SECTION 5: Standards for Storm Drainage Systems
5.0 STANDARDS FOR STORM DRAINAGE SYSTEMS

5.1 GENERAL

5.1.A Design Standards
Drainage facilities shall be designed in accordance with the City of Kent Surface Water Design Manual (KSWDM).

5.1.B Specifications
Materials, construction, and testing are specified in Section 7-04 of the WSDOT Standard Specifications.

5.1.C Conflicts
Where technical conflicts may occur between this document and the KSWDM, these Standards shall govern.

5.2 EASEMENTS AND RIGHTS-OF-WAY
Permanent on-site easements for access, maintenance, and construction are required in accordance with KSWDM Section 4.1 for all storm drain extensions located outside of public right-of-way.

Private improvements such as buildings, fences, garages, carports, retaining walls, utilities, signs, light standards, etc., are not allowed in public easements and rights-of-way. Where an encroachment occurs, the Developer shall remove and relocate the conflicting private improvement immediately upon direction from the Engineer.

Easements shall be accessible for construction equipment normally used for the operation and maintenance of the facility. Cross slopes exceeding 5 percent will require a deviation approval of the Engineer.

5.3 STORM WATER SYSTEM AND CULVERTS

5.3.A Pipe Bedding
Pipe bedding shall be placed under and all around the pipe meeting the requirements of gravel backfill for pipe zone bedding per Section 9-03.12(3) of the WSDOT Standard Specifications, latest edition. It shall be compacted in layers around the pipe and to a sufficient height above the pipe to adequately support and protect the pipe to 95 percent compaction ASTM D-1557. See WSDOT Standard Plans and Standard Plan 3-22.
5.3.B **Access Roads**

Access roads to each catch basin and manhole are required for maintenance. Access and/or maintenance roads (where required) shall be 15’ wide and have a minimum inside turning radius of 45’. Access and/or maintenance roads will require an approved all-weather surface, and shall be designed to support an HS-20 vehicle load to support construction equipment and loads. The profile of an access road shall not exceed 15 percent. Access roads with grades exceeding 12 percent shall be paved. Whenever an easement or right-of-way is fenced, a gate shall be installed matching the width of the easement and a City lock must be placed in “series”.

All access roads longer than 150’ from the nearest face of curb or edge of pavement of the connecting street shall have an approved hammerhead turnaround per Standard Plan 6-21 or shall be looped to connect back to a public street.

5.3.C **Casings:**

Where a storm water line passes under or through a retaining wall or is attached to a bridge structure, the pipe shall be cased in steel pipe at least 4” larger than the largest outer diameter of the bell or joint of the storm water line. No pipe joints will be allowed within the casing, except on bridge structures or unless otherwise approved by the Engineer. The casing shall extend on either side of the wall a distance equal to the highest height of the retaining wall at the wall penetration, plus 4’. All voids within the casing shall be filled with blown sand except on bridge structures. Casing spacers shall be Cascade Waterworks Manufacturing Company stainless steel casing spacers or approved equal. The casing spacers shall be installed such that the storm water line is centered and restrained within the casing and spaced such that a uniform profile grade will be maintained within the casing.

5.4 **CATCH BASIN LOCATIONS AND JUNCTIONS**

5.4.A **Catch Basins**

Catch basins, rather than inlets, shall be used to collect storm water from street surfaces, unless otherwise approved by the Engineer. See Standard Plans 5-1 and 5-2.

5.4.B **Connections to Pipe Systems**

Connections to pipe systems may be made without placing a catch basin or manhole on the mainline only in accordance with Standard Plan 5-18. All other connections shall be made at catch basins or manholes.
5.4.C  Manholes in Lieu of Catch Basins
Manholes may be used in lieu of catch basins if they do not collect surface water. Manholes must be used if invert elevations are different by more than 18”. See Standard Plan 4-1.

5.4.D  Control Structure Placement
A control structure shall be placed in a manhole downstream of detention systems utilizing pumps.

5.4.E  Roof and Yard Drains
Roof and yard drains, or other concentrated flow from adjacent property, shall not discharge over the surface of streets, sidewalks, pathways, or shoulders.

5.5  FRAMES, GRATES, AND COVERS

5.5.A  Metal Castings for Drainage Structures
Metal castings for drainage structures shall not be dipped, painted, welded, plugged or repaired.

5.5.B  Porosity in Metal Castings for Drainage Structures
Porosity in metal castings for drainage structures shall be considered a workmanship defect subject to rejection by the Inspector.

5.5.C  Casting for Manhole Rings
Casting for manhole rings shall be gray-iron conforming to the requirements of AASHTO M 105, Grade 30B. Covers shall be ductile iron conforming to ASTM A 536, Grade 80-55-06. Manhole rings and covers shall meet the strength requirements of Federal Specification RR-F-621 E. All mating surfaces shall be machine finished to ensure a non-rocking fit.

5.5.D  Manhole Rings and Covers Identification
All manhole rings and covers shall be identified as specified in Section 9-05.15 of the WSDOT Standard Specifications and Standard Plans 5-10 or 5-11.

5.5.E  Metal Frame Castings for Catch Basins and Inlets
1. Castings for metal frames for catch basins and inlets shall be cast steel, gray iron, or ductile iron as specified in Sections 9-06.8, 9-06.9, or 9-06.14 of the WSDOT Standard Specifications.
2. Castings for metal frames for catch basins, inlets, grates and solid metal covers shall meet the strength requirements of Federal Specification RR-F-621 E.
5.5.F Metal Grates and Covers for Catch Basins and Inlets

Castings for grates and solid metal covers for catch basins and inlets shall be cast steel or ductile iron as specified in Sections 9-06.8 or 9-06.14 of the WSDOT Standard Specifications. The foundry name and material designation shall be embossed on the top of the grate. The material shall be identified as “CS” for cast steel, and “DUC” or “DI” for ductile iron and shall be located near the manufacturer’s name. See Standard Plans 5-4 through 5-9.

5.5.G Grate and Cover Seating

Grates and covers shall be seated properly to prevent rocking, including the replacement of existing covers with solid metal covers.

5.5.H Vaned Grates

Unless otherwise specified, vaned grates shall be used with standard frame in the traveled way, gutter, or shoulder. Vaned grates shall not be located within crosswalks. See Standard Plans 5-4 through 5-6.

5.5.I Rolled Curbs

Use rolled curb frame and grates along rolled curbs. See Standard Plan 5-7.

5.5.J Runoff Collection in Catch Basins

New catch basins that do not collect runoff shall use solid locking covers. Existing catch basins, which no longer collect runoff, shall have their frame and grates replaced with new frames and solid covers. See Standard Plan 5-9.

5.5.K Locking Drain Covers and Grates

All storm drain covers and grates shall be locking. All control structures storm drain covers shall be locking regardless of their location.

5.5.L Fencing for Stormwater Facilities

All on-site detention ponds located within commercial or residential zones shall have fencing 6’ high. See Standard Plans 5-22 & 5-23.

5.6 TELEVISION INSPECTION

All new storm drain extensions will be TV camera inspected by the City prior to acceptance.

Prior to TV camera inspection:

1. Storm drain lines and catch basins must be cleaned
2. All construction must be completed and approved by the Inspector.

3. The casting and top grade rings do not have to be mudded in until after the finished grade is established.

4. The Developer shall bear all costs for correction of deficiencies found during TV inspection, including all costs for subsequent TV inspections to verify the correction of deficiencies.

5. The Developer shall schedule TV inspections no less than five (5) working days prior to being ready. If the system is not ready, the Developer shall notify the City no later than 24 hours prior to the scheduled time. If the Developer fails to notify the City that they are not ready and the TV inspection crew shows up at the site, the Developer will be responsible for all costs of additional TV inspections to verify the system.

6. All costs for re-inspections including the Inspector’s time to come back due to “not being ready” will be the responsibility of the Developer. Costs shall include labor at overtime rates, overhead, equipment, material and any other associated charges. The costs shall be based on the latest cost schedule prepared and approved annually by the Engineer.

7. Sags in storm drain lines indentified during the TV inspection greater than 0.5” shall be repaired by the contractor by removal and re-laying of the pipe. Repaired sections of pipe shall be TV inspected for verification prior to final inspection at the cost of the Developer as described above.

5.7 EROSION CONTROL

All projects shall provide erosion control in accordance with the KSWDM.

DOE requires coverage under the NPDES Construction Stormwater General Permit when the disturbed area for the project exceeds one (1) acre. The NPDES permit requires that a stormwater pollution prevention plan (SWPPP) be developed for all projects covered. A Certified Erosion and Sediment Control Lead shall be required to be onsite during construction. See the Department of Ecology website at:

http://www.ecy.wa.gov/programs/wq/stormwater/construction

See the Kent Surface Water Design Manual, King County Surface Water Design Manual for allowable erosion control best management practices. See Standard Plans 5-27, 5-30 and 5-31 for additional information.

5.8 LOW IMPACT DEVELOPMENT TECHNOLOGIES

The City encourages the use of Low Impact Development (LID) technologies. LID is a stormwater management and land development strategy applied at the parcel and subdivision scale that emphasizes conservation and use of
existing natural site features integrated with engineered small scale hydrologic controls to more closely mimic pre-development functions. The goal of LID is to prevent measurable harm to streams, lakes, wetlands, and other natural aquatic systems from residential, commercial, or industrial development sites.

LID technologies include stormwater best management practices designed to reduce runoff from development using infiltration, evapotranspiration, or stormwater reuse. Examples of LID technologies include trees, preservation of native vegetation, porous pavement, bio-retention swales, infiltration systems, dry wells, cisterns, and rain gardens. Examples of these technologies are provided in the 2005 King County Surface Water Design Manual.
5.9 STORM DRAIN SYSTEM STANDARD PLANS

5-1 Catch Basin Type I
5-2 Catch Basin Type II
5-3 Misc. Details for Drainage Structures
5-4 18” x 24” Catch Basin Frame
5-5 18” x 24” Vaned Grate
5-6 18” x 24” 2-Way Vaned Grate
5-7 Through – Curb Inlet Frame
5-8 Through-Curb Inlet Installation
5-9 Solid Catch Basin Cover
5-10 **Round-Solid-Catch Basin Frame and Cover**

   Use WSDOT Standard Plan B-30.70-03 Type 2

5-11 Private Round Catch Basin Cover
5-12 15” X 22” Rolled Curb Frame and Grate
5-13 Beehive Grate
5-14 20” x 24” Catch Basin Frame
5-15 Debris Cage
5-16 Extended Debris Cage
5-17 Catch Basin with Oil/Water Separator
5-18 Field Tapping of Concrete Pipe
5-19 Beveled End Pipe Section
5-20 Trash Screen
5-21 Shear Gate
5-22 Chain Link Fence, Type I for Ponds Only
5-23 Driveway and Walk Gate for Ponds Only
5-24 Tree Planting
5-25 Shrub Planting
5-26 Trench Infiltration System for Small Sites
5-27 Flow Spreader Option Catch Basin with Beehive Grate
5-28 Critical Areas Sign
5-29 Split Rail Fence
5-30 Sample TESC Site Plan, 1 Acre and Smaller
5-31 Filter Fabric Fence
5-32 TESC Sediment Trap Earth Berm
5-33 TESC Interceptor Ditch with Rock Check Dams
5-34  TESC Pipe Slope Drain
5-35  Temporary Stockpiling
NOTES:

1. CATCH BASIN TO BE CONSTRUCTED IN ACCORDANCE WITH AASHTO M 199, (ASTM C 478, & ASTM C 890) UNLESS OTHERWISE SHOWN ON PLANS OR NOTED IN THE WSDOT STANDARD SPECIFICATIONS.

2. AS AN ACCEPTABLE ALTERNATE TO REBAR, WELDED WIRE FABRIC HAVING A MINIMUM AREA OF 0.12 SQUARE INCHES PER FOOT MAY BE USED. WELDED WIRE FABRIC SHALL COMPLY TO AASHTO M 221 (ASTM A 497). WIRE FABRIC SHALL NOT BE PLACED IN THE KNOCKOUTS.

3. PRECAST BASES SHALL BE FURNISHED WITH CUTOUTS OR KNOCKOUTS. THE KNOCKOUT DIAMETER SHALL NOT EXCEED 20°. KNOCKOUTS SHALL HAVE A WALL THICKNESS OF 2 INCHES MINIMUM. PROVIDE A 1.5 INCH MINIMUM GAP BETWEEN THE KNOCKOUT WALL AND THE OUTSIDE OF THE PIPE.

4. ALL JOINTS IN THE BRICKS, GRADE RINGS, RISERS AND CASTINGS SHALL BE SEATED IN MORTAR. PICK HOLES, CRACKS AND ANY OTHER JOINTS SHALL BE FINISH GROUTED TO PROVIDE A WATERTIGHT STRUCTURE.

5. THE MAXIMUM DEPTH FROM THE FINISHED GRADE TO THE LOWEST PIPE INVERT SHALL BE 5'.

PIPE ALLOWANCES

<table>
<thead>
<tr>
<th>PIPE MATERIAL</th>
<th>MAXIMUM INSIDE DIAMETER</th>
</tr>
</thead>
<tbody>
<tr>
<td>REINFORCED OR PLAIN CONCRETE</td>
<td>12'</td>
</tr>
<tr>
<td>ALL METAL PIPE</td>
<td>15'</td>
</tr>
<tr>
<td>SOLID WALL PVC (WSDOT STD. SPEC. 9-05.12(1))</td>
<td>15'</td>
</tr>
</tbody>
</table>

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NOTES:

1. CATCH BASINS TO BE CONSTRUCTED IN ACCORDANCE W/ AASHTO M 199, (ASTM C 478, AND ASTM C 890) UNLESS OTHERWISE SHOWN ON PLANS OR NOTED IN THE WSDOT STD. SPECS.

2. HANDHOLDS IN RISER OR ADJUSTMENT SECTION SHALL HAVE 3" MIN. CLEARANCE. STEPS IN CATCH BASIN SHALL HAVE 6" MIN. CLEARANCE. NO STEPS ARE REQ'D WHEN 'B' IS 4' OR LESS.

3. THE BOTTOM OF THE PRECAST CATCH BASIN MAY BE SLOPED TO FACILITATE CLEANING.

4. KNOCKOUTS SHALL HAVE A WALL THICKNESS OF 2" MINIMUM TO 2.5" MAXIMUM. PROVIDE A 1.5" MINIMUM GAP BETWEEN THE KNOCKOUT WALL AND THE OUTSIDE OF THE PIPE. AFTER THE PIPE IS INSTALLED, FILL THE GAP WITH JOINT MORTAR IN ACCORDANCE WITH WSDOT STANDARD SPECIFICATION 9-04.3.

5. ALL BASE REINFORCING STEEL SHALL HAVE A MIN. YIELD STRENGTH OF 60,000 PSI & BE PLACED IN THE UPPER HALF OF THE BASE WITH 1" MIN. CLEARANCE.

6. PICK HOLES, CRACKS AND ANY OTHER JOINTS SHALL BE FINISHED GROUTED TO PROVIDE A WATERTIGHT STRUCTURE.
#6 BARS @ 7" CENTERS BOTTOM FACE WITH 1" MIN. COVER

ONE #3 BAR HOOP FOR 6" TWO #3 BAR HOOPS FOR 12"

AS AN ACCEPTABLE ALTERNATIVE TO REBAR, WIRE MESH HAVING A MINIMUM AREA OF 0.12 SQUARE INCHES PER FOOT MAY BE USED FOR ADJUSTMENT SECTIONS.

RECTANGULAR ADJUSTMENT SECTION

#5 BARS @ 6" CENTERS BOTTOM FACE WITH 1" MIN. COVER

ONE #3 BAR HOOP

CIRCULAR ADJUSTMENT SECTION

#4 BARS @ 6" CENTERS BOTTOM FACE WITH 1" MIN. COVER

TYPICAL ORIENTATION FOR ACCESS AND STEPS

NOTES:

1. SLAB OPENING SHALL BE 24" X 20" FOR RECTANGULAR AND 24" DIAMETER FOR ROUND.

2. SEE STANDARD PLAN 4-5 FOR STEP, LADDER AND GRADE RING.

3. ONLY ONE STYLE OF CATCH BASIN STEPS MAY BE USED IN A CATCH BASIN. DO NOT MIX STYLES.
NOTES:

1. MATERIAL USED FOR THE FRAME SHALL BE CAST IRON ONLY. (PER ASTM A48 CL30 H-20 LOADING).

2. TOP OF FRAME SHALL BE ADJUSTED EVEN WITH ROADWAY SECTION.

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NOTES:

1. PROVIDE FRAME SHOWN IN STANDARD PLAN 5-4.
2. PROVIDE 2-5/8" DIAMETER STAINLESS STEEL ALLEN TYPE BOLTS COUNTER SUNK FLUSH WITH COVER.
3. GRATE SHALL BE STAMPED "DUMP NO POLLUTANTS", "OUTLET TO STREAM".
4. ALL LETTERING SHOWN SHALL BE 1/2" AND SHALL BE RECESSED UNLESS OTHERWISE INDICATED IN THE SPECIAL PROVISIONS.
5. DUCTILE IRON ASTM A-536 GRADE 60-55-06 H-2G RATED.
6. GRATE SHALL BE LOCKING.

SLOT FORMED AND RECESSED FOR 5/8" - 11 NC x 2"
S.S. SOCKET HEAD (ALLEN HEAD) CAP SCREW.
NOTES:

1. PROVIDE FRAME SHOWN STANDARD PLAN 5-4.

2. FOR THRU CURB INLETS AT LOW POINTS, USE 2-WAY VANED GRATE.

3. GRATE SHALL BE STAMPED "DUMP NO POLLUTANTS", "OUTLET TO STREAM".

4. ALL LETTERING SHOWN SHALL BE 1/2" AND SHALL BE RECESSED.

5. DUCTILE IRON ASTM A-536 GRADE 80-55-06 H-2O RATED.

6. GRATE SHALL BE LOCKING.

7. PROVIDE 2-5/8" DIAMETER STAINLESS STEEL ALLEN TYPE BOLTS COUNTER SUNK FLUSH WITH COVER.

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NOTES:

1. FRAME AND HOOD CAST IRON ASTM A48 CL30 H-20 LOADING.

2. USE VANED GRATE AS SHOWN ON STANDARD PLAN 5-5.

3. AT LOW POINTS, USE 2-WAY VANED GRATE AS SHOWN ON STANDARD PLAN 5-6.

4. MAKE 3/16" NON-SKID DIAMOND PATTERN ON TOP SURFACE OF HOOD. SEE STANDARD PLAN 5-9.

5. BOLT, WASHER AND NUT SHALL BE GALVANIZED OR CORROSION RESISTANT.

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CITY OF KENT
ENGINEERING DEPARTMENT

THROUGH–CURB
INLET FRAME

DESIGNED: DH
DRAWN: KB
CHECKED: Date
APPROVED: Engineer

5-7
NOTES:

1. FOR INSTALLATIONS AT LOW POINTS USE 2-WAY VANED GRATE. OTHERWISE, USE STANDARD VANED GRATE.

2. CURB AND GUTTER 5’ EITHER SIDE OF CATCH BASIN SHALL BE POURED AT THE TIME OF FRAME AND GRATE INSTALLATION.

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NOTES:

1. WHEN SPECIFIED ON THE APPROVED PLANS, THE SOLID METAL COVER FOR CATCH BASIN SHALL BE FURNISHED IN PLACE OF THE GRATE PROVIDED FOR ON STANDARD PLAN 5-5.

2. RAISED DESIGNS OTHER THAN THE DIAMOND DESIGN SHOWN HEREON MAY BE USED IF APPROVED BY THE ENGINEER.

3. CAST IN THE LETTERS "DRAIN" IN 2" RAISED LETTERS, 1/8" HIGH.

4. TO BE USED WITH FRAME SHOWN IN STANDARD PLAN 5-4.

5. PROVIDE 2-5/8" DIAMETER STAINLESS STEEL ALLEN TYPE BOLTS COUNTER SUNK FLUSH WITH COVER. (SEE STANDARD PLAN 5-4 FOR BOLT-DOWN CATCH BASIN FRAME).

6. FRAME, CAST IRON ASTM A48 CL30, COVER, DUCTILE IRON ASTM A 536 GR 8055-06 H-20 RATED.

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NOTES

1. The gasket and groove may be in the seat (frame) or in the underside of the cover. The gasket may be "T" shaped in section. The groove may be cast or machined.

2. Bolt-down capability is required on all frames, grates, and covers, unless specified otherwise in the Contract. Provide 3 holes in the frame that are vertically aligned with the grate or cover slots. The frame shall accept the 5/8" x 1 NC x 2" Allen head cap screw by being tapped, or other approved mechanism. Location of bolt down holes varies by manufacturer.

3. For bolt-down manhole ring and covers that are not designated "Watertight," the neoprene gasket, groove, and washer are not required.

4. Washer shall be neoprene (Detail "B").

5. In lieu of blind pick notch for manhole covers, a single 1" pick hole is acceptable. Hole location and number of holes may vary by manufacturer.

6. Alternative reinforcing designs are acceptable in lieu of the rib design.

7. For clarity, the vertical scale of the Cover Section has been exaggerated, it is 1.5 times the horizontal scale (1H:1.5V).

SPECIFY LETTERING

CIRCULAR FRAME (RING) AND COVER
STANDARD PLAN B-30.70-03

PLAN VIEW

RING PLAN

RING SECTION A

RING SECTION A

ISOMETRIC VIEW

SKID GROOVE PATTERN DETAIL

COVER PLAN

COVER PLAN

COVER SECTION B

COVER SECTION B

SEE DETAIL "A"

SEE DETAIL "A"

SEE DETAIL "A"

SEE DETAIL "A"

SEE DETAIL "B"

SEE DETAIL "B"

SEE DETAIL "B"

SEE DETAIL "B"

BOLT-DOWN / WATERTIGHT TYPE 1

BOLT-DOWN / WATERTIGHT TYPE 2

STANDARD

WASHER (SEE NOTES)

WASHER (SEE NOTES)

1/4" COUNTERSUNK HOLE WITH NEOPRENE GASKET (SEE NOTES)
NOTES:

1. CAST IRON TO CONFORM TO SPEC. ASTM - 159-55, ALLOY #111 RATING H-20.

2. SEAT OF COVER & FRAME MACHINED.

3. NON-ROCKING FIT FOR MANHOLE COVERS.

4. BREAK ALL SHARP CORNERS WHERE POSSIBLE.

5. CASTING TO BE SHOT BLASTED AND FREE FROM SURFACE SAND AND SCALE.

6. CASTING TO BE SMOOTH, TRUE TO PATTERN, FREE FROM BLOWHOLES, POROSITY, HARD SPOTS, SHRINK HOLES, WARP, OR ANY OTHER DEFECTS WHICH COULD IMPAIR SERVICEABILITY.

7. CASTINGS SHALL BE COATED AS DIRECTED BY THE ENGINEER.
1. MATERIAL USED FOR THE FRAME SHALL BE CAST IRON ONLY (PER ASTM A48 CL30 H-20 LOADING).

2. GRATE SHALL BE STAMPED "DUMP NO POLLUTANTS-OUTLET TO STREAM".

3. SEE STANDARD PLAN 5-8 FOR INSTALLATION IN ROLLED CURB & GUTTER.
SECTIONS A-A
LOCKING BEEHIVE GRATE

SECTIONS B-B
23"x6" MANHOLE RING & LOCKING BEEHIVE GRATE

NOTES:
1. MATERIAL: DUCTILE IRON ASTM A536, CL 80-55-06.
2. SEE STANDARD PLAN 5-14 FOR FRAME.
3. PROVIDE 2-5/8" DIAMETER STAINLESS STEEL ALLEN TYPE BOLTS COUNTER SUNK FLUSH WITH COVER.

NOTES:
2. SEE STANDARD PLAN 5-10 FOR FRAME.
3. PROVIDE 2-5/8" DIAMETER STAINLESS STEEL ALLEN TYPE BOLTS COUNTER SUNK FLUSH WITH COVER.

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1. MATERIAL USED FOR THE FRAME SHALL BE CAST IRON ONLY. (PER ASTM A48 CL30 H-20 LOADING).

2. TOP OF FRAME SHALL BE ADJUSTED EVEN WITH ROADWAY SECTION.

3. FOR USE WITH RECTANGULAR BEEHIVE GRATE.

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3/4" DIAM. SMOOTH ROUND BARS EQUALLY SPACED. BARS SHALL BE WELDED TO UPPER & LOWER BANDS.

*NOTE: BARS OMITTED ON DRAWING

NOTES:

1. ALL STEEL IN PLATES, BARS AND BANDS SHALL CONFORM TO THE REQUIREMENTS OF ASTM A36.

2. DEBRIS CAGE SHALL BE HOT-DIP GALVANIZED IN ACCORDANCE WITH AASHTO M111 (ASTM A123).

3. ENTRY GATE SHALL BE LOCKABLE WITH A CITY OF KENT PADLOCK.

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NOTES:

1. MIN. OUTLET PIPE DIAMETER IS 12".

2. ALL METAL PARTS AND SURFACES MUST BE MADE OF CORROSION RESISTANT MATERIAL OR GALVANIZED.

3. DIMENSION "D" IS NOMINAL DIAMETER OF OUTLET PIPE.

<table>
<thead>
<tr>
<th>OUTLET PIPE DIAM.</th>
<th>STRUCTURE TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 12&quot;</td>
<td>TYPE 2 CB-48&quot;</td>
</tr>
<tr>
<td>≤ 18&quot;</td>
<td>TYPE 2 CB-54&quot;</td>
</tr>
</tbody>
</table>

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NOTES:

1. "D", THE INSIDE DIAM. OF THE INLET PIPE, SHALL BE 24 IN. OR LESS. FOR LARGER VALUES, OF "D", USE AN APPROVED STRUCTURE.

2. IN NO CASE SHALL THE OUTSIDE DIAM. OF THE INLET PIPE EXCEED ONE-HALF THE INSIDE DIAM. OF THE MAIN STORM SEWER.

3. Q OF INLET PIPE SHALL BE ON RADIUS OF MAIN STORM DRAIN.

4. THE MIN. OPENING INTO THE EXISTING STORM DRAIN SHALL BE THE OUTSIDE DIAM. OF THE INLET PIPE PLUS 1 IN.

5. FIELD TAPPING ONLY WHERE ANGLE IS 0° TO 45°.

6. MAKE CONNECTIONS IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. STANDARD SHOP FABRICATED TEES, WYES AND SADDLES SHALL BE USED.
END SECTION

1' MIN. METAL
4' MIN. PLASTIC
3:1
(TYP.)

4' MAX.

PLANNED CULVERT LENGTH

METAL & PLASTIC PIPE

NOTE:
SIDE SLOPE SHALL BE WARPED TO MATCH THE BEVELED PIPE END. WHEN CULVERT IS ON SKEW, BEVELED END SHALL BE ROTATED TO CONFORM TO SLOPE. IF SLOPE DIFFERS FROM 3:1, PIPE SHALL BE BEVELED TO MATCH SLOPE.

TONGUE END ON INLET END
GROOVE END ON OUTLET END
ENDS TO FIT ADJACENT PIPE SECTIONS

ROUND EDGES
1/2" - 1"

PLAN

END SECTION

1' MIN.

3:1
(TYP.)

4' MAX.

PLANNED CULVERT LENGTH

ELEVATION

CONCRETE PIPE

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(2) 1/4"x3" GALVANIZED STEEL STRIPS

3/4" DIA. GALVANIZED STEEL BARS. WELD ENDS TO FRAME

3/4" Ø GALVANIZED STEEL BAR

(4) 1/4"x2"x6" GALVANIZED STEEL STRIPS. BEND AND WELD TO FRAME. SPACE UNIFIEDLY

VARIRES

6" MAX. SPACING

STORM DRAIN PIPE (18"Ø OR LARGER)

DRILL THROUGH PIPE MATERIAL & STEEL STRIPS. BOLT WITH 1/2" S. STL. HEX BOLTS

NOTES:

1. WELD AT ALL JOINTS.

2. SHOP DRAWINGS REQUIRED.

3. ALL STEEL IN PLATES, BARS AND BANDS SHALL CONFORM TO THE REQUIREMENTS OF ASTM A36.

4. DEBRIS CAGE SHALL BE HOT-DIP GALVANIZED IN ACCORDANCE WITH AASHTO M111 (ASTM A123).

5. GALVANIZING SHALL BE PER WSDOT STD. SPECIFICATION 9-05.1(2).

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NOTES:

1. SHEAR GATE SHALL BE STAINLESS STEEL PER ASTM A480.

2. GATE SHALL BE 8" DIAMETER FOR PIPE 12 INCHES OR LESS IN DIAMETER, 12" DIAMETER FOR PIPE GREATER THAN 12" INCHES.

3. GATE SHALL BE JOINED TO TEE SECTION BY BOLTING THROUGH FLANGE.

4. LIFT ROD: AS SPECIFIED BY MFR. WITH HANDLE EXTENDING TO WITHIN ONE FOOT OF COVER AND ADJUSTABLE HOOK LOCK FASTENED TO FRAME OR UPPER HANDHOLD.

5. GATE SHALL NOT OPEN BEYOND THE CLEAR OPENING BY LIMITED HINGE MOVEMENT, STOP TAB, OR SOME OTHER DEVICE.

6. NEOPRENE RUBBER GASKET REQUIRED BETWEEN RISER MOUNTING FLANGE AND GATE FLANGE.

7. MATING SURFACES OF LID AND BODY TO BE MACHINED FOR PROPER FIT.

8. FLANGE MOUNTING BOLTS SHALL BE 3/8" DIAM. STAINLESS STEEL.

9. ALTERNATE SHEAR GATES PROVIDED THEY MEET THE MATERIAL SPECIFICATIONS AND DESIGN ABOVE, ARE ALLOWED WITH THE ENGINEERS APPROVAL.
NOTES:

1. ALL MATERIAL AND INSTALLATION SHALL BE PER SECTION 8-12 AND 9-16 OF THE WSDOT STANDARD SPECIFICATIONS

2. DETAILS ARE ILLUSTRATIVE AND SHALL NOT LIMIT HARDWARE DESIGN OR POST SELECTION OF ANY PARTICULAR FENCE TYPE.

3. COATING FOR FRAME, POSTS, FITTINGS AND FABRIC SHALL BE VINYL OR POWDER COATED FROM THE FACTORY.
   SEE 1998 KCSWDM 5.3.1 FOR COLOR.

4. SEE STANDARD PLAN 5-22 FOR FENCE DETAIL.

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PLACE TOP OF ROOTBALL 1" ABOVE THE LEVEL OF NATIVE SOIL. BEFORE MULCH, POTTING SOIL SHOULD BE VISIBLE

3" DEPTH MULCH NOT TOUCHING STEM

CUT CIRCULATING ROOTS AND SPREAD OR "BUTTERFLY" ROOTBALL

NATIVE SOIL

ROOT BALL

REST BOTTOM OF ROOTBALL ON UNDISTURBED NATIVE SOIL

WIDTH OF PLANTING HOLE SHALL BE AT LEAST 1.5 TIMES THE WIDTH OF THE ROOTBALL

SPREAD A 3' MINIMUM DIAMETER MULCH RING (DONUT) AROUND THE PLANTING HOLE

TREE TIE SHALL NOT CONSTRICT TREE DEVELOPMENT

STAKE ONLY IF NECESSARY (TYPICALLY IF TREE IS GREATER THAN 4' TALL)

STAKE TREE AT 1/3 HEIGHT OF TREE, USE "TREE TIES" OR ENGINEER APPROVED EQUIVALENT, REMOVE STAKE AND TIE AFTER 1 YEAR

BACKFILL WITH TOPSOIL ONLY, COMPACT MODERATELY BY HAND

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WIDTH OF PLANTING HOLE SHALL BE AT LEAST 1.5 TIMES THE WIDTH OF THE ROOTBALL

SPREAD A 3" MINIMUM DIAMETER MULCH RING (DONUT) AROUND THE PLANTING HOLE

NOT TO SCALE

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CITY OF KENT ENGINEERING DEPARTMENT

SHRUB PLANTING

DESIGNED:
DREW:
CHECKED:
APPROVED:

SCALE: NONE

STANDARD PLAN

5-25

September 2009
NOTES:

1. THE WETLAND/STREAM SIGN SHALL BE POSTED AT THE BOUNDARY BETWEEN THE LOT AND THE CRITICAL AREA BUFFER.

2. ONE SIGN SHALL BE POSTED FOR EVERY RESIDENTIAL LOT AND ONE PER EVERY 100 FEET FOR ALL PUBLIC RIGHTS OF WAY, TRAILS, PARKING AREAS, PLAYGROUNDS AND ALL OTHER USES LOCATED ADJACENT TO CRITICAL AREAS AND ASSOCIATED BUFFERS AND SHALL BE STATIONED PER LOCATION, ON THE APPROVED PLANS TO THE PROPOSED DEVELOPMENT.

3. PRE-PRINTED METAL SIGN (AVAILABLE AT CITY OF KENT)
NOTES:

1. POSTS AND RAILINGS ARE PRECUT FOR ASSEMBLY.

2. 3 RAILS ARE PERMITTED.

3. FENCES SHALL BE PLACED AT THE APPROVED BUFFER EDGE.
CLEARING LIMITS:
PRIOR TO ANY SITE CLEARING OR GRADING, THOSE AREAS THAT ARE TO REMAIN UNDISTURBED DURING PROJECT CONSTRUCTION SHALL BE DELINEATED.
MEASURES TO USE:
IN MOST CIRCUMSTANCES, MARK CLEARING LIMITS BY DELINEATING THE SITE WITH A CONTINUOUS LENGTH OF ORANGE BARRIER FENCE.

LEGEND:

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IN CRITICAL AREAS, INSTALL A SILT FENCE IN THE SEDIMENT BASIN.

CATCH BASIN

SEDIMENT BASIN OUTLET STRUCTURE AND DAM - SEE STANDARD PLAN 5-32

NOTES:

1. THIS IS A SAMPLE PLAN ONLY, INTENDING TO SHOW HOW TESC FEATURES MAY BE SHOWN ON A SITE PLAN. INDIVIDUAL PROJECT TESC PLANS SHOULD BE LAID OUT TO MEET PROJECT SPECIAL REQUIREMENTS.
2. TESC FEATURES ARE SHOWN IN THESE STD PLANS (5-29, 5-32, 5-34) AND THE KSWDM.

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NEWLY GRADED OR DISTURBED SIDE SLOPE

WIRE FABRIC

LARGE ROCK 2" OR GREATER IN DIAMETER

NATIVE BACKFILL MATERIAL OR 3/4" - 1 1/2" WASHED GRAVEL

SECTION A-A

FILTER FABRIC MATERIAL MIRAFI 100X OR EQUIVALENT

JOINTS IN FILTER FABRIC SHALL BE SPLICED AT POSTS. USE STAPLES, WIRE RINGS, OR EQUIVALENT TO ATTACH FABRIC TO POSTS.

STEEL OR 2 X 4 WOOD POSTS. 6' O.C.

FILTER FABRIC MATERIAL OR EQUIVALENT

WIRE RINGS (TYPICAL)

2" x 2" x 14 GAUGE WELDED WIRE FABRIC OR EQUIVALENT (IF 180# EXTRA-STRENGTH FABRIC IS USED MAY ELIMINATE WIRE FABRIC)

INSTALLATION NOTES:

1. FILTER FABRIC FENCE SHALL BE REMOVED WHEN THEY HAVE SERVED THEIR USEFUL PURPOSE AFTER THE UPSLOPE AREA HAS BEEN PERMANENTLY STABILIZED. THE NEWLY DISTURBED AREAS RESULTING FROM FILTER FABRIC REMOVAL SHALL BE IMMEDIATELY SEEDED AND MULCHED OR STABILIZED AS APPROVED BY THE ENGINEER.

2. FILTER FABRIC FENCES SHALL BE INSPECTED IMMEDIATELY AFTER EACH RAINFALL AND AT LEAST DAILY DURING PROLONGED RAINFALL. ANY REQUIRED REPAIRS SHALL BE MADE IMMEDIATELY.

3. REMOVE SEDIMENT WHEN IT REACHES 1/3 FENCE HEIGHT.

4. INSTALL THE SILT FENCE FIRST. AFTER THE SILT FENCE HAS BEEN INSTALLED, CONSTRUCT BERM AND TRENCH.

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CITY OF KENT ENGINEERING DEPARTMENT

FILTER FABRIC FENCE

DESIGNED: DH

DRAWN: RB

CHECKED: DATE

APPROVED: ENGINEER

STANDARD PLAN

5-31
GENERAL NOTES:

1. SHAPE OF SEDIMENTATION POND MAY VARY TO FIT DRAINAGE AREA AND TERRAIN. MODIFY AS NECESSARY TO ENSURE SATISFACTORY TRAPPING OF SEDIMENT.

2. USE THE KENT SURFACE WATER DESIGN MANUAL TO DETERMINE THE TRAP GEOMETRY.

3. TO AID IN DETERMINING SEDIMENT DEPTH, ALL TRAPS SHALL HAVE A STAFF GAUGE WITH A PROMINENT MARK 1 FOOT ABOVE THE BOTTOM OF THE TRAP. CONTRACTOR SHALL RESTORE THE TRAP BACK TO ORIGINAL DEPTH AND SIZE WHEN THE SEDIMENT ReACHES THIS LEVEL.

4. FOR USE ON SITES LESS THAN 1 ACRE IN SIZE.

5. TRAP MAY BE BERM OR BY PARTIAL OR COMPLETE EXCAVATION.
DETAIL NOTES:

1. DAM SPACING
2. SEDIMENT TRAP LENGTH
3. LINE THE BOTTOM OF THE SWALE WITH 4" CRUSHED SURFACING BASE COURSE.

GENERAL NOTES:

1. SUMP BEHIND ROCK CHECK DAM SHALL BE INSPECTED DAILY, AND CLEANED WHEN COLLECTED DEBRIS EXCEEDS 1/2 OF ITS DEPTH.
FOR FURTHER INFORMATION ON STOCKPILING MATERIAL SEE SECTION 2.3.E

BURY SHEETING INTO EXISTING SOIL MINIMUM 4"X4" TRENCH
TIRES, SANDBAGS, OR EQUIVALENT MAY BE USED TO WEIGHT PLASTIC
MAX SPACING SHALL BE 10'

CLEAR PLASTIC SHEETING SHALL HAVE A MINIMUM THICKNESS
OF 6 MIL.

BURY SHEETING INTO EXISTING SOIL MINIMUM 4"X4" TRENCH

GENERAL NOTES:

1. PLASTIC SHEETING SHALL MEET THE REQUIREMENTS OF WSDOT
   STANDARD SPECIFICATIONS 9-14.5.

2. MAXIMUM PERMITTED SLOPE SHALL BE 2H:1V.

3. SEAMS BETWEEN SHEETS MUST OVERLAP A MINIMUM OF 12" AND BE
   WEIGHTED OR TAPELED.

4. TEMPORARY STOCKPILES SHALL NOT BLOCK THE SIGHT DISTANCES OF
   ANY INTERSECTION OR DRIVEWAY.