Gratiot County Drain Commissioner

Standard Construction Specifications

2025 Edition-B

Standard Specifications

Standard Details

(D) Surface Improvements Details

D-01 – Sidewalk
D-02 – Sidewalk – Thickened Edge
D-03 – Concrete Section – Heavy Duty
D-04 – Pavement Section
D-05 – Curb and Gutter F-4
D-06 – Curb and Gutter B-2

(E) Soil Erosion and Sediment Control Details

E-01 – Inline Sediment Sump
E-02 – Mulch Blanket
E-03 – Silt Fence
E-04 – Inlet Protection
E-05 – Slope Stabilization
E-06 – Rock Riprap Dissipator
E-07 – Toe of Slope and Bank Protection
E-08 – Armored Spillway
E-09 – Tile Outlet with Splash Pad
E-10 – Outfall Stabilization
E-11 – Straw Wattle
Flexamat Standard Details and Specifications

(F) Guidelines for Stormwater Management

F-1 – How a Sediment Basin Works & Section Thru Embankment & Basin Controls
F-2 – How a Sediment Basin Works & Section Thru Embankment & Basin Controls (High Risk)
F-3 – Detention Outlet Structure
F-4 – H.D.P.E. Rain Garden Inlet Minimum Cover Applications
F-5 – Typical Roadside Rain Garden Cross Section
F-6 – Typical Rain Garden with Structure Cross Section
F-7 – R.C.P. Storm Sewer Trench Detail – Typical Rain Garden Cross Section
F-8 – Typical Rain Garden Planting Detail for Shady Locations
F-9 – Typical Rain Garden Planting Detail Master Plant List for Shady Locations
F-10 – Typical Rain Garden Planting Detail for Sunny Locations
F-11 – Typical Rain Garden Planting Detail Master Plant List for Sunny Locations

ARTICLE 2-PRELIMINARY MATTERS

CONTRACT TIME

1.1 The Contract Time will commence on the day indicated in the Notice to Proceed.

1.2 The date of beginning and the Contract Time for completion of the Work are essential conditions of the Contract Documents. Time requirements are for the benefit of OWNER, CONTRACTOR and other Project Contractors. CONTRACTOR shall proceed with the Work at a rate of progress to ensure completion within the stipulated Contract Time. It is expressly agreed by CONTRACTOR that the Contract Time is reasonable, taking into consideration the average climatic and economic conditions and the availability of manpower, products, and construction machinery prevailing at the locality of the Work.

BEFORE STARTING THE WORK

1.3 CONTRACTOR shall carefully study and compare the Contract Documents and check and verify all figures shown thereon and all field measurements. CONTRACTOR shall, within 48 hours, report to PROJECT MANAGER any conflict, error or discrepancy which CONTRACTOR may discover before proceeding with the Work.

1.4 A preconstruction meeting will be held to review the Construction Schedules, to establish procedures for handling Shop Drawings and other submissions and for processing payments, and to establish working relationships between the parties.

ARTICLE 2-CONTRACT DOCUMENTS INTENT

GENERAL:

2.1 It is the intent that the Contract Documents comprise the entire agreement between OWNER and CONTRACTOR and may be altered only by a Modification. No oral order, objection, claim or notice by OWNER, CONTRACTOR or PROJECT MANAGER shall affect or modify any of the terms or obligations contained in the Contract Documents.

ARTICLE 3-LANDS AND CONTROLS

UNFORESEEN SUBSURFACE CONDITIONS

3.1 The underground conditions indicated in the Contract Documents represent the information available at the time of preparation and are not guaranteed as to accuracy or completeness. CONTRACTOR shall within 48 hours after discovery notify OWNER and PROJECT MANAGER of any subsurface or latent physical conditions at the site differing materially from those indicated in the Contract Documents. PROJECT MANAGER will investigate within 72 hours after Notice and, if warranted, advise OWNER to obtain additional investigations and tests. If said additional investigations and tests show subsurface or latent physical conditions to be materially different and which could not have reasonably been anticipated by CONTRACTOR, a Change Order will be issued incorporating the necessary revision.

REFERENCE POINTS

3.2 CONTRACTOR shall be responsible for the preservation of established property corners, monuments, bench marks and similar reference points outside of the normal working area. CONTRACTOR shall report to PROJECT MANAGER whenever any reference point is lost, destroyed or requires relocation.

3.3 Construction stakes will be provided by the OWNER to the extent as may be set forth in the Specifications.

ARTICLE 4 - INSURANCE

CONTRACTOR'S LIABILITY INSURANCE

4.1 CONTRACTOR shall annualy provide an Insurance Certificate in accordance with the Gratiot County Drain Commissioner’s requirements.

ARTICLE 5-CONTRACTOR'S RESPONSIBILITIES

GENERAL

5.1 CONTRACTOR will issue communications relative to the Work, to OWNER or PROJECT MANAGER.

5.2 CONTRACTOR shall supervise and direct the Work competently, efficiently and with skill and attention required to complete the Work in accordance with the Contract Documents. CONTRACTOR shall be solely responsible for the means, methods, techniques, sequences and procedures of construction.

5.3 Unless otherwise specified, restricted work times shall be as follows, except in the event of an emergency as defined in this Article: Sunday or holiday work will not be permitted; and, work will not be permitted from 8:00 p.m. to 7:00 a.m.

LABOR, MATERIALS AND EQUIPMENT

5.4 CONTRACTOR shall provide competent, suitably qualified personnel to execute and complete the Work as required by the Contract Documents.

5.5 CONTRACTOR shall guarantee that he has available the quantities and quality of labor and supervision necessary to fulfill the CONTRACTOR'S obligations under the Contract Documents.

5.6 CONTRACTOR shall furnish all materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, and all other facilities and incidentals necessary for the execution, testing, initial operation, and completion of the Work.

5.7 All Products shall be of good quality and new. When required by PROJECT MANAGER, CONTRACTOR shall furnish satisfactory evidence as to the kind and quality of materials and installed equipment.

SUBCONTRACTORS

5.8 CONTRACTOR shall be fully responsible for all acts and omissions of Subcontractors and of persons directly or indirectly employed by them and persons for whose acts any of them may be liable to the same extent that CONTRACTOR is responsible for the acts and omissions of persons directly employed by CONTRACTOR. Nothing in the Contract Documents shall create any contractual relationship between any Subcontractor and OWNER or PROJECT MANAGER or any obligation on the part of OWNER or PROJECT MANAGER to pay or to see to the payment of any moneys due any Subcontractor. OWNER or PROJECT MANAGER may furnish to any Subcontractor, to the extent practicable, evidence of amounts paid to CONTRACTOR for specific work done.

OWNER FURNISHED PRODUCTS:

5.9 When the Contract Documents stipulate that the OWNER will furnish Products to be incorporated in the Work, the CONTRACTOR'S responsibilities will be:

A. Coordinate the delivery of each product with the OWNER.

B. Submit to PROJECT MANAGER Notice of any discrepancies or problems anticipated in the use of the Product.

C. Receive and unload the Products at the Site.

D. Promptly inspect Products jointly with the OWNER, record shortages, and damaged or defective items.

E. Handle Products at the Site, including uncrating and storage.

F. Protect the Products from exposure to the elements and from damage.

G. Assemble, install, connect, and adjust the Products as stipulated in the Specifications.

H. Repair or replace items damaged by the CONTRACTOR.

PERMITS

5.10 CONTRACTOR shall obtain all temporary permits required to complete the Work. Application and inspection fees associated with temporary permits shall be paid by the CONTRACTOR.

USE OF PREMISES

5.11 CONTRACTOR shall confine Work operations to the Site and other designated areas. All disturbed areas shall be restored to equal to or better than original condition.

SAFETY AND PROTECTION

5.12 CONTRACTOR shall be responsible for initiating, maintaining and supervising safety programs in connection with the Work. CONTRACTOR shall take precautions and provide protection to prevent damage, injury or loss to:

A. Employees on the Work and other persons who may be affected thereby;
B. The Work and Products to be incorporated therein, whether in storage on or off the site; and
C. Other property at the Site or adjacent thereto, both above and below ground, not designated for removal, relocation or replacement. CONTRACTOR shall erect and maintain necessary safeguards for safety and protection of property and shall notify owners of adjacent utilities when prosecution of the Work may affect them. CONTRACTOR shall be responsible for costs associated with all damage, injury or loss.

EMERGENCIES

5.13 In emergencies affecting the safety of persons, the Work or adjacent property, CONTRACTOR, without authorization from PROJECT MANAGER or OWNER, is obligated to act, at CONTRACTOR's discretion, to prevent threatened damage, injury or loss. CONTRACTOR shall give PROJECT MANAGER prompt Notice of the emergency action taken, and any significant changes in the Work or deviations from the Contract Documents caused thereby.

INDEMNIFICATION

5.14 CONTRACTOR shall indemnify, defend and hold harmless OWNER and PROJECT MANAGER, their consultants, agents and employees, from and against claims, damages, losses, attorney's fees, and expenses arising out of, or resulting from, the performance of the Work, provided that any such claim, damage, loss or expense:

A. is attributable to bodily injury, sickness, disease or death, or to injury to, or destruction of, tangible property other than the Work itself, including the loss of use resulting therefrom; and

B. is caused in whole or in part by any negligent act or omission of CONTRACTOR, any Subcontractor, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder.

5.15 In all claims against OWNER or PROJECT MANAGER or their agents or employees, by any employee of CONTRACTOR or Subcontractors or anyone for whose acts they may be liable, the indemnification obligation shall not be limited by the amount or type of damages, compensation or benefits under workmen's compensation acts, disability benefit acts, or other employee benefit acts.

5.16 The indemnification obligation of CONTRACTOR shall not extend to the liability of PROJECT MANAGER, agents or employees arising out of the preparation or approval of maps, Drawings, reports, surveys, Change Orders, designs or Specifications.

ARTICLE 6-OWNER'S RESPONSIBILITIES

OWNER FURNISHED PRODUCTS

6.1 When the Contract Documents stipulate that the OWNER will furnish Products to be incorporated in the Work, the OWNER'S responsibilities will be:

A. Arrange and pay for delivery of the Products to the Site in accordance with the Construction Schedule.

B. Deliver supplier's bill of materials to the CONTRACTOR.

C. Submit claims for transportation damage.

ARTICLE 7-PROJECT MANAGER'S STATUS

OWNER'S REPRESENTATIVE

7.1 PROJECT MANAGER will be OWNER'S representative during the bidding and construction period. Communications between the OWNER and the CONTRACTOR, or claimant, will be directed through the PROJECT MANAGER. The duties, responsibilities and limitations of authority of PROJECT MANAGER as OWNER's representative during the bidding and construction are set forth in these Contract Documents and shall be modified only with consent of OWNER and PROJECT MANAGER.

7.2 PROJECT MANAGER will not be responsible for the construction means, methods, techniques, sequences or procedures, or the safety precautions and programs incident thereto, and PROJECT MANAGER will not be responsible for the CONTRACTOR's failure to perform the Work in accordance with the Contract Documents.

7.3. PROJECT MANAGER will not be responsible for the acts or omissions of the CONTRACTOR, or any Subcontractors, or any of their agents or employees, or any other persons performing any of the Work.

VISITS TO SITE

7.4 PROJECT MANAGER will make visits to the site at intervals appropriate to the various stages of construction to observe the progress and quality of the executed Work and to determine, in general, if the Work is proceeding in accordance with the Contract Documents.

REJECTING DEFECTIVE WORK

7.5 PROJECT MANAGER will have authority to disapprove of or reject Defective Work. PROJECT MANAGER will also have authority to require special inspection or testing of Work whether or not the Work is fabricated, installed or completed.

DECISIONS ON DISAGREEMENT

7.6 PROJECT MANAGER will be initial interpreter of the requirements of Contract Documents and judge of acceptability of the Work. Claims, disputes, and other matters pertaining to bidding, execution and progress of the Work shall be referred initially to PROJECT MANAGER with a request for an informal meeting and a formal decision. Notice of each such claim, dispute and other matter shall be delivered by claimant to PROJECT MANAGER and other party within 15 days of occurrence of the event giving rise thereto. Additional supporting data shall be supplied within 30 days of occurrence. PROJECT MANAGER's written decision will be rendered within 40 days after the occurrence. In PROJECT MANAGER's capacity as interpreter and judge, PROJECT MANAGER will be impartial to OWNER, CONTRACTOR or claimant and will not be liable for any decision rendered in good faith.

7.7 The rendering of a decision by PROJECT MANAGER with respect to any such claim, dispute or other matter, will be a condition precedent to arbitration under these General Conditions. The PROJECT MANAGER's decision shall become final and binding on the parties 30 days after the decision is rendered unless deferred by an arbitration request, litigation or administrative appeal (if applicable) filed by either party within the 30-day period to a court of competent jurisdiction.

7.8 No decision made by PROJECT MANAGER in good faith, either to exercise or not to exercise authority under this Article shall give rise to any duty, liability or responsibility of PROJECT MANAGER to claimant, CONTRACTOR, any Subcontractor, any of their agents or employees, or any other person performing any of the Work.

ARTICLE 8-CHANGES IN THE WORK

8.1 Without invalidating the Contract, OWNER may, at any time, order additions, deletions or revisions in the Work by Change Orders. Upon receipt of an executed Change Order, CONTRACTOR shall proceed with the Work involved.

8.2 PROJECT MANAGER may authorize minor changes or alterations in the Work not involving extra cost and not inconsistent with the overall intent of the Contract Documents. These changes will be authorized by a Bulletin and will be binding upon OWNER and CONTRACTOR.

8.3 Additional work performed by CONTRACTOR without authorization of a Change Order will not entitle CONTRACTOR to an increase in the Contract Price or an extension of the Contract Time.

ARTICLE 9-CHANGE OF CONTRACT PRICE

GENERAL

9.1 The Contract Price constitutes the total compensation payable for performing all duties, responsibilities and obligations assigned to or undertaken by CONTRACTOR, and includes all taxes payable by CONTRACTOR as a result of the Work.

9.2 The Contract Price shall only be changed by a Change Order.

ARTICLE 10-CHANGE OF THE CONTRACT TIME

10.1 The Contract Time may only be altered by a Change Order.

ARTICLE 11-WARRANTY, TESTS AND DEFECTIVE WORK

WARRANTY AND GUARANTEE

11.1 CONTRACTOR warrants and guarantees to OWNER and PROJECT MANAGER that materials and equipment shall be new and that Work shall be of good quality and free from faults or defects and in accordance with requirements of the Contract Documents. Prompt Notice of any defects will be given to CONTRACTOR.

11.2 CONTRACTOR warrants and guarantees that title to all Work, materials and equipment covered by monthly estimates, passes automatically to OWNER at the time of payment, free and clear of all liens.

TESTS AND INSPECTIONS

11.3 If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any portion of the Work to be inspected, tested, or approved by someone other than CONTRACTOR, CONTRACTOR shall give PROJECT MANAGER timely notice of readiness therefore. Such tests shall be in accordance with the methods prescribed by the applicable organization or the Contract Documents. All certification fees, testing laboratory fees, and inspection fees of said public authorities will be paid by CONTRACTOR. Inspection coordination is the responsibility of the CONTRACTOR, unless otherwise indicated in the Contract Documents.

11.4 Neither observations by PROJECT MANAGER nor inspections, tests or approvals by persons other than CONTRACTOR shall relieve CONTRACTOR from obligations to perform the Work required by the Contract Documents, laws, ordinances, rules, regulations or orders of public authority having jurisdiction.

UNCOVERING WORK

11.5 If Work requiring inspection, testing or approval is covered either without PROJECT MANAGER's written approval where required, or contrary to PROJECT MANAGER's specific request, the Work shall, if requested by PROJECT MANAGER, be uncovered for observation and replaced at CONTRACTOR's expense.

CORRECTION OR REMOVAL OF DEFECTIVE WORK

11.6 CONTRACTOR shall promptly, as specified by PROJECT MANAGER, either correct any Defective Work or remove it from the Site and replace it with acceptable Work. If CONTRACTOR does not correct or remove and replace such Defective Work within a reasonable time, OWNER may have the deficiency corrected or the Defective Work removed and replaced by others. All direct and indirect costs of such correction or removal, and replacement, including compensation for additional PROJECT MANAGERing services, shall be paid by CONTRACTOR in an amount as verified by PROJECT MANAGER.

ONE YEAR CORRECTION PERIOD

11.7 Prior to the expiration of one year after the date of Acceptance or such longer period of time as may be prescribed by law or by the terms of any applicable special guarantee required by the Contract Documents, CONTRACTOR shall promptly correct identified Defective Work or remove it from the Site and replace it with acceptable Work. If CONTRACTOR does not promptly comply, OWNER's rights to correction will be the same as for Defective Work in this Article. Repairs and replacements made under this paragraph shall bear an additional 12-month correction period dated from the acceptance of repair and replacement.

ACCEPTANCE OF DEFECTIVE WORK

11.8 If OWNER prefers to accept Defective Work, an appropriate reduction in the Contract Price will be made. If the acceptance occurs after final payment, an appropriate amount, as determined by PROJECT MANAGER, shall be paid by CONTRACTOR to OWNER.

ARTICLE 12-PAYMENTS AND COMPLETION

PROGRESS PAYMENTS AND RETAINAGES

12.1 CONTRACTOR will prepare a monthly payment request, supported by such data as PROJECT MANAGER may reasonably request from CONTRACTOR.

12.2 Progress payments and retainage shall conform to the following, provided CONTRACTOR'S progress is in accordance with the approved Construction Schedule and the conditions for payment as set forth in this Article.

A. Progress payments covering the first 50 percent of the Work shall be 90 percent of the progress period Work completed and 75 percent of the Products furnished and not incorporated in the Work, but specifically authorized by the OWNER.

B. Progress payments covering the final 50 percent of the Work, at the discretion of the OWNER, may be increased to 100 percent of the progress period Work completed and 75 percent of Products furnished and not incorporated in the Work, but specifically authorized by the OWNER.

C. All payments to the CONTRACTOR by the OWNER, including retainage, shall be in accordance with all laws and regulations applicable to these activities in the state in which the Work is performed.

APPROVAL OF PAYMENT

12.3 CONTRACTOR will prepare monthly payment requests and present them to PROJECT MANAGER for recommendation to the OWNER. PROJECT MANAGER shall complete review of such requests, make adjustments as deemed appropriate, and forward to the OWNER within ten (10) days of receipt from the CONTRACTOR.

12.4 OWNER will make payment to CONTRACTOR on monthly requests within 30 days of PROJECT MANAGER'S presentation to OWNER.

SUBSTANTIAL COMPLETION

12.5 When PROJECT MANAGER considers that the Work has been substantially but not entirely completed and full completion thereof is materially delayed through no fault of CONTRACTOR, PROJECT MANAGER will issue a Certification of Substantial Completion. Liquidated damages for that portion of Work will not be assessed beyond the date of Substantial Completion.

PAYMENT FOR SUBSTANTIAL COMPLETION

12.6 OWNER will, upon Certificate of Substantial Completion by PROJECT MANAGER and without terminating the Contract, make payment of the balance due for Work fully completed and accepted. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

NOTIFICATION OF COMPLETION

12.7 When CONTRACTOR considers the Work required in the performance of this Contract to be complete and ready for final inspection, CONTRACTOR shall provide Notice to the PROJECT MANAGER.

FINAL INSPECTION

12.8 CONTRACTOR shall serve Notice of completion on PROJECT MANAGER who will, within 7 days, schedule the final inspection with OWNER and CONTRACTOR, and will notify CONTRACTOR of incomplete and Defective Work. CONTRACTOR shall remedy such defects immediately and again submit a Notice of completion. Questions regarding quantities for payment will be measured jointly by the CONTRACTOR and PROJECT MANAGER.

FINAL PAYMENT

12.9 After CONTRACTOR has remedied all incomplete and Defective Work and delivered documents required by the Contract Documents, CONTRACTOR will prepare a request for final payment. CONTRACTOR shall furnish an executed Affidavit of Completion.

CONTRACTOR'S CONTINUING OBLIGATION

12.10 The CONTRACTOR's obligation to perform the Work in accordance with the Contract Documents shall be absolute. Recommendation of any progress or final payment by PROJECT MANAGER, issuance of a Certificate of Substantial Completion, any payment by OWNER to CONTRACTOR, any use or occupancy of the Work or any part thereof by OWNER, any act of acceptance by OWNER or any failure to do so, or any correction of Defective Work by OWNER shall not constitute an acceptance of Work contrary to the Contract Documents.

12.11 The duties and obligations imposed on CONTRACTOR by these General Conditions, and the rights and remedies available hereunder, and the rights and remedies available to OWNER and PROJECT MANAGER hereunder, shall be in addition to, and not a limitation of, any otherwise imposed or available by law, by special guarantee, or other provisions of the Contract Documents.

WAIVER OF CLAIMS

12.12 The making and acceptance of final payment shall constitute:

A. a waiver of all claims by OWNER against CONTRACTOR, except claims arising from unsettled Liens, from Defective Work appearing after final inspection pursuant to this Article or from failure to comply with the Contract Documents. However, it shall not constitute a waiver by OWNER of any rights with respect to CONTRACTOR's continuing obligations under the Contract Documents; and

B. A waiver of all claims by CONTRACTOR against OWNER, except those claims under negotiation, arbitration, or litigation.

LIQUIDATED DAMAGES

12.13 OWNER will deduct the amount of any liquidated damages and expenses, calculated in accordance with the Agreement, from moneys due or to become due to CONTRACTOR. If such amount exceeds such unpaid balance, the CONTRACTOR shall pay the difference to the OWNER.

ARTICLE13-SUSPENSION AND TERMINATION

WORK SUSPENSION

13.1 OWNER may order CONTRACTOR to suspend the Work, or any portion thereof, until the reason for such suspension has been eliminated; however, this right shall not give rise to any duty by OWNER to exercise this right for the benefit of CONTRACTOR or any other party.

13.2 OWNER may suspend the Work for the following reasons:

A. Defective Work.

B. CONTRACTOR fails to supply sufficient skilled workmen or suitable Products.

C. CONTRACTOR fails to make prompt payments to Subcontractors or for labor or Products.

D. CONTRACTOR fails to maintain proper insurance, bonds, licenses, or federal, state, or local permits.

OWNER TERMINATION OF WORK

13.3 Upon the occurrence of any one or more of the following events OWNER may, after giving CONTRACTOR and Surety 10 days written Notice of Termination, terminate the services of the CONTRACTOR.

A. CONTRACTOR fails to initiate and diligently proceed with the Work.

B. CONTRACTOR is adjudged bankrupt or insolvent.

C. CONTRACTOR makes a general assignment for the benefit of creditors.

D. a trustee or receiver is appointed for CONTRACTOR or for any of CONTRACTOR's property.

E. CONTRACTOR files a petition to take advantage of any debtor's act, or to reorganize under the bankruptcy or similar laws.

F. CONTRACTOR repeatedly fails to supply sufficient skilled workmen or suitable Products.

G. CONTRACTOR repeatedly fails to make prompt payments to Subcontractors or for labor or Products.

H. CONTRACTOR disregards laws, ordinances, rules, regulations or orders of any public body having jurisdiction.

I. CONTRACTOR disregards the authority of the PROJECT MANAGER.

J. CONTRACTOR otherwise violates any provisions of the Contract Documents.

OWNER COMPLETION OF WORK ON TERMINATION:

13.4 If the Surety does not resume performance of the Work within 10 days after Notice of Termination is received from OWNER, OWNER shall have the absolute right to complete the Work in the most expeditious manner and shall have the right to exclude CONTRACTOR from the Site and take possession of the Work and of all CONTRACTOR's tools, appliances, equipment and machinery at the Site and use the same without liability to CONTRACTOR for trespass or conversion. OWNER may incorporate in the Work all Products for which OWNER has paid CONTRACTOR but which are stored elsewhere. In such case CONTRACTOR shall not be entitled to receive any further payment until the Work is finished. If the balance due to CONTRACTOR at the time of termination exceeds the direct and indirect costs of completing the Work, including compensation for additional PROJECT MANAGERing services, attorney's fees, technical services and administrative costs, such excess shall be paid to CONTRACTOR. If such costs exceed such unpaid balance, CONTRACTOR

shall pay the difference to OWNER. Such costs incurred by OWNER shall be verified by PROJECT MANAGER and incorporated in a Change Order, but in finishing the Work OWNER shall not be required to obtain the lowest cost for the remaining portion of the Work performed.

OWNER'S ADDITIONAL TERMINATION RIGHTS

13.5 Where CONTRACTOR's services have been terminated by OWNER, said termination shall not affect any rights of OWNER against CONTRACTOR then existing or which may thereafter accrue. Any retention due or payment of money by OWNER to CONTRACTOR shall not release CONTRACTOR from liability.

OWNER'S TERMINATION FOR CONVENIENCE

13.6 Upon 10 days' written Notice to CONTRACTOR, Surety and PROJECT MANAGER, OWNER may, without cause and without prejudice to any other right or remedy, elect to abandon the Work and terminate the Contract. In such case, CONTRACTOR will be paid for Work executed and expense sustained plus a reasonable profit.

CONTRACTOR'S CONTINUING WORK DURING DISPUTES

13.7 CONTRACTOR shall carry on the Work and maintain the Construction Schedule during all disputes or disagreements with OWNER. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as CONTRACTOR and OWNER may otherwise agree.

PART 1 - GENERAL

1.01 SECTION INCLUDES:

A. Measurement and payment criteria applicable to the Work.

1.02 AUTHORITY:

A. Measurement methods delineated in the individual specification sections are intended to complement the criteria of this section.

B. The ENGINEER or OWNER will take all measurements and compute quantities accordingly.

C. Assist by providing necessary equipment, workers, and survey personnel as required.

1.03 UNIT QUANTITIES SPECIFIED:

A. Quantities and measurements indicated in the Bid Form are for bidding and contract purposes only. Quantities and measurements supplied or placed in the Work and verified by the ENGINEER or OWNER shall determine payment.

B. If the actual Work requires more or fewer quantities than those quantities indicated, provide the required quantities at the unit prices contracted.

1.04 MEASUREMENT OF QUANTITIES:

A. Measurement Devices:
   1. Weigh Scales: Inspected, tested and certified.
   2. Platform Scales: Of sufficient size and capacity to accommodate the conveying vehicle.
   3. Metering Devices: Inspected, tested and certified.

B. Measurement by Weight: Concrete reinforcing steel, rolled or formed steel or other metal shapes will be measured by handbook weights. Welded assemblies will be measured by handbook weights.

C. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.

D. Measurement by Area: Measured by square dimension using mean length and width or radius.

E. Linear Measurement: Measured by linear dimension, at the item centerline.

1.05 PAYMENT:

A. Payment Includes: Full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

B. Final payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities accepted by the ENGINEER or OWNER multiplied by the unit price for Work which is incorporated in or made necessary by the Work.

1.06 MEASUREMENT AND PAYMENT SCHEDULE:

A. The following schedule outlines the method of measurement and basis of payment to be used on this project. Requirements for materials and methods described under each unit price are included in the specification sections.

- Mobilization (_% max.):
  - a. Includes, but not limited to , the following in accordance with the Specifications:
    - i. Preparatory work and expenses incurred prior to beginning work onsite.
    - ii. Transporting materials, personnel, and equipment to the job site.
    - iii. Establishing temporary onsite construction facilities.
    - iv. Insurances, bonding, and other costs associated with the project in general and not included in other pay items.
  - b. Unit of Measure:
    - i. Lump sum limited to _% of the bid total.
    - ii. 50% payment will be made after 5% of the original contract amount is earned.
    - iii. Additional 50% payment will be made after 25% of the contract amount is earned.

- Traffic Control:
  - a. Includes furnishing, installing, and maintaining the following as indicated on the drawings and in accordance with the specifications:
    - i. Furnishing all labor, materials and equipment as necessary to complete the Work.
    - ii. Traffic control devices including barricades, barrels and signage as directed by the ENGINEER, OWNER or Gratiot County Road Commission.
    - iii. Maintaining access to residential driveways.
    - iv. Maintaining one access lane at all times for emergency vehicles.
  - b. Unit of Measure:
    - i. Lump Sum.
    - ii. 50% payment shall be made for installation of traffic control devices.
    - iii. 50% payment shall be made after removal of traffic control devices

- Selective Clearing, Grubbing & Snagging
- Clearing, Grubbing & Snagging:
  - a. Includes the following as indicated on the drawings and in accordance with the specifications:
    - i. Furnishing all labor, materials and equipment as necessary to complete the Work.
    - ii. Clearing and Grubbing in accordance with Details and as indicated on the Drawings.
    - iii. Remove deadfall, log jams and other debris from within the drain channel/easement.
    - iv. Applying growth preventer to all stumps.
    - v. Disposal of woody debris in accordance with specifications and all local, state, and federal regulations.
    - vi. Remove or bury all debris (2’ cover).
    - vii. Cleanup and maintenance of the Work in the finished condition until final acceptance.
  - b. Unit of Measure: Linear foot of open channel as measured along the centerline of the survey stationing indicated on the Drawings.

- Logjam Removal:
  - a. Includes the following as indicated on the drawings and in accordance with the specifications:
    - i. Furnishing all labor, materials and equipment as necessary to complete the Work.
    - ii. Clearing as necessary to access the work.
    - iii. Logjam Removal in accordance with Details and as indicated on the Drawings.

iv. Removal of deadfall and other debris from within the channel.
v. Disposal by chipping or burning in an upland area as agreed upon in Landowner Agreement.
vi. Seed any disturbed areas in accordance with General Specifications.
vii. Cleanup and maintenance of the Work in the finished condition until final acceptance.

b. Unit of Measure: Lump Sum.

- Sediment Removal
- Open Channel Excavation:
  a. Includes the following as indicated on the drawings and in accordance with the specifications:
     i. Furnishing all labor, materials and equipment as necessary to complete the Work.
     ii. Excavating open channel to the lines and grades indicated on the Drawings.
     iii. Removal of snags, deadfall and debris from channel.
     iv. Strip, stockpile and respread topsoil from disturbed banks.
     v. Cleanup and maintenance of the Work in the finished condition until final acceptance.
  b. Unit of Measure: Linear foot of open channel as measured along the centerline of the survey stationing indicated on the Drawings.

- Spoil Leveling:
  a. Includes the following as indicated on the drawings and in accordance with the specifications:
     i. Furnishing all labor, materials and equipment as necessary to complete the Work.
     ii. Placing, leveling, spreading and shaping of spoils as indicated on the Drawings.
     iii. Cleanup and maintenance of the Work in the finished condition until final acceptance.
  b. Unit of Measure: Linear foot of open channel as measured along the centerline of the survey stationing indicated on the Drawings.

- Clean Existing Culvert:
  a. Includes the following as indicated on the drawings and in accordance with the specifications:
     i. Furnishing all labor, materials and equipment as necessary to complete the Work.
     ii. Removal and disposal of all material within the culvert.
     iii. Cleanup and maintenance of the Work in the finished condition until final acceptance.
  b. Unit of Measurement: Each.

- Remove Existing Crossing:
  a. Includes the following as indicated on the drawings and in accordance with the specifications:
     i. Furnishing all labor, materials and equipment as necessary to complete the Work.
     ii. Excavating and dewatering.
     iii. Stripping and stockpiling topsoil.
     iv. Removal and disposal of all vegetation and debris including inorganic material, trees, brush, stumps and roots as required for construction.
     v. Removal and disposal or salvaging (as indicated on plans) of existing storm sewers, culverts or bridges and appurtenant items.
     vi. Cutting, filling, shaping, grading, compacting, or otherwise preparing a finished subgrade.
     vii. Spreading topsoil (stripped during grading) adjacent to crossing.
     xii. Restoration of all other disturbed areas with seed, fertilizer and mulch.
     xiii. Cleanup and maintenance of the Work in the finished condition until final acceptance.

b. Unit of Measure: Each

- Remove and Replace Private Crossing:
  a. Includes the following as indicated on the drawings and in accordance with the specifications:
     i. Furnishing all labor, materials and equipment as necessary to complete the Work, including but not limited to geotextile fabric, riprap and backfill material.
     ii. Excavating and dewatering.
     iii. Stripping and stockpiling topsoil.
     iv. Removal and disposal of all vegetation and debris including inorganic material, trees, brush, stumps and roots as required for construction.
     viii. Removal and disposal or salvaging (as indicated on plans) of existing storm sewers, culverts or bridges and appurtenant items.
     ix. Cutting, filling, shaping, grading, compacting, or otherwise preparing a finished subgrade.
     x. Placing and compacting pipe bedding.
     xi. Placing proposed culvert (provided by PROPERTY OWNER).
     xii. Placing riprap and geotextile fabric.
     xiii. Furnishing, placing and compacting backfill and surface course.
     xiv. Spreading topsoil (stripped during grading) adjacent to crossing.
     xii. Restoration of all other disturbed areas with seed, fertilizer and mulch.
     xiii. Cleanup and maintenance of the Work in the finished condition until final acceptance.
  b. Unit of Measure: Each

- Remove and Replace Road Crossing (Gravel):
  a. Includes the following as indicated on the drawings and in accordance with the specifications:
     i. Furnishing all labor, materials and equipment as necessary to complete the Work, including but not limited to geotextile fabric, riprap and backfill material.
     ii. Excavating and dewatering.
     iii. Stripping and stockpiling topsoil.
     iv. Removal and disposal of all vegetation and debris including inorganic material, trees, brush, stumps and roots as required for construction.
     v. Removal and disposal or salvaging (as indicated on plans) of existing storm sewers, culverts or bridges and appurtenant items.
     vi. Cutting, filling, shaping, grading, compacting, or otherwise preparing a finished subgrade.
     vii. Placing and compacting pipe bedding.
     viii. Placing proposed culvert (provided by GRATIOT COUNTY ROAD COMMISSION).
     ix. Placing riprap and geotextile fabric.
     x. Furnishing, placing and compacting sand subbase, aggregate base course and surface course.
     xi. Compaction testing to be perfomed by ENGINEER and OWNER approved independent laboratory and paid for by CONTRACTOR.
     xii Fine grading aggregate surface course.
     xiii. Spreading topsoil (stripped during grading) adjacent to roadway.
     xiv. Restoration of all other disturbed areas with seed, fertilizer and straw mulch.
     xv. Cleanup and maintenance of the Work in the finished condition until final acceptance.
  b. Unit of Measure: Each.

- Remove and Replace Road Crossing (Paved):
  a. Includes the following as indicated on the drawings and in accordance with the specifications:

i. Furnishing all labor, materials and equipment as necessary to complete the Work, including but not limited to geotextile fabric, riprap and backfill material.
ii. Excavating and dewatering.
iii. Stripping and stockpiling topsoil.
iv. Removal and disposal of all vegetation and debris including inorganic material, trees, brush, stumps and roots as required for construction.
v. Removal and disposal or salvaging (as indicated on plans) of existing storm sewers, culverts or bridges and appurtenant items.
vi. Cutting, filling, shaping, grading, compacting, or otherwise preparing a finished subgrade.
vii. Placing and compacting pipe bedding.
viii. Placing proposed culvert (provided by GRATIOT COUNTY ROAD COMMISSION).
ix. Placing riprap and geotextile fabric.
x. Furnishing, placing and compacting sand subbase and aggregate base course.
xi. Furnishing, placing and compacting bituminous base and top course mixtures.
xii. Density and Compaction testing to be performed by ENGINEER and OWNER approved independent laboratory and paid for by CONTRACTOR.
xiii. Spreading topsoil (stripped during grading) adjacent to roadway.
xiv. Restoration of all other disturbed areas with seed and straw mulch.
xv. Cleanup and maintenance of the Work in the finished condition until final acceptance.

b. Unit of Measure: Each.

- Riprap Dissipator
- Outfall Stabilization
- Toe of Slope and Bank Protection:
  a. Includes the following as indicated on the Drawings and in accordance with the Specifications:
     i. Furnishing all labor, materials and equipment as necessary to complete the Work, including but not limited to riprap and geotextile fabric.
     ii. Excavating and grading as necessary to complete the Work.
     iii. Placing rock and geotextile fabric as indicated on the Drawings or as directed by the ENGINEER or OWNER.
     iv. Adjustments as directed by the ENGINEER or OWNER in order to ensure proper function.
     v. Cleanup and maintenance of the Work in the finished condition until final acceptance.
  b. Unit of Measure: Square Yards. Will not be paid above plan quantity unless approved by the OWNER or ENGINEER.

- Rock Ford Crossing
- Armored Spillway
- Rock Riffle:
  a. Includes the following as indicated on the Drawings and in accordance with the Specifications:
     i. Furnishing all labor, materials and equipment as necessary to complete the Work, including but not limited to riprap and geotextile fabric.
     ii. Excavating and grading as necessary to complete the Work.
     iii. Placing rock and geotextile fabric as indicated on the Drawings or as directed by the ENGINEER or OWNER.
     iv. Adjustments as directed by the ENGINEER or OWNER in order to ensure proper function.
     v. Cleanup and maintenance of the Work in the finished condition until final acceptance.
  b. Unit of Measure: Each

- Slope Stabilization:
  a. Includes the following as indicated on the Drawings and in accordance with the Specifications:
     i. Furnishing all labor, materials and equipment as necessary to complete the Work, including but not limited to erosion control blanket.
     ii. Excavating and grading as necessary to complete the Work.
     iii. Placing minimum 4 inches topsoil over disturbed areas.
     iv. Placing erosion control blanket as indicated on the Drawings or in accordance with the manufacturer's specifications.
     v. Adjustments as directed by the ENGINEER or OWNER in order to ensure proper function.
     vi. Cleanup and maintenance of the Work in the finished condition until final acceptance.
  b. Unit of Measure: Linear Foot

- Farm Tile Connection:
  a. Includes the following as indicated on the drawings and in accordance with the specifications:
     i. Furnishing and installing all labor, materials, and equipment as required to complete the Work including but not limited to pipe and fittings.
     ii. Excavating, dewatering, bedding, and backfilling.
     iii. Removal and disposal of existing tile necessary to make connection.
     iv. Cleanup and maintenance of the Work in the finished condition until final acceptance.
  b. Unit of Measure: Each.

- Tile Extension:
  a. Includes the following as indicated on the drawings and in accordance with the specifications:
     i. Furnishing and/or installing all labor, materials, and equipment as required to complete the Work including but not limited pipe and fittings, geotextile fabric and riprap.
     ii. Excavating and grading as necessary to complete the Work.
     iii. Placing geotextile fabric and riprap as directed by OWNER or ENGINEER.
     iv. Adjustments as directed by the OWNER or ENGINEER to ensure proper function.
     v. Cleanup and maintenance of the Work in the finished condition until final acceptance.
  b. Unit of Measure: Each.

- Core Existing CB:
  a. Includes the following as indicated on the drawings and in accordance with the specifications:
     i. Furnishing and installing all materials as required to complete the work including but not limited to grout.
     ii. Excavating, dewatering, bedding, and backfilling.
     iii. Coring existing drainage structure.
     i. Grouting pipe connections and wrapping with geotextile fabric.
     v. Cleanup and maintenance of the Work in the finished condition until final acceptance.
  b. Unit of Measure: Each.

- Nyloplast Drain Basin
- Precast Concrete Manhole
- Precast Concrete Catch Basin
- Yard / Field Basin:
  a. Includes the following as indicated on the drawings and in accordance with the specifications:
     i. Furnishing all labor, materials and equipment as required to complete the work including but not limited to geotextile fabric, riprap and pipe connections (OWNER to furnish drainage structure and casting / grate).

ii. Excavating, dewatering, bedding and backfilling.
iii. Installing drainage structure, casting / grate to finished grade.
ii. Grouting pipe connections and wrapping with geotextile fabric.
v. Placing geotextile fabric and riprap as indicated on the plans or as directed by Engineer or OWNER.
vi. Removal of all debris within top 2-feet of ground surface.
vii. Cleanup and maintenance of the Work in the finished condition until final acceptance.

b. Unit of Measure: Each

- Place Storm Sewer:
  a. Includes the following as indicated on the drawings and in accordance with the specifications:
     i. Furnishing all labor, equipment and materials as required to complete the Work, including but not limited to, backfill material. (OWNER to Provide PE pipe).
     ii. Coordinating with Material Supplier on delivery of OWNER furnished materials.
     iii. Sidecasting / separating existing topsoil.
     iv. Removal and disposal of existing storm sewer or culverts and appurtenance items.
     v. Cutting, filling, shaping, grading, compacting, or otherwise preparing a finished subgrade.
     vi. Placing and compacting pipe bedding.
     vii. Installing Owner furnished pipe.
     viii. Furnishing, placing and compacting backfill.
     ix. Respreading sidecast topsoil.
     x. Restoration of all other disturbed areas with seed, fertilizer and mulch.
     xi. Removal of all debris within top 2-feet of ground surface.
     xii. Cleanup and maintenance of the Work in the finished condition until final acceptance.
  b. Unit of Measure: Linear foot as measured along the centerline of the survey stationing indicated on the Drawings.

- Open Channel Seeding:
  a. Includes the following as indicated on the Drawings and in accordance with the Specifications:
     i. Furnishing all labor, materials and equipment as necessary to complete the Work.
     ii. Salvaging, stockpiling, replacing and grading existing topsoil.
     iii. Placing seed (provided by OWNER) along channel banks and in all other disturbed areas.
     iv. Reseeding as necessary to establish adequate vegetation.
     v. Cleanup and maintenance of the Work in the finished condition until final acceptance.
  b. Unit of Measure: Linear Foot of open channel as measured along the centerline of the survey stationing indicated on the Drawings.

- Lawn Restoration:
  a. Includes the following as indicated on the drawings and in accordance with the specifications:
     i. Furnishing and installing all labor, materials and equipment as required to complete the Work, including but not limited to topsoil, fertilizer and mulch.
     ii. Grading existing topsoil and preparing seed bed.
     iii. Placing fertilizer, seed (provided by OWNER), mulch and tackifier at specified rates.
     iii. Reseeding as necessary to establish adequate vegetation.
     v. Cleanup and maintenance of the Work in the finished condition until final acceptance.
  b. Unit of Measure: Lump sum

- Restoration:
  a. Includes the following as indicated on the drawings and in accordance with the specifications:
     i. Furnishing and installing all labor, materials and equipment as required to complete the Work, including but not limited to topsoil, fertilizer and mulch.
     ii. Grading existing topsoil and preparing seed bed.
     iii. Placing fertilizer, seed (provided by OWNER), mulch and tackifier at specified rates.
     iv. Cleanup and maintenance of the Work in the finished condition until final acceptance.
  b. Unit of Measure: Lump sum

- Mulch Blanket:
  a. Includes the following as indicated on the drawings and in accordance with the specifications:
     i. Furnishing all labor, materials and equipment as necessary to complete the Work.
     ii. Placing and anchoring mulch blanket in accordance with Manufacturer's specifications where indicated on the Drawings or as directed by the ENGINEER.
     iii. Cleanup and maintenance of the Work in the finished condition until final acceptance.
  b. Unit of Measure: Square Yard.

- Straw Wattle:
  a. Includes the following as indicated on the drawings and in accordance with the specifications:
     i. Furnishing all labor, materials and equipment as necessary to complete the Work.
     ii. Placing and anchoring straw wattle in accordance with Manufacturer's specifications where indicated on the Drawings or as directed by the ENGINEER.
     iii. Cleanup and maintenance of the Work in the finished condition until final acceptance.
  b. Unit of Measure: Each.

PART 1 - GENERAL

1.01 DESCRIPTION:

A. Work Included:
1. Provide permanent and/or temporary erosion and sedimentation control as called for on the plans.

B. Intent and Purpose of Control:
1. Keep disturbed areas small.
2. Stabilize and protect disturbed areas as soon as possible.
3. Keep storm water runoff velocities low.
4. Protect disturbed areas from runoff.
5. Retain sediment within the corridor or site area.

C. Method of Measurement and Basis of Payment:
1. Temporary Measures - Incidental to construction.
2. Permanent Measures - See Proposal for pay item.

1.02 PERMIT:

A. Soil Erosion and Sedimentation Control (Part 91, Act 451, PA 1994)
1. CONTRACTOR shall obtain a Soil Erosion and Sedimentation Control Permit issued by the Gratiot County Permits Office.
2. CONTRACTOR shall comply with the requirements and conditions of the APA.

1.03 JOB CONDITIONS:

A. Scheduling:
1. Control measures shall be constructed prior to the time construction starts uphill or upstream from the control measure location.
2. Removal and cleanup of temporary control structures: Within one week after control measure is no longer needed.

PART 2 – PRODUCTS

2.01 MATERIALS:

A. Seeding:
1. Open Channel Seeding:
a. MDOT, Sec. 816.02, 917.12.
b. Temporary Measures: MDOT Table 816-2 and 917-1. CR (Cereal Rye, less than 6 mos.) at a rate of 70 lb/acre.
c. Permanent Measures: As provided by OWNER applied at specified rate.

B. Topsoil:
1. Temporary Measures: Not required unless readily available.
2. Permanent Measures: MDOT 816.02.

C. Mulching:
1. Temporary and Permanent Measures: MDOT 816 shall apply. Required as specified on plans and/or in Project Specifications.
2. Mulch Blanket: NA Green SC-150BN or equal.

D. Riprap:
1. Crushed Cobblestone: Sound, non-stratified, durable rock free from structural defects. Material shall be range in dimension as indicated on the Drawings. MDOT 916.01 shall apply.
2. Limestone: Sound, non-stratified, durable rock free from structural defects. Material shall range in dimension as indicated on the Drawings. MDOT 916.01 shall apply.

3. Crushed Concrete: Sound, non-stratified, durable concrete free from structural defects, debris, reinforcing steel, metal, paint soil, etc. Material shall range in dimension as indicated on the Drawings. MDOT 916.01 shall apply.

E. Geotextile Fabric:
1. Mirafi 140N or approved equal.

PART 3 - EXECUTION

3.01 PERFORMANCE:

A. General:
1. Abide with all applicable rules and regulations as established by the State of Michigan and the local governmental unit pursuant to Part 91, Soil Erosion and Sedimentation Control, of the Natural Resources and Environmental Protection Act, Act 451, PA 1994.
2. Achieve Effective Erosion Control:
a. Provide all materials.
b. Promptly take actions necessary to prevent off Site sedimentation.
3. Maintain erosion controls.
4. Remove temporary soil erosion and sedimentation control measures once permanent measures are established and accepted by the ENGINEER or OWNER.
5. Even though a specific erosion control measure is not called out on the plans, this does not relieve the CONTRACTOR from his obligation under the above Act to properly control and/or prevent all erosion caused by the CONTRACTOR's construction operation.

B. Sediment Removal:
1. Take such steps as are necessary to assure the retention and removal of any sediment which enters an existing storm sewer or open ditch along the construction route before said sewer or ditch discharges into a stream or pond.
2. If eroded material is allowed to enter a storm sewer system it shall be the CONTRACTOR's responsibility to see that all catch basins and manholes are cleaned following construction prior to receipt of final payment. Unless the CONTRACTOR can document positively to what extent an existing storm sewer system along the construction area is silted in prior to construction, no credit will be allowed for cleaning the system stem.
3. The CONTRACTOR shall be responsible for maintaining the roadways in a passable condition until the paving is completed. This includes any maintenance necessary for dust control.

3.02 SEEDING:

A. Scheduling:
1. Daily seed all disturbed areas.
2. Seasonal Limitations:
a. April 15 through October 10.
b. Dormant seeding after November 1 to freeze up.

B. Topsoil Spreading: Spread minimum 3” topsoil along channel banks prior to seeding.
.
C. Sowing:
1. Sow the seed following or in conjunction with the fertilizer and while the seed bed is in a friable condition.
2. Do not sow seed through mulch.

D. Method:
1. Broadcast: Do not seed when wind velocity exceeds 5 miles per hour.
2. Mechanical drills.
3. Hydroseeder:
a. Use only equipment specifically designed for hydraulic seeding application.
b. Mix seed, fertilizer and pulverized mulch in water until uniformly blended into homogeneous slurry.

c. Continue mixing during application.

E. Inspection:
1. Visually inspect for uniform distribution.
2. Reseed areas as required to establish a uniform and stable stand of grass.

F. Finishing: Incorporate seed into the upper 1/2-inch of soil.

G. Acceptance: Upon Final Completion, the OWNER or ENGINEER will inspect the Work to ensure that a uniform stand of vegetation is established.

3.03 TEMPORARY VEGETATIVE COVER:

A. General:
1. Provide temporary seed if permanent measures will not be placed within 15 days of initial disturbance and area will not undergo further earth change within 15 days of initial disturbance:
2. Within 15 days from the time final grade has been established, provide permanent soil erosion and sedimentation control measures.

B. Seed: Apply uniformly at a minimum rate of 70 pounds per acre.

C. Mulch: As needed to effectively control soil erosion.

3.04 MULCH BLANKET:

A. General: Directions of installation, staple patterns and other requirements in accordance with Manufacturer's directions.

Location: Where indicated on the Drawings or as directed by the ENGINEER or OWNER.

3.05 RIPRAP:

A. General:
1. Includes riprap toe of slope bank protection, outfall stabilization, riprap dissipator and splash pad.
2. Conform to slopes and dimensions indicated on the Drawings.

B. Grading:
1. Excavate to finished grade of required section and slope.
2. Excavate header and footer trench at upstream and downstream toe.

C. Geotextile Fabric:
1. Place geotextile fabric beneath all riprap areas.
2. Extend geotextile fabric into trenches for anchorage at upstream and downstream.

D. Placing Riprap: As indicated on the Drawings or as directed by ENGINEER or OWNER.

E. Maintenance: Regrade, relay riprap and geotextile fabric as necessary.

3.06 ARMORED SPILLWAY:

A. General:
1. Conform to slopes and dimensions indicated on the Drawings.

B. Grading:
1. Excavate to finished grade of required section and slope.
2. Excavate header and footer trench at upstream and downstream toe.

C. Geotextile Fabric:
1. Place geotextile fabric beneath riprap areas as indicated in details.

2. Extend geotextile fabric into trenches for anchorage at upstream and downstream.

D. Placing Rock: As indicated on the Drawings or as directed by ENGINEER or OWNER.

E. Engineer's Approval: Obtain approval from ENGINEER or OWNER that riprap spillway is functioning properly.

F. Maintenance: Regrade, relay and adjust rock as necessary in order to ensure that riprap spillway is functioning properly.

3.07 OPEN CHANNEL EXCAVATION

A. Power equipment such as bulldozers shall not enter the water unless approved by ENGINEER or OWNER.

B. Complete excavation, clearing, grubbing, snagging, tree cutting, pulling, raking, and related work in such a way as to minimize erosion of soil in the areas in which work is completed.

C. Channel banks and other disturbed areas.
1. Stabilize within 24 hours after a disturbance unless otherwise approved by ENGINEER or OWNER.
2. In no case shall banks be left un-stabilized for more than 7 days.

D. Construct sediment basins or traps prior to excavation.

E. Comply with measures for soil erosion and sediment control as indicated on the Drawings.

3.08 AIRBORNE SEDIMENT

A. Dust Control:
1. Use legal means necessary to control dust on and near the Work and on and near off Site borrow areas if such dust is caused by CONTRACTOR's operations during performance of the Work or if resulting from the condition of the Site when earthwork operations are suspended.
2. Treat haul roads, delivery roads, temporary Site access roads and other surfaces as required to prevent dust from being a nuisance to the public, neighbors, and concurrent performance of other work on the Site, and as directed by ENGINEER or OWNER.
3. Periodically scrape and broom adjacent streets and paved areas to remove tracked dirt.

B. Wind Erosion:
1. Erect and maintain barriers to prevent migration of windblown sediment off Site.
2. Conduct operations in such a manner as to minimize the amount of Site area exposed to wind erosion.
3. Be responsible for removal of windblown sediments deposited off Site, including costs for repairs required due to sediment deposition and removal.

PART 1 - GENERAL

1.01 DESCRIPTION:

A. This work consists of clearing, selective thinning and application of any growth preventive material where required. CLEARING: Shall consist of cutting, removing from the ground, and disposing of trees, stumps, brush, shrubs, and other vegetation occurring within the project site which interfere with excavation, embankment, channel flow or clear vision, or are otherwise noted on the construction drawings to be removed and includes the preservation from injury or defacement of all vegetation and objects designated to remain. Where removal of a stump may result in damage to existing utilities, the stump shall be removed by chipping to a depth of at least one foot below the finished ground surface. Other stumps may be removed by chipping when approved by the ENGINEER or OWNER. Any trees or shrubs that are designated to be saved but are damaged by the CONTRACTOR's operations shall be repaired or replaced by the CONTRACTOR, as directed by the ENGINEER or OWNER, at no additional cost to the Owner.

1.02 PERMITS:

A. Permit for transport and disposal of debris by CONTRACTOR.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Except as noted the CONTRACTOR maintains possession of all materials being demolished.

B. Growth preventative material shall be applied by a certified applicator.

PART 3 - EXECUTION

3.01 GENERAL:

A. Limits of Work:
1. Clear within drain right of way according to the plans.
2. Clear both sides of the channel to top of bank and remove log jams and debris from the channel. Stumps are to remain if they do not interfere with the flow or construction process.
3. Grubbing is where spoil is not being spread.

B. Precautions: Avoid damage to stable, vegetated channel banks, or to trees and shrubs that are not designated for excavation or removal during completion of the clearing operations.

C. Ownership:
1. The property owner shall have the option of retaining ownership of trees that are removed on his property.
2. CONTRACTOR shall notify the property owner of CONTRACTOR's schedule for clearing in order to allow a reasonable amount of time for removal of material by the property owner.
3. If the owner of the property to be cleared requests to maintain possession of the material to be cleared the CONTRACTOR shall have the property owner complete the Land Owner Agreement Form found in the Supplemental Conditions. Cleared material claimed by the property owner shall be placed outside of the drain easement
4. Trees, stumps, etc., that are not removed by the property owner after a reasonable amount of time shall become the property of CONTRACTOR and shall be removed or disposed of in accordance with the Specifications.

3.02 CLEARING:

A. Cutting:
1. Cut trees and brush a maximum of 4 inches above the ground.
2. Remove tree tops and limbs prior to cutting the entire tree if necessary to avoid damage to adjacent structures or trees that are not designated for removal.

3. The final cut shall be an even cut, parallel with the ground.

B. Log Jams, Deadfall and Debris:
1. Remove dead leaning trees within channel cross-section.

C. Access:
1. Restrict equipment access for Clearing operations to areas indicated on the Drawings or as designated by ENGINEER or OWNER.
2. Equipment shall remain outside of the channel limits unless authorized by ENGINEER or OWNER.

D. Fruit Trees: Clear only when authorized by ENGINEER or OWNER.

3.03 GRUBBING:

A. Stump Removal: See Plans

B. Stump Treatment: Treat all stumps with growth preventer

C. Utilities:
1. Notify ENGINEER or OWNER of instances in which stump removal may result in damage to existing utilities or culverts.
2. Contractor is responsible for damage to utilities that may result from stump removal.

3.04 DISPOSAL:

A. Trash, debris and other nonwoody material: Sort out and dispose of in a licensed landfill.

B. Burial:
1. Trees, brush, stumps and other woody material may be disposed of by burial where authorized by ENGINEER or OWNER and in areas that do not conflict with present land use.
2. Bury material in compacted trenches with a minimum of 4-feet of compacted earth cover.
3. Locate buried trenches a minimum of 10 feet (horizontal) beyond the top edge of the proposed channel bank.

C. Burning:
1. Woody material may be disposed of by burning where authorized by ENGINEER or OWNER and in accordance with all local, State and Federal regulations.
2. Maintain a minimum 200 feet horizontal isolation distance between overhead public utilities or wooded areas and burning piles.
3. Bury material that remains following burning or remove from the Site.
4. Burning will not be permitted in areas with combustible organic soils.

D. Debris Piles:
1. Woody material may be placed in debris piles when a landowner agreement form is signed and as authorized by OWNER or ENGINEER and in locations that do not conflict with present land use.
2. Limb trees and neatly windrow debris piles beyond the spoil piles or place in debris piles at intervals of not less than 100 feet.
3. Maintain a minimum clearance of 200 feet (horizontal) between debris piles and overhead public utilities.
4. Floodplains: Not in floodplains.

E. Removal: Material that is required to be removed from the Site shall become the property of CONTRACTOR.

3.05 MAINTENANCE:

A. Clear and snag trees that become unstable (lean) or fall into drain between completion of the work and final completion.

PART 1 - GENERAL

1.01 DESCRIPTION:

A. The work includes earthwork for foundations, floor slabs, miscellaneous exterior concrete, asphalt pavements, yard piping and rough site grading.

1.02 REFERENCES:

A. MDOT - Michigan Department of Transportation, "Standard Specifications for Construction," 2020 ed.

B. American Society of Testing Materials, latest edition.

1.03 DEFINITIONS:

A. Optimum Moisture - Percentage of water at maximum density.

B. Borrow - material required for earthwork construction in excess of the quantity of suitable material available from required excavation grading or cutting. Borrow may be necessary even though not shown on the plans.

C. Suitable Excavated Material - mineral (inorganic) soil free of cinders, refuse, sod, boulders, rocks, pavement soft or plastic clays, vegetable or other organic material capable of being compacted as specified. Moisture content has no bearing on the suitability of materials to be used.

D. Granular Material - Coarse grained materials having no cohesion, which derive their resistance to displacement from internal stability.

E. Cohesive Material - Fine grained material which produces resistance to displacement by mutual attraction between particles. Clays are cohesive.

F. Rough Grade - earth grade before placing structure or landscaping.

G. Subgrade - earth grade upon which a pavement structure is to be placed.

H. Rock Excavation: - Boulders or rock weighing 4,000 pounds (approximately one cubic yard) or more and all solid or ledge rock, slate, shale sandstone and other hard materials that require continuous use of pneumatic tools, heavy rippers or continuous drilling and blasting for removal. Pavements are not included.

I. Proof Rolling - applying test loads over the rough grade or subgrade surface by means of a heavy pneumatic tire roller or other approved means, to locate and permit timely correction of deficiencies likely to adversely affect performance of the pavement structure.

1.04 JOB CONDITIONS:

A. If during progress of the work, testing indicates that materials do not meet specified requirements, remove defective work and replace at no cost to the OWNER.

B. Protect and preserve all public and private property including existing vegetation, landscape features, monuments within, along and adjacent to the work area.

C. Moisture content has no bearing on the suitability of material to be used.
   1. The moisture content of a material, however, may be such that its use will require extensive manipulation to achieve required compaction.
   2. It is the contractor's responsibility to determine the economics of using or disposing and replacing of such materials.
   3. Materials determined by the contractor to be uneconomical for use may be disposed of off-site or on-site in areas approved by the ENGINEER or OWNER and replaced with other material at no additional cost to the OWNER.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Fill:
1. Granular Material: MDOT 902.11, Table 902-3, Class III limited to 2.0 inch maximum size.
2. Select Granular Material MDOT 902.11, Table 902-3 Class II or IIa limited to 1.0 inch maximum size.
3. Suitable Excavated Material:
   a. Free of cinders, ashes, refuse, sod, boulders, rocks, pavement, soft or plastic clays, and vegetable or other objectionable organic material and capable of being compacted as specified herein.
   b. Moisture content has no bearing on the suitability of materials.
4. Clay liner Material: Unified Classification CL, CH, ML, MH.

B. Topsoil: Surface soils containing organic matters and productive of plant life.

C. Pipe Bedding: Compact granular material.

PART 3 - EXECUTION

3.01 OPEN CHANNEL EXCAVATION:

A. Location: Excavate existing channels from one side only with the intent to incur minimal disturbance to the opposite bank.

B. Tolerance:
1. Excavation of the open channel drain shall conform to the cross-sections and horizontal and vertical alignment indicated on the Drawings.
2. The completed cross-section shall not be more than 0.1-foot above or 0.3-foot below the plan elevation without the prior approval of ENGINEER or OWNER.
3. The finished bottom grade shall not be greater than 0.5 foot below the plan elevation within 300 feet upstream or downstream of structures or enclosures.

C. Rock Excavation:
1. CONTRACTOR shall notify ENGINEER or OWNER immediately when rock is encountered during excavation.
2. Rock excavation and removal methods shall be approved by ENGINEER or OWNER prior to initiating the work.
3. Rock excavation shall be paid under separate change order unless a specific item appears in the Bid Form.

D. Other Excavation:
1. Natural Items: In accordance with Division 2 Section “SITE CLEARING.”
2. Manmade Items:
   a. CONTRACTOR shall notify ENGINEER or OWNER immediately when manmade items are encountered during excavation.
   b. Excavation and removal methods of manmade items shall be approved by ENGINEER or OWNER prior to initiating the Work.
   c. Excavation, removal and disposal of manmade items greater than 1/2-cubic yard in volume shall be paid under separate change order unless a specific item appears in the Bid Form.

E. Unstable Soils:
1. CONTRACTOR shall notify ENGINEER or OWNER immediately when a significant amount of unstable soils are encountered during excavation.
2. Additional excavation that is deemed necessary by ENGINEER or OWNER to compensate for unstable soil conditions shall be paid under a separate change order, unless a specific item appears in the Bid Form.

F. Spoil Banks:
1. Spoil material shall be placed and graded in the location and to the slopes indicated on the Drawings.
2. Location:
   a. On one side of channel only unless indicated otherwise on the Drawings.
   b. Away from existing tributary water courses or drains.
   c. Away from landscaped areas.
   d. Away from the trunks of trees.
   e. Initial placement: Minimum 8 feet between the top of channel bank and the edge of the spoil pile.
3. Grading:
   a. Grade spoil banks to no steeper than 5 on 1 side slopes away from the drain in open areas and a minimum 2 on 1 side slopes in wooded areas unless indicated otherwise on the Drawings.
   b. Level spoil to allow broad, flat drainage ways to enter the drain without the ponding of surface water behind the spoil banks.
   c. Maintain a minimum 4-foot buffer strip between the leveled spoil and the top of the channel bank.
4. Organic Soils: Maintain a minimum 15-foot buffer strip between the leveled spoil and the top of the channel bank.
5. Sticks and Stones: Sticks 1-inch diameter or larger and 18 inches in length or longer, and rocks or boulders 8 inches in diameter or larger shall be removed or buried within the drain right-of-way in accordance with Division 2 Section “SITE CLEARING”.

G. Spoil Ownership: If the owner of the property requests or is willing to accept excavated material, the CONTRACTOR shall have the property owner complete the Land Owner Agreement Form found in the Supplemental Conditions. Excavated material claimed by the property owner shall be spread in accordance with the agreed upon instructions in the Land Owner Agreement. Otherwise spoil material becomes property of the CONTRACTOR and shall be disposed of in accordance with all local, state and federal regulations.

H. Tributaries:
1. Grade tributaries at a constant slope away from the drain excavation throughout the limit of the available right-of-way or 66-feet, whichever is less.
2. Begin tributary grading at the proposed drain elevation and meet the existing grade at the limit of the regrading.
3. Regrade the tributary to a bottom width equal to the existing bottom width. Regraded channel side slopes shall be a minimum of 2 on 1.

I. Channels Parallel to Roads:
1. Excavate from field side of drain.
2. Comply with requests of highway authority having jurisdiction within road right-of-way.
3. Preserve and maintain existing driveways.

PART 1 - GENERAL

1.01 DESCRIPTION:

A. This section includes the work required for trenching, excavating and backfilling, clearing, special pipe foundations, and special work below grade.

1.02 DEFINITIONS:

A. Maximum density: Maximum dry weight in pounds per cubic foot of a specific material.

B. Optimum moisture: Percentage of water at maximum density.

C. Rock excavation: Includes all boulders or rock weighing 400 pounds (approx. one cubic yard) or more and all solid or ledge rock, slate, shale, sandstone, and other hard materials that require continuous use of pneumatic tools, heavy rippers, or continuous drilling and blasting for removal. Pavements are not included.

D. Suitable Excavated Material: Mineral (inorganic) soil free of cinders, refuse, sod, boulders, rocks, pavement, soft or plastic clays, vegetable or other organic material and capable of being compacted as specified. Moisture content has no bearing on the suitability of materials to be used.

E. Granular Material: Coarse grained material having no cohesion, which derives its resistance to displacement from internal stability.

F. Cohesive Material: Fine grained material which derives its resistance to displacement by mutual attraction between particles of the mass, involving forces of molecular origin (i.e. Clays are considered cohesive).

1.03 REFERENCES:

A. MDOT - Michigan Department of Transportation, "Standard Specifications for Construction," 2020

B. MDOT – Density Control Handbook, latest edition.

C. American Society of Testing Materials, latest edition.

1.04 DESIGN AND PERFORMANCE REQUIREMENTS

A. Trench Bottom Suitability:
   1. Be responsible for the suitability of the normal trench bottom in supporting the utility, bedding and backfill.
   2. Notify ENGINEER or OWNER and await ENGINEER or OWNER's decision if a possible unsuitable condition exists.
   3. Poor dewatering techniques or lack of excess water control shall not be a reason for additional payment for remedial measures.

B. Trench Wall Stability:
   1. Be responsible for the trench configuration, including sheeting, shoring and bracing necessary to support trench side walls from collapsing.
   2. Be responsible for the structural design and stability of a pipe-laying box if utilized on the Project to prevent trench walls from collapsing.

1.05 QUALITY ASSURANCE

A. Compaction:
   1. Determine density by the modified Proctor method, ASTM D1557.
   2. Compact trench backfill and bedding to at least 95% maximum density.
   3. Compact suitable material to at least 90% maximum density.
   4. The first 12 inches of native material at the bottom of utility trenches:
      a. Test for density.
      b. Compact to at least 95% maximum density if the existing density is below 95%.

1.04 SUBMITTALS:

A. Quality Assurance/Control Submittals: For imported materials:
   1. Source.
   2. MDOT classification.
   3. Gradation.

B. Testing and Inspection Reports: Written reports shall be submitted to ENGINEER or OWNER, with copy to the CONTRACTOR, documenting testing and/or inspection results. Tests shall include:
   1. Test results on borrow material.
   2. Gradation analysis for granular backfill and sub-base materials.
   3. Field reports for in-place soil density tests.

1.05 JOB CONDITIONS:

A. Obtain and comply with construction permits from agencies having jurisdiction over the work.

B. Scheduling: Clean up promptly following utility installation backfilling.

C. Dust Control: Broom or apply dust palliatives as needed.

D. Existing Structures, Utility Structures, and Utilities:
   1. Call MISS DIG to locate existing underground utilities prior to starting excavation.
   2. Where utilities, utility structures or structures are encountered which are in active use:
      a. Provide adequate protection for them.
      b. Be responsible for damage to them.
   3. Provide stand-by utility service if temporary removal is necessary for a period exceeding 2 hours.
   4. Where utility service connections to occupied buildings must be temporarily disconnected, give 48 hours notice to the affected occupants of the time and duration of the anticipated shutoff.
   5. Notify Fire Department 48 hours in advance if water main or fire supply line shutoff is required.
   6. Raise, lower, or move underground utilities, utility structures or structures which interfere with the utility or utility structure being constructed as part of this Work.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. General:
   1. Approval Required: Material shall be subject to the approval of ENGINEER or OWNER.
   2. Notification: For approval of imported material, notify ENGINEER or OWNER at least 1 week in advance of intention to import material, designate the proposed borrow area, and permit ENGINEER or OWNER to sample as necessary from the borrow area for the purpose of making acceptance tests to prove the quality of the material.

B. Material Sources and Uses:
   1. Imported Material:
      a. Stone stabilization course.
      b. Bedding.
      c. Trench backfill.
   2. Native material unless quantity is not sufficient; then shall be imported material: Suitable material.

C. Stone Stabilization Course:
   1. Crushed Stone: MDOT 6A or crushed concrete ranging from 1 to 3 inches in nominal diameter and containing less than 7 percent passing the No. 200 sieve.
   2. Filter Fabric:
      a. By Mirafi; Amoco; Exxon; Nicolon; or equal.
      b. Monofilament polypropylene heavy, woven fabric.

c. Equivalent opening size of 70.

D. Bedding:
1. For Pipes Less Than 36 Inches (unless indicated otherwise):
a. MDOT 902 Granular Material Class II modified to 100% passing a 1/2-inch sieve, or
b. MDOT 902 Coarse Aggregate 17A or 26A.
2. For Pipes and Structures 36 Inches and Larger: See Drawings.

E. Trench Backfill: MDOT 902 Granular Material Class II (unless indicated otherwise).

F. Suitable Material:
1. Native Material Which is Used as Backfill:
a. Exclusive of gray or blue clay, peat, organic matter, or frozen lumps.
b. Containing no rocks or lumps over 3 inches in greatest dimension.
c. Having a moisture content such that material is capable of being compacted to 95% maximum density.
2. MDOT 902 Granular Material Class II if native material is not adequate in opinion of ENGINEER or OWNER.

PART 3 - EXECUTION

3.01 PREPARATION:

A. Conflicting Utilities:
1. Before starting excavation, establish location and extent of existing utilities in work area.
2. Establish potential conflict areas prior to construction.
3. Excavate and expose existing utilities presenting potential conflict to determine their exact location and elevation.
4. Provide adequate means of support and protection during operations.
5. Advise ENGINEER or OWNER of conflicts and obtain instructions on how to proceed.
6. Make adjustments in proposed utility location at no additional cost to OWNER.
7. Make arrangements with owner of existing utility for relocation, if necessary.
8. Schedule work accordingly.

B. Signs, mailboxes, fences and other movable surface features:
1. Witness location prior to removal. Relocate to accessible location and maintain during construction.
2. Upon completion of construction, replace to original position and condition.
3. Replace regulatory traffic control signs immediately after utilities are placed and backfilled.

C Property Irons
1. Protect existing property irons at edge of right-of-way. If property iron must be removed for construction, the CONTRACTOR shall have a registered professional surveyor witness the property iron(s) prior to disturbance and replace the existing property iron(s) at the CONTRACTOR'S expense.

D. Clearing and Grubbing:
1. Remove trees and shrubs not indicated to be preserved, as required.
2. Grub out all roots.
a. To a minimum depth of 4 feet below finished grade within roadways.
b. To a minimum depth 2.0 feet below finished grade other location.
3. Remove all debris from site resulting from clearing and grubbing.

E. Topsoil: Remove from all areas of new construction and stockpile on site in designated areas.

F. Protect Plantings and other features to remain as part of final landscaping.

3.02 EXCAVATION:

A. General:
1. Dispose of surplus and unsuitable excavated material.

2. Remove, salvage and stockpile topsoil on-site in area designated by ENGINEER or OWNER.
3. Unsuitable material encountered in subgrade or below payment line: Notify ENGINEER or OWNER and obtain instruction on how to proceed.

B. Trenches:
1. Depth: Provide a uniform and continuous bearing and support for proposed utility on solid and undisturbed or compact granular material.
2. Minimum Width: Allow space for jointing and bedding.
3. Maximum Width: Limitations apply at utility crown.
   a. 6 inch through 10 inch diameter: 30 inches.
   b. 12 inch to 30 inch diameter: Outside diameter plus 24 inches.
   c. 30 inch and over diameter: Outside diameter plus 36 inches.
   d. Elliptical: Outside pipe width plus 36 inches.
4. Maximum Width of Trench at Ground Surface:
   a. Not outside of the property line or easement.
   b. As required for protection of the Work and safety of workers.
   c. Use sheeting, bracing and shoring if required.

C. Length of Open Trench: Maximum 200 feet.

D. Damage to Existing Underground Utilities:
1. Report all damage to ENGINEER or OWNER and Utility Owner.
2. Repair to utility owner's standard at CONTRACTOR's expense.

3.03 BACKFILLING:

A. Pipe bedding area: Compact granular material to 95% of maximum density unless circular trench bottom installation is utilized.

B. Compaction:
1. Determine density by the modified Proctor method, ASTM D1557.
2. Compact trench backfill and bedding to at least 95% maximum density.
3. Compact suitable material to at least 90% maximum density.
4. The first 12 inches of native material at the bottom of utility trenches:
   a. Test for density.
   b. Compact to at least 95% maximum density if the existing density is below 95%.

C. Structures:
1. Density requirements: Same as Trenches.
2. Concrete structure: Place backfill only after 75 percent of concrete design strength has been reached.

3.04 COMPACTION, TESTING AND INSPECTION:

A. Performance and test equipment: Paid for by the CONTRACTOR, performed by ENGINEER or OWNER approved independent laboratory as required.

B. Moisture - Density relationships:
1. AASHTO T99 Method C

C. Field Density: Either of following:
1. ASTM D-2167 (Rubber Balloon)
2. ASTM D-2922 (Nuclear)
3. AASHTO T191
4. One Point Michigan Cone

D. Furnish equipment and personnel to provide access to test location and depth. Density tests will be performed at various levels, as determined by ENGINEER or OWNER, during or after backfilling operation.

E. Correct any deficiencies resulting from insufficient or improper compaction. Retest if required.

3.05 SOIL EROSION AND SEDIMENTATION CONTROL:

A. In accordance with Section 01570 “EROSION AND SEDIMENTATION CONTROL”

3.06 SURPLUS MATERIALS:

A. Surplus excavated and unsuitable excavated material becomes the property of the CONTRACTOR.

B. Dispose of surplus excavated or unsuitable excavated materials off-site or on-site in areas designated by ENGINEER or OWNER in accordance with all Local, State and Federal regulations.

3.07 EXCESS WATER CONTROL

A. Regulations and Permits: Comply with soil erosion control permit in accordance with Mich. P.A. 451, Part 91 of 1994, the Natural Resource and Environmental Protection Act, and all pertinent rules, laws, and regulations.

B. Unfavorable Weather:
1. Do not place, spread or roll fill material during unfavorable weather conditions.
2. Do not resume operations until moisture content and fill density are satisfactory to ENGINEER or OWNER.

C. Pumping and Drainage:
1. Provide, maintain and use at all times during construction adequate means and devices to promptly remove and dispose of water from every source entering the excavations or other parts of the Work.
2. Dewater by means which will ensure dry excavations, preserve final lines and grades, and do not disturb or displace adjacent soil. Use wells, portable pumps, temporary underdrains, or other methods as necessary.
3. Perform Pumping and Drainage:
   a. In such a manner to cause no damage to property or structures and without interference to the rights of the public, owners of private property, pedestrians, vehicular traffic, or the work of other CONTRACTORs.
   b. In accordance with pertinent laws, rules, ordinances, and regulations.
4. Do not overload or obstruct existing drainage facilities.

D. General:
1. Keep excavations dry during construction.
2. Remove water by use of wells, well points, portable pumps, bailing, drains, underdrains or other acceptable methods.
3. Provide crushed stone or gravel as required to aid dewatering operations.
4. Divert or temporarily reroute existing sewers and drainage of discharge lines to adequate and acceptable outlets during construction. CONTRACTOR responsible to ascertain availability of outlets.
5. Divert surface water from entering excavations by construction and maintenance of channels or berms.
6. Sediment traps and other soil erosion control measures shall prevent soil particles from entering any sewer, watercourse or similar conveyance.
7. Protect utilities, utility structures, and structures, existing and new, from hydrostatic uplift.

3.08 SHEETING, SHORING AND BRACING EXCAVATIONS

A. General:
1. Furnish, put in place and maintain sheeting, bracing and shoring as may be required to properly support the sides of excavations and to prevent movement of earth which could in any way injure the Work or adjacent property.

2. Exercise care in the removal of sheeting, shoring, bracing and timbering to prevent collapse or caving of the excavation faces being supported and damage to the Work and adjacent property.
3. A pipe-laying box may be used in lieu of sheeting.

B. Sheeting:
1. Do not install by jetting.
2. Remove as backfilling proceeds, unless ordered left in place by ENGINEER or OWNER. Use care to fill and compact voids created by removal, especially below mid-height of utility.
3. Sheeting Left in Place:
   a. Requires written approval of ENGINEER or OWNER.
   b. Cut off minimum of 2 feet below finished grade.

3.09 CLEANUP

A. Upon completion of the work of this Section, remove all excess excavated material, trash, and debris resulting from construction operations. No debris will be allowed to be buried. Remove equipment and tools. Leave the Site in a neat and orderly condition acceptable to ENGINEER or OWNER.

PART 1 - GENERAL

1.01 DESCRIPTION:
- A. This section includes work required for storm sewer pipe, structures and related work.

1.02 DEFINITIONS:
- A. Line and grade control terminology: SEE PLAN DETAILS

1.03 SUBMITTALS:
- A. Submit the following in accordance with SECTION 01330 – SUBMITTAL PROCEDURES.
  1. Product Data for all pipe.
  2. Shop Drawings on radius pipe.
- B. Notify ENGINEER or OWNER on presence of wastewater:
- C. Line and grade control method other than Laser Beam shall be approved by ENGINEER or OWNER.

1.04 JOB CONDITIONS:
- A. Maintain operation of existing storm sewer.
- B. Install catch basins and inlet leads as pipe laying progresses and within maximum of 600 feet of mainline sewer installation.
- C. Clean-up promptly following pipe installation and within maximum of 400 feet behind pipe laying operation.

PART 2 – PRODUCTS

2.01 PIPE:
- A. Concrete Pipe Classification Table:

Type and Size	Design Depth (feet) 3-10	10-19	Over 19
Reinforced Concrete 12" - 54"	ASTM C-76 Class III	ASTM C-76 Class III	ASTM C-76 Class IV
Reinforced Concrete 60" - 90"	ASTM C-76 Class II	ASTM C-76 Class III	ASTM C-76 Class IV

- B. Reinforcement: Concrete Pipe reinforcing shall be circular.
- C. Corrugated Metal:
  1. Metallic coated (Aluminized): AASHTO M 196.
  2. Polymer coated: AASHTO M 294
- D. High Density Polyethylene (HDPE): Smooth lined corrugated Meeting AASHTO M 294

2.02 STANDARD JOINTS:
- A. Concrete
  1. Coldmastic Bituminous: MDOT 909.09.
  2. Mortar: MDOT 702, Type R-2.
- B. Corrugated Metal: Provide coupling bands.
  1. Material: Same as pipe, in two halves.
  2. Width: Minimum 12 inch for pipe diameters 8 inch thru 36 inch and minimum 24 inch for pipe diameters over 36 inch.

C. HDPE: AASHTO M252 or M 294, ASTM D3212.

2.03 PREMIUM JOINTS:

A. Concrete: ASTM C443, modified to include "O"-rings on grooved pipe ends.

B. Corrugated Metal:
1. Coupling bands: Same as standard joints.
2. Waterproofing material: 3/8 inch Neoprene, solid.
3. Neoprene width: 7 inch for 12 inch bands and 12 inch for 24 inch bands.

C. HDPE: AASHTO M252 or M 294, ASTM D3212.

PART 3 - EXECUTION

3.01 PREPARATION:

A. Alignment and Grade:
1. Deviations: Notify ENGINEER or OWNER and obtain instructions to proceed where there is a grade discrepancy or an obstruction not shown on the plans.

2. Expose existing utilities at crossings of proposed storm sewer in advance of laying pipe to verify existing depth. Advise ENGINEER or OWNER of conflicts in grade and provide adjustments in grade of storm sewer at no additional cost to OWNER.

B. Laser Beam Control:
1. Check grade at set-up point, 25 feet, 50 feet, 100 feet and 200 foot points thereafter to the next set-up point.
2. Laser advancement: Reset at each manhole.

3.02 INSTALLATION:

A. Laying Pipe:
1. Install in accordance with manufacturers recommendations.
2. Provide continuous bearing by supporting entire length of pipe barrel evenly.
3. Direction shall be upstream with spigot or tongue end downstream and bell end upstream.
4. Joints shall be smooth and clean.
5. Wrap joint surfaces with geotextile fabric.
6. Place pipe length and bedding as a unit in a frost free, dry trench.
7. Special supports and saddles: SEE PLAN DETAILS

B. Manholes, Catch Basins and Inlets:
1. General: SEE PLAN DETAILS
2. Base bedding: Provide 4 inches of pea stone with full and even bearing in impervious soils or wet conditions. Otherwise provide on undisturbed frost-free dry subgrade.
3. Adjusting rings: Set in full bed of mortar, joints maximum 1/2 inch at inside face and wipe joints. Plaster coat complete interior of structure with 1/2-inch coat of cement mortar. For HDPE adjusting rings, follow manufacturers installation instructions.
4. Provide manhole casting grade setting as follows:
   a. Existing pavement: Finished grade.
   b. Gravel or lawn grade: 4 inches below.
   c. Unpaved areas: Finished grade.
5. Provide catch basin casting grade setting as follows:
   a. Gutter grade: 1/2 inch below.

3.03 GENERAL CONSTRUCTION and TOLERANCES:

A. General:
1. Coordination: By ENGINEER or OWNER.
2. Completion: Before connecting to active system.
3. Notification: Arrange with ENGINEER or OWNER for inspection.
4. Keep pipe and structures clean as work progresses.

B. Line and Grade Tolerances: Allowable drift between structures from proposed alignment will be as follows:

1. Line:
   a. Thru 36 inch: 0.40 foot.
   b. Over 36 inch: 0.80 foot.
2. Grade:
   a. Thru 36 inch: 0.05 foot.
   b. Over 36 inch: 0.10 foot.

PART 1 - GENERAL

1.01 DESCRIPTION:

A. Work includes construction of new and reconstruction of existing HMA pavements including associated earthwork, paving and surfacing for all roads, driveways, parking lots, curb and gutter, sidewalks, and shoulders.

B. Definitions:
1. Pavement structure: Any combination of subbase, base course, and surface course, including shoulders, placed on a subgrade.
2. Permanent pavement: All improved pavement surfaces above the quality of treated or untreated gravel.
3. Subgrade: That portion of the earth grade upon which the pavement structure is to be placed.
4. Subbase: The layer of specified material of designed thickness placed on the subgrade as a part of the pavement structure.
5. Base course: The layer or layers of specified or selected material of designed thickness placed on a subbase or a subgrade to support leveling and surface courses.
6. Leveling course: Layer of specified material placed on the base course in preparation for the surface course.
7. Surface course: The top layer of a pavement structure.
8. Maximum density (soils): Maximum unit weight of soil material according to Modified Proctor Method ASTM D1557.
9. Maximum density (HMA): Maximum unit weight of a representative sample of the hot mix asphalt according to the Marshall Method ASTM D2726.

1.02 REFERENCES:

A. Michigan Department of Transportation (MDOT), "Standard Specifications for Construction," 2020 ed.

B. American Society of Testing Materials (ASTM), latest edition.

1.03 SUBMITTALS:

A. Asphalt Mix Design: Provide job-mix formula prepared by independent lab or approved by MDOT for HMA leveling and surface courses to ENGINEER or OWNER two weeks prior to paving.

B. Certification of quality by producer for the following:
1. Cement
2. Aggregates
3. Asphalt cement
4. Pavement marking material
5. Prime coat
6. Bond coat

C. Concrete Test Specimens: Provide sample.

1.04 JOB CONDITIONS:

A. Seasonal Limitations:
1. Removal of permanent pavement: Unless otherwise specified, execute during the period from March 15 to October 15.
2. Restoration of permanent pavement: Unless otherwise specified, execute during the period from May 5 to November 15 (Region South of M-46).

B. Clean up promptly following pavement installation.

C. Maintenance of Temporary Surfaces: Maintain temporary surfaces until permanent pavement installation is completed.

D. Driveway Closing: 48 hour maximum

E. Allow access to the HMA plant for verification of mix proportions, aggregate gradations, and temperatures.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Subbase: Granular material MDOT Class II or IIA, MDOT 902.08.

B. Aggregate Base Course: For bases to be surfaced with concrete or HMA, use Aggregate 22A unless otherwise specified. MDOT 302 and 902.06.

C. Aggregate Surface Course:
1. Use Aggregate 22A when the Aggregate surface course is to receive a HMA surface at a later date. MDOT 302 and 902.06.
2. Use Aggregate 23A when the Aggregate Surface Course is to be constructed without a HMA surface. MDOT 302 and 902.06.

D. Aggregate Shoulders and Approaches:
1. Use Aggregate 22A for construction of Class AA shoulders and approaches. MDOT 302 and 902.06.
2. Use Aggregate 23A for construction of Class A shoulders and approaches. MDOT 302 and 902.06.
3. Use roadway excavation or borrow material for construction of Class B shoulders and approaches. MDOT 302 and 902.06.

E. HMA Base Course: Shall be an MDOT mixture as indicated on Plans.

F. HMA Leveling and Surface Courses: Shall be an MDOT mixture as indicated on Plans.

G. HMA Bond Coat: HMA material. MDOT 904-5. (SS 1h Asphalt emulsion)

I. Pavement Marking: Conform to MDOT 920.

J. Concrete Curb & Gutter: Unless otherwise specified, use concrete Grade P1 or S2 for concrete curb, gutter, combination curb and gutter, gutter pan and spillways. MDOT 601, 701, 6 sacks per cubic yard minimum.

K. Concrete Sidewalk: Unless otherwise specified, use concrete Grade P1 or S2 for concrete sidewalk ramps and steps. MDOT 601, 701, 6 sacks per cubic yard minimum.

L. Concrete Joint Filler: Conform to ASTM D 1751.

M. Reinforcing Bars: Bar reinforcement shall be deformed steel bars meeting ASTM requirements as specified under MDOT 905.

N. Welded Steel Wire Fabric Reinforcement: Conform to MDOT 905.

PART 3 - EXECUTION

3.01 PREPARATION:

A. Removal: Remove all existing pavement structure required, as shown on the plans or in the proposal.
1. Pavement remnant limit: Remove pavement to edge or joint, where dimension is less than 3 feet. All removals shall be to a saw cut edge if a joint is more than three feet away.
2. Butt joint: Provide where new pavement meets existing pavement.

B. Dispose of all material removed during the construction.

C. Subgrade:
1. Obtain approval prior to placing the subbase or base course.
2. Construct to the required line, grade and cross section. MDOT 205.03.N.
   a. Tolerance if subbase is required: Trim within ± 1inch of design grade.
   b. Tolerance if subbase is not required: Trim within ± 3/4 inch of design grade.
3. Compaction:
   a. Compact to not less than 95 percent of the maximum density using Modified Proctor.

D. Excavation: Conform to MDOT 205.03.G.

E. Embankment: Conform to MDOT 205.03.H.

3.02 PERFORMANCE:

A. Subbase:
1. Thickness: Conform to design cross section.
2. Construction method:
   a. Place in layers not exceeding 12 inches loose measure.
   b. Spread evenly and compact to not less than 95 percent maximum density according to Modified Proctor.
   c. Conform construction to MDOT 301.01 thru 301.03.

B. Aggregate Base Course:
1. Thickness: Compacted depth of any layer of aggregate placed, maximum 6 inches, minimum 3 inches.
2. Construction Method: Conform the placing of aggregate base course with MDOT 302.01 thru 302.03.
3. Tolerances:
   a. Curbed streets: Shape the aggregate base course to the established grade and cross section, within a tolerance of 1/4 inch.
   b. Other: Unless otherwise specified, shape within 1/2 inch of the established grade and cross section.
   c. Check and correct grades prior to pavement placement.

C. Aggregate Surface Course:
1. Thickness: Maximum 6 inches thickness of any one layer when compacted, unless otherwise specified.
2. Construction Method: Conform construction of an aggregate surface course to MDOT 306.01 thru 306.03.

D. Shoulder Area (aggregate): Provide 4 inches thickness of compacted aggregate shoulder on an aggregate base, unless otherwise specified.

E. Shoulder Area (other than aggregate): Stabilize shoulder to a 4 inch depth with compacted soil or topsoil.

F. HMA Base Course:
1. Thickness: Maximum lift thickness - 2 inches compacted, unless otherwise approved. MDOT 502.03.F.
2. Construction Methods: Conform placement of the HMA base course mixture in accordance with MDOT 502.03.F.
3. Tolerances:
   a. Curbed streets: Shape the HMA base course to the established grade and cross section, within a tolerance of 1/4 inch. Windrowing (placing a lift of varying thickness to create a crown) HMA shall not be allowed to correct grading deficiencies.
   b. Other: Unless otherwise specified, shape within 1/2 inch of the established grade and cross section.

G. HMA Bond Coat:
1. Construction method: Apply between successive paving courses where any soils are tracked onto the finished mat between successive lifts.
2. Application rate: Provide 0.10 gallon per square yard.
3. Not required when permitted by ENGINEER or OWNER.

H. HMA Leveling and Surface Courses:
1. Cutting: Saw vertically and in straight lines at any angle with pavement centerline.
2. Thickness: Do not place HMA top course mixture in lifts exceeding 2 inches unless otherwise approved.
3. Construction Methods:
   a. Paving: Conform method of paving to MDOT 502.03.F.
   b. Prior to placement of HMA surface, crowns and grades of roadway will be verified by CONTRACTOR for positive drainage. Any deficiencies in grade or crown shall be corrected prior to placement of surface course.
4. Tolerances: HMA surface on streets with new curbs shall have a finish elevation of 1/4 inch above curb. Windrowing (placing a lift of varying thickness to create a crown) HMA shall not be allowed to correct grading deficiencies.
5. Pavement density: Minimum density of in-place course material when the course thickness is greater than 3 times the maximum aggregate size of the mix shall be 97 percent of the recorded laboratory specimen density and 95 percent when the course thickness is less.

I. Concrete Curb & Gutter (P1 & S2):
1. Removal: Remove to joint.
2. Thickness: Conform thickness to plan detail.
3. Construction Methods: Unless otherwise specified, construct curbing mechanically or with forms and either by casting separately or as an integral part of the pavement MDOT 802.

J. Concrete Sidewalk (P1 & S2):
1. Removal: Remove to joints.
2. Thickness: 4 inches nominal and 6 inches at driveways and alleys.
3. Construction Methods: Conform construction of sidewalks, unless otherwise specified to MDOT 803.

K. Concrete Joint Seal:
1. Cleaning: Unless otherwise specified, clean all joints with a jet of compressed air, immediately prior to sealing.
2. Sealing: Seal joints in accordance with the plans and as specified in MDOT 602.03.S.

3.03 STRUCTURE ADJUSTMENT:

A. Street Castings.
1. Adjust castings to finish grade or to a maximum of 1/4" below finish grade of all manholes, catch basins, and valve boxes.
   a. Set grades of castings and valve boxes from street grades with a tilt of castings where necessary to meet proposed street grades and crown.
   b. All castings, when adjusted to finish grade, shall be placed in a bed of hot HMA mix placed in entire area disturbed for casting adjustment. Alternately, as approved by the ENGINEER or OWNER, a concrete mix may be used in the void created to raise the casting.
2. Castings shall be adjusted to finish grade after the leveling course is complete.
   a. Castings shall be kept below grade or flush with the proposed sand subgrade so as not to conflict with grading operations or conflict with placement of leveling course.
3. Adjustment of new structures will not be paid for separately.

3.04 TESTING AND INSPECTION:

A. Inspection: By the ENGINEER or OWNER or his designated authorized representative.

B. Acceptance Testing:
1. By the CONTRACTOR, in accordance with Plans and Specifications and performed by OWNER or ENGINEER approved third party.
2. If initial testing indicates failed or nonconformance to specifications, perform additional tests. If further testing verifies nonconformance, additional testing shall be paid by CONTRACTOR. Replace nonconforming material at no additional cost to OWNER.

C. Aggregates:
1. Sampling and analysis: Michigan Testing Methods, Series 100.
2. Exception: Provide certification of approved stockpiled material.

D. HMA Mix Composition:
1. Sampling: ASTM D979, one sample per mix or one per two thousand tons.
2. Extraction: ASTM D2172.
3. Sieve analysis: ASTM C117 and ASTM C136.

E. Concrete:
1. Slump: 4 inches maximum.
2. Entrained Air: 4 to 7 percent.
3. Strength: 3500 psi, 28-day.

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract and Division 2 Specification Sections apply to this Section.

1.02 SUMMARY:

A. This Section includes the following:
1. Topsoil placement, finish grading
2. Seeding - lawn areas
3. Seeding - rough areas
4. Fertilizing
5. Mulching
6. Maintenance

B. Related Sections: The following Sections contain requirements that relate to this Section.
1. Division 2 Section "Earthwork" for backfilling and grading work.
2. Division 2 Section "Landscape Work" for topsoil requirements.

1.03 SUBMITTALS:

A. Submit the following in accordance with SECTION 01330 – SUBMITTAL PROCEDURES.
1. Fertilizer
2. Tackifier
3. Mulch

1.04 QUALITY ASSURANCE:

A. Installer Qualifications: Engage an experienced installer who has successfully completed turf installation work of similar scope and quality.

PART 2 - PRODUCTS

2.01 SEEDS:

A. All Seed shall be provided by OWNER.

2.02 SEEDING FERTILIZER:

A. Fertilizer shall be uniform in composition, free-flowing and suitable for application with approved spreader, delivered in original, unopened containers with the analysis, type and trade name attached to each container and shall be given to Landscape Architect's representative.

B. For initial lawn seeding, the Contractor shall incorporate a starter fertilizer, a complete fertilizer of the following ratio: 12-12-12 applied at a rate of 250 lbs per acre.

2.03 WATER:

A. Clean, fresh, free from harmful substances.

2.04 STRAW MULCH:

A. Dry, Clean Straw.

2.05 HYDRO-MULCH:

A. Mulch for hydro-mulching shall be commercially available wood cellulose fiber or wood pulp for use in spray applicators. Hydro-mulching shall be used in all mowable areas.

PART 3 - EXECUTION

3.01 LAWN TURF INSTALLATION:

A. Seedbed Preparation
1. After the areas to be seeded have been brought to the required grade with a minimum of 6" of topsoil, bring topsoil to a friable condition by disking, harrowing or otherwise looseing and mixing to a depth of 3-inches to 4-inches. Thoroughly break up all clumps and clods.
2. Remove sticks, stones and debris larger than 1-inch from topsoil once finish grade is achieved.
3. If the prepared seedbed is not fertilized, satisfactorily seeded, and mulched before the friable condition is lost through compaction or crusting, repeat the seedbed preparation prior to seeding or reseeding.
4. Notify OWNER or ENGINEER for approval of prepared seedbed prior to seeding.

3.02 FERTILIZING
A. Dry Fertilizer:
1. Broadcast on surface as first step in seeding process.
2. Apply with seed if wet seeded.
3. Work fertilizer into soil to a depth of 1-inch to 2-inches, if applied separate of hydroseeding application.
4. Apply uniformly.
5. Application Rate: 250 pounds per acre of 12-12-12.

3.03 SEEDING
A. Scheduling:
1. Within 7 days from the time the area was first disturbed in highly erodible areas.
2. Channel Banks: Within 24-hours from the time the area was first disturbed.
3. Seasonal Limitations:
a. April 20 through November 1.
b. Dormant Seeding after November 1.

B. Sowing:
1. Sow the seed following or in conjunction with the fertilizer and while the seedbed is in a friable condition.
2. Do not sow seeds through mulch.
3. Application Rate:
a. Lawn Areas: Sow seed at a minimum rate of 200 lbs. per acre.
b. Other Areas: Sow seed at a minimum rate of 100 lbs. per acre.

C. Finishing: Float and lightly compact areas sown by a hydroseeder or the broadcast method to incorporate the seed into the uppermost ½-inch of topsoil.

D. Method:
1. Broadcast Seeding.
2. Mechanical Drills.
3. Wet Seeding.
a. Use only equipment specifically designed for hydraulic seeding application.
4. Hydroseeder:
a. Use only equipment specifically designed for hydraulic seeding application.
b. Mix seed, fertilizer and pulverized mulch in water until uniformly blended into homogeneous slurry.
c. Continue mixing during application.

E. Inspection: Areas which are sown by hydroseeder shall be visally inspected for uniformity of application; areas in which visual inspection fails to reveal an average of 2 seeds per square inch shall be resown at no additional cost to OWNER.

3.04 MULCHING:
A. Method:

1. Straw Much.
    a. Apply straw mulch at a rate of 2 tons per acre.
    b. Apply Hydromulching/Tacking, using 500 pounds of wood fiber mulch per acre and 100 pounds of tackifier, applied over loose, blown straw to tack it down.

2. Hydromulching.
    a. Use only equipment specifically designed for hydraulic seeding application.
    b. Apply Hydromulching w/ Tacking, using 2,000 pounds of wood fiber mulch per acre.

3.05 TURF MAINTENANCE:

A. Seeded lawn areas shall be maintained by the Contractor through to final completion AND establishment of a close stand of approved grass. The Contractor shall maintain all work by watering, weeding, reseeding, fertilizing, cultivating and general maintenance, to obtain first-quality lawns and healthy-growing plants. Lawn maintenance shall continue until a close stand of grass of the varieties specified, free of weeds, has been established.

3.06 ACCEPTANCE:

A. When a uniform stand of the specified grasses is established without evidence of excessive weeds or crabgrass infestation, notify the OWNER or ENGINEER for an inspection of the established lawn. The OWNER or ENGINEER shall inspect all turf work for substantial completion upon notification of the CONTRACTOR. The request shall be received at least 5 calendar days before the desired date of inspection.

B. In lawn area being readied for inspection, no individual area of lawn shall have bare spots or cover that is unacceptable totaling more than 2% of the individual lawn area. Any material showing a weak growth shall be replaced by the CONTRACTOR during the proper season and all material shall be guaranteed as specified above.

GRATIOT COUNTY DRAIN COMMISSIONER
BERNARD J. BARNES

LANDOWNER AGREEMENT FORM

Property Owner(s): _____

Address: _____

Phone No: _____

Parcel No: _____

Impacted County Drain: _____ Drain

Request Permission To: _____

_____

_____

_____

_____

_____

We certify, as applicant, we are the legal owners of the property stated above.

As such, we hereby authorize _____, as the Contractor for the _____ Drain construction project to temporarily utilize our property to complete the scope of work indicated above.

We understand that the requested work is beyond the scope of said Drain project. We agree to waive any and all damages or claims against the _____ Drain Drainage District arising from work performed by said Contractor.

_____ _____
Owner's Signature Date

_____ _____
Contractor's Signature Date

Table 902-1
Grading Requirements for Coarse Aggregates, Dense-Graded Aggregates, and Open-Graded Aggregates

Material Type	Class	Item of Work by Section Number (Sequential)	Sieve Analysis (MTM 109) Total Percent Passing (a)										Loss by Washing (MTM 108) % Passing
			2½ in	2 in	1½ in	1 in	¾ in	½ in	⅜ in	No. 4	No. 8	No. 30	No. 200 (a)
Coarse Aggregates	4 AA (b)	602	100	90–100	40–60	—	0–12	—	—	—	—	—	≤2.0
	6 AAA (b)	602	—	—	100	90–100	60–85	30–60	—	0–8	—	—	≤1.0 (c)
	6 AA (b)	601, 602, 706, 708, 806	—	—	100	95–100	—	30–60	—	0–8	—	—	≤1.0 (c)
	6 A	205, 401,402, 601, 602, 603,706,806	—	—	100	95–100	—	30–60	—	0–8	—	—	≤1.0 (c)
	17 A	401,406,701,706, 708		—	—	100	90–100	50–75	—	0–8	—	—	≤1.0 (c)
	25 A		—	—	—	—	100	95–100	60–90	5–30	0–12	—	≤3.0
	26 A	706, 712	—	—	—	—	100	95–100	60–90	5–30	0–12	—	≤3.0
	29 A		—	—	—	—	—	100	90–100	10–30	0–10	—	≤3.0
Dense-Graded Aggregates	21 AA	302,304,305,306, 307	—	—	100	85–100	—	50–75	—	—	20–45	—	4–8 (d,e)
	21 A	302,305,306, 307	—	—	100	85–100	—	50–75	—	—	20–45	—	4–8 (d,e)
	22 A	302,305, 306,307	—	—	—	100	90–100	—	65–85	—	30–50	—	4–8 (d, e, f)
	23 A	306,307	—	—	—	100	—	—	60–85	—	25–60	—	9–16 (e)
Open-Graded Aggregates	4 G (g)	303	—	—	—	—	—	—	—	—	—	—	—
	34 R	401, 404	—	—	—	—	—	100	90–100	—	0–5	—	≤3.0
	34 G	404	—	—	—	—	—	100	95–100	—	0–5	—	≤3.0

a. Based on dry weights.
b. Class 6AAA will be used exclusively for all mainline and ramp concrete pavement when the directional commercial ADT is greater than or equal to 5,000 vehicles per day.
c. Loss by Washing will not exceed 2.0 percent for material produced entirely by crushing rock, boulders, cobbles, slag, or concrete.
d. When used for aggregate base courses, surface courses, shoulders and approaches and the material is produced entirely by crushing rock, boulders, cobbles, slag, or concrete, the maximum limit for Loss by Washing must not exceed 10 percent.
e. The limits for Loss by Washing of dense-graded aggregates are significant to the nearest whole percent.
f. For aggregates produced from sources located in Berrien County, the Loss by Washing must not exceed 8 percent and the sum of Loss by Washing and shale particles must not exceed 10 percent.
g. Reference contract documents.

Table 902-3
Grading Requirements for Granular Materials

Material	Sieve Analysis (MTM 109), Total % Passing (a)									Loss by Washing % Passing No. 200 (a), (b)
	6 in	3 in	2 in	1 in	½ in	⅜ in	No. 4	No. 30	No. 100	
Class I	—	—	100	—	45–85	—	20–85	5–30		0–5
Class II (c)	—	100	—	60–100	—	—	50–100	—	0–30	0–7
Class IIA (c)	—	100	—	60–100	—	—	50–100	—	0–35	0–10
Class IIAA	—	100	—	60–100	—	—	50–100	—	0–20	0–5
Class III	100	95–100	—	—	—	—	50–100	—	—	0–15
Class IIIA	—	—	—	—	—	100	50–100	—	0–30	0–15

a. Test results based on dry weights.
b. Use test method MTM 108 for Loss by Washing.
c. Except for use in granular blankets, Class IIA granular material may be substituted for Class II granular material for projects located in the following counties: Arenac, Bay, Genesee, Gladwin, Huron, Lapeer, Macomb, Midland, Monroe, Oakland, Saginaw, Sanilac, Shiawassee, St. Clair, Tuscola, and Wayne counties.

Table 902-4
Grading Requirements for Fine Aggregates

Material	Sieve Analysis (MTM 109), Total Percent Passing (a)							Loss by Washing % Passing No. 200 (a), (b)	Fineness Modulus Variation (c)
	⅜ in	No. 4	No. 8	No. 16	No. 30	No. 50	No. 100		
2NS	100	95–100	65–95	35–75	20–55	10–30	0–10	0–3.0	±0.20 (d)
2SS (e)	100	95–100	65–95	35–75	20–55	10–30	0–10	0–4.0	±0.20 (d)
2MS	—	100	95–100	—	—	15–40	0–10	0–3.0	±0.20 (d)

a. Test results based on dry weights.
b. Use test method MTM 108 for Loss by Washing.
c. Aggregate having a fineness modulus differing from the base fineness modulus of the source by the amount exceeding the maximum variation specified in the table, will be rejected. Use ASTM C 136.
d. The base fineness modulus will be supplied by the aggregate producer at the start of each construction season and be within the range of 2.50 to 3.35. The base FM, including the permissible variation, will be within the 2.50 to 3.35 range.
e. Quarried carbonate (limestone or dolomite) cannot be used for any application subject to vehicular traffic.

GENERAL NOTES

1. IF PROPERTY OWNER REQUESTS CLEARED OR EXCAVATED MATERIAL, CONTRACTOR SHALL OBTAIN A LANDOWNER AGREEMENT FOUND IN THE SPECIFICATIONS. CLEARED MATERIAL CLAIMED BY PROPERTY OWNER SHALL BE PLACED OUTSIDE THE DRAIN EASEMENT BY THE CONTRACTOR. EXCAVATED MATERIAL CLAIMED BY THE PROPERTY OWNER SHALL BE SPREAD IN ACCORDANCE WITH THE AGREED UPON INSTRUCTIONS IN THE LANDOWNER AGREEMENT, BUT IN NO CASE SHALL IT BE PLACED CLOSER THAN 8' FROM THE TOP OF CHANNEL BANKS.

2. ALL TREES SHALL BE CUT FLUSH WITH AND PARALLEL TO THE GROUND AND A GROWTH PREVENTER SHALL BE APPLIED TO ALL EXPOSED STUMPS. STUMPS SHALL BE GRUBBED OR COVERED WITH 2-FEET OF SPOIL MATERIAL. ALL WOODY DEBRIS MATERIAL SHALL BE CHIPPED, BURIED OR BURNED.

3. CONTRACTOR SHALL SPREAD SPOILS EVENLY WITHIN THE EASEMENT LIMITS IN OPEN AREAS AND WITHIN CLEARING LIMITS IN WOODED AREAS. NO SPOIL SHALL BE PLACED ON LAWN AREAS. THE CONTRACTOR SHALL ENSURE THAT OVERLAND FLOW TO THE DRAIN IS MAINTAINED. SEE DETAILS.

4. IF DRAIN IS ACCESSED ACROSS A PROPERTY AND NOT ALONG THE DRAIN ALIGNMENT A LANDOWNER AGREEMENT FORM GRANTING ACCESS MUST BE OBTAINED.

5. UNLESS OTHERWISE NOTED, CONTRACTOR MAINTAINS POSSESSION OF ALL REMOVED OR DEMOLISHED MATERIAL, CONSISTING OF, BUT NOT LIMITED TO DRAINAGE PIPE, STRUCTURES, HEADWALLS, ETC.

6. CONTRACTOR SHALL ENSURE DRAINS REMAIN OPERATIONAL THROUGHOUT THE COURSE OF CONSTRUCTION.

7. CONTRACTOR SHALL REMOVE EX. TILE WHILE INSTALLING PROP. STORM SEWER. TILE PIECES MUST BE SEPARATED & SPOILED IN THE TRENCH A MINIMUM OF 2-FEET FROM THE PROPOSED STORM SEWER AND/OR GROUND SURFACE.

8. CONNECT ALL LATERAL TILE LINES ENCOUNTERED DURING CONSTRUCTION ACCORDING TO FARM TILE CONNECTION DETAIL.

9. DAMAGED TILE OUTLETS ALONG THE DRAIN ALIGNMENT THAT HAVE BEEN IDENTIFIED BY PROPERTY OWNERS SHALL BE REPAIRED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER.

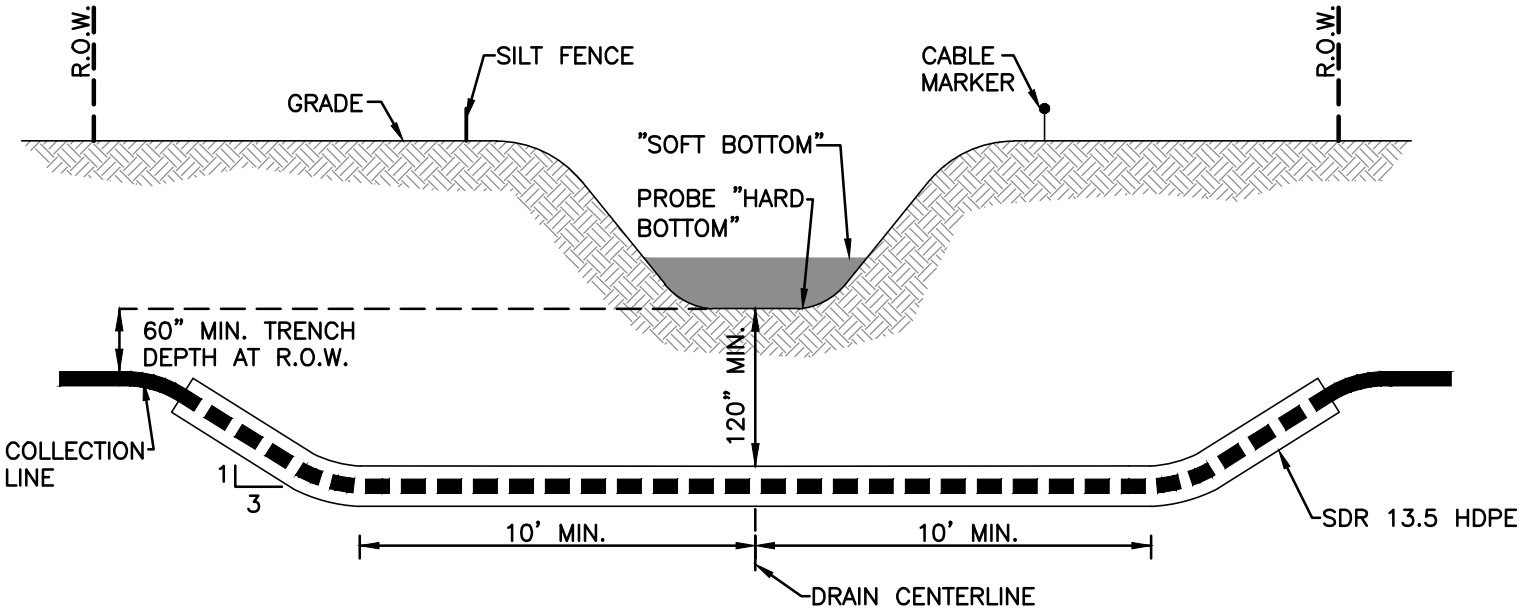
10. CONTRACTOR SHALL PROVIDE ALL TRAFFIC CONTROL DEVICES AS REQUIRED BY THE GRATIOT COUNTY ROAD COMMISSION AND SHALL COORDINATE A TRAFFIC CONTROL PLAN THROUGH THE PERMIT PROCESS WITH THE GRATIOT COUNTY ROAD COMMISSION.

11. RIPRAP MAY BE CRUSHED COBBLESTONE, LIMESTONE OR CRUSHED CONCRETE PER SPECIFICATIONS.

12. CONTRACTOR SHALL PROVIDE PHOTOGRAPHIC DOCUMENTATION THAT RIPRAP WAS PROPERLY INSTALLED AND WITH GEOTEXTILE FILTER FABRIC TUCKED IN ACCORDING TO SPECIFICATIONS.

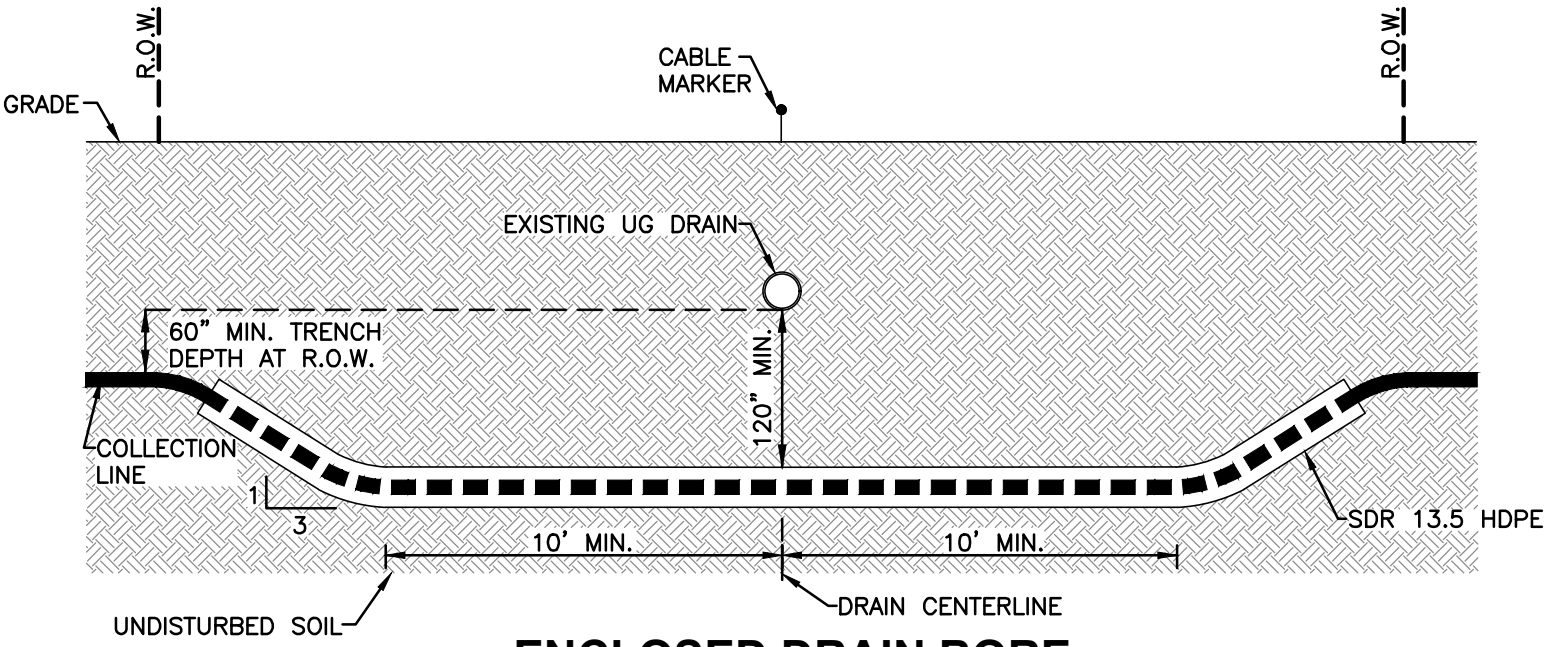
13. QUANTITIES WILL NOT BE PAID ABOVE THE CONTRACT AMOUNT UNLESS AUTHORIZED BY THE OWNER/ENGINEER.

14. ALL TRASH OR CONSTRUCTION DEBRIS SHALL BE REMOVED FROM THE SITE. NO DEBRIS WILL BE ALLOWED TO BE BURIED.



OPEN CHANNEL DRAIN BORE

NOT TO SCALE



ENCLOSED DRAIN BORE

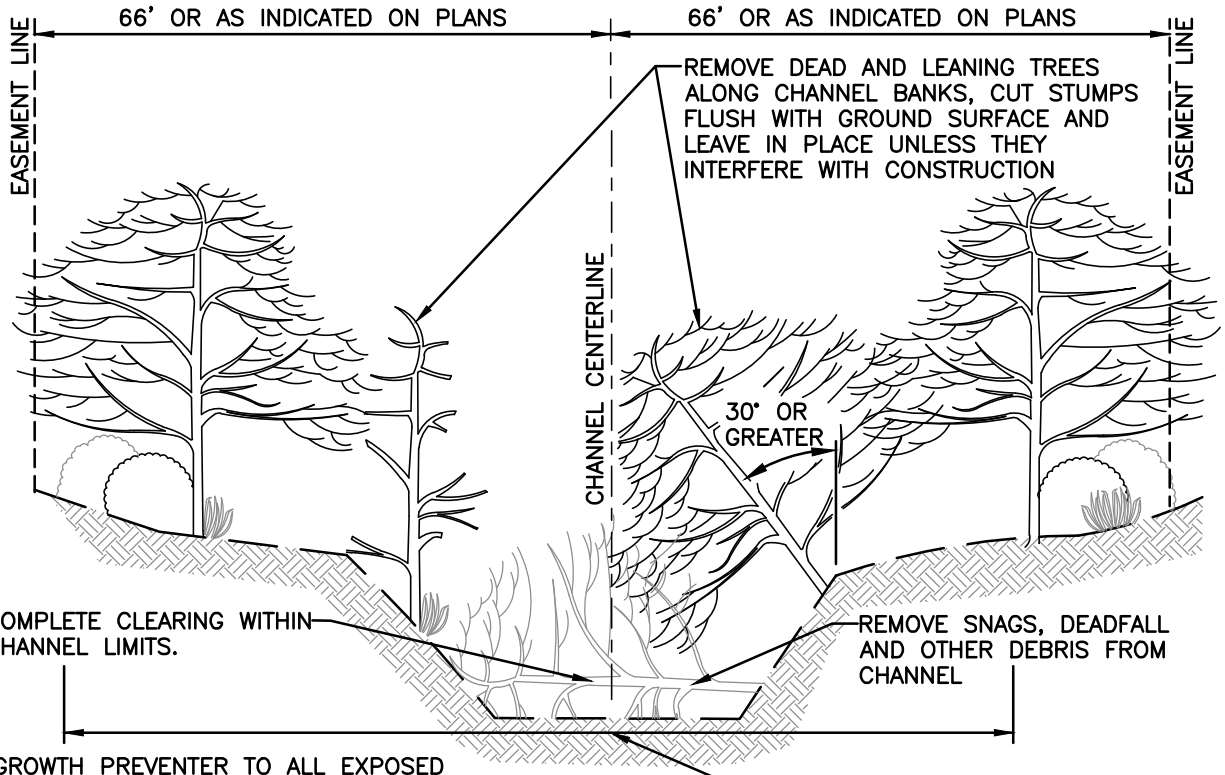
NOT TO SCALE

NOTES:

1. THE RATE OF SLOPE OF CABLE TO DEPTH BELOW DRAIN SHALL NOT EXCEED 3:1.
2. IF NO DRAIN RIGHT-OF-WAY EXISTS THE BORE MUST EXTEND A MINIMUM OF 10 FEET BEYOND THE TOP OF BANK.
3. SEE SITE SPECIFIC SWPP FOR MORE INFORMATION.
4. PARALLEL BORE SEPARATION SHALL BE A MINIMUM OF 50 FEET.
5. GPS COORDINATES SHALL BE TAKEN AT ALL CROSSINGS.

DATE: 1-19-2022	EXHIBIT B - TYPICAL BORES
PROJECT:	

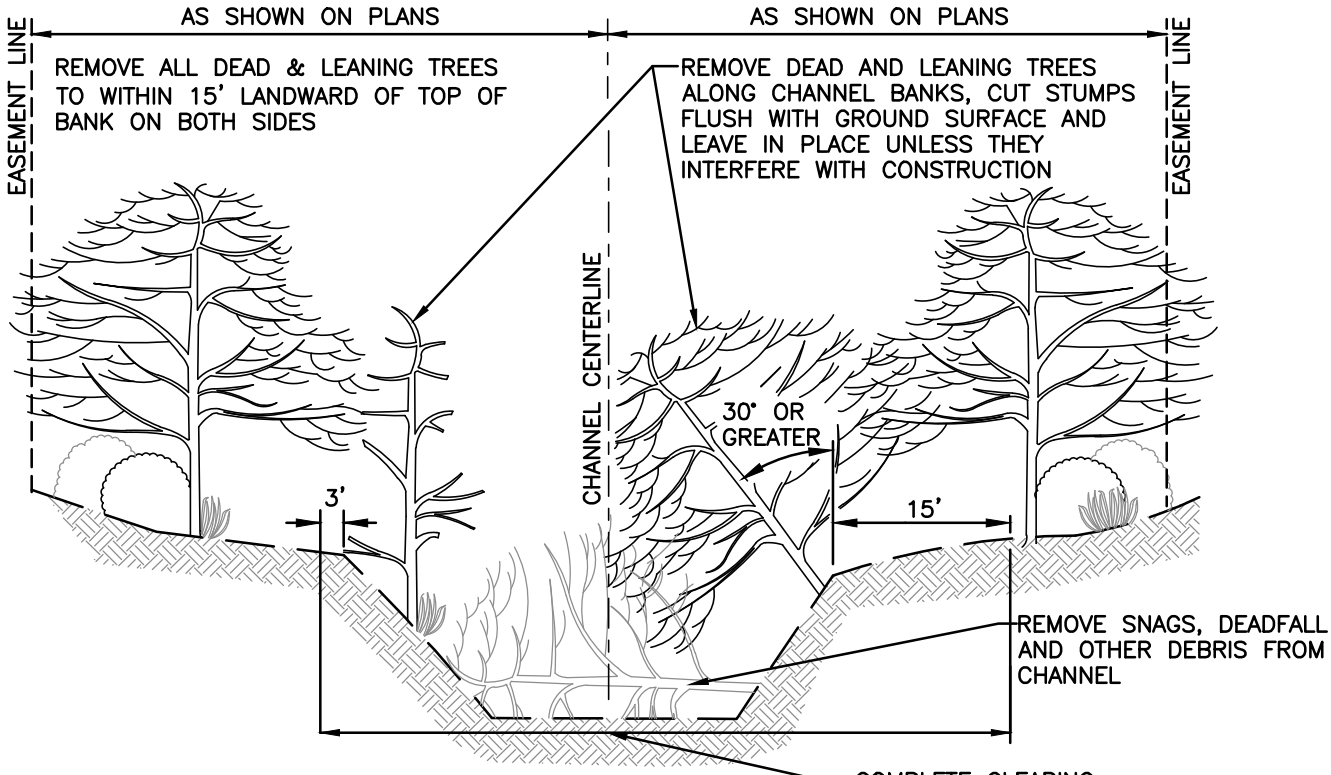
Apr 22, 2025 - 12:08pm H:\Projects\Gratiot County\Drain Details\Exhibit B - Typical Bores.dwg, XREFs:
By:KB



NOTES:
1. APPLY GROWTH PREVENTER TO ALL EXPOSED STUMPS.
2. STUMPS SHALL BE GRUBBED TO A DEPTH OF 2–FEET BELOW GRADE OR COVERED WITH 2–FEET OF SPOIL MATERIAL.
3. GRUB ALL STUMPS IN LAWN AREAS.
4. IF LAND OWNER REQUESTS WOODY DEBRIS, LIMB TREES AND NEATLY WINDROW DEBRIS PILES BEYOND SPOIL PILES AT INTERVALS OF NOT LESS THAN 100–FEET.

CLEARING, GRUBBING & SNAGGING DETAIL

NOT TO SCALE



NOTES:
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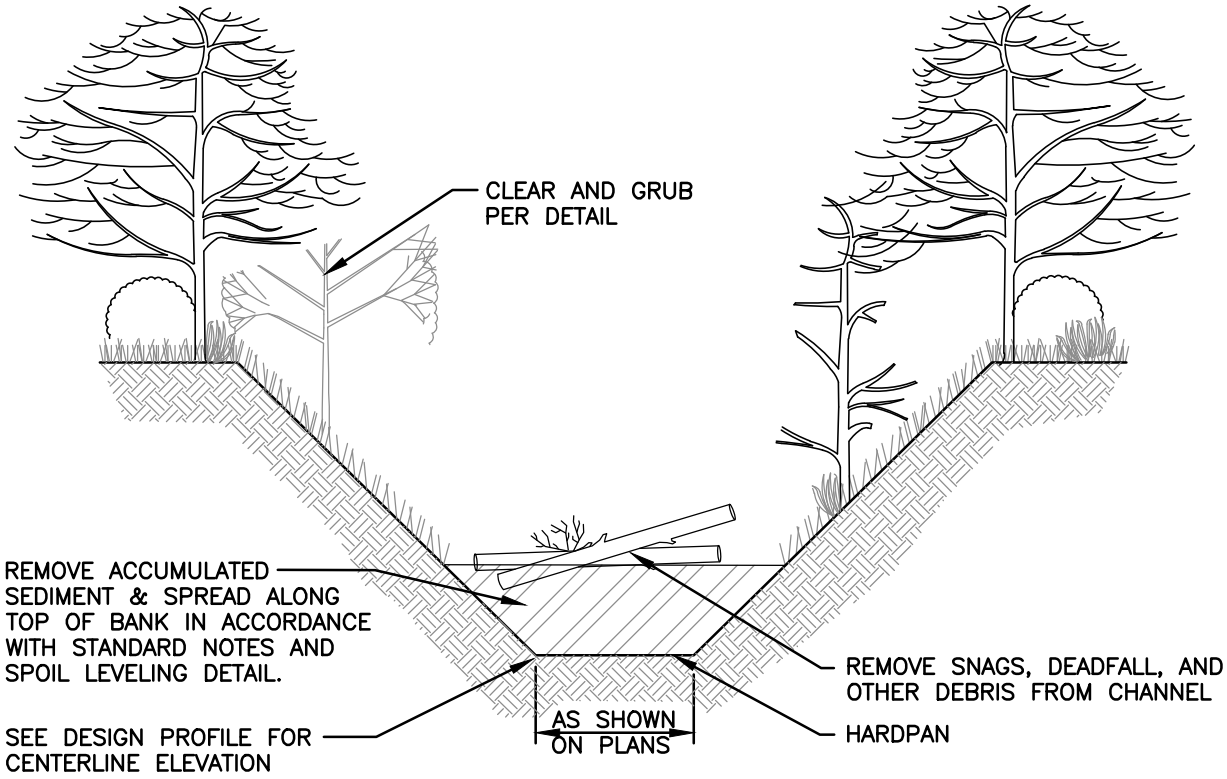
3. GRUB ALL STUMPS IN LAWN AREAS.
4. IF LAND OWNER REQUESTS WOODY DEBRIS, LIMB TREES AND NEATLY WINDROW DEBRIS PILES BEYOND SPOIL PILES AT INTERVALS OF NOT LESS THAN 100–FEET.

SELECTIVE CLEARING, GRUBBING & SNAGGING DETAIL

NOT TO SCALE



SEDIMENT REMOVAL DETAIL

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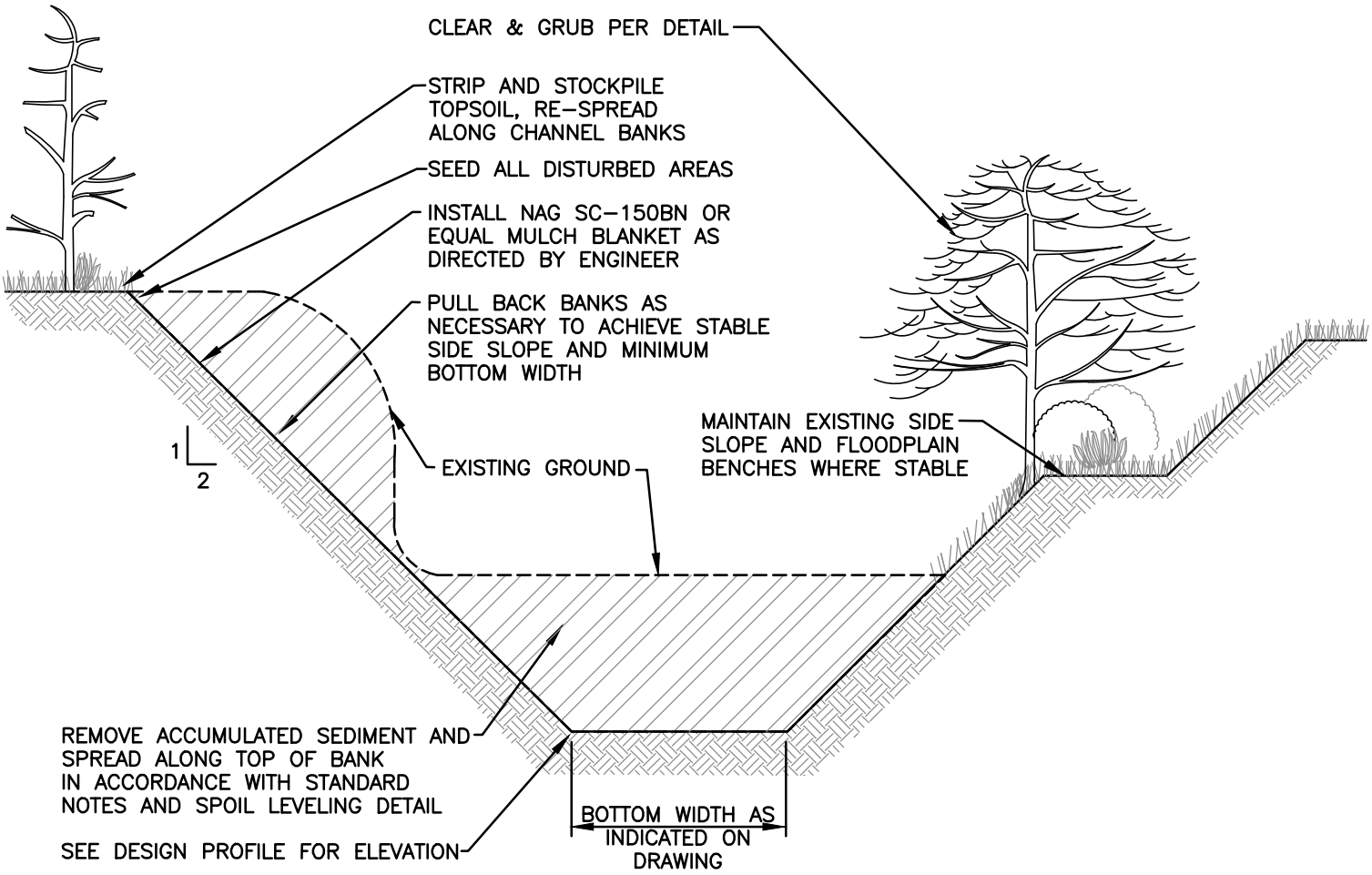

OPEN CHANNEL EXCAVATION DETAIL

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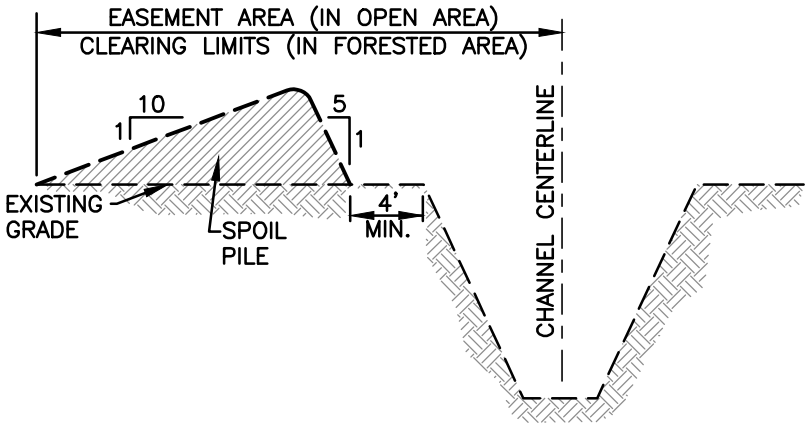
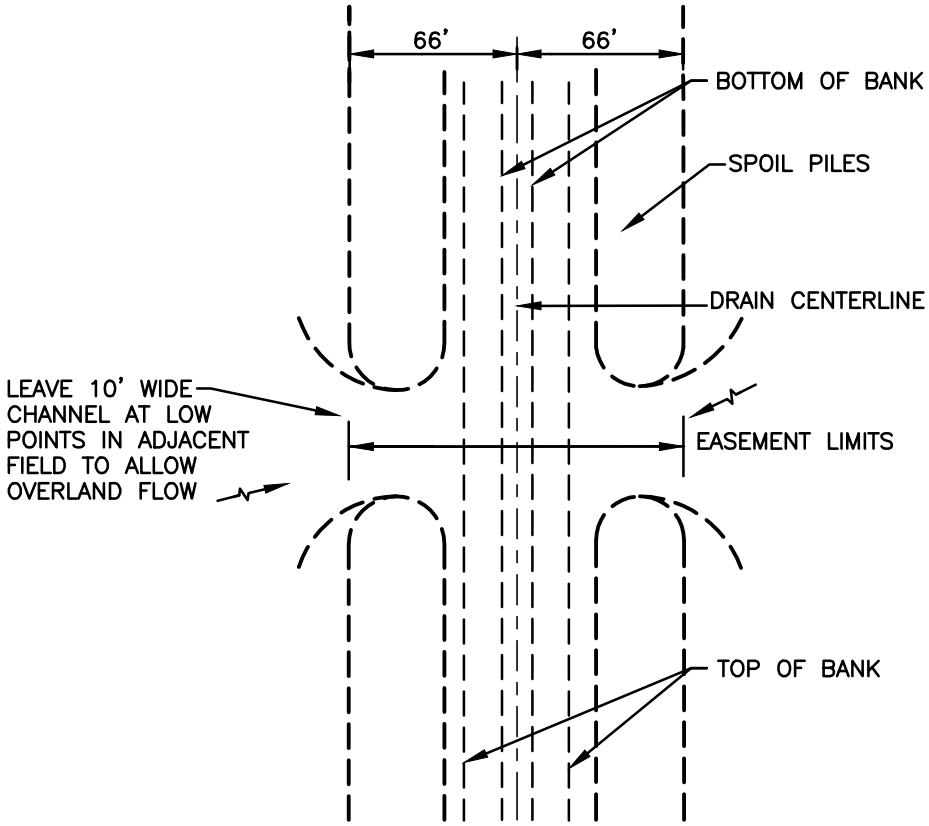


CROSS SECTION-SPOIL LEVELING AREA

NOT TO SCALE



SPOIL LEVELING DETAIL

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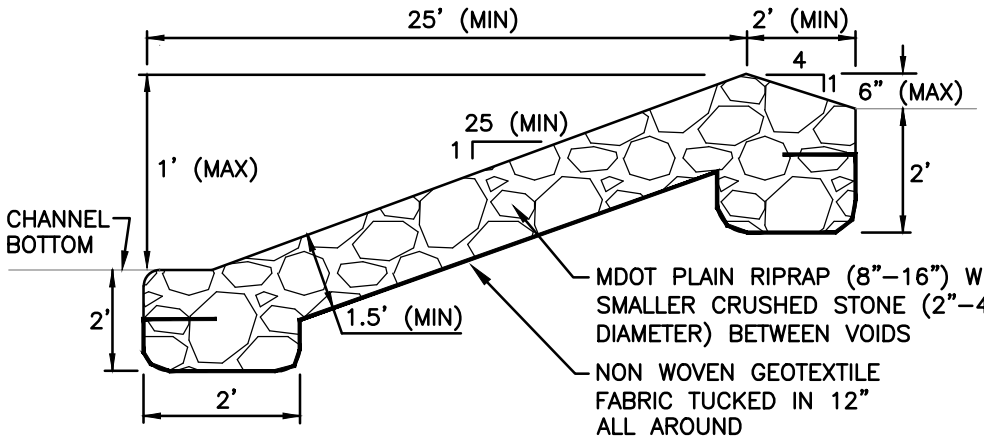
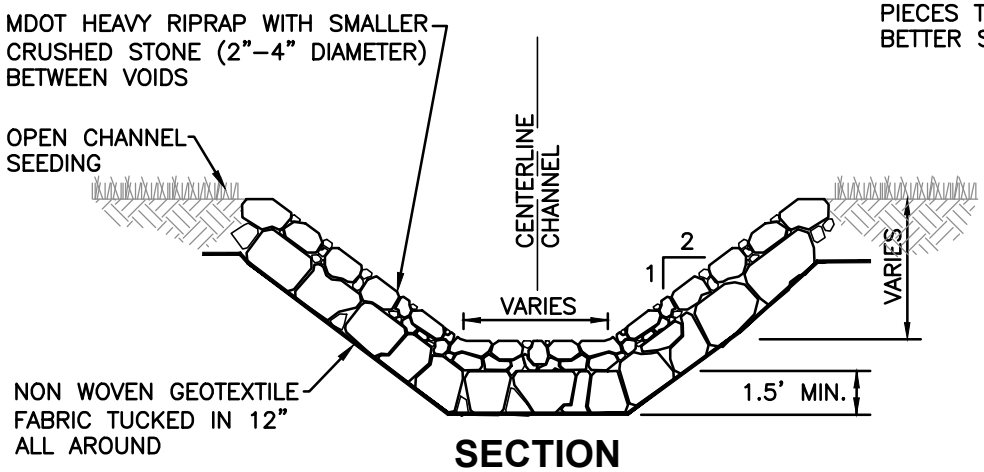


PROFILE

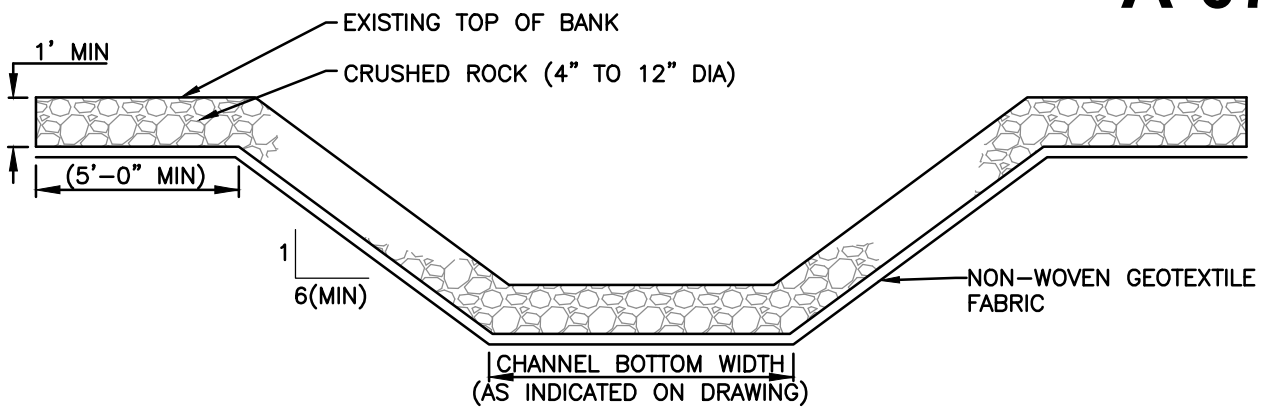
NOTES:
1. RIPRAP MAY BE ANGULAR NATURAL STONE OR BROKEN CONCRETE
2. CONTRACTOR MAY USE SMALLER PIECES TO FILL SPACES FOR BETTER SLOPE PROTECTION



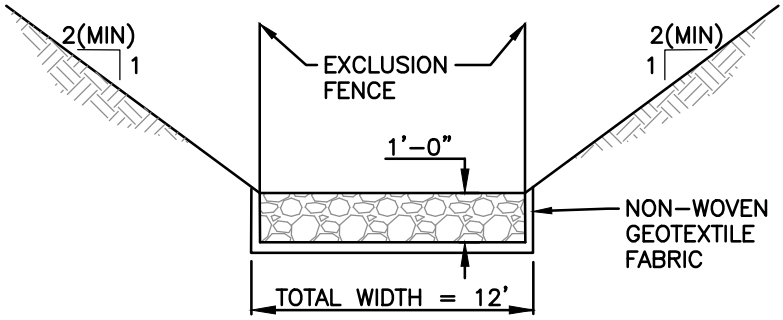
SECTION

ROCK RIFFLE DETAIL

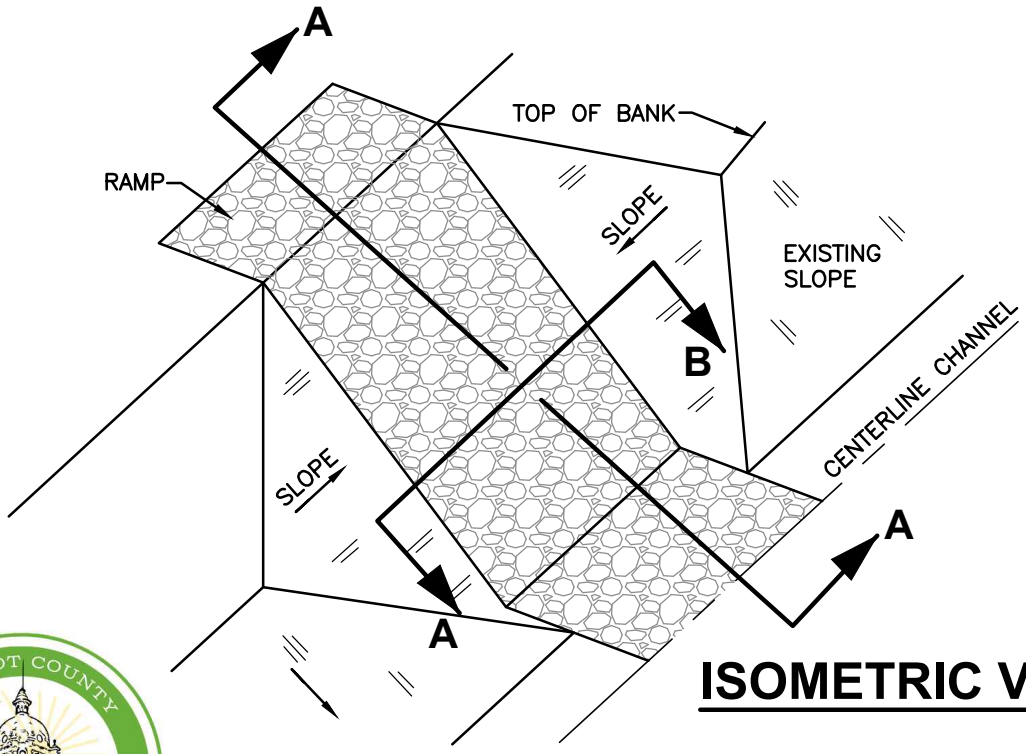
NOT TO SCALE



CROSSING PROFILE A-A



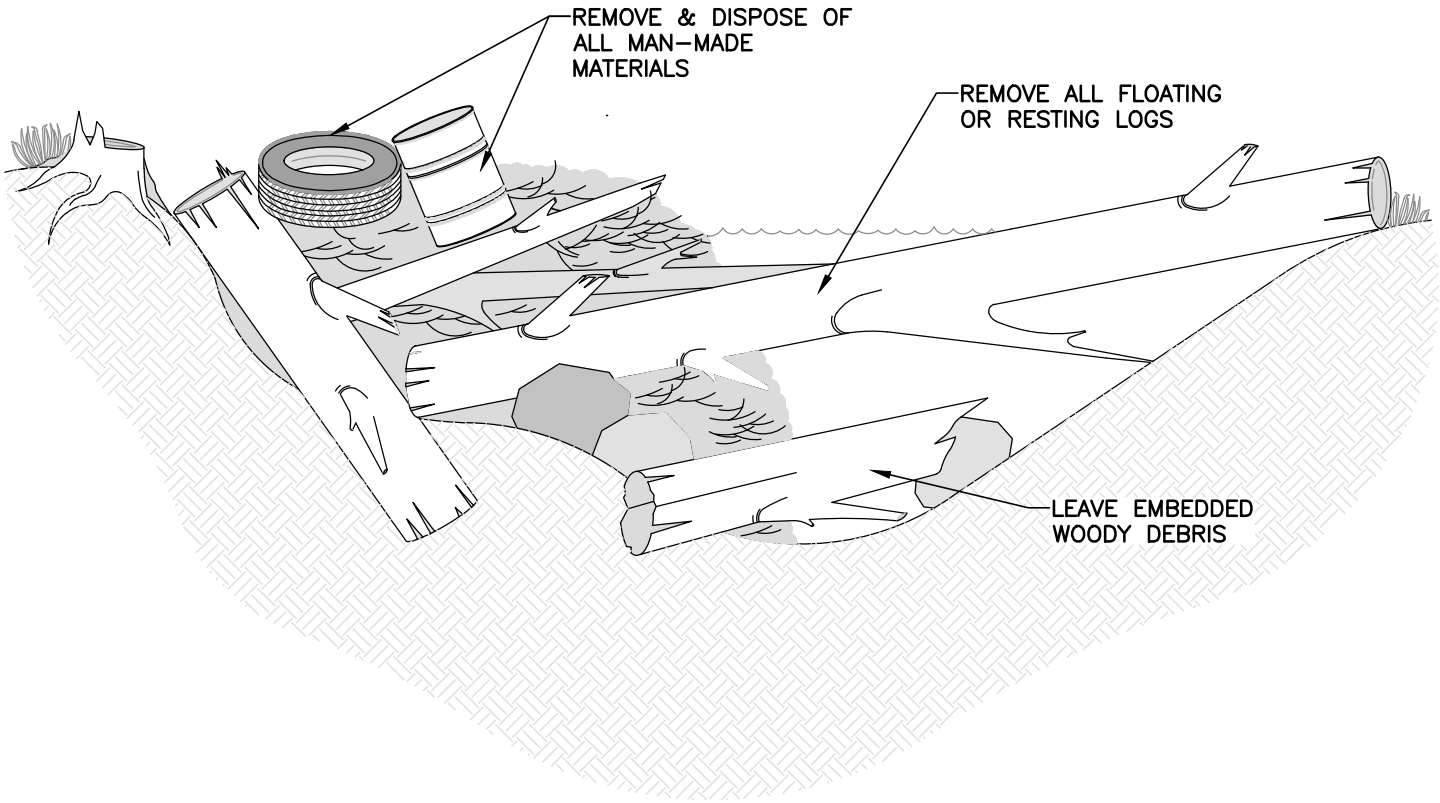
CROSS SECTION B-B



ISOMETRIC VIEW

ROCK FORD CROSSING DETAIL

NOT TO SCALE



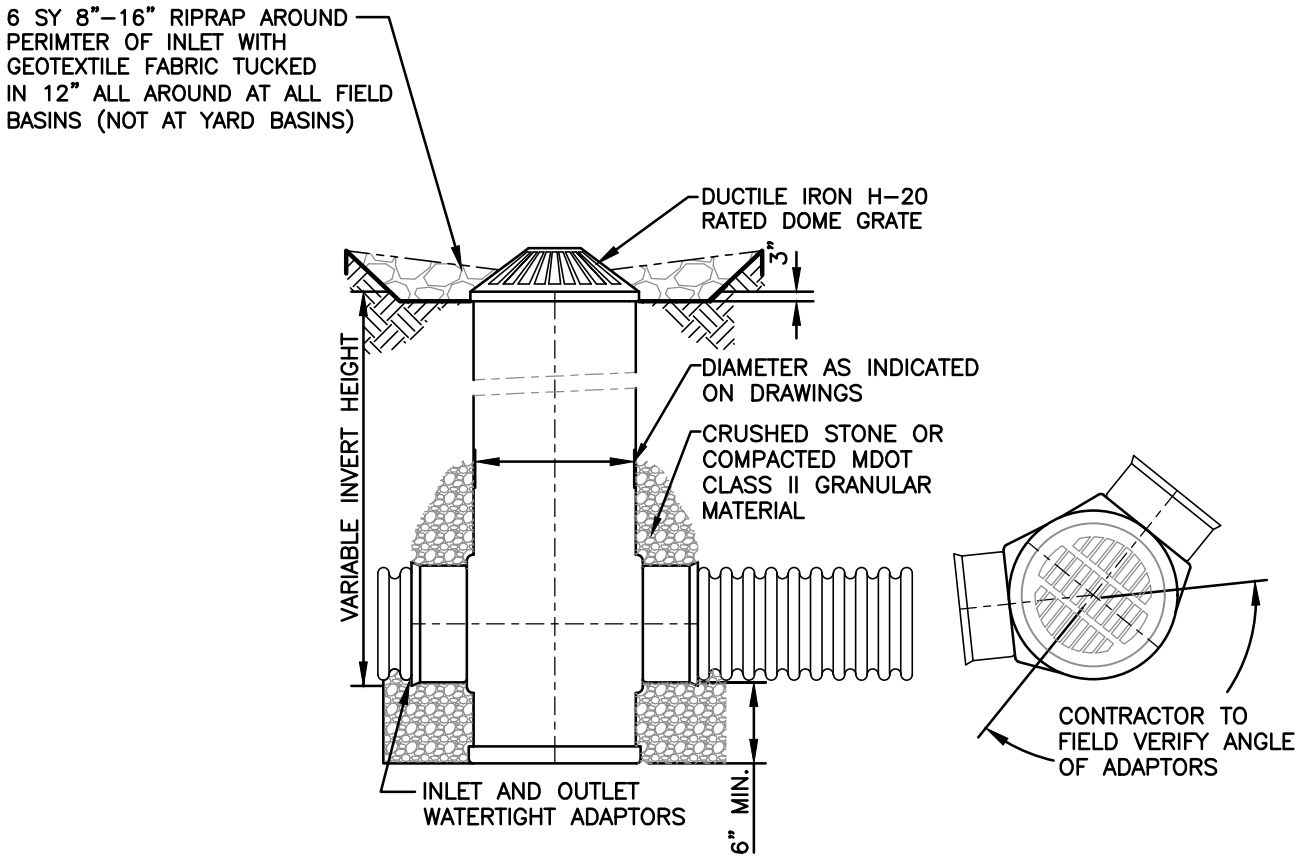
NOTES:

1. REMOVE TRASH & FLOATING DEBRIS TO ALLOW A PASSAGE FOR FLOW.
2. CUT & REMOVE BRANCHES FROM LOGJAM TO MAXIMIZE OPENING WITHOUT DISTURBING STREAM BED OR BANKS.
3. PLACE EXCESS WOODY DEBRIS ALONG STREAMBANKS & IN ADJACENT RIPARIAN CORRIDOR TO CREATE HABITAT.
4. LEAVE WOODY DEBRIS THAT IS EMBEDDED IN THE STREAM'S BANKS OR BOTTOM UNDISTURBED.
5. MINIMIZE IMPACT TO THE RIPARIAN CORRIDOR ALONG WORK SITE.

LOGJAM REMOVAL DETAIL

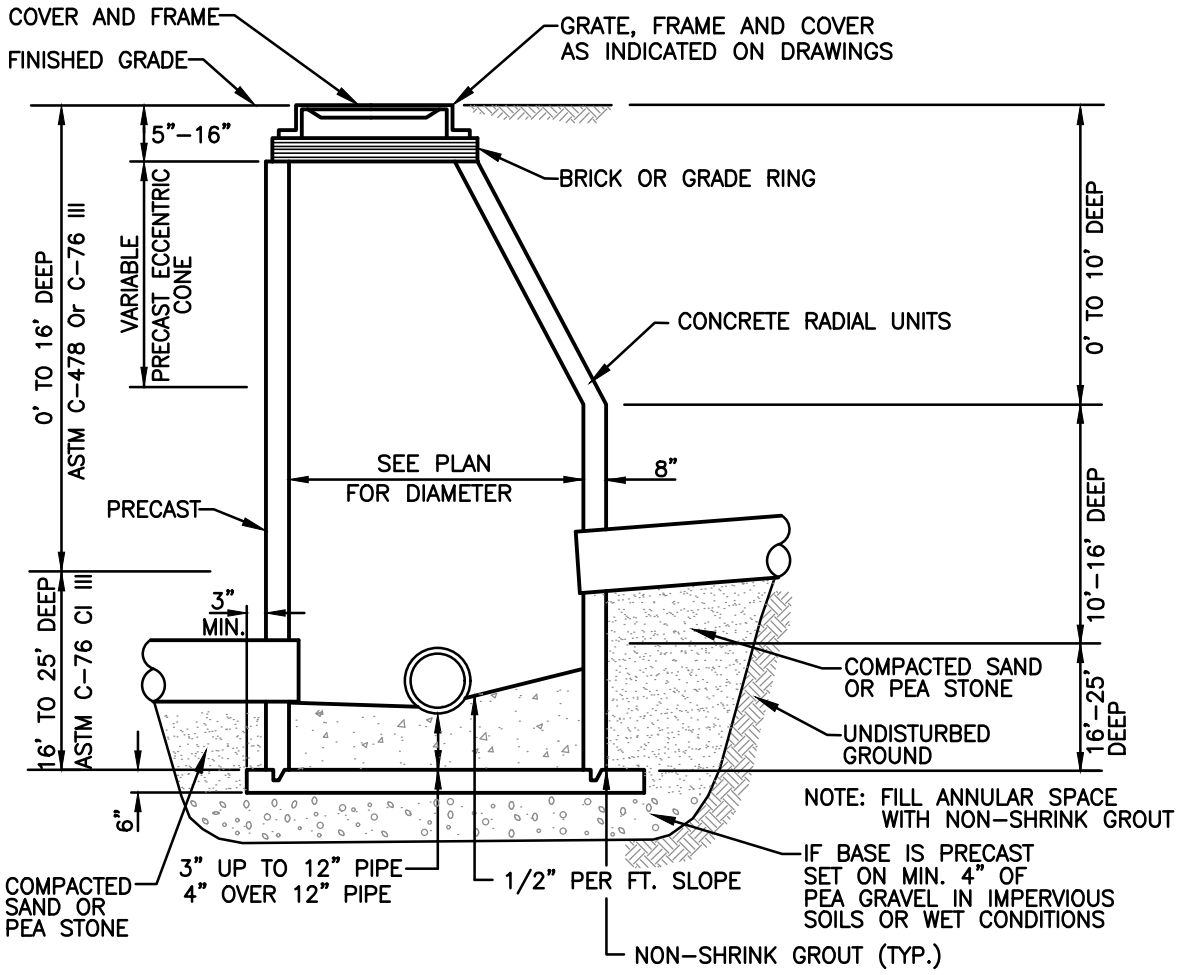
NOT TO SCALE

B-01



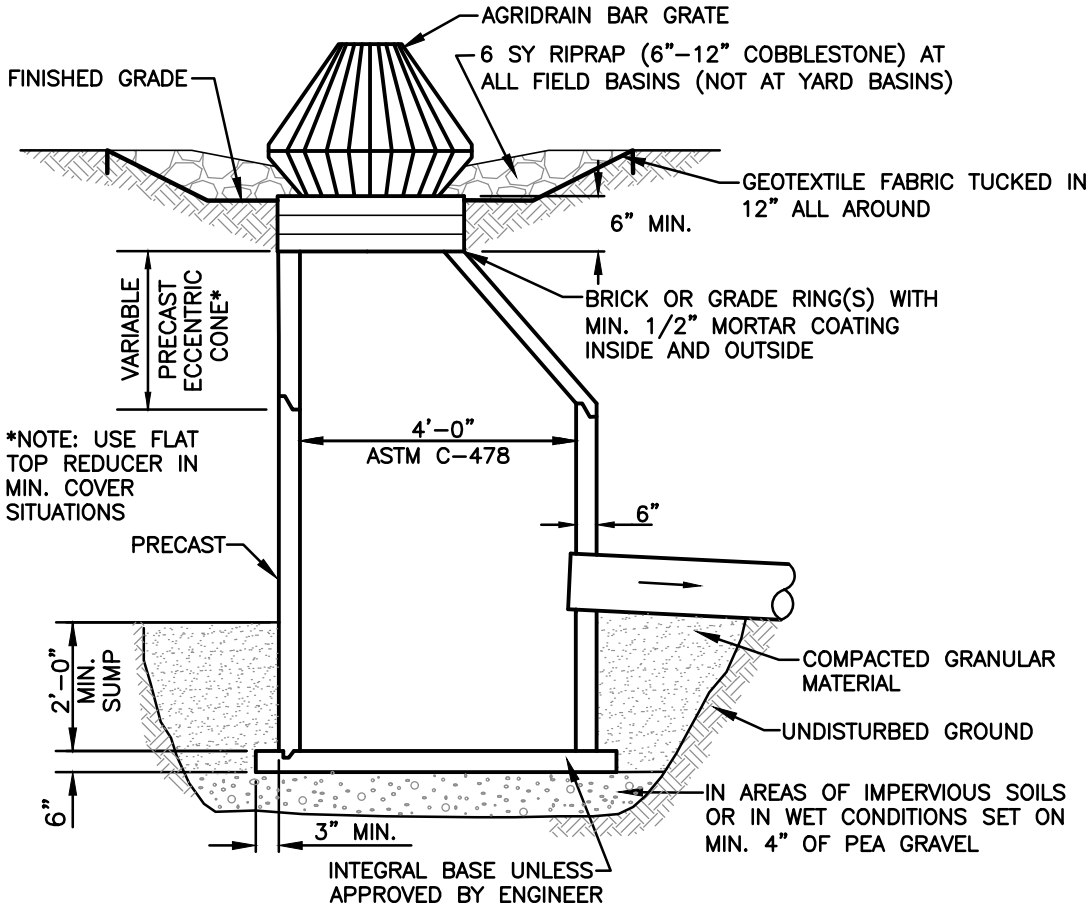
NYLOPLAST DRAIN BASIN DETAIL

NOT TO SCALE



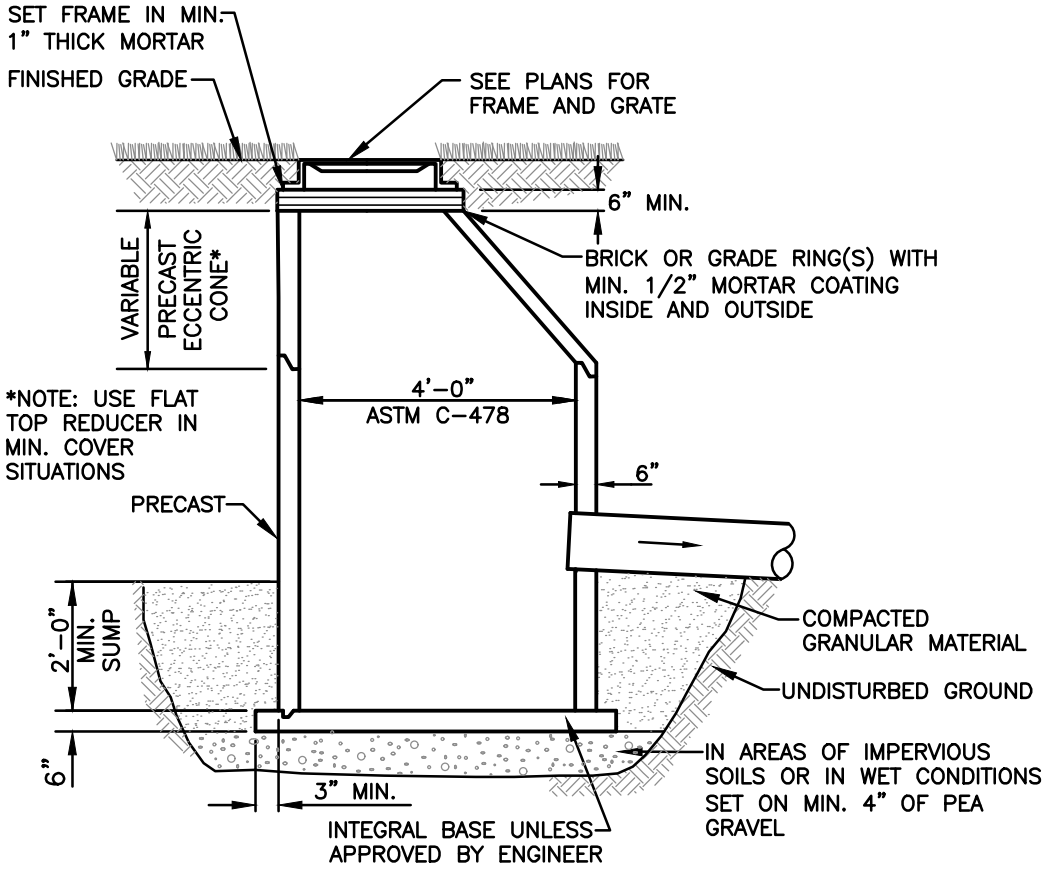
PRECAST CONCRETE STORM MANHOLE

NOT TO SCALE



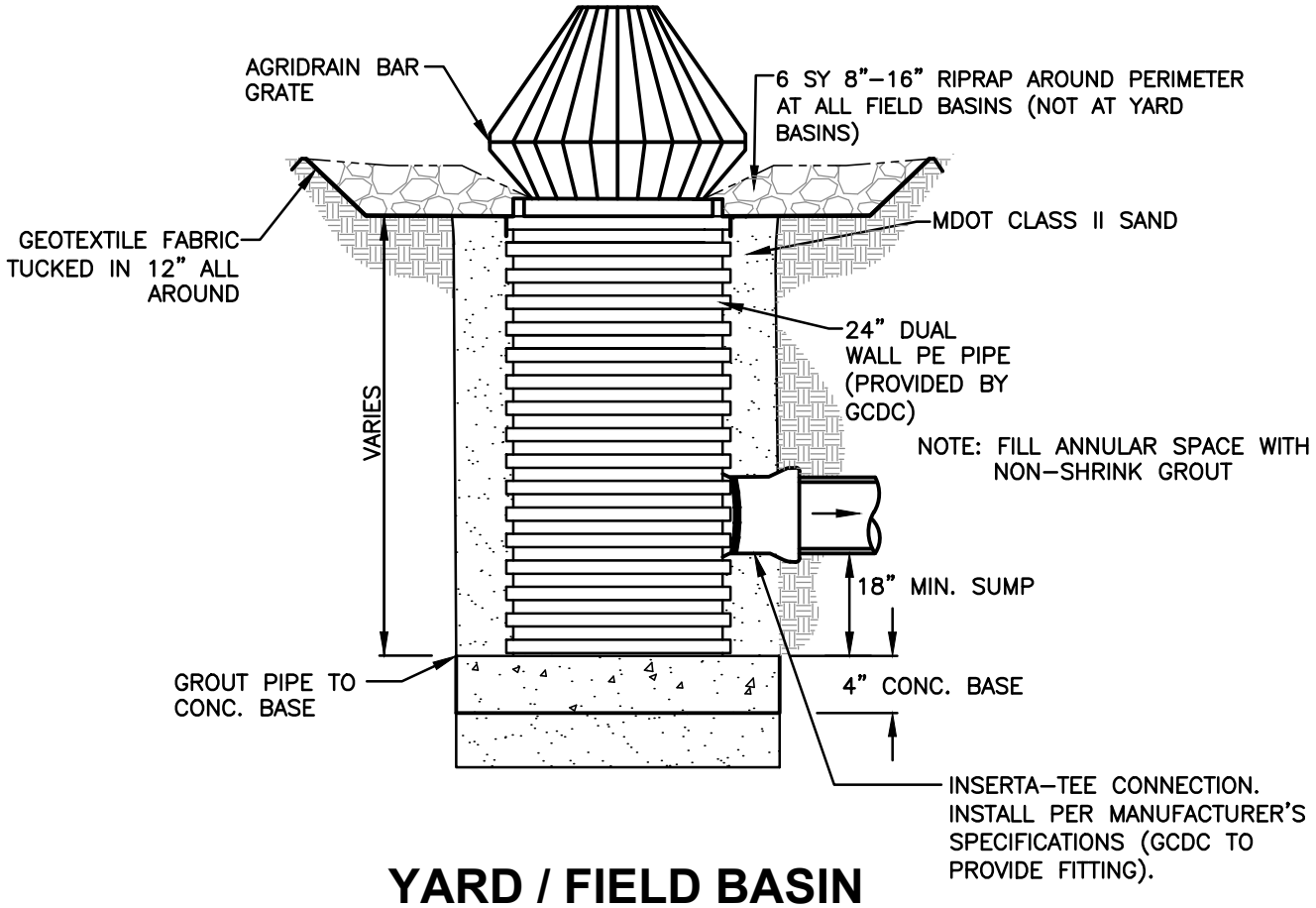
STANDARD CATCH BASIN TYPE A

NOT TO SCALE



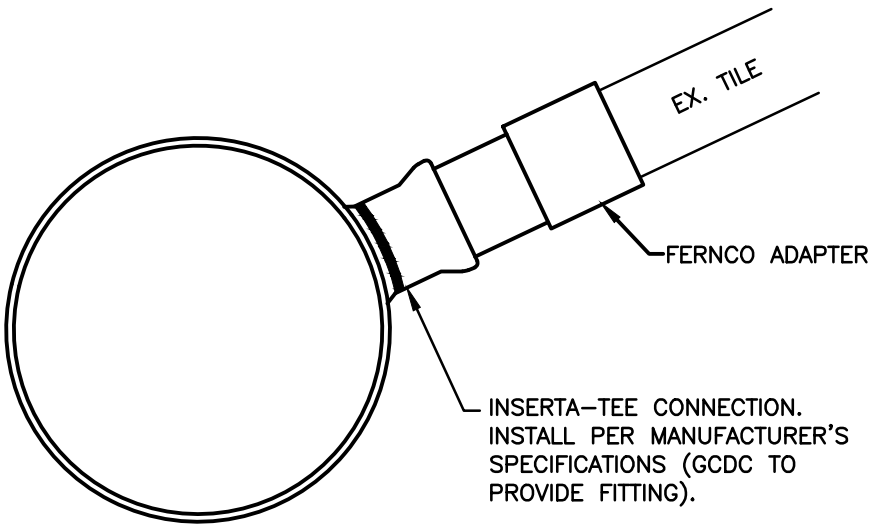
STANDARD CATCH BASIN TYPE B

NOT TO SCALE



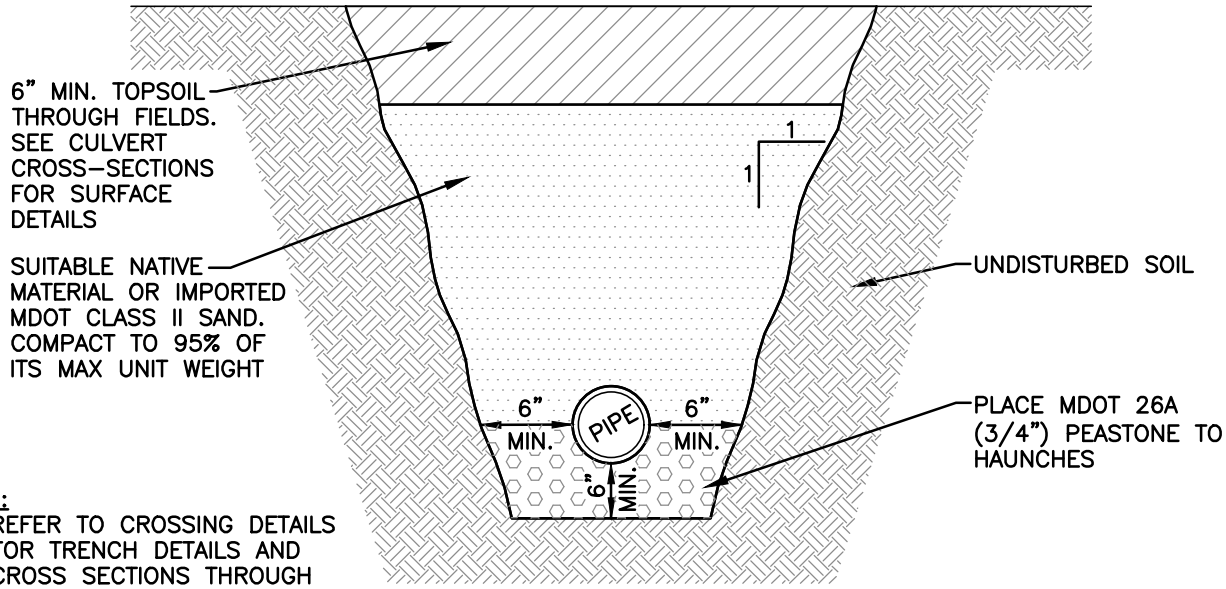
YARD / FIELD BASIN

NOT TO SCALE



FARM TILE CONNECTION DETAIL

NOT TO SCALE

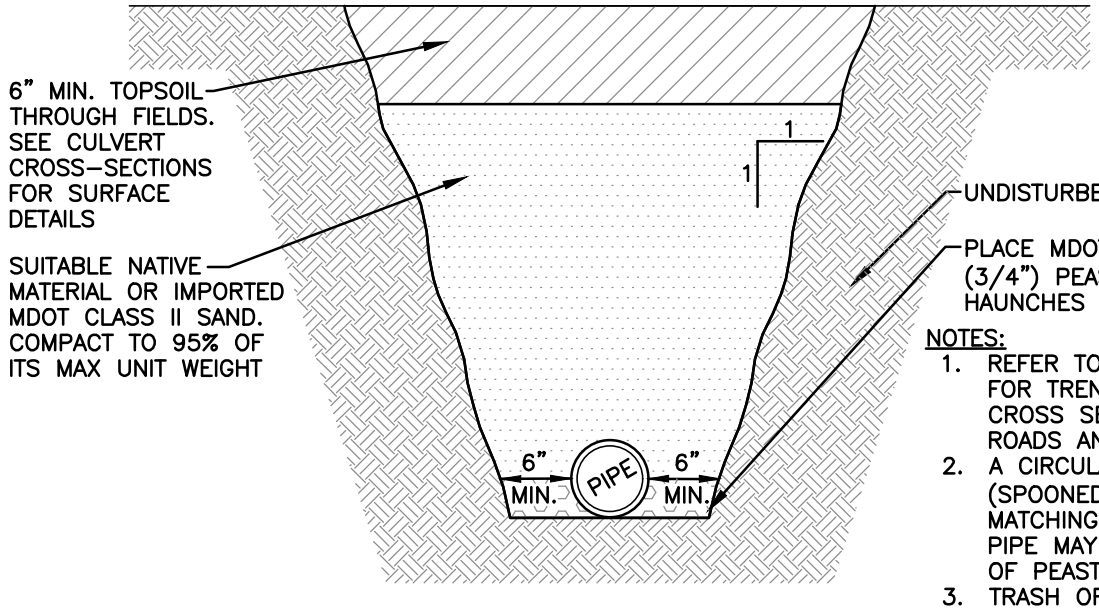


NOTES:

1. REFER TO CROSSING DETAILS FOR TRENCH DETAILS AND CROSS SECTIONS THROUGH ROADS AND DRIVEWAYS
2. TRASH OR CONSTRUCTION DEBRIS SHALL BE REMOVED FROM SITE AND NOT DISCARDED IN TRENCH

STORM SEWER TRENCH DETAIL
UNSUITABLE SOILS

NOT TO SCALE



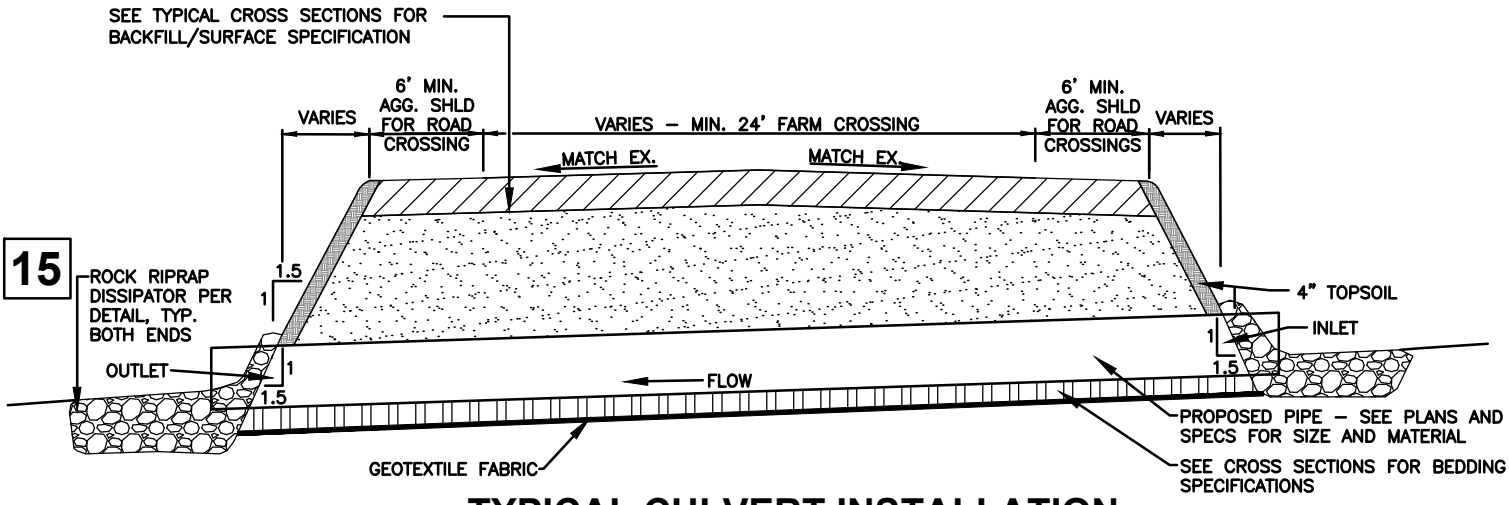
NOTES:

1. REFER TO CROSSING DETAILS FOR TRENCH DETAILS AND CROSS SECTIONS THROUGH ROADS AND DRIVEWAYS
2. A CIRCULAR TRENCH BOTTOM (SPOONED) WITH DIAMETER MATCHING THE O.D. OF THE PIPE MAY BE USED IN LIEU OF PEASTONE BACKFILL
3. TRASH OR CONSTRUCTION DEBRIS SHALL BE REMOVED FROM SITE AND NOT DISCARDED IN TRENCH

STORM SEWER TRENCH DETAIL
SUITABLE SOILS

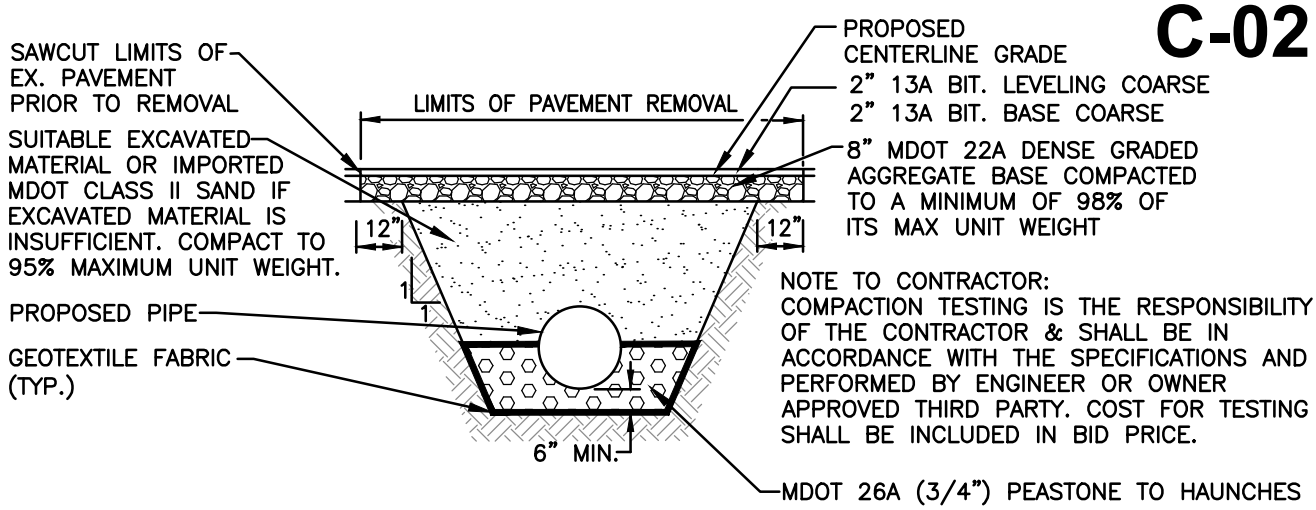
NOT TO SCALE

NOTE:
1. EMBED CULVERT BELOW DITCH BOTTOM ACCORDING TO CULVERT REQUIREMENTS CHART.



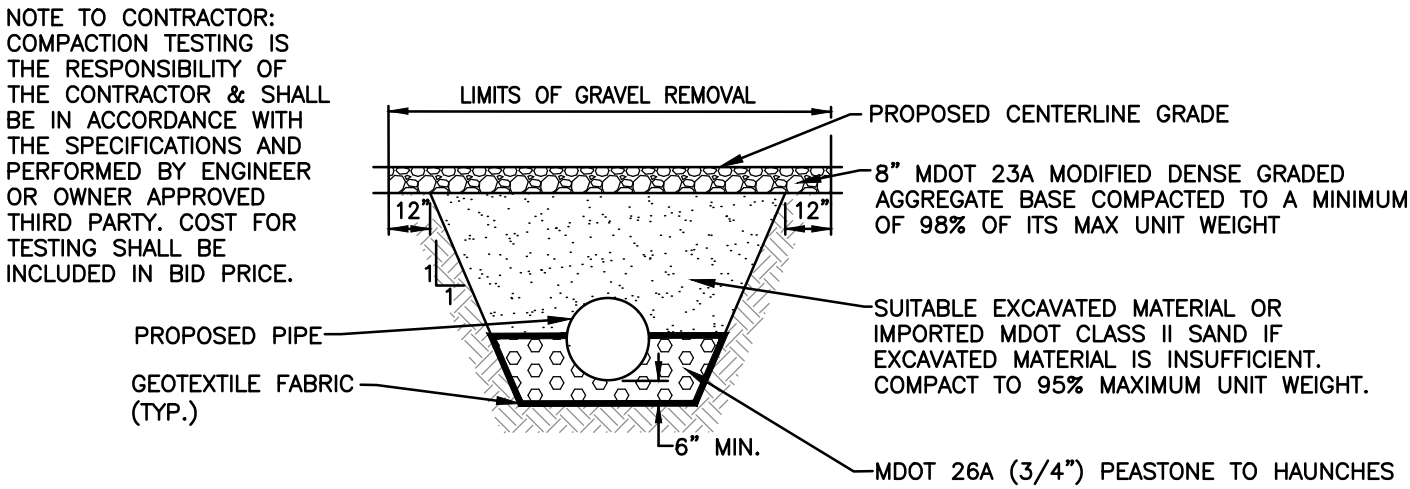
TYPICAL CULVERT INSTALLATION

NOT TO SCALE



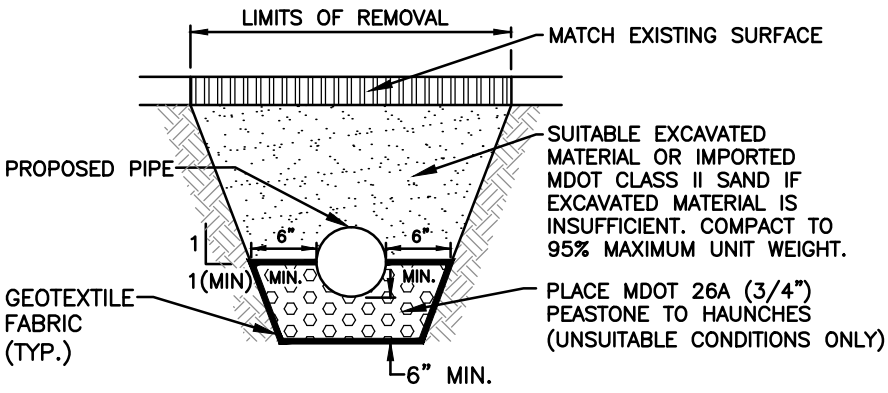
TYPICAL PAVED ROAD CROSS SECTION

NOT TO SCALE



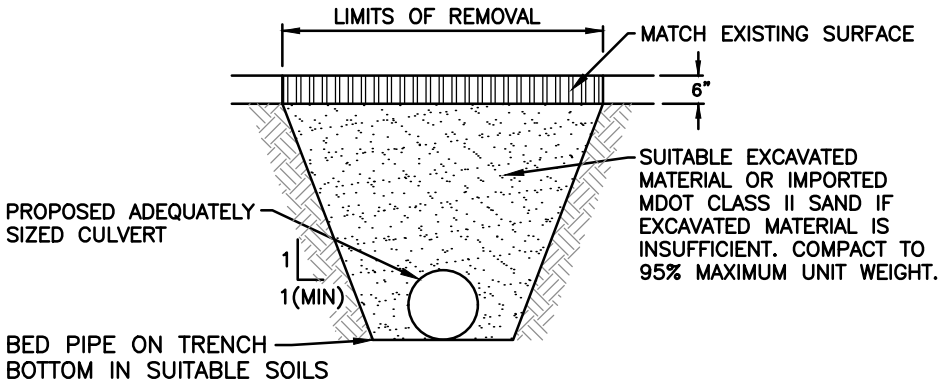
TYPICAL GRAVEL ROAD CROSS SECTION

NOT TO SCALE



TYPICAL PRIVATE DRIVE CROSS SECTION

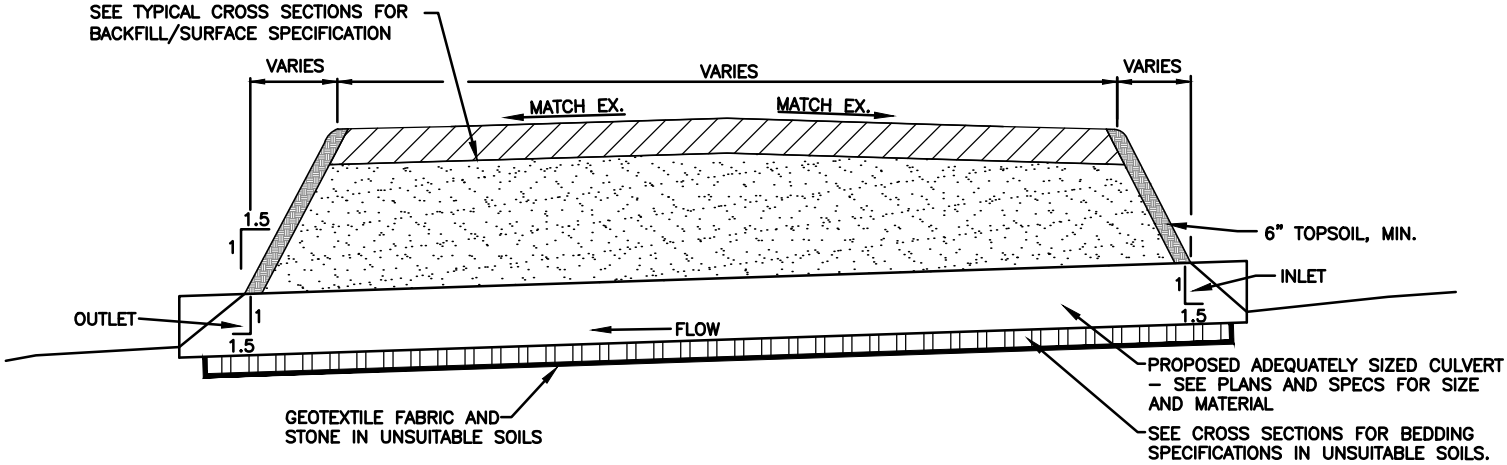
NOT TO SCALE



TYPICAL ADEQUATE SIZED UNIMPROVED CULVERT CROSS SECTION

NOT TO SCALE

NOTE:
1. FOLLOW THIS DETAIL ONLY WHEN DIRECTED BY GCDC.
2. EMBED CULVERT BELOW DITCH BOTTOM ACCORDING TO CULVERT REQUIREMENTS CHART.



CULVERT INSTALLATION (UNIMPROVED CROSSING)

NOT TO SCALE

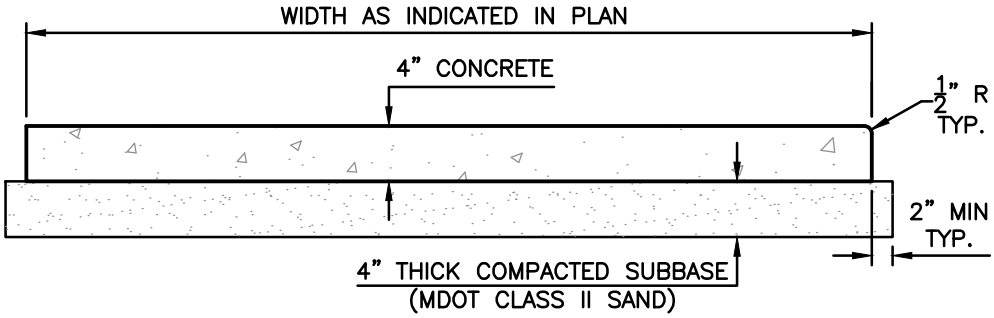
CULVERT REQUIREMENTS

DEPTH, COVER AND RIPRAP

		CULVERT SIZE (IN.)	DEPTH OF BURY* (IN.)	MINIMUM COVER (IN.)	RIPRAP QUANTITY (SQ.YARD)	
					UPSTREAM	DOWNSTREAM
DUAL WALL PLASTIC (N12)	CMP – 2 2/3"x1/2" CORR.	12	3	12	2	5
		15	3	12	2	5
		18	6	12	2	5
		24	6	12	3	7
		30	6	12	5	11
		36	6	12	6	15
		42	7	12	8	20
		48	8	12	10	26
		54	9	12**	13	32
		60	10	12**	15	39
CMP – 5" x 1" OR 3" x 1" CORRUGATION		66	11	12	18	47
		72	12	12	22	56
		78	13	12	25	65
		84	14	12	29	74
		90	15	12	33	85
		96	16	12	37	96
		102	17	18	41	108
		108	18	18	46	121
		114	19	18	51	134
		120	20	18	56	148
		126	21	24	61	163
		132	22	24	67	178
		138	23	24	73	194
		144	24	24	79	211

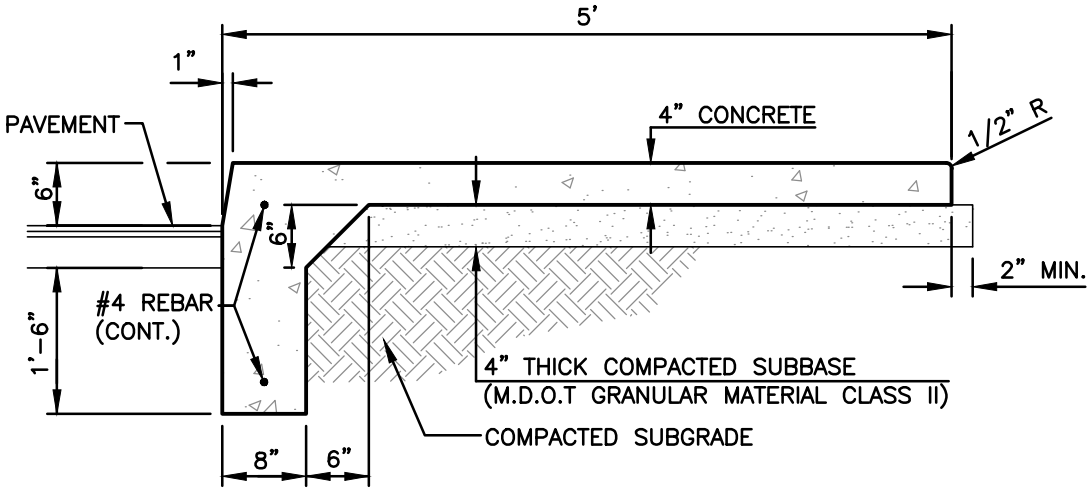
*1/6 BANKFULL DEPTH OR AS LISTED

**24" MIN. COVER FOR DUAL WALL PLASTIC PIPE (N12)



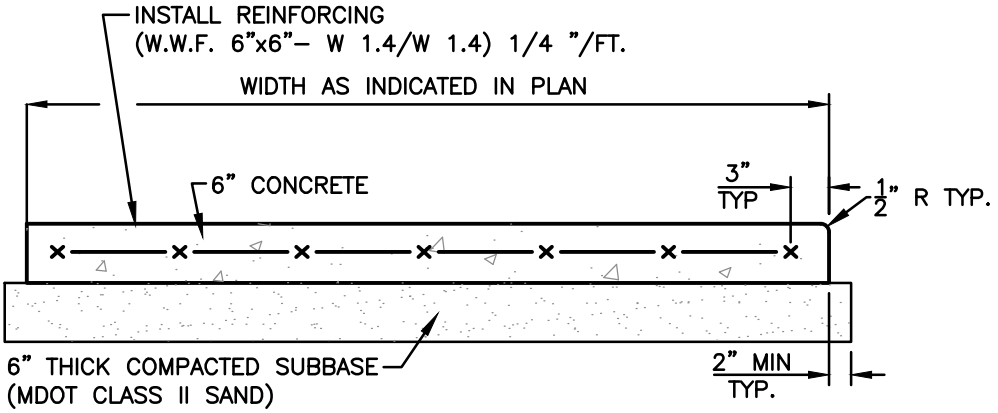
STANDARD SIDEWALK

NOT TO SCALE



THICKENED EDGE SIDEWALK - REINFORCED

NOT TO SCALE



HEAVY DUTY CONCRETE

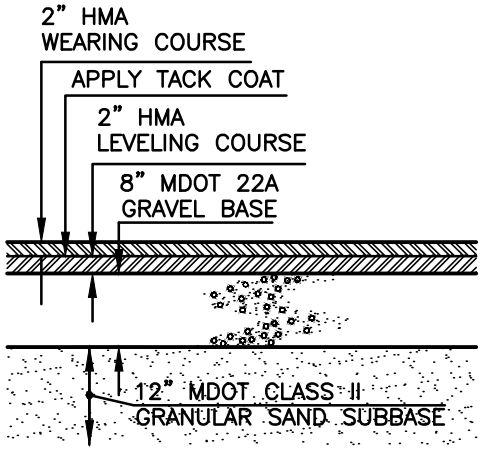
NOT TO SCALE

MATERIAL TYPES:

HMA WEARING COURSE MDOT HMA 4C (165#/SYD)

HMA LEVELING COURSE MDOT HMA 3C (275#/SYD)

ALL MATERIAL DESIGNATIONS REFER TO M.D.O.T. STANDARD SPECIFICATIONS FOR CONSTRUCTION, 2020 EDITION AND SUPPLEMENTAL SPECIFICATIONS

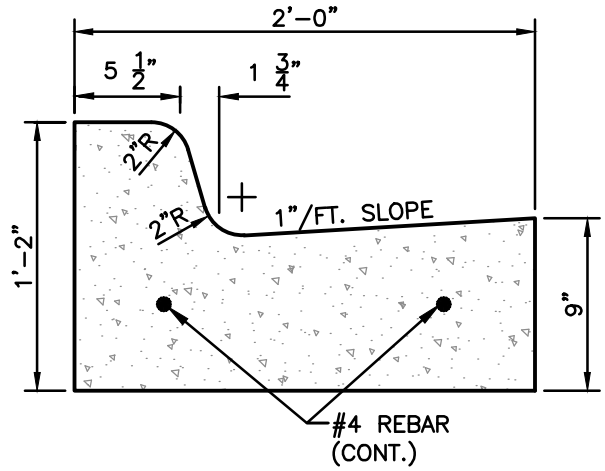


PAVEMENT SECTION

NOT TO SCALE

CONTRACTION & EXPANSION JOINT NOTES:

1. PLACE 1" FIBER JOINT FILLER AT 400' MAXIMUM INTERVALS
2. PLACE 1" FIBER JOINT FILLER AT SPRING POINTS OF CURB RETURNS (& INTERSECTING STREETS)
3. PLACE 1" FIBER JOINT FILLER IN ADJACENT CONTRACTION JOINTS EACH SIDE OF CATCH BASINS.
4. PLACE CONTRACTION JOINTS AT 40' MAXIMUM INTERVALS (NO SAW JOINTS ALLOWED)



M.D.O.T. F-4 MODIFIED CURB & GUTTER

NOT TO SCALE

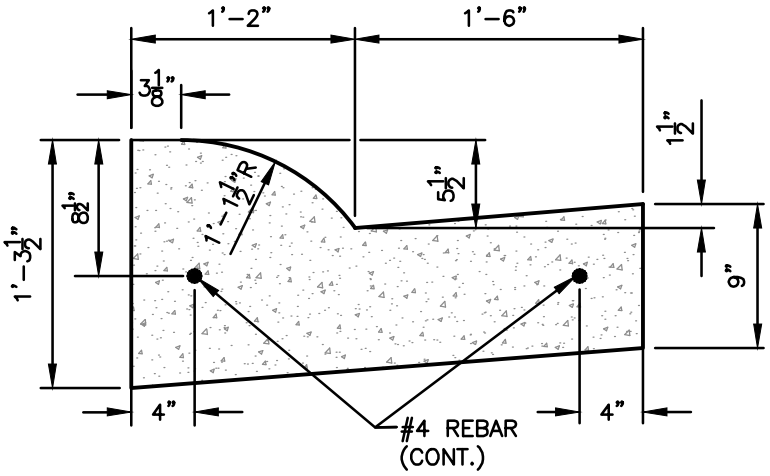
CONTRACTION AND EXPANSION JOINT NOTES

1. PLACE 1" FIBER JOINT FILLER AT 400' MAXIMUM INTERVALS

2. PLACE 1" FIBER JOINT FILLER AT SPRING POINTS OF CURB RETURNS (& INTERSECTING STREETS)

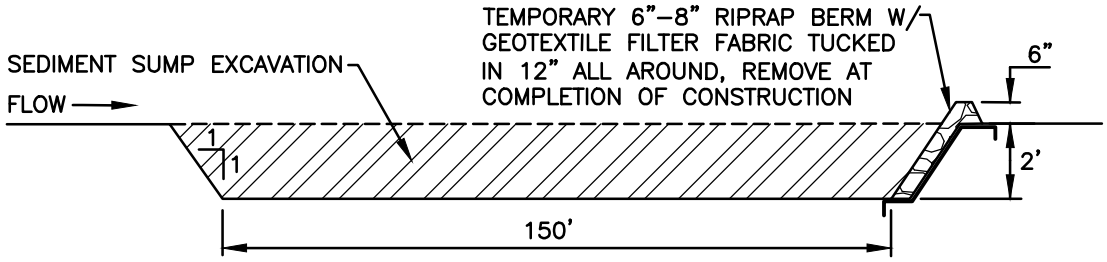
3. PLACE 1" FIBER JOINT FILLER IN ADJACENT CONTRACTION JOINTS EACH SIDE OF CATCH BASINS

4. PLACE CONTRACTION JOINTS AT 40' MAXIMUM INTERVALS (NO SAW JOINTS ALLOWED)



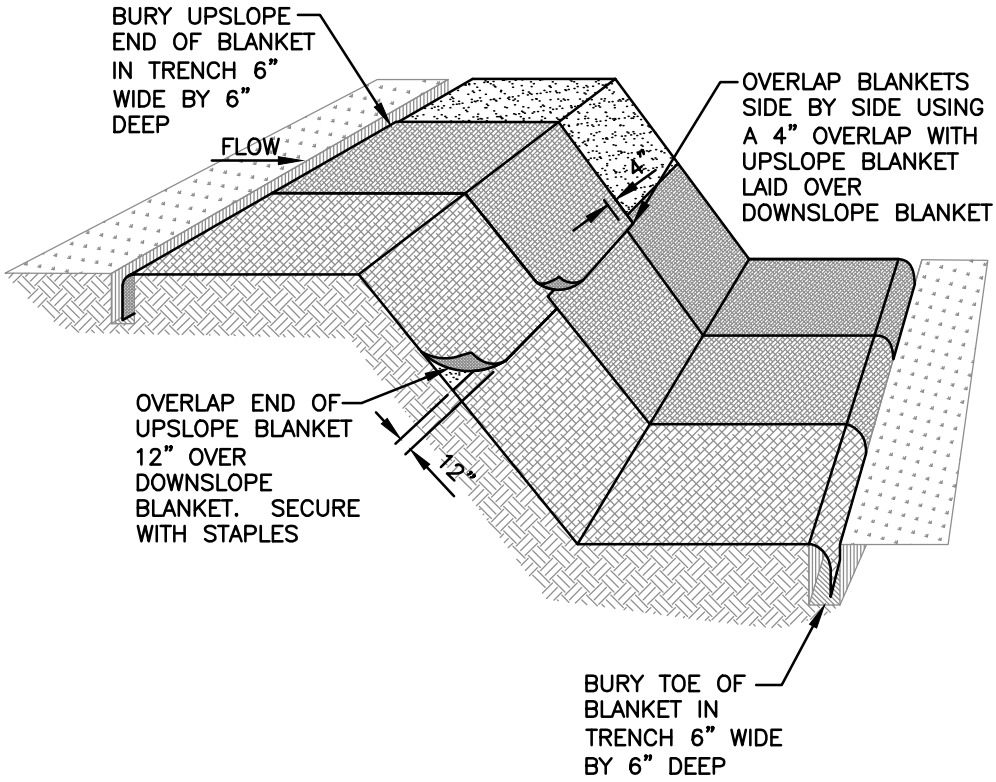
M.D.O.T. B-2 CURB & GUTTER DETAIL

NOT TO SCALE



37 INLINE SEDIMENT SUMP DETAIL

NOT TO SCALE

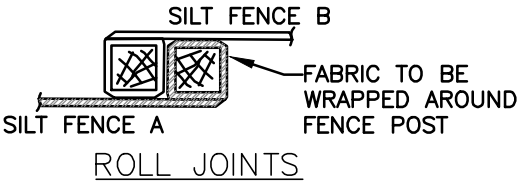


NOTES:

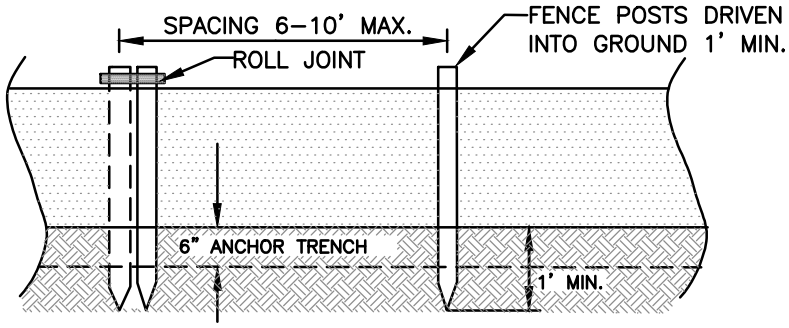
1. ALL MULCH BLANKET SHALL BE NAG SC–150 BN OR EQUAL.
2. PLACE MULCH BLANKET PARALLEL TO FLOW AND ANCHOR SECURELY.
3. STAPLES INSTALLED/SECURED ACCORDING TO MANUFACTURER'S SPECIFICATIONS.

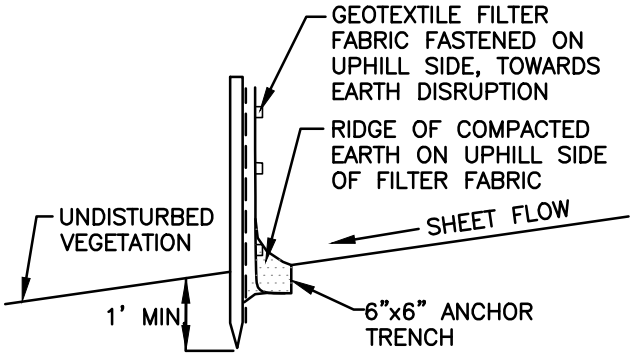
2 MULCH BLANKET

NOT TO SCALE



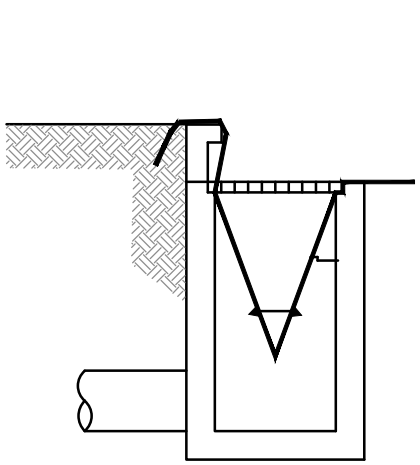
ROLL JOINTS



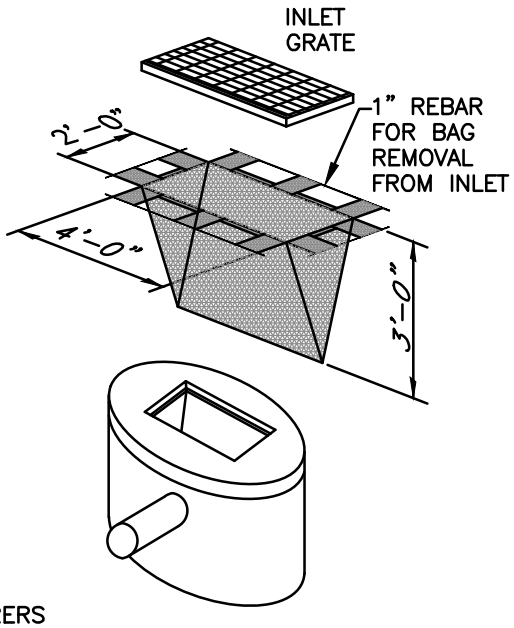


5 SILT FENCE DETAIL

NOT TO SCALE



INSTALLATION DETAIL

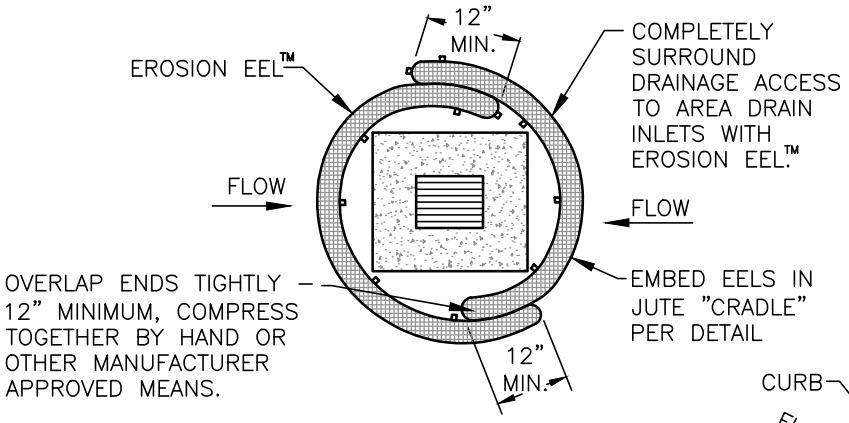


ISOMETRIC VIEW

NOTE: 1. INSTALL PER MANUFACTURERS INSTRUCTIONS.

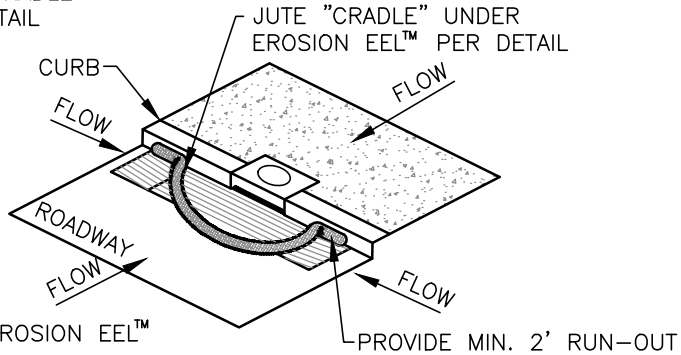
7 INLET PROTECTION - FABRIC DROP

NOT TO SCALE



NOTE:
EROSION EELS™ USED FOR INLET PROTECTION SHALL CONSIST OF EITHER MIXTURE SPECIFICATION 1.0 OR 1.1, PER ENGINEER'S RECOMMENDATIONS.

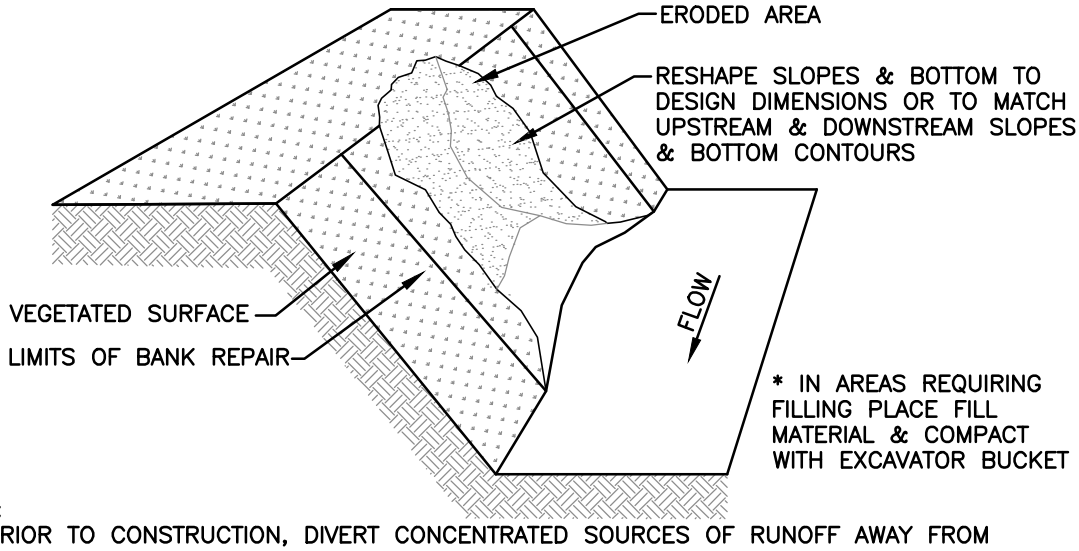
TIGHTLY COMPRESS EEL AGAINST CURB



NOTE:
PERIODIC MAINTENANCE SHALL INCLUDE CLEANING EEL SURFACE WITH HIGH PRESSURE WASH OR BRUSHING SURFACE WITH BROOM.

INLET PROTECTION - EROSION EEL™
7 TYPE 1 - EXTERNAL TEMPORARY COLLECTION

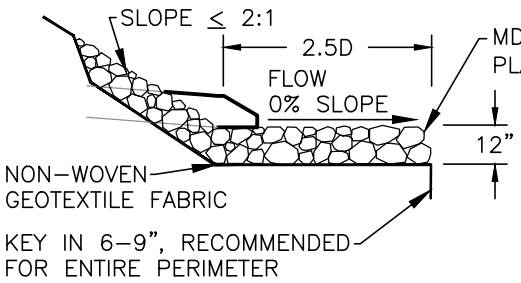
NOT TO SCALE



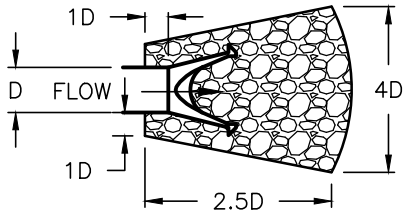
NOTES:
1. PRIOR TO CONSTRUCTION, DIVERT CONCENTRATED SOURCES OF RUNOFF AWAY FROM EARTHWORK AREA.
2. SALVAGE TOPSOIL & STOCKPILE IN DRAIN EASEMENT LEAVING A NATURAL BUFFER OF VEGETATION BETWEEN THE SPOILS & THE DRAIN.
3. RESHAPE SLOPES AS INDICATED.
4. REPLACE/SUPPLEMENT TOPSOIL & COMPACT WITH EXCAVATOR BUCKET.
5. LOOSEN TOPSOIL, SEED & PLACE MULCH BLANKET.

13 SLOPE STABILIZATION DETAIL

NOT TO SCALE

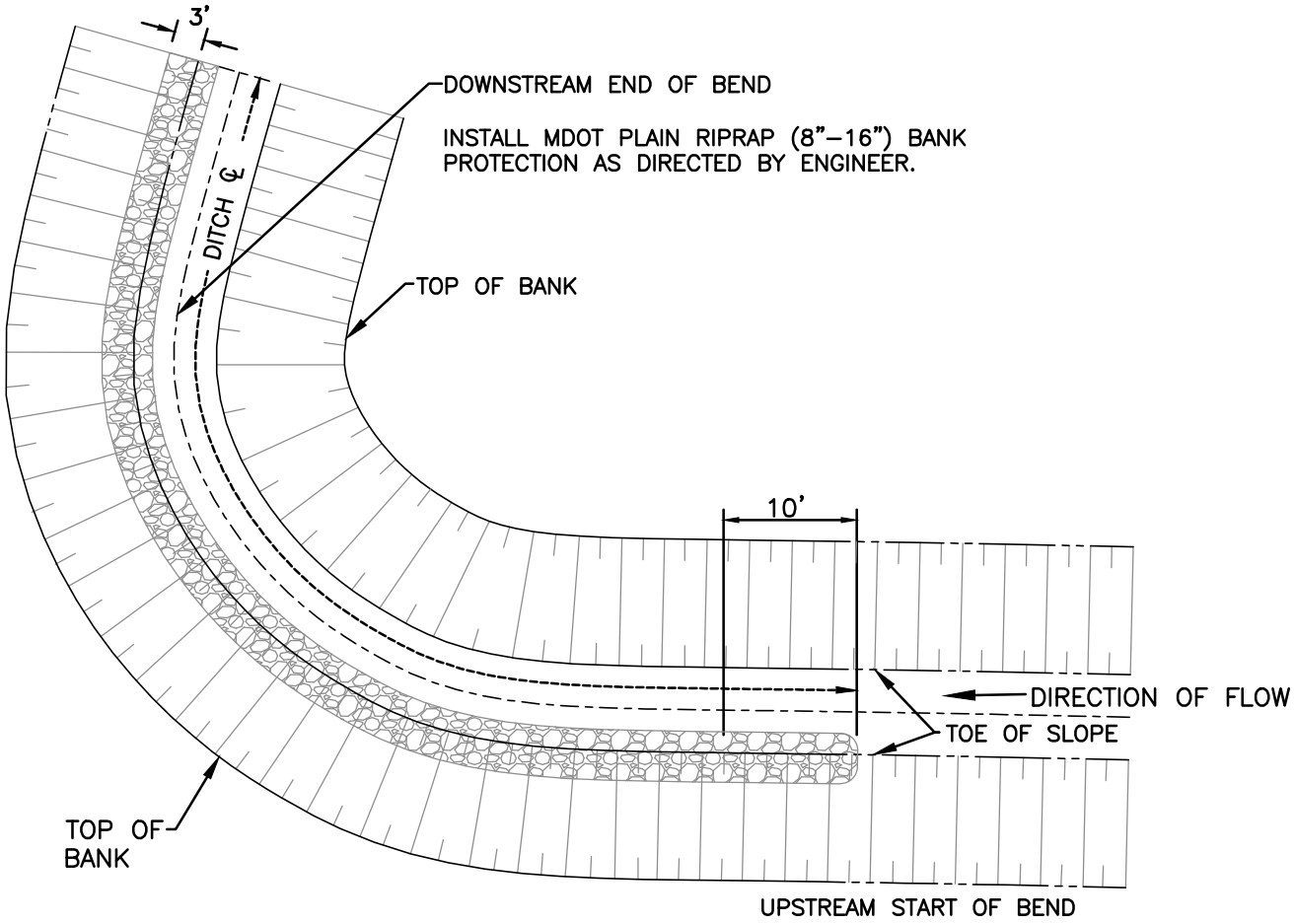


NOTES:
1. RIPRAP MAY BE ANGULAR NATURAL STONE OR BROKEN CONCRETE
2. CONTRACTOR MAY USE SMALLER PIECES TO FILL SPACES FOR BETTER SLOPE PROTECTION



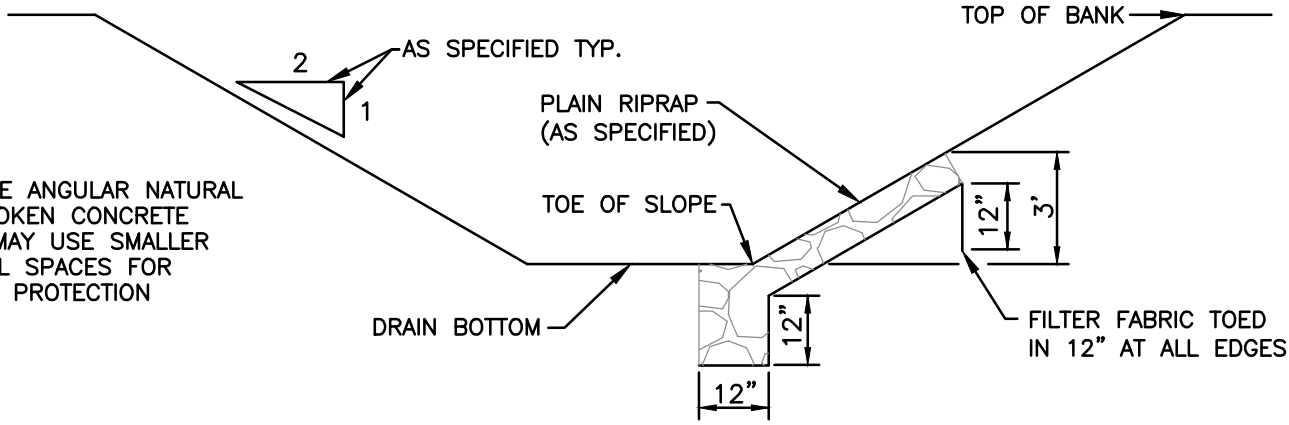
15 ROCK RIPRAP DISSIPATOR

NOT TO SCALE

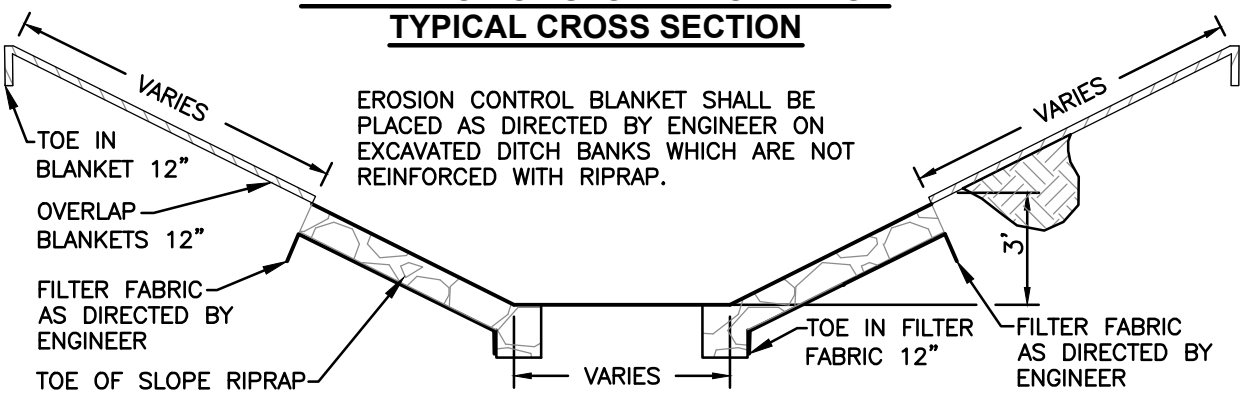


RIPRAP TOE OF SLOPE PROTECTION
PLAN VIEW

NOTES:
1. RIPRAP MAY BE ANGULAR NATURAL STONE OR BROKEN CONCRETE
2. CONTRACTOR MAY USE SMALLER PIECES TO FILL SPACES FOR BETTER SLOPE PROTECTION



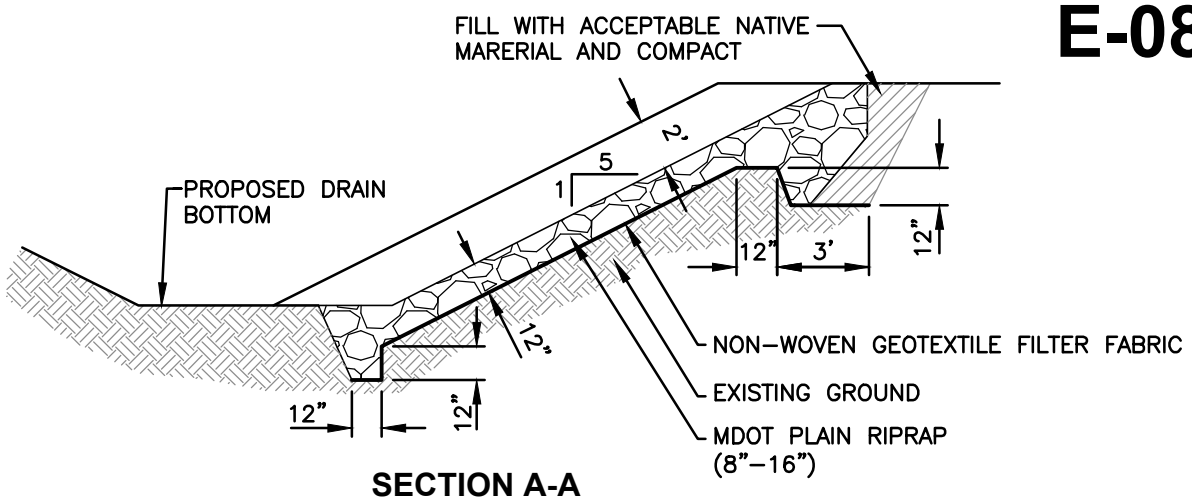
RIPRAP TOE OF SLOPE PROTECTION
TYPICAL CROSS SECTION



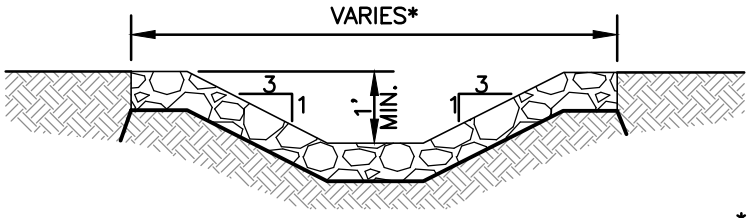
TOE OF SLOPE AND BANK PROTECTION DETAIL

16

NOT TO SCALE



SECTION A-A

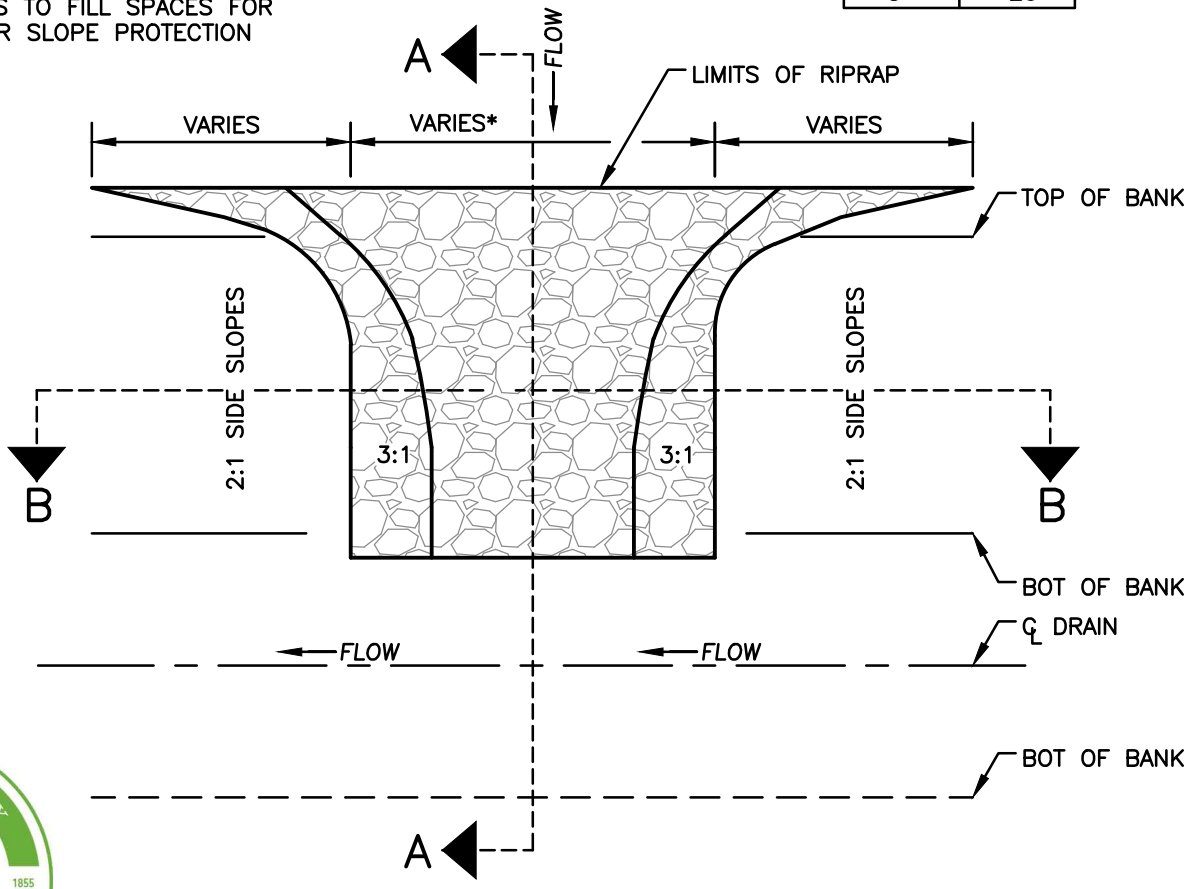


SECTION B-B

NOTES:
1. RIPRAP MAY BE ANGULAR NATURAL STONE OR BROKEN CONCRETE
2. CONTRACTOR MAY USE SMALLER PIECES TO FILL SPACES FOR BETTER SLOPE PROTECTION

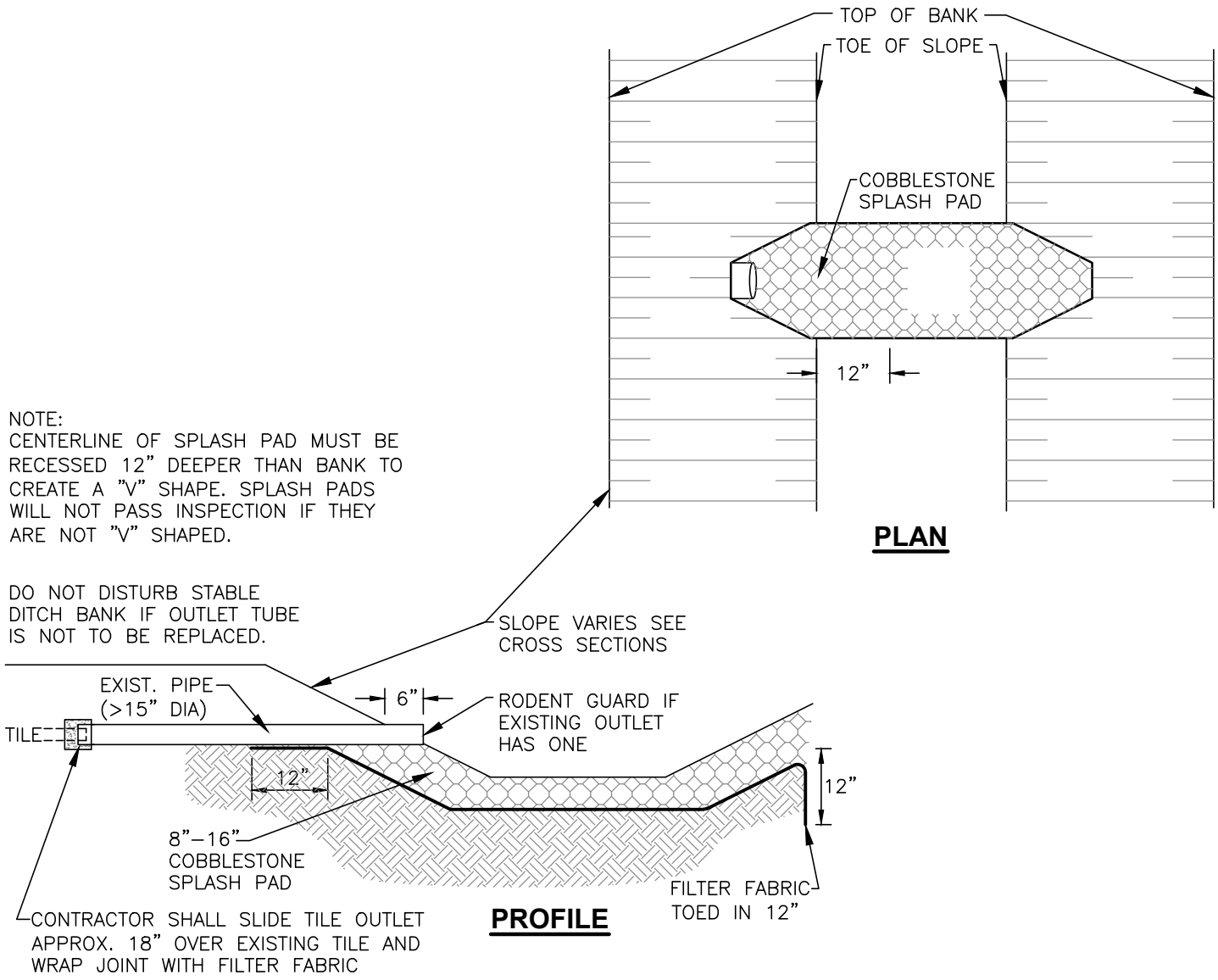
*

TYPE	WIDTH
A	6'
B	12'
C	20'



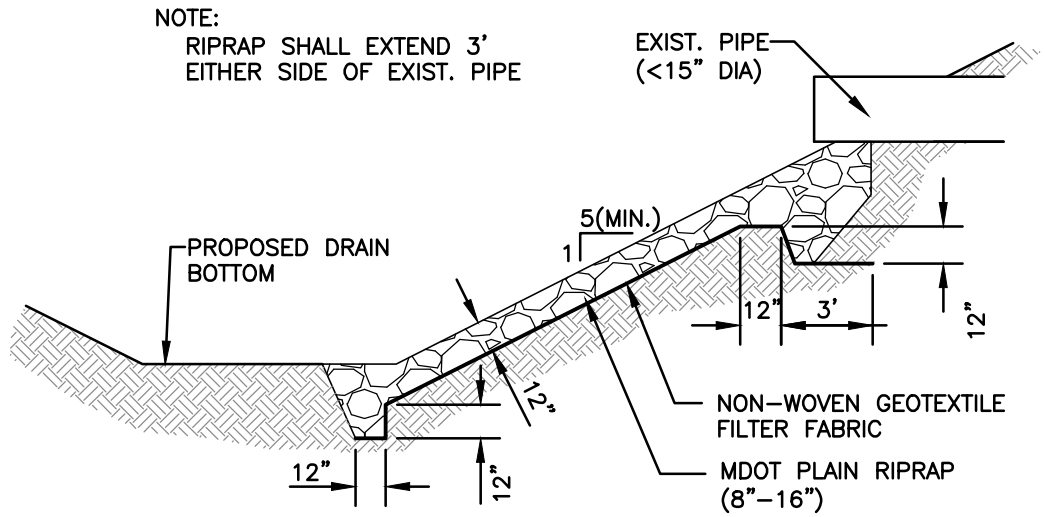
19 ARMORED SPILLWAY DETAIL

NOT TO SCALE



23 TILE OUTLET WITH SPLASH PAD DETAIL

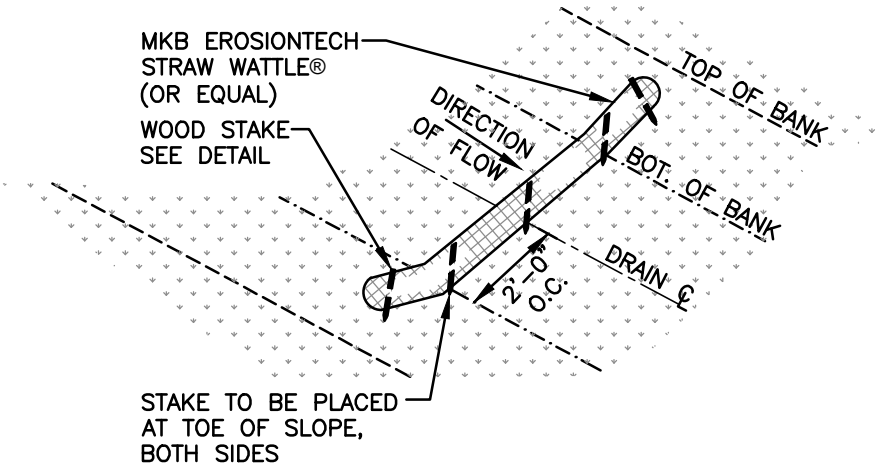
NOT TO SCALE

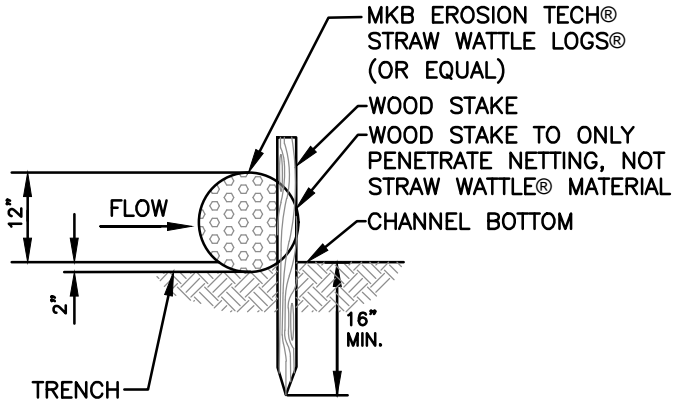


NOTES:
1. RIPRAP MAY BE ANGULAR NATURAL STONE OR BROKEN CONCRETE
2. CONTRACTOR MAY USE SMALLER PIECES TO FILL SPACES FOR BETTER SLOPE PROTECTION

23 OUTFALL STABILIZATION DETAIL

NOT TO SCALE





STAKE DETAIL
(WITH TRENCH)

NOTE: TRENCH OPTION IS MOST APPLICABLE IN LOOSE, UNCONSOLIDATED SOILS.

1 1/8" x 1 1/8" x 30" WOODEN STAKES ARE RECOMMENDED FOR 6", 9" AND 12" STRAW WATTLE LOGS.®

STRAW WATTLE DETAIL

NOT TO SCALE

Motz Enterprises, Inc.
3153 Madison Road
Cincinnati, OH 45209
Office: 513-772-6689
Fax: 513-772-6690
www.Flexamat.com

INSTALLATION GUIDELINES

Flexamat® is a tied concrete block system that is manufactured with site specific underlay. First, for applications where vegetation growth is expected, we use a 12-18 month degradable excelsior blanket (Curlex® II), second, for applications where vegetation will be sparse, we use a permanent synthetic erosion control blanket (Recyclex® TRM-V), and third, for sandy, non-cohesive soils, we use a non-woven geotextile fabric

Flexamat® is available in widths of 4', 5.5', 8', 10', 12', and 16'. For applications with wider widths, mats are installed adjacent to another. The manufacturer or authorized representative will provide technical assistance during installation as needed.

SHIPPING, TRANSPORT, STORAGE & HANDLING:

Flexamat® is packaged in rolls for shipment. The rolls have a minimum weight of 10 pounds per square feet. Rolls are packaged with handling straps. For safety, it is recommended that these straps only be used for lifting below 2' as a means to place heavy duty lifting straps under rolls.

Upon delivery, rolls may be left exposed for up to 30 days. If exposure will exceed 30 days, the rolls must be tarped or otherwise covered to minimize UV exposure.

SUBGRADE PREPARATION:

The prepared subgrade shall provide a firm, unyielding foundation for the mats. The subgrade shall be prepared as detailed on the plans. Subgrade surface shall be free of any debris, protrusions, rocks, sticks, roots or other hindrances which would result in an individual block being raised more than ¾" above the adjoining blocks. Undulations, rolls, knolls and rises in the subgrade to which the tied concrete mat is able to contour over and maintain intimate contact with the subgrade will be allowed. The Flexamat block has a height of 2.25". When grading next to hard surfaces like a road, sidewalk, or outlet pad, consider lowering the grade to allow for a smooth transition for water to flow from the hard surface onto the Flexamat. Before unrolling the Flexamat, apply seed and soil amendments directly to the prepared soil prior to installation of mats. Use seed and soil amendments or topsoil per project specifications.

UNROLLING:

Position the rolls in the direction to be unrolled, with the leading edge at the bottom of the roll with the line and grade shown on the plans and according to the manufacturer's installation guidelines. Flexamat can be unrolled down or across slopes. It is important to considering the direction of any overland or channel flow when anchoring and installing the succeeding rolls for seams or abutments in the design. All edges exposed to concentrated flows, especially the upstream leading edges must be terminated and properly anchored according to engineer drawings. If no hydraulic or overland flow is expected, a soil transition cover of 4"-6" can be graded over the edges in lieu of placement in an anchor trench. Overlapping seam should be installed like a shingle on a roof.

PANEL SEAMING:
Panel seams (Channel and Slopes) perpendicular to the hydraulic flow must be overlapped. The downstream panels will be terminated and properly anchored according to engineer drawings and placed under the upstream panel by overlapping 18”. If no hydraulic or overland flow is expected, butting the seams together is acceptable along with a 4’ section of erosion control matting is used with 2’ being placed under each neighboring panel.

ANCHORING:
Flexamat shall have an 18" toe-in at edges perpendicular to concentrated hydraulic flow. For areas exposed to surface sheet flow, recess the mat 12”. Alternately, edges not exposed to surface sheet flow do not need to be toed. Rather, a soil transition cover may be placed 4” along the edge of mat to transition to landscape.

Where permanent anchoring is required, e.g., installing mats on steep slopes, the cables (polypropylene grid) shall be attached to the anchoring system as indicated on the contract drawings. Important areas for considering anchoring are the leading edges, seams and overlaps. The design and layout of the anchored system shall be designed by the engineer with assistance from manufacturer.

MAINTENANCE:

Inspect at regular intervals and after storm events. Mow and fertilize vegetation. Do not maintain with grass killing chemicals. Remove sediment buildups in any swales or outlets.

Motz Enterprises, Inc.
3153 Madison Road
Cincinnati, OH 45209
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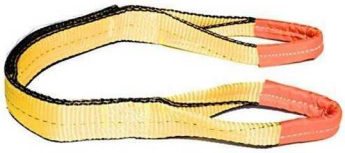
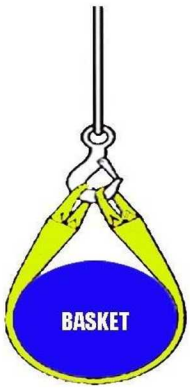
Flexamat® Plus UV-T is a Concrete Block Mat with Triple Underlayment..

Flexamat® Plus UV-T is available in widths of 4', 5.5', 8', 10', 12', 15.5' and 16'. For applications with wider widths, mats are installed adjacent to another. The manufacturer or authorized representative will provide technical assistance during installation as needed.

SHIPPING, TRANSPORT, STORAGE & HANDLING:
Flexamat® Plus UV-T is packaged in rolls for shipment. The rolls have a minimum weight of 10 pounds per square feet. Rolls are packaged with lifting straps. A BASKET LIFT IS THE ONLY METHOD FOR TRANSPORTING ROLLS OF FLEXAMAT. The lifting system must be appropriately rated for the weight of each roll. This system should include one Screw Pin Anchor Shackle Clevis, two or three Eye to Eye Sling Straps (12' and 16' width rolls require 3 straps), and a Three Leg Bridle Wire Sling with Safety Latches.





Using forks, chains, cables and grapple buckets could damage the mat.

Upon delivery, rolls may be left exposed for up to 30 days. If exposure will exceed 30 days, the rolls must be tarped or otherwise covered.

SUBGRADE PREPARATION:
The prepared subgrade shall provide a firm, unyielding foundation for the mats. The subgrade shall be prepared as detailed on the plans. Subgrade surface shall be free of

any debris, protrusions, rocks, sticks, roots, or other hindrances which would result in an individual block being raised more than ¾" above the adjoining blocks. Undulations, rolls, knolls and rises in the subgrade to which the tied concrete mat is able to contour over and maintain intimate contact with the subgrade will be allowed. The Flexamat block has a height of 2.25". When grading next to hard surfaces like a road, sidewalk, or outlet pad, consider lowering the grade to allow for a smooth transition for water to flow from the unvegetated surface onto the top of the Flexamat blocks. Before unrolling the Flexamat, apply seed and soil amendments directly to the prepared soil prior to installation of mats. Use seed and soil amendments or topsoil per project specifications.

UNROLLING:
Stage the rolls in the direction to be unrolled, and position the leading edge of the roll, so that this edge is on the bottom of the roll aligned to the grade shown on the plans or at the end of the proceeding roll, and according to the manufacturer's installation guidelines. Flexamat can be unrolled down or across slopes.

MAINTENANCE:

Key points for inspections and maintenance:

- Do not spray with weed or grass killers. Use a selective herbicide to control invasive plants if necessary.
- Maintain stabilization of adjacent areas. Repair any rills or gullies that can affect upstream/downstream or top of slope terminations.
- Maintain adjacent vegetation. Exposed soil above and along the sides of the Flexamat should be seeded or covered.
- Routine maintenance can include mowing on stabilized areas

If mats need to be removed:

- Cut the section of mat that requires removal with a with a knife, hatchet, or concrete saw.
- If mat removal is temporary, the cut section can be folded or rolled to the side to access the subgrade. If the section needs to be completely removed, roll up the section of mat for removal. Lay lifting straps on the ground behind the cut section to roll the section of mat onto to then lift and remove.

Removed section can be reinstalled:

- Seed the prepared subgrade where mat was removed.
- Replace underlayment if it was damaged during removal.
- Reinstall Flexamat section. Once section is installed back into place, secure the mat seams by installing 18" U-Anchors in 1' increments or 20" stainless steel zip ties in 6" increments. Anchors and zip ties shall encompass 3 cords of geogrid from each mat.

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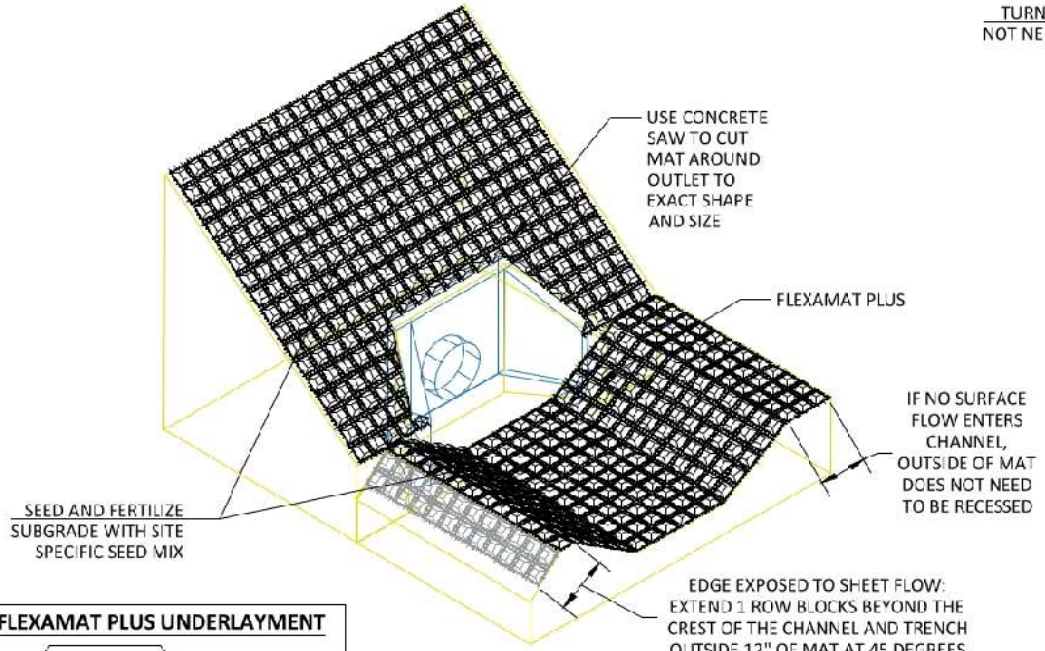
U-Anchor Properties

Material	#3 Rebar
Leg length	18”
Leg spacing	3”

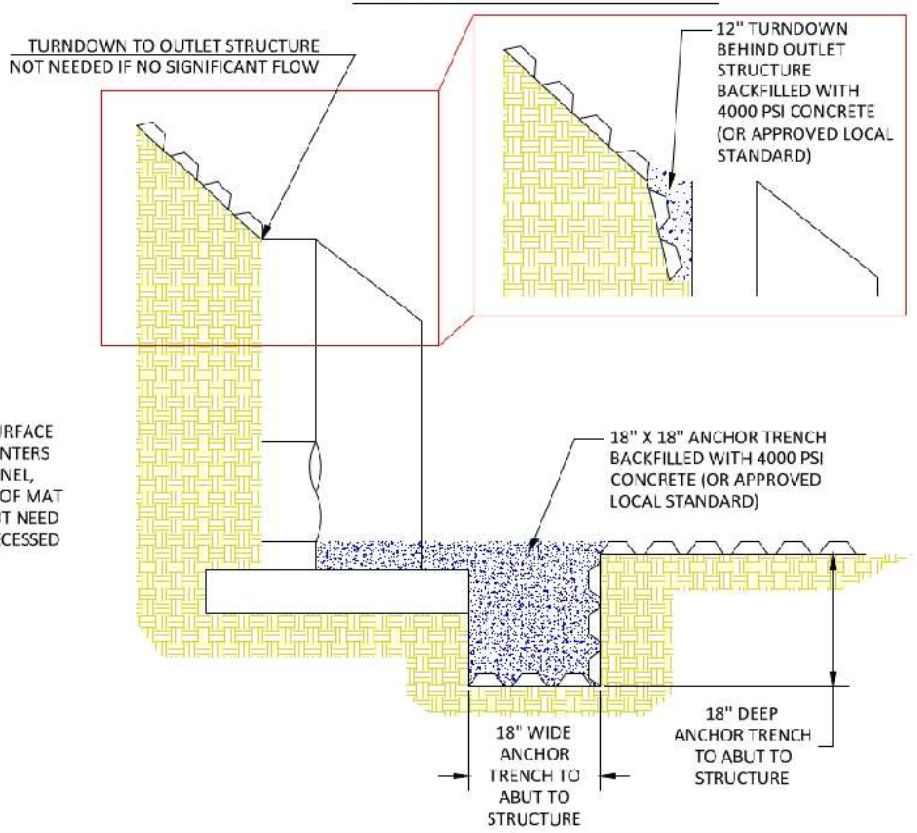
Picture of U-Anchor

Proudly Manufactured in the USA

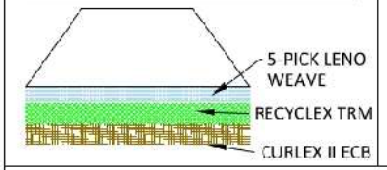
ISOMETRIC VIEW OF OUTLET AND SLOPE PROTECTION



PROFILE VIEW OF ANCHOR TRENCHES



FLEXAMAT PLUS UNDERLAYMENT



FLEXAMAT PLUS - OUTLET ARMORING

CONSTRUCTION NOTES:

1. GRADE CHANNEL SO THAT WATER WILL FLOW DOWN CENTER OF THE CHANNEL AND BE CONTAINED TO THE CHANNEL. ALL SUBGRADE SURFACES PREPARED FOR PLACEMENT OF MATS SHALL BE SMOOTH AND FREE OF ALL ROCKS, STICKS, ROOTS, OTHER PROTRUSIONS, OR DEBRIS OF ANY KIND. THE PREPARED SURFACE SHALL PROVIDE A FIRM UNYIELDING FOUNDATION FOR THE MATS.
2. PRIOR TO FLEXAMAT PLUS INSTALLATION SEED AND FERTILIZER SUBGRADE WITH SITE SPECIFIC SEED MIX IN ACCORDANCE WITH THE PROJECT PLANS AND SPECIFICATIONS.
3. INSTALL FLEXAMAT ROLLS. AVAILABLE WIDTHS ARE 4', 5.5', 8', 10', 12', AND 16' AVAILABLE IN CUSTOM LENGTHS. FOR WIDTHS WIDER THAN 16', INSTALL 15.5' WIDE MAT WITH 12" GEOGRID EXTENSION AND 6" UNDERLAYMENT EXTENSION.
   - 3.1. WHERE POSSIBLE AVOID LONGITUDINAL ABUTMENT SEAMS IN CHANNEL BOTTOM.
   - 3.2. FOR OUTLET PROTECTION WIDER THAN 16' SEE CHANNEL PARALLEL TO FLOW INSTALLATION DETAIL.
   - 3.3. FOR OUTLET PROTECTION THAT REQUIRES MORE THAN 1 MAT IN LENGTH TO COVER CHANNEL SEE CHANNEL PARALLEL TO FLOW INSTALLATION DETAIL.
4. AT THE BEGINNING OF CHANNEL, THE INITIAL LEADING EDGE OF FLEXAMAT EXPOSED TO CONCENTRATED FLOW SHALL BE EMBEDDED 18" VERTICALLY INTO ANCHOR TRENCH. THE TRENCH SHALL BE FILLED WITH 4,000 PSI CONCRETE.
5. AT THE END OF THE ARMORED CHANNEL, EMBED THE MAT 18" IN A TERMINATION TRENCH. FILL AND COMPACT TERMINATION TRENCH WITH A COHESIVE FILL.

GUIDANCE TABLE FOR STORMWATER OUTFALL PROTECTION

PIPE DIAMETER		FLEXAMAT WIDTH	FLEXAMAT LENGTH (*MIN)
12"	8 CFS	5.5'	5'
18"	20 CFS	8'	8'
24"	30 CFS	8'	10'
36"	75 CFS	12'	16'
48"	100 CFS	16'	20'
60"	150 CFS	20'	25'

*CONSULT MANUFACTURER FOR GUIDANCE IF DESIGN DISCHARGE VARIES SIGNIFICANTLY FROM VALUES LISTED IN TABLE.
*LENGTH OF PROTECTION WILL VARY ON THE LENGTH OF THE SLOPE, DEGREE OF SLOPE, OR IF IT IS DISCHARGING ONTO A FLAT AREA. OUTFALLS DISCHARGING ONTO SLOPES, IT IS RECOMMENDED TO EXTEND FLEXAMAT PLUS THE LENGTH OF THE SLOPE AND 3' PAST THE TOE.

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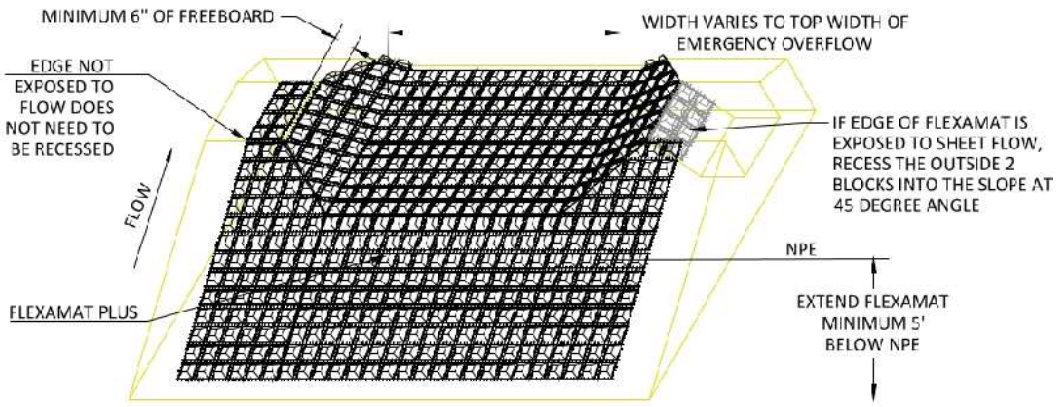
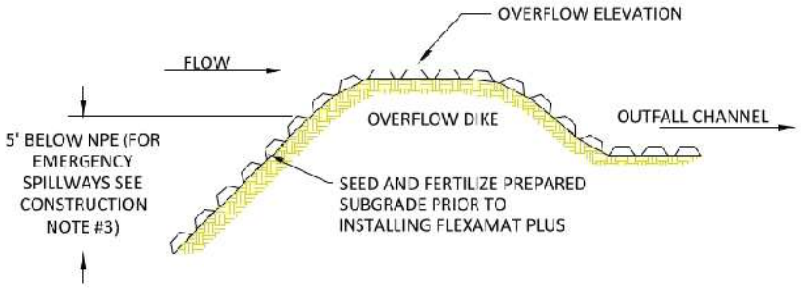
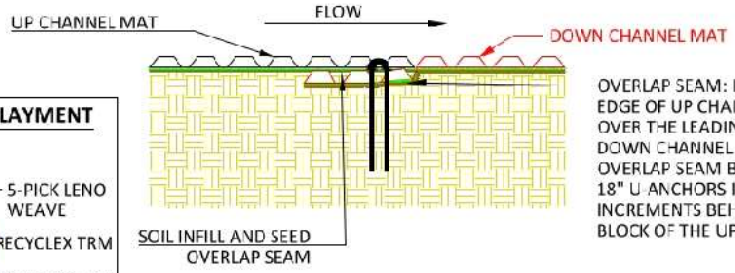
EMERGENCY SPILLWAY - ISOMETRIC VIEW



OVERFLOW DIKE - PROFILE VIEW

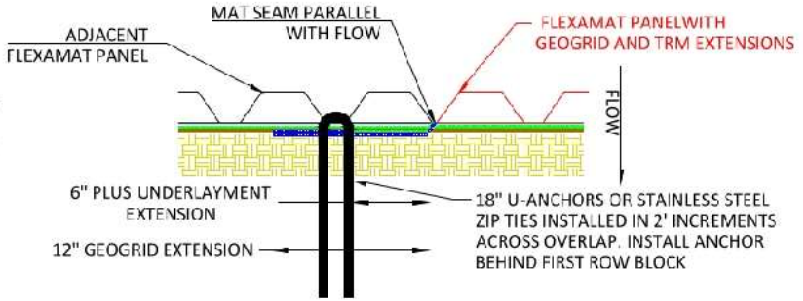


1. OVERLAP METHOD FOR SEAMS PERPENDICULAR TO FLOW

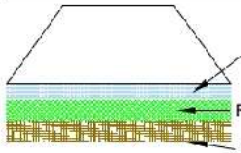


OVERLAP SEAM: INSTALL ENDING EDGE OF UP CHANNEL MAT 18" OVER THE LEADING EDGE OF THE DOWN CHANNEL MAT. SECURE OVERLAP SEAM BY INSTALLING 18" U ANCHORS IN 2' INCREMENTS BEHIND THE FIRST BLOCK OF THE UP CHANNEL MAT

2. OVERLAP METHOD FOR SEAMS PARALLEL TO FLOW



FLEXAMAT PLUS UNDERLAYMENT



FLEXAMAT PLUS - OVERFLOW CHANNEL PARALLEL TO FLOW

CONSTRUCTION NOTES:

1. AN ENGINEER OR MANUFACTURERS REPRESENTATIVE SHALL BE ONSITE FOR THE START OF THE INSTALLATION.
2. ALL SUBGRADE SURFACES PREPARED FOR PLACEMENT OF MATS SHALL BE SMOOTH AND FREE OF ALL ROCKS, STICKS, ROOTS, OTHER PROTRUSIONS, OR DEBRIS OF ANY KIND. THE PREPARED SURFACE SHALL PROVIDE A FIRM UNYIELDING SUBGRADE FOR THE MATS.
3. PRIOR TO THE FLEXAMAT PLUS INSTALLATION SEED AND FERTILIZE SUBGRADE WITH SITE SPECIFIC SEED MIX IN ACCORDANCE WITH THE PROJECT PLANS AND SPECIFICATIONS.
4. MAT SHALL EXTEND 5' BELOW NORMAL POND ELEVATION. (FOR EMERGENCY OVERFLOW INSTALLATIONS EXTEND THE MAT 3' DOWN THE INSIDE FACE OF THE OVERFLOW DIKE.)
5. INSTALL FLEXAMAT PLUS ROLLS. MANUFACTURER RECOMMENDS INSTALLING THE WIDEST MAT POSSIBLE FOR SPILLWAY APPLICATIONS.
   - 5.1. FOR WIDTHS WIDER THAN 16'. INSTALL 15.5' WIDE MATS WITH GEOGRID AND TRM UNDERLAYMENT EXTENSIONS. INSTALL ADJACENT MAT OVER THE 12" GEOGRID AND 6" TRM UNDERLAYMENT EXTENSIONS OF THE ADJACENT MATS. ENSURE THE GEOGRID AND TRM UNDERLAYMENT EXTENSIONS ARE LAYING FLAT ON THE SUBGRADE BEFORE INSTALLING ADJACENT MAT OVER THE EXTENSIONS. INSTALL #3 REBAR 18" U-ANCHORS IN 2' INCREMENTS ACROSS THE GEOGRID AND TRM EXTENSION OVERLAP. INSTALL ANCHORS PERPENDICULAR TO THE FLOW DIRECTLY BEHIND FIRST ROW OF BLOCKS ON THE ADJACENT MAT.
   - 5.2. FOR ADDITIONAL SECTIONS OF MAT, OVERLAP THE DOWNSTREAM SECTION 18" WITH UPSTREAM SECTION OF MAT. PRIOR TO INSTALLING OVERLAP, FLIP UPSTREAM MAT BACK 24". EXCAVATE 2.25" OF SOIL 18" FROM THE END OF THE UPSTREAM MAT. DOWNSTREAM SECTION IS THEN LAID IN THE SHALLOW TRENCH. RETURN AND TAMP SOIL OVER INITIAL EDGE AND SEED AREA. FLIP END OF UPSTREAM MAT OVER THE SOIL COVERED INITIAL LEADING EDGE. SEED AND FERTILIZE SOIL INFILL PRIOR TO FLIPPING END OF UPSTREAM MAT OVER THE SOIL COVERED INITIAL LEADING EDGE OF DOWNSTREAM MAT. SECURE PERPENDICULAR OVERLAP SEAMS BY INSTALLING #3 REBAR - 18" U ANCHORS PERPENDICULAR TO FLOW IN 2' INCREMENTS.
6. AT THE END OF THE ARMORED SPILLWAY, EMBED THE MAT 18" IN A TERMINATION TRENCH. FILL AND COMPACT TERMINATION TRENCH WITH SUITABLE FILL. (AS SPECIFIED BY EOR.)

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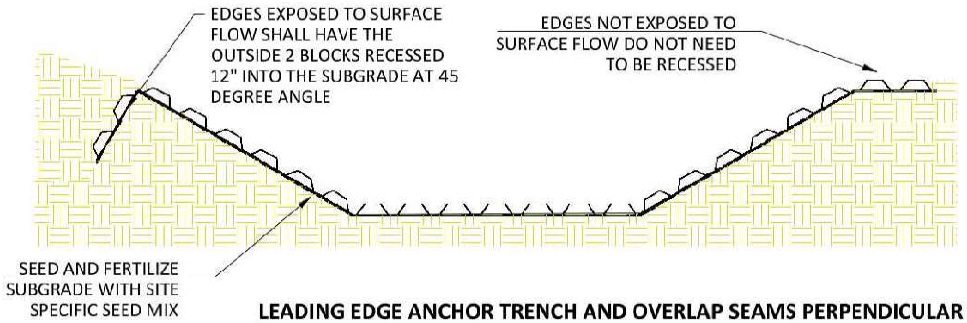
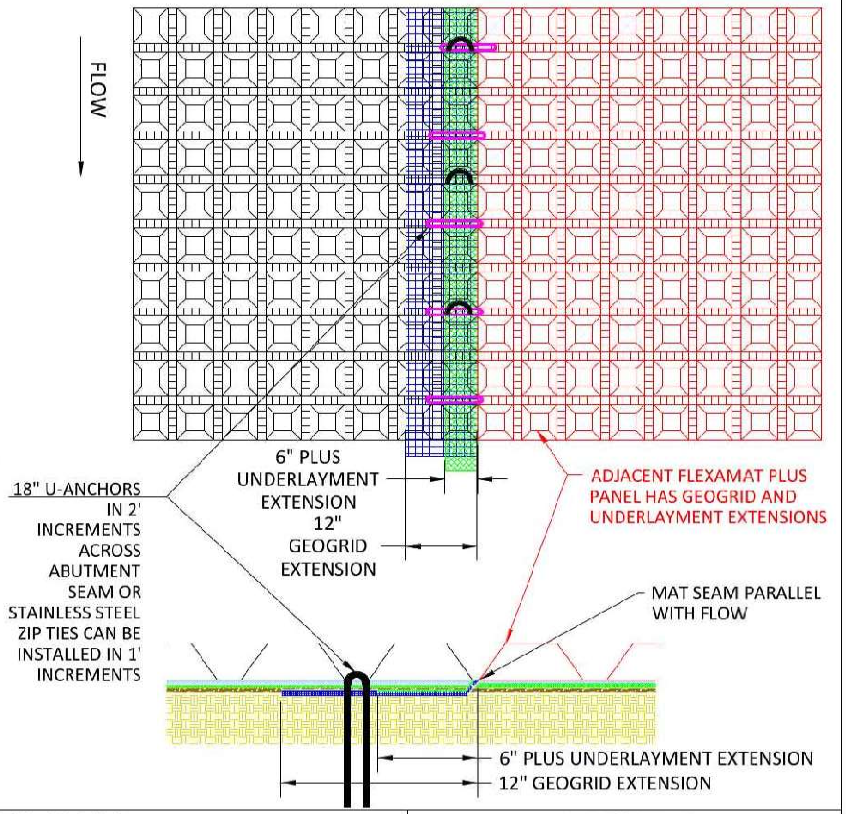
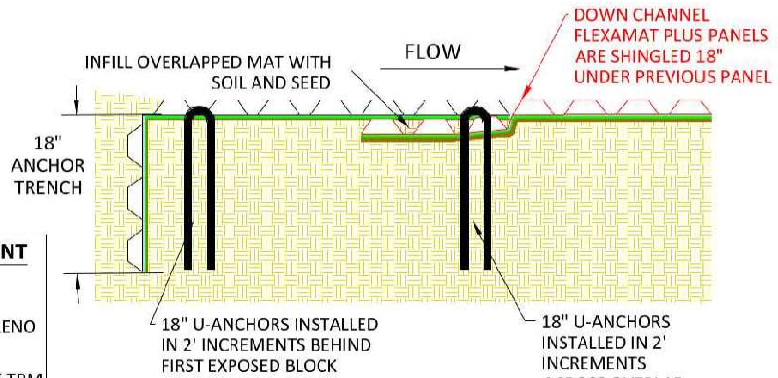
METHOD FOR TREATING EDGES EXPOSED TO SURFACE SHEET FLOW



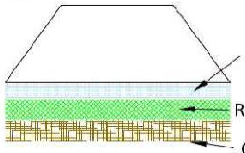
ABUTMENT METHOD FOR WIDER THAN 16'



LEADING EDGE ANCHOR TRENCH AND OVERLAP SEAMS PERPENDICULAR TO FLOW



FLEXAMAT PLUS UNDERLAYMENT



FLEXAMAT PLUS CHANNEL - LAYOUT PARALLEL TO FLOW

CONSTRUCTION NOTES:

1. AN ENGINEER OR MANUFACTURES REPRESENTATIVE SHALL BE ONSITE FOR THE START OF THE INSTALLATION.
2. GRADE CHANNEL SO THAT WATER WILL FLOW DOWN CENTER OF THE CHANNEL AND BE CONTAINED TO THE CHANNEL. ALL SUBGRADE SURFACES PREPARED FOR PLACEMENT OF MATS SHALL BE SMOOTH AND FREE OF ALL ROCKS, STICKS, ROOTS, OTHER PROTRUSIONS, OR DEBRIS OF ANY KIND.
3. PRIOR TO FLEXAMAT PLUS INSTALLATION SEED AND FERTILIZE THE PREPARED SUBGRADE WITH SITE SPECIFIC SEED MIX AND IN ACCORDANCE WITH THE PROJECT PLANS AND SPECIFICATIONS.
4. INSTALL FLEXAMAT PLUS ROLLS, USING THE WIDEST ROLLS POSSIBLE TO AVOID SEAMS.
   - 4.1. FOR CHANNELS THAT ARE WIDER THAN 16', INSTALL 15.5' WIDE FLEXAMAT PLUS ROLLS THAT INCLUDE 12" GEOGRID EXTENSIONS WITH A 6" PLUS UNDERLAYMENT EXTENSIONS. THESE SEAMS ARE PARALLEL WITH FLOW, THE ADJACENT MAT INSTALLED OVER THE EXTENSIONS. ENSURE GEOGRID AND TRM EXTENSIONS ARE LAYING FLAT ON SUBGRADE PRIOR TO INSTALLING ADJACENT MAT.
   - 4.2. SECURE THE ABUTMENT PARALLEL WITH FLOW BY INSTALL NG 18" U-ANCHORS IN 2' INCREMENTS OR 20" STAINLESS STEEL ZIP TIES IN 1' INCREMENTS THROUGH THE EXTENSION OVERLAP. U ANCHORS OR ZIP TIES TO BE INSTALLED PERPENDICULAR TO FLOW. ZIP TIES SHALL ENCOMPASS 3 CORDS OF GEOGRID FROM EACH MAT.
5. FOR ADDITIONAL SECTIONS OF MAT, SECURE SEAM PERPENDICULAR WITH FLOW BY OVERLAPPING THE DOWNSTREAM SECTION 18" WITH UPSTREAM SECTION OF MAT. PRIOR TO INSTALLING OVERLAP, FLIP UPSTREAM MAT BACK 24". EXCAVATE 2.25"' OF SOIL 18" FROM END OF UPSTREAM MAT. DOWNSTREAM SECTION IS LAID IN THE SHALLOW TRENCH. RETURN AND TAMP SOIL OVER INITIAL EDGE AND SEED. FLIP END OF UPSTREAM MAT OVER THE SOIL COVERED AND SEEDED INITIAL LEADING EDGE OF DOWNSTREAM MAT.
   - 5.1. SECURE OVERLAPS PERPENDICULAR TO FLOW BY INSTALLING 18" U-ANCHORS IN 2' INCREMENTS OR 20" STAINLESS STEEL ZIP TIES IN 1' INCREMENTS THROUGH THE OVERLAP. ZIF TIES SHALL ENCOMPASS 3 CORDS OF GEOGRID FROM EACH MAT.
6. AT THE INITIAL LEADING EDGE OF THE FLEXAMAT PLUS ARMORED CHANNEL, EMBED THE MAT 18" IN A VERTICAL ANCHOR TRENCH. FILL AND COMPACT ANCHOR TRENCH WITH SUITABLE FILL. AT ENDING EDGE OF PROTECTION, EMBED THE MAT 18" IN A TERMINATION TRENCH. THE TRENCH SHALL BE FILLED AND COMPACTED WITH SUITABLE FILL, AS DETERMINED BY THE ENGINEER OF RECORD.

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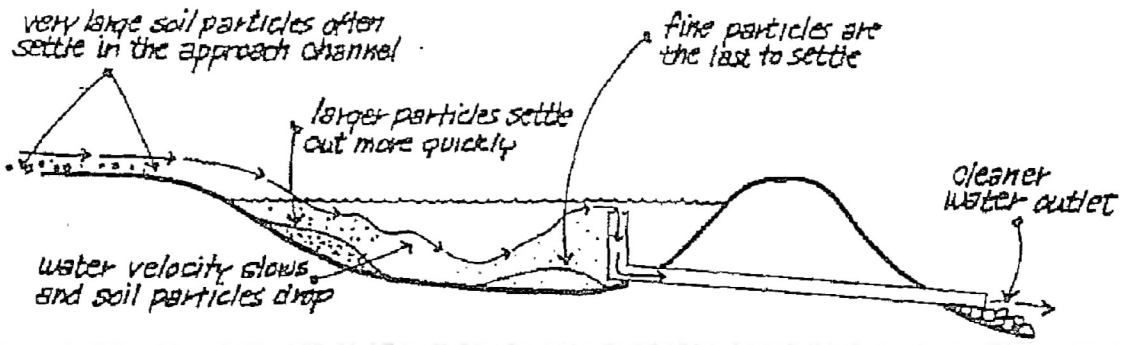
REV - 2

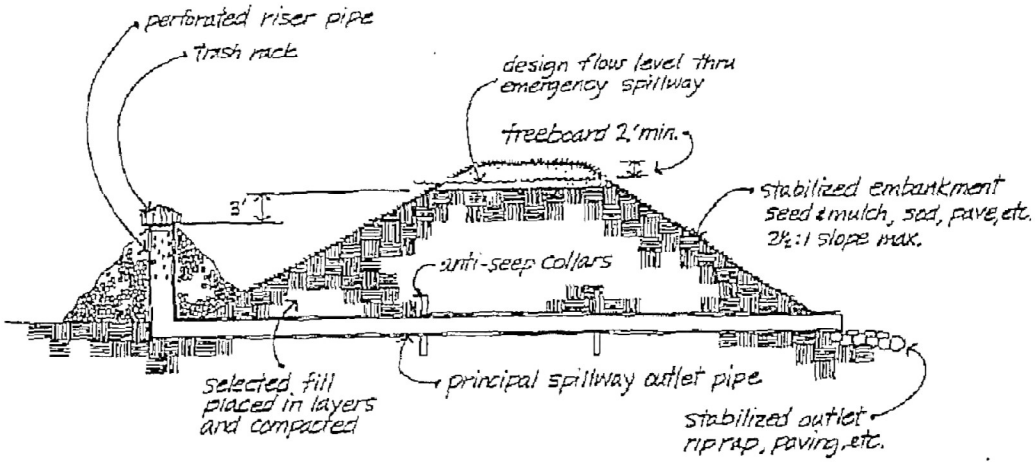
Exhibit 2

Side View of a Sediment Basin



HOW A SEDIMENT BASIN WORKS

NOT TO SCALE



SECTION THRU EMBANKMENT & BASIN CONTROLS

NOT TO SCALE

Source: Sediment Basin (brochure). Michigan Department of Natural Resources, Land and Water Management Division.

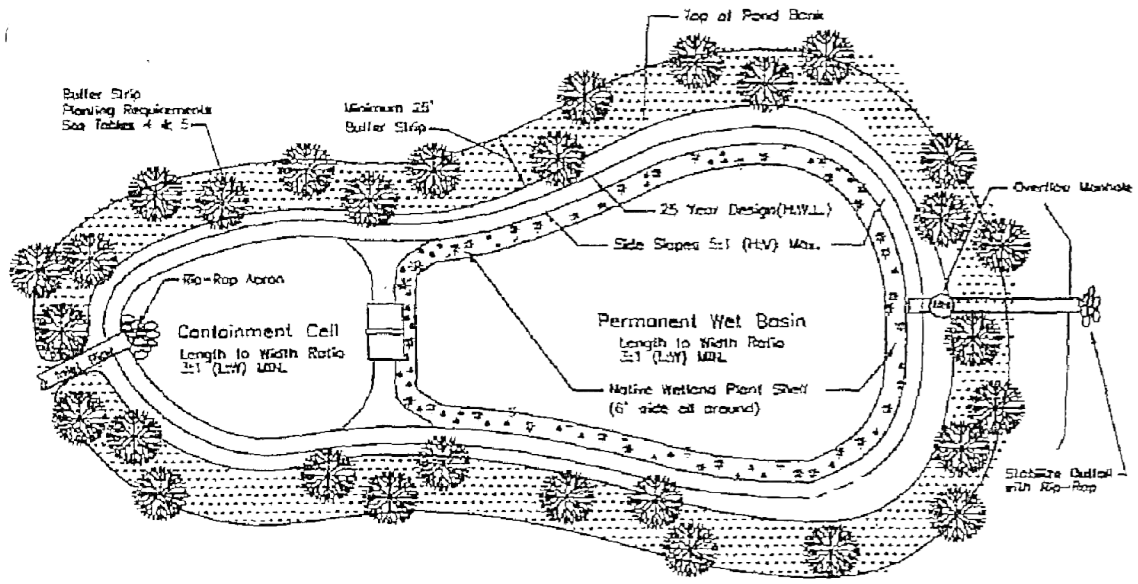
BERNARD J. BARNES

GRATIOT COUNTY DRAIN COMMISSIONER

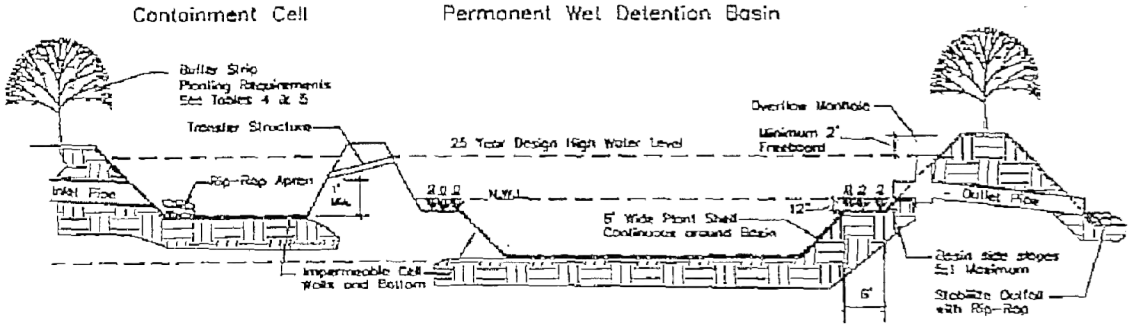
GUIDELINES FOR STORM WATER MANAGEMENT

HOW A SEDIMENT BASIN WORKS & SECTION THRU EMBANKMENT & BASIN CONTROLS

	DATE *FEBRUARY, 2013*	SHEET *1* OF *1*
	SCALE *NONE*	



HIGH RISK – DETENTION @ PLAN VIEW
(EXTENDED WET BASIN)
NOT TO SCALE



HIGH RISK – DETENTION @ SIDE VIEW
(EXTENDED WET BASIN)
NOT TO SCALE

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HOW A SEDIMENT BASIN WORKS & SECTION THRU EMBANKMENT & BASIN CONTROLS

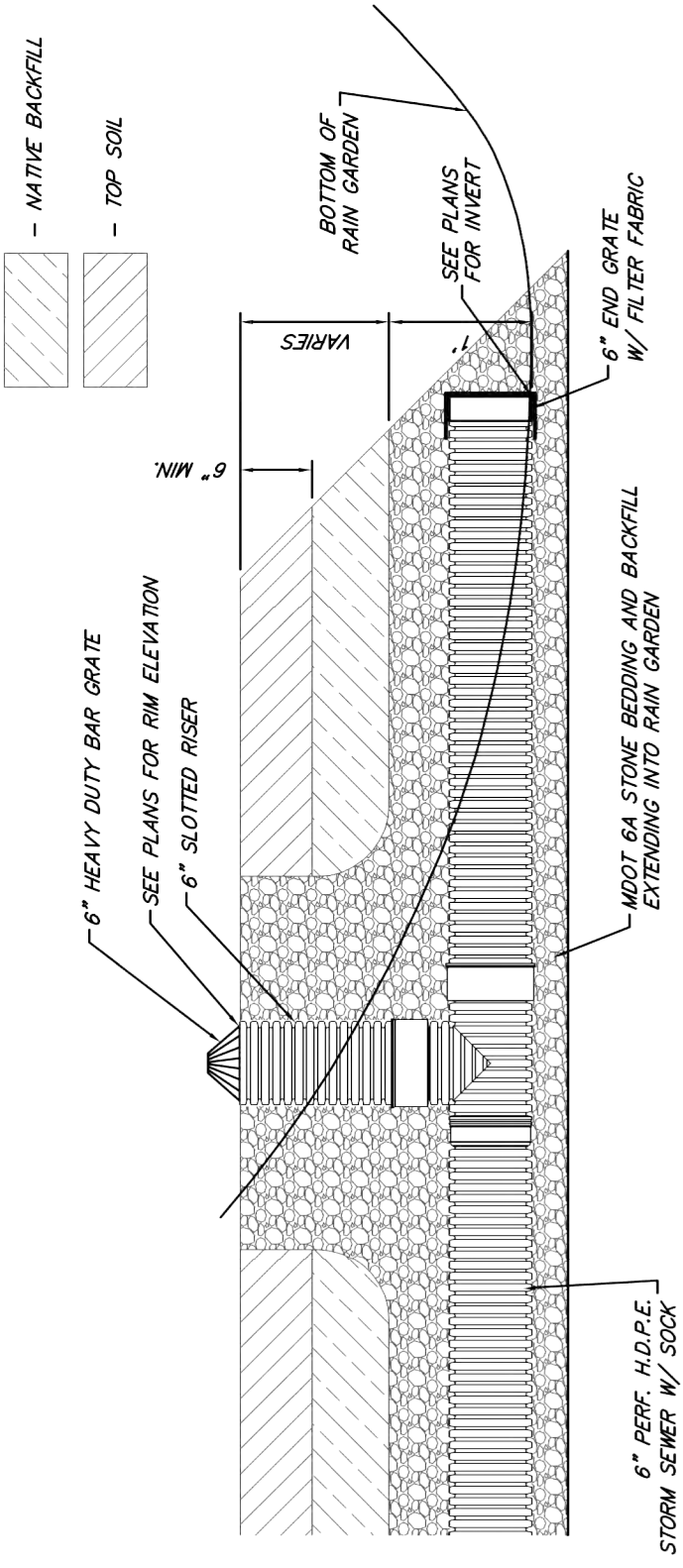
	DATE *FEBRUARY, 2013* SCALE *NONE*	SHEET *1* OF *1*

DETENTION OUTLET SCHEDULE								
OUTLET PIPE LENGTH (A)	OUTLET PIPE SLOPE (B)	END SECTION INVERT (C)	100-YEAR HWL (D)	FIRST FLUSH DISCHARGE INV/ORIFICE SIZE (E)	BANK FULL DISCHARGE INV/ORIFICE SIZE (F)	100-YEAR FLOOD DISCHARGE INV/ORIFICE SIZE (G)	TOP OF STAND PIPE ELEVATION (H)	POND CREST ELEVATION (I)	EMERGENCY SPILLWAY ELEVATION (J)

BERNARD J. BARNES
GRATIOT COUNTY DRAIN COMMISSIONER

GUIDELINES FOR STORM WATER MANAGEMENT
DETENTION OUTLET STRUCTURE

DATE *FEBRUARY, 2013*
SCALE *NONE*
SHEET *1* OF *1*



H.D.P.E. RAIN GARDEN INLET MINIMUM COVER APPLICATIONS

NOT TO SCALE

QUANTITIES PER DETAIL

- 6" AGRI-DRAIN SLOTTED RISER
- 6"X6" AGRI-DRAIN TEE SECTION
- 6" EXTERNAL GUARD W/FILTER FABRIC
- 6" HEAVY DUTY BAR GRATE (1/4" ROD W/BLACK POWDER COAT)

SAMPLE DETAIL

BERNARD J. BARNES
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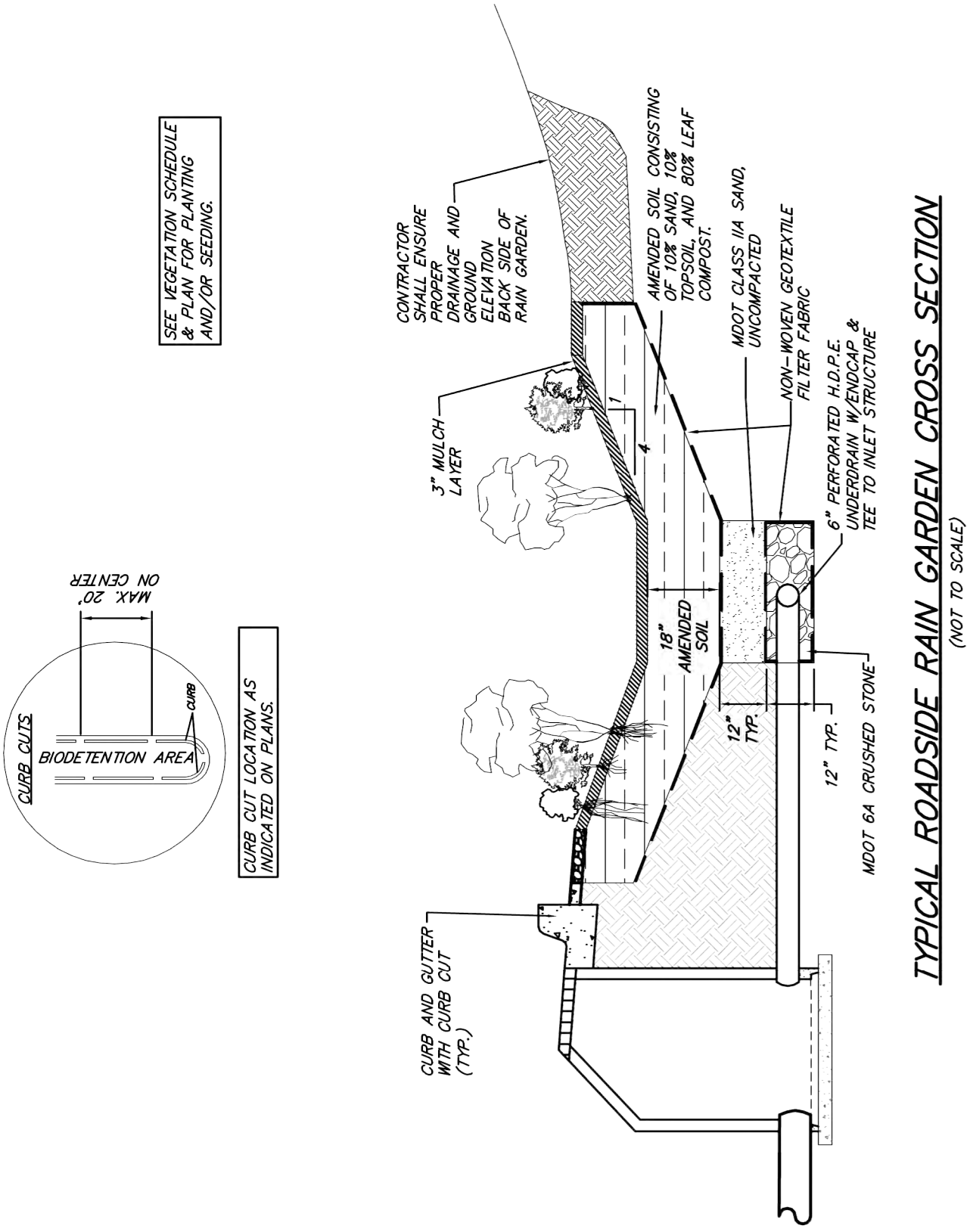
GUIDELINES FOR STORM WATER MANAGEMENT
H.D.P.E. RAIN GARDEN INLET MINIMUM COVER APPLICATIONS

DATE FEBRUARY, 2013
SCALE NONE
SHEET 1 OF 1



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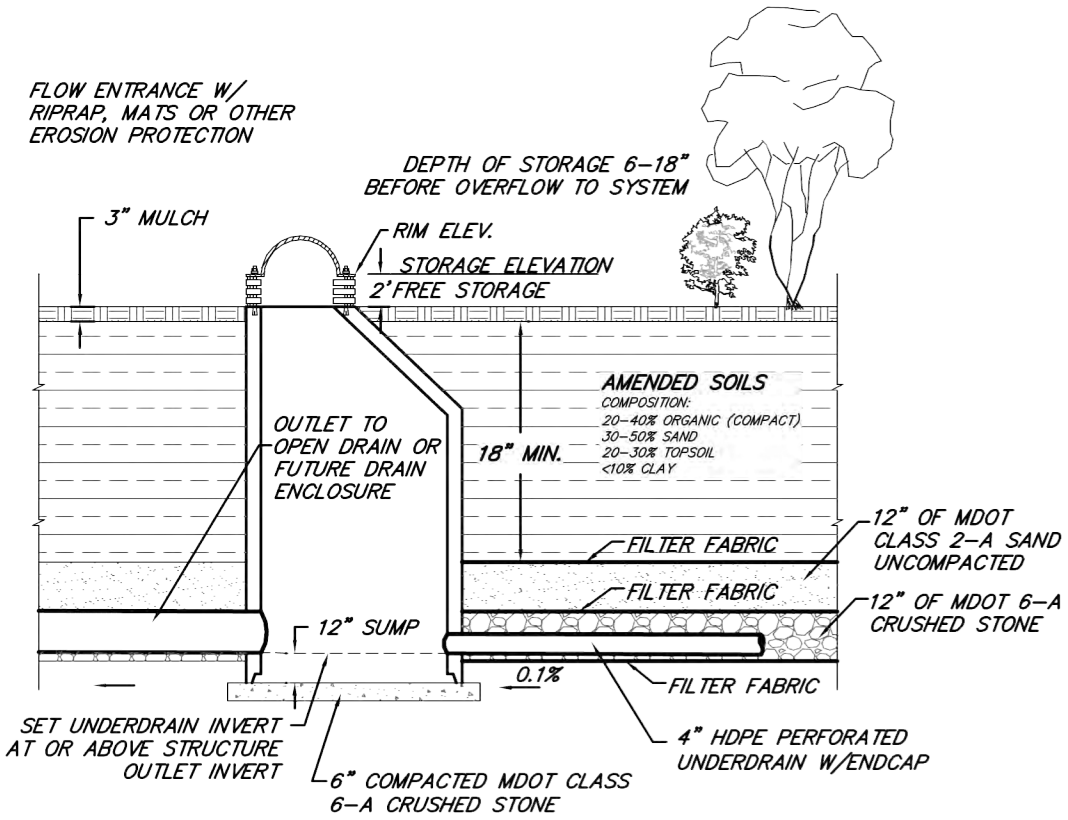
GUIDELINES FOR STORM WATER MANAGEMENT
TYPICAL ROADSIDE RAIN GARDEN CROSS SECTION

	DATE *FEBRUARY, 2013*	
	SCALE *NONE*	SHEET *1* OF *1*



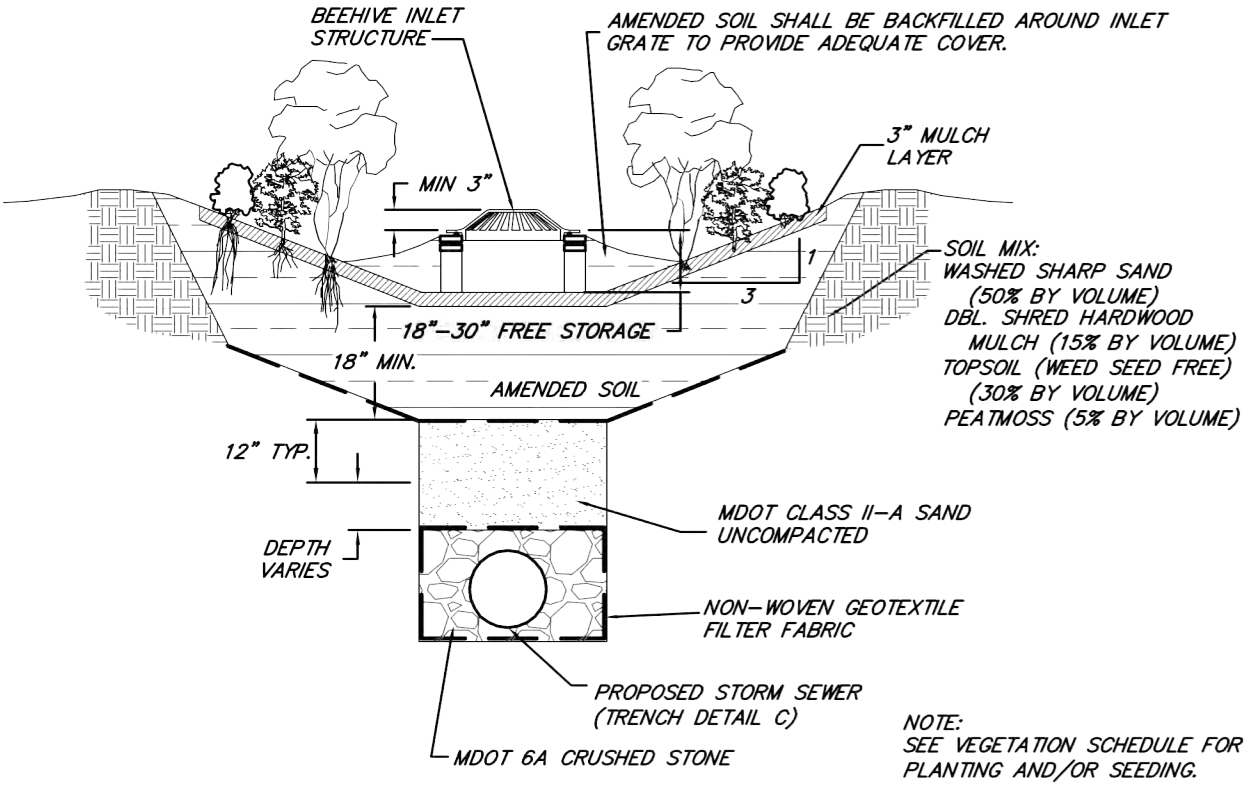
TYPICAL RAIN GARDEN WITH STRUCTURE CROSS SECTION

(NOT TO SCALE)

BERNARD J. BARNES
GRATIOT COUNTY DRAIN COMMISSIONER

GUIDELINES FOR STORM WATER MANAGEMENT
TYPICAL ROADSIDE RAIN GARDEN WITH STRUCTURE CROSS SECTION

	DATE *FEBRUARY, 2013* SCALE *NONE*	SHEET *1* OF *1*



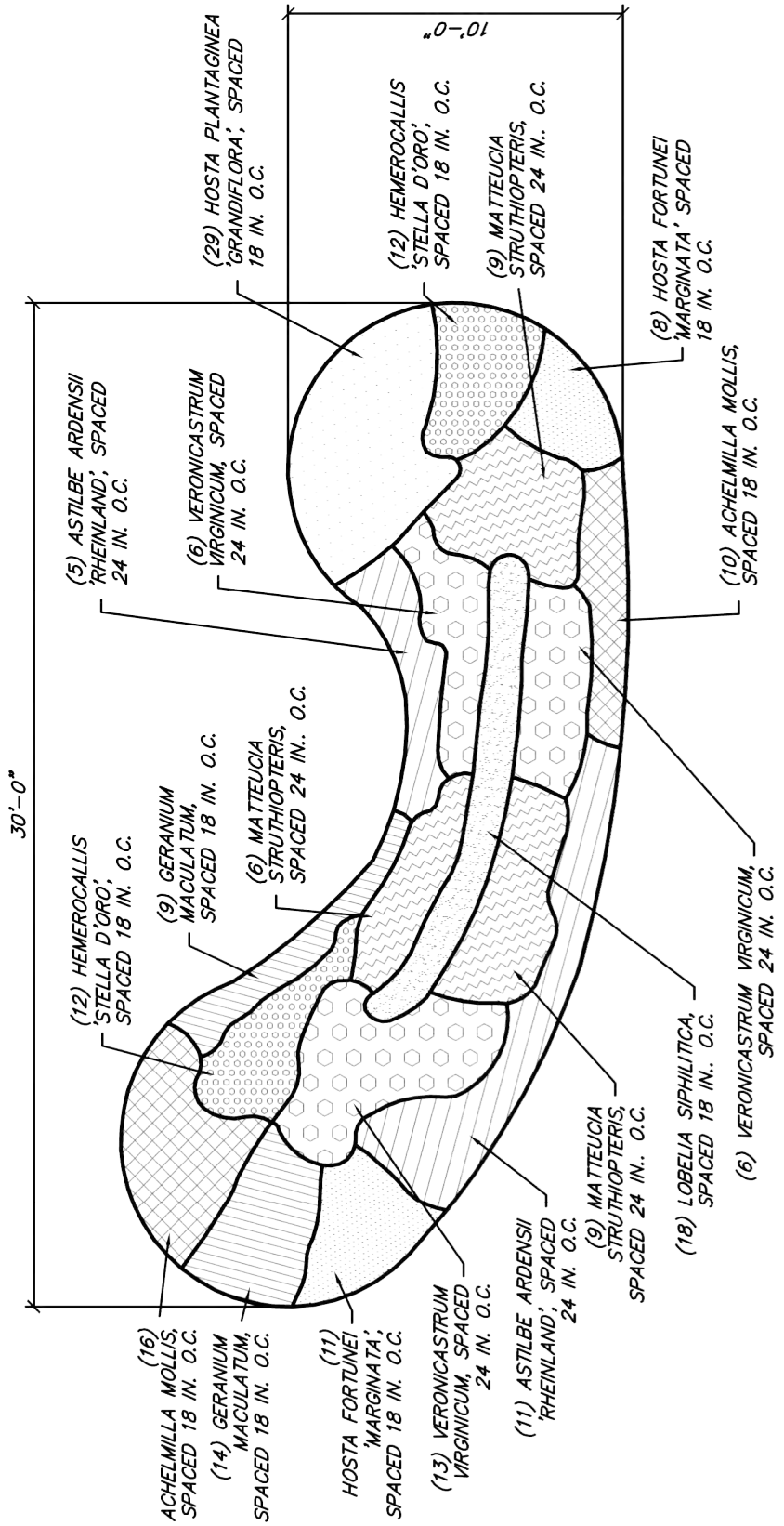
R.C.P. STORM SEWER TRENCH DETAIL
TYPICAL RAIN GARDEN CROSS SECTION

NOT TO SCALE

BERNARD J. BARNES
GRATIOT COUNTY DRAIN COMMISSIONER

GUIDELINES FOR STORM WATER MANAGEMENT
R.C.P. STORM SEWER TRENCH DETAIL
TYPICAL RAIN GARDEN CROSS SECTION

	DATE *FEBRUARY, 2013* SCALE *NONE*	SHEET *1* OF *1*



TYPICAL RAIN GARDEN PLANTING DETAIL
FOR SHADY LOCATIONS

NOT TO SCALE

BERNARD J. BARNES
GRATIOT COUNTY DRAIN COMMISSIONER

GUIDELINES FOR STORM WATER MANAGEMENT
TYPICAL RAIN GARDEN PLANTING DETAIL FOR SHADY LOCATIONS

	DATE FEBRUARY, 2013 SCALE NONE	SHEET 1 OF 2

MASTER PLANT LIST					
Total of Each Detail	Typical Detail Qty. (per each detail)	Description / Botanical Name	Common Name	Size	Notes
	TYPICAL RAIN GARDEN (SHADY)				
	SITE PREPARATION				
1750 SY	70 SY	Site preparation (includes excavation, topsoil & mulch)			
	GROUNDCOVER / PERENNIALS				
650	26	Achelmilla mollis	Lady's Mantle	No. 1	Spacing, 18in. o.c.
400	16	Astilbe arendsii 'Rheinland'	Pink Astilbe	No. 1	Spacing, 24in. o.c.
575	23	Geranium maculatum	Wild Geranium	No. 1	Spacing, 18in. o.c.
600	24	Hemerocallis 'Stella D'Oro'	'Stella D'Oro' Daylily	No. 1	Spacing, 18in. o.c.
475	19	Hosta fortunei 'Marginata'	Golden-Edged Hosta	No. 1	Spacing, 18in. o.c.
725	29	Hosta plantaginea 'grandiflora'	August Lily Hosta	No. 1	Spacing, 18in. o.c.
450	18	Lobelia siphilitica	Great Blue Lobelia	No. 1	Spacing, 18in. o.c.
600	24	Mateuccia pennsylvanica	Ostrich Fern	No. 1	Spacing, 24in. o.c.
625	25	Veronicastrum virginicum	Culver's Root	No. 1	Spacing, 24in. o.c.

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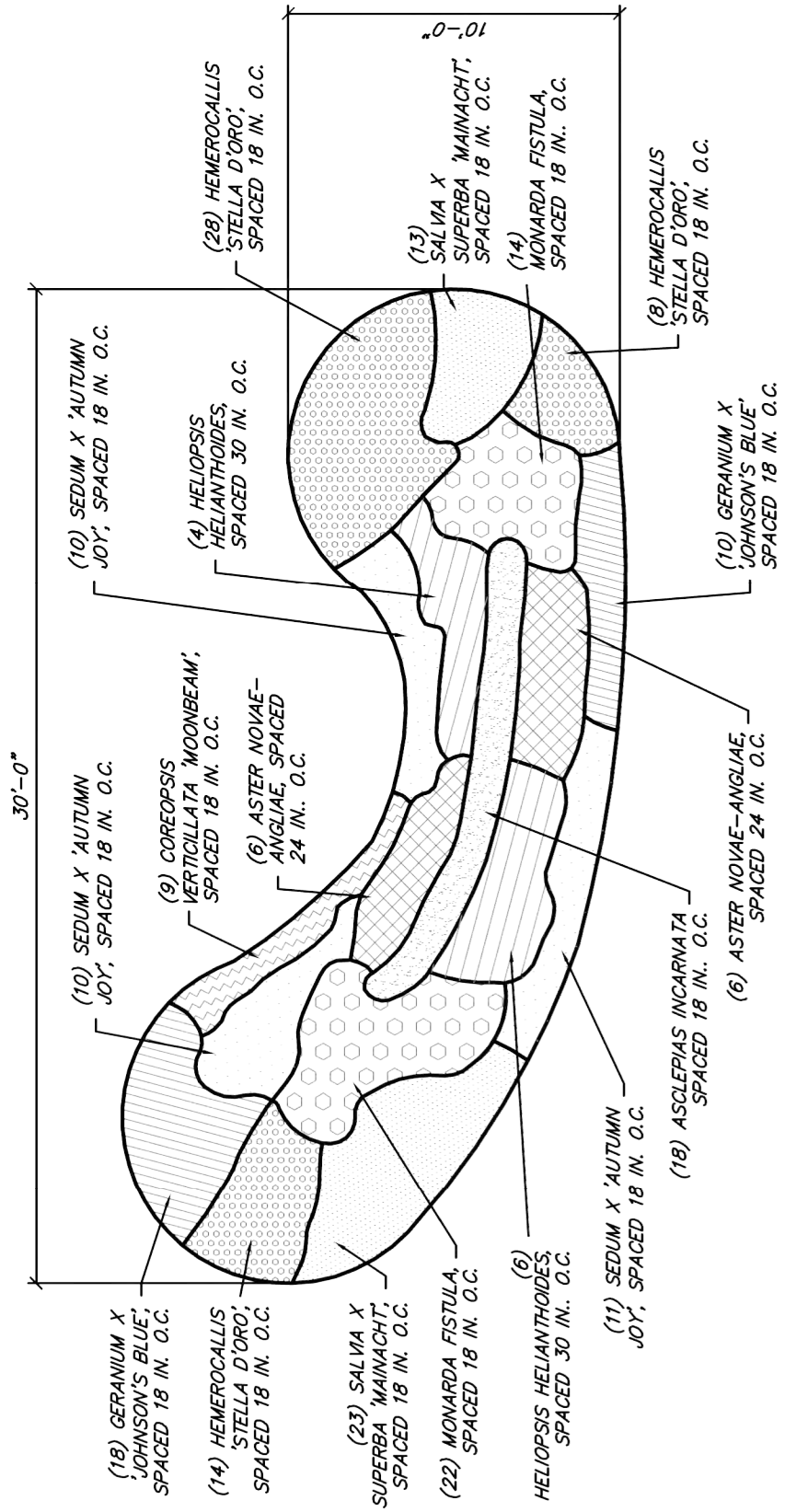
GUIDELINES FOR STORM WATER MANAGEMENT
TYPICAL RAIN GARDEN PLANTING DETAIL MASTER PLANT LIST FOR SHADY LOCATIONS

DATE *FEBRUARY, 2013*
SCALE *NONE*
SHEET *2* OF *2*



TYPICAL RAIN GARDEN PLANTING DETAIL FOR SUNNY LOCATIONS

NOT TO SCALE

BERNARD J. BARNES
GRATIOT COUNTY DRAIN COMMISSIONER

GUIDELINES FOR STORM WATER MANAGEMENT
TYPICAL RAIN GARDEN PLANTING DETAIL FOR SUNNY LOCATIONS

	DATE FEBRUARY, 2013 SCALE NONE	SHEET 1 OF 2

MASTER PLANT LIST					
Total of Each Detail	Typical Detail Qty. (per each detail)	Description / Botanical Name	Common Name	Size	Notes
	TYPICAL RAIN GARDEN (SUNNY)				
	SITE PREPARATION				
1540 SY	70 SY	Site preparation (includes excavation, topsoil & mulch)			
	GROUNDCOVER / PERENNIALS				
396	18	Asclepias incarnata	Marsh Milkweed	No. 1	Spacing, 18in. o.c.
264	12	Aster novae-angliae	New England Aster	No. 1	Spacing, 24in. o.c.
198	9	Coreopsis verticillata 'Moonbeam'	Moonbeam Coreopsis	No. 1	Spacing, 18in. o.c.
616	28	Geranium x 'Johnson's Blue'	Johnson's Blue Geranium	No. 1	Spacing, 18in. o.c.
220	10	Heliopsis helianthoides	Oxeye Sunflower	No. 1	Spacing, 30in. o.c.
1100	50	Hemerocallis 'Stella D'Oro'	'Stella D'Oro' Daylily	No. 1	Spacing, 18in. o.c.
792	36	Monarda fistula	Bee Balm; Bergamot	No. 1	Spacing, 18in. o.c.
792	36	Salvia x superba 'Mainacht'	May Night Salvia	No. 1	Spacing, 18in. o.c.
682	31	Sedum x 'Autumn Joy'	Autumn Joy Sedum	No. 1	Spacing, 18in. o.c.

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GUIDELINES FOR STORM WATER MANAGEMENT
TYPICAL RAIN GARDEN PLANTING DETAIL MASTER PLANT LIST FOR SUNNY LOCATIONS

DATE *FEBRUARY, 2013*
SCALE *NONE*
SHEET *2* OF *2*