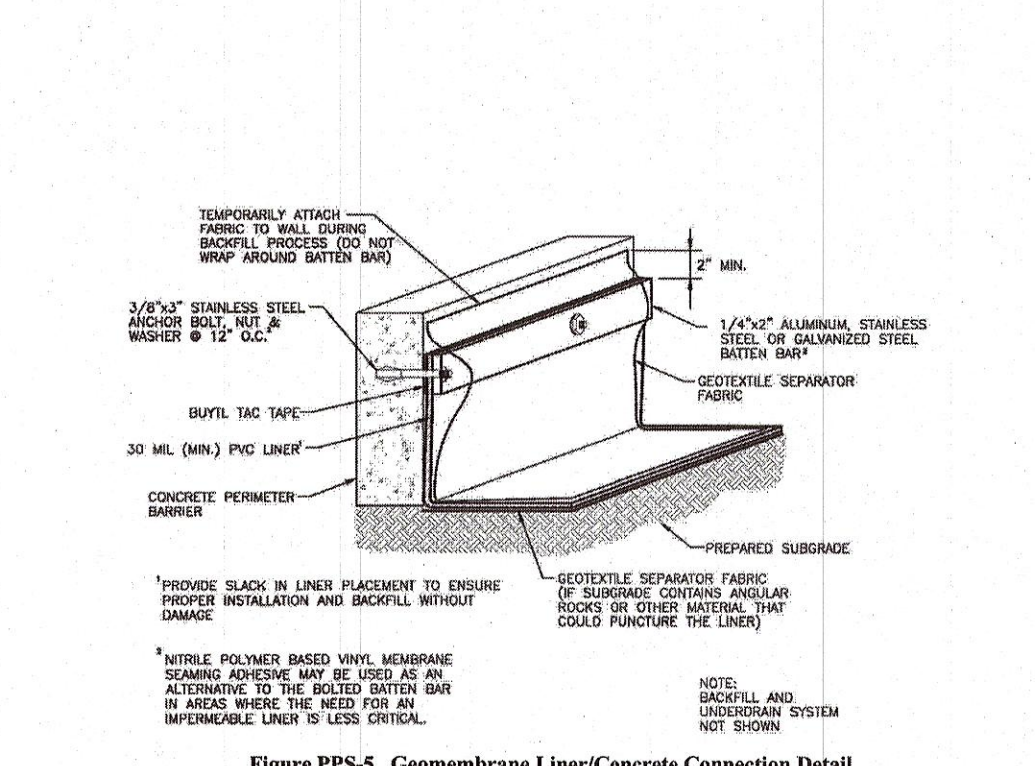
**Permeable Pavement Systems T-10**



- Figure PPS-1. Permeable Pavement Sections**
- PERFORATED BARRIER (IF APPLICABLE)
  - 6" MIN. RESERVOIR (AGSHTO #57 OR #58)
  - 6" FILTER MATERIAL MEETING TABLE PPS-1
  - SEPARATOR FABRIC IF NEEDED FOR MATERIAL COMPATIBILITY TO BE DETERMINED BY A GEOTECHNICAL ENGINEER

PPS-6 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 August 2013

**Permeable Pavement Systems T-10**



- Figure PPS-1. Permeable Pavement Sections**
- PERFORATED BARRIER (IF APPLICABLE)
  - 6" MIN. RESERVOIR (AGSHTO #57 OR #58)
  - 6" FILTER MATERIAL MEETING TABLE PPS-1
  - SEPARATOR FABRIC IF NEEDED FOR MATERIAL COMPATIBILITY TO BE DETERMINED BY A GEOTECHNICAL ENGINEER

PPS-16 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 August 2013

**Permeable Pavement Systems T-10**

- Call for construction fence on the plans around pervious areas where infiltration rates need to be preserved and could be reduced by compaction from construction traffic or storage of materials.
- Example Construction Drawing Notes**
- Excavation of subgrade shall not commence until after the pre-construction meeting.
  - Subgrade shall be excavated using low ground pressure (LGP) track equipment to minimize over compaction of the subgrade.
  - Grading and compaction equipment used in the area of the permeable pavement should be approved by the engineer prior to use.
  - Loose materials shall not be stored on the permeable pavement area.
  - The contractor shall, at all times during and after system installation, prevent sediment, debris, and dirt from any source from entering the permeable pavement system.
  - Placement of the wearing course shall be performed after fine grading and landscaping in adjacent areas is complete. If the wearing course becomes clogged due to construction activities, clean the surface with a vacuum machine to restore the infiltration rate after construction is complete.
  - For partial and full infiltration sections only.

- Design Procedure and Criteria**
- Note: This manual includes a variety of specific pavements, which are discussed and distinguished in supplemental BMP Fact Sheets T-10.1, T-10.2, etc. This BMP Fact Sheet outlines the design procedure and other design components and considerations that are common to all of the systems. Review of the supplemental Fact Sheets is recommended to determine the appropriate pavement for a specific site or use.
- Subsurface Exploration and Determination of a No-Infiltration, Partial Infiltration, or Full Infiltration Section:** Permeable pavements can be designed with three basic types of sections. The appropriate section will depend on land use and activities, proximity to adjacent structures and soil characteristics. Sections of each installation type are shown in Figure PPS-1.
    - No-Infiltration Section:** This section includes an underdrain and an impermeable liner that prevents infiltration of stormwater into the subgrade soils. Consider using this section when any of the following conditions exist:
      - Land use or activities could contaminate groundwater if stormwater is allowed to infiltrate.
      - Permeable pavement is located over potentially expansive soils or bedrock that could swell due to infiltration and potentially damage the permeable pavement system or adjacent structures (e.g., building foundation or conventional pavement).

August 2013 Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3 PPS-3