## STORMWATER MANAGEMENT COST ESTIMATE

ALL COSTS GIVEN ARE COMPLETE IN PLACE

NOT APPLICABLE

| DESCRIPTION | UNIT | QUANTITY | UNIT COST | TOTAL COST |
|---|---|---|---|---|
| CLEARING & GRUBBING | LS | | | $ |
| EXCAVATION | CY | | | |
| EMBANKMENT | CY | | | |
| FENCING | LF | | | |
| STRUCTURES | | | | |
| ACCESS ROAD | | | | |
| AS-BUILTS | | | | |
| SUB-TOTAL | | | | $ |
| 10% CONTINGENCY | | | | $ |
| TOTAL PROJECT COST | | | | $ |

## GENERAL NOTES

1. DESIGN OF DETENTION BASINS SHALL CONFORM TO THE REQUIREMENTS OF THE COUNTY OF ROANOKE DRAINAGE STANDARDS (REF. SECTIONS 503.02, 503.03, AND 505.02). THE DESIGN OF THE FACILITY AND PREPARATION OF AS-BUILT PLANS SHALL BE BY A CERTIFIED PROFESSIONAL ENGINEER LICENSED TO PRACTICE IN THE COMMONWEALTH OF VIRGINIA.

2. ACCESS TO THE FACILITY MUST BE PROVIDED IN ACCORDANCE WITH THE COUNTY OF ROANOKE DESIGN AND CONSTRUCTION STANDARDS FOR DETENTION PONDS, LATEST EDITION.

3. IF THE FACILITY IS OVER FOUR (4) FEET DEEP, TAKES OVER TWO (2) HOURS TO DRAIN, OR THE INTERIOR SLOPE EXCEEDS 3 (H) : 1 (V), PERMANENT FENCING MAY BE REQUIRED. ADDITIONALLY, IF THE FACILITY IS IN A CONGESTED AREA OR WILL IN ANY WAY POSE A HAZARD TO THE GENERAL PUBLIC, FENCING MAY BE REQUIRED. FENCING SHALL BE A MINIMUM OF SIX (6) FEET HIGH, A MINIMUM OF STANDARD NINE GAUGE LINK FENCE, AND MUST HAVE ONE OR MORE LOCKING DOUBLE GATES (MINIMUM TEN FEET WIDE) FOR ACCESS.

4. DETENTION PONDS SHALL BE BONDED IN ACCORDANCE WITH THE ROANOKE COUNTY BONDING POLICY FOR SUBDIVISION AND SITE DEVELOPMENT. A SEPARATE BOND FOR THE DETENTION FACILITY WILL BE REQUIRED AND ADMINISTERED APART FROM THE SUBDIVISION DEVELOPMENT BOND. REFERENCE ESTIMATE - THIS SHEET.

5. REFERENCE THE COUNTY OF ROANOKE DESIGN AND CONSTRUCTION STANDARDS FOR DETENTION PONDS, LATEST EDITION, FOR ACCEPTANCE AND MAINTENANCE OF THE FACILITY. CERTIFIED AS-BUILTS ARE REQUIRED AND MUST INCLUDE:

   A. DIMENSIONS OF THE FACILITY

   B. VOLUME @ MAXIMUM DEPTH

   C. ELEVATIONS OF STRUCTURES, SPILLWAYS, AND TOP

   D. MATERIALS VERIFICATION INCLUDING RESULTS OF DENSITY TESTS CONDUCTED BY AN INDEPENDENT SOIL TESTING LABORATORY

   E. LOCATION AND ELEVATION OF BENCHMARK.

6. ONE FOOT MINIMUM FREEBOARD REQUIRED FOR THE 100 YR WATER SURFACE ELEVATION.

## CONSTRUCTION NOTES

1. SITE PREPARATION SHALL BE IN ACCORDANCE WITH THE COUNTY OF ROANOKE DESIGN AND CONSTRUCTION STANDARDS FOR DETENTION PONDS, LATEST EDITION.

2. SLOPES STEEPER THAN 3 TO 1 (HORIZONTAL TO VERTICAL) SHALL BE BENCHED OR STEPPED PRIOR TO PLACING FILL ON THEM.

3. ON-SITE FILL MATERIAL OR BORROW FILL MATERIAL MAY BE UTILIZED. FILL MATERIAL SOILS, IN GENERAL:

   A. SHALL BE COMPACTABLE
   B. SHALL BE WITHIN AN ACCEPTABLE RANGE OF MOISTURE CONTENT WHICH IS READILY CONTROLLED
   C. SHALL NOT BE HIGHLY SUSCEPTIBLE TO VOLUME CHANGE (SHRINKAGE OR SWELL) OR SETTLEMENT

4. FILL MATERIALS CONTAINING ROCKS LARGER THAN SIX (6) INCHES (15.2 CM) SHALL NOT BE USED. THE UPPERMOST TWO (2) FEET (61 CM) SHALL NOT HAVE ANY ROCK LARGER THAN TWO (2) INCHES (5.1 CM) IN DIAMETER.

5. THE APPROVED FILL SHALL BE PLACED IN EIGHT (8) INCH (20 CM) LOOSE LIFTS. EACH LIFT SHALL BE SPREAD IN UNIFORM LAYERS. FILL SOIL SHALL BE UTILIZED ONLY WITHIN A MOISTURE RANGE OF +/- 5% OF THE OPTIMUM MOISTURE CONTENT. COMPACTION OF THE FILL SHALL BE PERFORMED WITH APPROVED EQUIPMENT. COMPACTION OF THE LAYERS SHALL BE CONTINUOUS AND UNIFORM.

6. EMBANKMENT MATERIAL IN FILL AREAS SHALL BE PLACED IN LIFTS NOT EXCEEDING EIGHT (8) INCHES AND SHALL BE COMPACTED TO A MINIMUM 95% DENSITY IN ACCORDANCE WITH SECTION 303 OF THE VIRGINIA DEPARTMENT OF TRANSPORTATION ROAD AND BRIDGE SPECIFICATIONS.

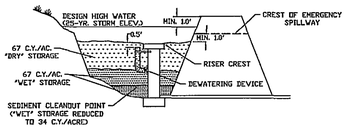
7. FIELD DENSITY TESTS ARE TO BE CONDUCTED BY AN INDEPENDENT SOILS TESTING LABORATORY UNDER THE DIRECTION OF A QUALIFIED GEOTECHNICAL ENGINEER. THE RESULTS OF THESE TESTS SHALL BE SUBMITTED TO THE COUNTY OF ROANOKE WITH AS-BUILT PLANS AS A CONDITION OF ACCEPTANCE OF THE FACILITY BY THE COUNTY. FIELD DENSITY TESTS, AS DIRECTED BY THE ENGINEER SHALL BE PERFORMED PERIODICALLY TO DETERMINE THE DEGREE OF COMPACTION. ANY AREAS FAILING TO MEET THE ABOVE REQUIREMENTS SHALL BE REWORKED AND/OR RECOMPACTED UNTIL THE REQUIRED DEGREE OF COMPACTION IS ACHIEVED.

8. ANTI-SEEP COLLARS SHALL BE INSTALLED IN ACCORDANCE WITH THE REQUIREMENTS OF THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK, LATEST EDITION.

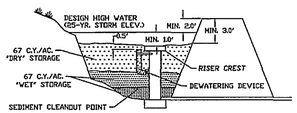
9. ALL DISTURBED AREAS SHALL BE COVERED WITH FOUR (4) INCHES OF TOPSOIL AND SEEDED.

10. THE MINIMUM SLOPE OF THE BASIN FLOOR SHALL BE ONE (1) PERCENT GRADED TO DRAIN TO THE PRINCIPAL SPILLWAY.

## SEDIMENT BASIN SCHEMATIC MINIMUM DESIGN STANDARDS



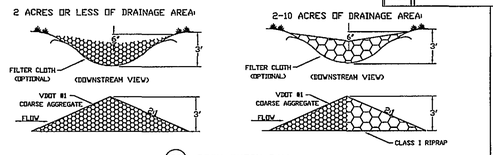

DESIGN ELEVATIONS WITH EMERGENCY SPILLWAY



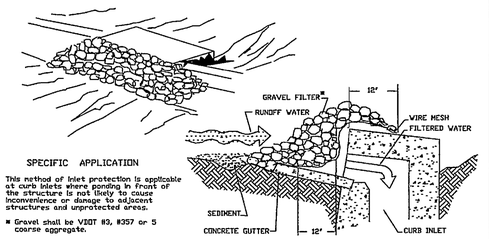

DESIGN ELEVATIONS WITHOUT EMERGENCY SPILLWAY (RISER PASSES 25-YR. EVENT)

| NO. | TITLE | KEY | SYMBOL |
|---|---|---|---|
| 3.01 | SAFETY FENCE | SAF | |
| 3.02 | TEMPORARY GRAVEL CONSTRUCTION ENTRANCE | CE | |
| 3.03 | CONSTRUCTION ROAD STABILIZATION | CRS | |
| 3.04 | STRAW BALE BARRIER | STB | |
| 3.05 | SILT FENCE | SF | |
| 3.06 | BRUSH BARRIER | BB | |
| 3.07 | STORM DRAIN INLET PROTECTION | IP | |
| 3.08 | CULVERT INLET PROTECTION | CIP | |
| 3.09 | TEMPORARY DIVERSION DIKE | DD | |
| 3.10 | TEMPORARY FILL DIVERSION | FD | |
| 3.11 | TEMPORARY RIGHT-OF-WAY DIVERSION | RWD | |
| 3.12 | DIVERSION | DV | |
| 3.13 | TEMPORARY SEDIMENT TRAP | ST | |
| 3.14 | TEMPORARY SEDIMENT BASIN | SB | |
| 3.15 | TEMPORARY SLOPE DRAIN | TSD | |
| 3.16 | PAVED FLUME | PF | |
| 3.17 | STORMWATER CONVEYANCE CHANNEL | SCC | |
| 3.18 | OUTLET PROTECTION | OP | |
| 3.19 | RIPRAP | RR | |

| NO. | TITLE | KEY | SYMBOL |
|---|---|---|---|
| 3.20 | ROCK CHECK DAMS | CD | |
| 3.21 | LEVEL SPREADER | LS | |
| 3.22 | VEGETATIVE STREAMBANK STABILIZATION | VSS | |
| 3.23 | STRUCTURAL STREAMBANK STABILIZATION | SSS | |
| 3.24 | TEMPORARY VEHICULAR STREAM CROSSING | VSC | |
| 3.25 | UTILITY STREAM CROSSING | USC | |
| 3.26 | DEWATERING STRUCTURE | DS | |
| 3.27 | TURBIDITY CURTAIN | TC | |
| 3.28 | SUBSURFACE DRAIN | SD | |
| 3.29 | SURFACE ROUGHENING | SR | |
| 3.30 | TOPSOILING | TO | |
| 3.31 | TEMPORARY SEEDING | TS | |
| 3.32 | PERMANENT SEEDING | PS | |
| 3.33 | SODDING | SO | |
| 3.34 | BERMUDA GRASS AND ZOYSIAURASS ESTABLISHMENT | BG/ZE | TREAT. 1 / TREAT. 2 |
| 3.35 | MULCHING | MU | |
| 3.36 | SOIL STABILIZATION BLANKETS AND MATTING | BL/ZE | |
| 3.37 | TREES, SHRUBS, VINES AND GROUND COVERS | VEG | |
| 3.38 | TREE PRESERVATION AND PROTECTION | TP | |
| 3.39 | DUST CONTROL | DC | |




CD ROCK CHECK DAM

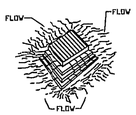


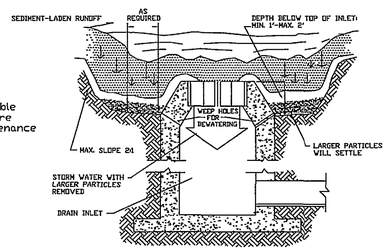

SPECIFIC APPLICATION

This method of inlet protection is applicable at curb inlets where ponding in front of the structure is not likely to cause inconvenience or damage to adjacent structures and unprotected areas.

* Gravel shall be VDOT #3, #357 or 5 coarse aggregate.

IP GRAVEL CURB INLET SEDIMENT FILTER

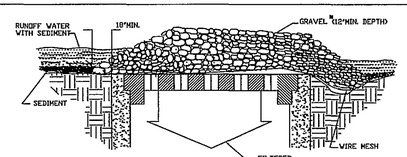



SPECIFIC APPLICATION

This method of inlet protection is applicable where heavy flows are expected and where an overflow capability and ease of maintenance are desirable.

IP EXCAVATED DROP INLET SEDIMENT TRAP

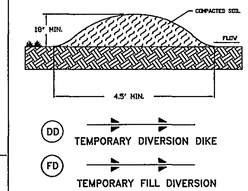


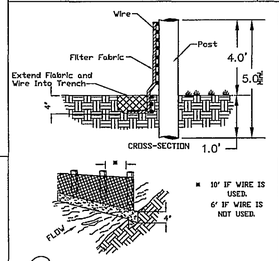

SPECIFIC APPLICATION

This method of inlet protection is applicable where heavy concentrated flows are expected, but not where ponding around the structure might cause excessive inconvenience or damage to adjacent structures and unprotected areas.

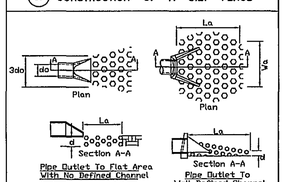
* Gravel shall be VDOT #3, #357 or #5 coarse aggregate.

IP GRAVEL AND WIRE MESH DROP INLET SEDIMENT FILTER



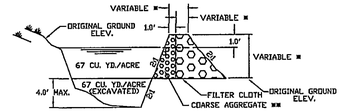




SF CONSTRUCTION OF A SILT FENCE



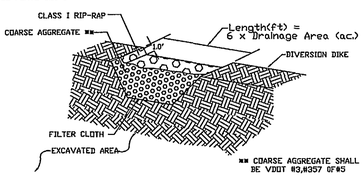

OP OUTLET PROTECTION

NOTES
1. Apron lining may be rip-rap, grouted rip-rap, or concrete.
2. La is the length of the rip-rap apron as calculated using plates 1.36d and 1.36e.
3. d = 1.5 times the maximum stone diameter, but not less than 6".




CROSS-SECTION

* SEE PLATE 3.13-1

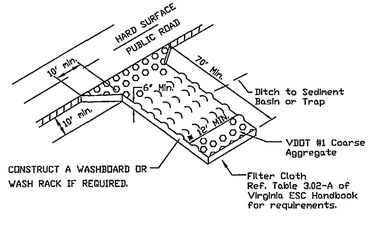



ST SEDIMENT TRAP

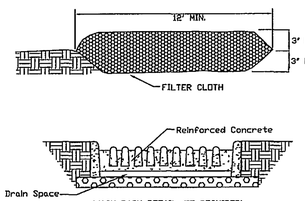
NOTE:
FOR AREAS LESS THAN 3.0 ACRES. FOR AREAS LARGER THAN 3.0 ACRES A SEDIMENT BASIN IS REQUIRED. SEE DETAIL THIS SHEET.

## TEMPORARY SEDIMENT TRAP DATA

| STRUCTURE | DRAINAGE AREA (ACRES) | STORAGE (C.Y.) REQ'D | STORAGE (C.Y.) DESIGN | WEIR LENGTH (FT.) | WEIR HEIGHT (FT.) | BERM HEIGHT (FT.) |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |




* MUST EXTEND FULL WIDTH OF INGRESS & EGRESS OPERATION.




CE TEMPORARY GRAVEL CONSTRUCTION ENTRANCE

## EROSION-SILTATION CONTROL COST ESTIMATE

ALL COSTS GIVEN ARE COMPLETE IN PLACE

| DESCRIPTION | UNIT | QUANTITY | UNIT COST | TOTAL COST |
|---|---|---|---|---|
| CONSTRUCTION ENTRANCE | EA | 2 | $1500.00 | $3000.00 |
| SILT FENCE | LF | 610 | $3.00 | $1830.00 |
| INLET PROTECTION | EA | 24 | $200.00 | $4800.00 |
| TEMPORARY DIVERSION DIKE | LF | 2420 | $2.00 | $4840.00 |
| TEMPORARY FILL DIVERSION | LF | 1650 | $2.00 | $3300.00 |
| CHECK DAM | EA | 1 | $250.00 | $250.00 |
| PERMANENT SEEDING | AC | 9.6 | $ 1500.00 | $ 14400.00 |
| SEDIMENT BASIN | EA | RESTORATION ONLY | | $1000.00 |
| OUTLET PROTECTION | EA | BONDED UNDER SUBD. ESTIMATE | | |
| SAFETY FENCING | EA | 160 | $2.00 | $320.00 |
| CONST. ROAD STABIL. | TONS | 8600 | $1.00 | $8600.00 |
| CULVERT INLET PROTECTION | EA | 1 | $500.00 | $500.00 |
| SUB-TOTAL | | | | $ 42840.00 |
| 10% CONTINGENCY | | | | $ 4290.00 |
| TOTAL PROJECT COST | | | | $ 47,130.00 |

## GENERAL EROSION AND SEDIMENT CONTROL NOTES

1. ALL SOIL EROSION & SEDIMENT CONTROL MEASURES SHALL BE ACCOMPLISHED IN STRICT ACCORDANCE WITH THE STANDARDS AND SPECIFICATIONS CONTAINED IN THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK, LATEST EDITION.

2. THE APPROVING AUTHORITY MAY ADD TO, DELETE, RELOCATE, CHANGE, OR OTHERWISE MODIFY CERTAIN EROSION AND SEDIMENT CONTROL MEASURES WHERE FIELD CONDITIONS ARE ENCOUNTERED THAT WARRANT SUCH MODIFICATIONS.

3. ALL SOIL EROSION AND SEDIMENT CONTROL MEASURES AS SHOWN ON THE PLAN SHALL BE PLACED IN ADVANCE OF THE WORK BEING PERFORMED, AS FAR AS PRACTICAL.

4. IN NO CASE DURING CONSTRUCTION SHALL WATER RUNOFF BE DIVERTED OR ALLOWED TO FLOW TO LOCATIONS WHERE ADEQUATE PROTECTION HAS NOT BEEN PROVIDED.

5. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO LEAVE THE SITE ADEQUATELY PROTECTED AGAINST EROSION, SEDIMENTATION, OR ANY DAMAGE TO ANY ADJACENT PROPERTY AT THE END OF EACH DAY'S WORK.

6. FOR THE EROSION CONTROL KEY SYMBOLS SHOWN ON THE PLANS, REFER TO THE VIRGINIA UNIFORM CODING SYSTEM FOR EROSION AND SEDIMENT CONTROL PRACTICES CONTAINED IN THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK, LATEST EDITION. THESE SYMBOLS AND KEYS ARE TO BE UTILIZED ON ALL EROSION CONTROL PLANS SUBMITTED TO ROANOKE COUNTY.

## PS PERMANENT SEEDING MIXTURE

| TYPE A | TYPE B (SLOPES 3:1 OR STEEPER) |
|---|---|
| 15 OCTOBER TO 1 FEBRUARY<br>K-31 FESCUE @ 5 LB / 1000 SF<br>BORZY WINTER RYE @ 1/2 LB / 1000 SF | 15 MARCH TO 1 MAY<br>CROWN VETCH @ 1/4 LB / 1000 SF<br>PERENNIAL RYEGRASS @ 1/2 LB / 1000 SF<br>RED TOP @ 1/6 LB / 1000 SF |
| 1 FEBRUARY TO 1 JUNE<br>K-31 FESCUE @ 5 LB / 1000 SF<br>ANNUAL RYE @ 1/2 LB / 1000 SF | 15 AUGUST TO 1 OCTOBER<br>CROWN VETCH @ 1/4 LB / 1000 SF<br>PERENNIAL RYEGRASS @ 1/2 LB / 1000 SF<br>RED TOP @ 1/6 LB / 1000 SF |
| 1 JUNE TO 1 SEPTEMBER<br>K-31 FESCUE @ 5 LB / 1000 SF<br>GERMAN MILLET @ 1/2 LB / 1000 SF | |
| 1 SEPTEMBER TO 15 OCTOBER<br>K-31 FESCUE @ 5 LB / 1000 SF<br>ANNUAL RYE @ 1/2 LB / 1000 SF | |

LIME: 140 LB / 1000 SF PULVERIZED AGRICULTURAL LIMESTONE

FERTILIZER: 5-20-10 @ 25 LB / 1000 SF
38-0-0 @ 6 LB / 1000 SF

MULCH: IF REQUIRED, SHALL BE USED OVER ALL SEEDED AREAS AND SHALL BE APPLIED IN ACCORDANCE WITH SECTION 3.35 OF THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK, LATEST EDITION.

SOIL CONDITIONING: INCORPORATION OF LIME AND FERTILIZER, SELECTION OF CERTIFIED SEED, MULCHING, MAINTENANCE OF NEW SEEDLINGS, AND RESEEDING SHALL BE IN ACCORDANCE WITH SPECIFICATIONS CONTAINED WITHIN THE VIRGINIA SOIL EROSION AND SEDIMENT CONTROL HANDBOOK, LATEST EDITION. ADDITIONAL SEEDING TO BE PERFORMED AS REQUIRED BY THE INSPECTOR.

SEED APPLICATION: APPLY SEED UNIFORMLY WITH A CYCLONE SEEDER, DRILL, CULTIPACKER SEEDER, OR HYDROSEEDER ON A FIRM, FRIABLE, SEEDBED. MAXIMUM SEEDING DEPTH SHALL BE 1/4 INCH.

TOTAL DISTURBED AREA = AC. = SQ. FT.

SEE REVISED SHEET

| NO. | REVISIONS | DATE |
|---|---|---|
| 1 | ENGR. & INSPEC. | 04-10-93 |
| 2 | ENGR. & INSPEC. | 08-05-93 |
| 3 | ENGR. & INSPEC. | 10-27-93 |
| 4 | | |
| 5 | | |
| 6 | | |

DEPARTMENT OF ENGINEERING AND INSPECTIONS

COUNTY OF ROANOKE

DATE: 11/02/93
SCALE: NO SCALE
DRAWING BY: CLN,AF
DESIGNED BY: G:\CAD\DETAILS\EROSION\EROSION)
APPROVED BY: GWS,III

EROSION & SEDIMENT CONTROL STORMWATER MANAGEMENT DETAILS

WVWA ID# 8PENKM

SHEET 19 OF 23

THIS SHEET WAS PREPARED BY ROANOKE COUNTY DEPARTMENT OF COMMUNITY DEVELOPMENT. CALDWELL WHITE ASSOCIATES IS NOT RESPONSIBLE FOR THE CONTENT OF THIS SHEET OR ANY ERRORS, OMISSIONS OR CONFLICTS RESULTING FROM THE DATA SHOWN HEREON.