Town of New Whiteland
Indiana

# STORMWATER CONSTRUCTION STANDARDS

## SPECIFICATIONS AND DETAILS

MAY 2020

# TOWN OF NEW WHITELAND, INDIANA
# STORMWATER CONSTRUCTION STANDARDS

## SPECIFICATIONS AND DETAILS

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# TECHNICAL SPECIFICATIONS

MAY 2020

Town of New Whiteland
Indiana

SECTION 02050 – DEMOLITION

PART 1 - GENERAL

1.01 Summary

A. Section Includes: Removal of existing concrete sidewalks, curbs, manholes, inlets, culverts, pipes, end sections, footings for lighting and signs, asphalt pavement, concrete pavement, and other structures, materials, and debris.

B. Related Sections

1. Section 02220 - Trenching, Backfilling and Compaction for Utilities
2. Section 02101 - Stormwater Pollution Prevention and Erosion Control

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.01 Coordination

A. Coordinate all Work with Town to assure a minimum of interruptions to drainage systems.

B. Complete removal and demolition Work to the satisfaction of the Town.

3.02 Asphalt Removal

A. When removing asphalt adjacent to existing concrete or asphalt, saw cut asphalt to be removed to a straight line.

3.03 Concrete Removal

A. Remove concrete to the next adjacent joint whenever possible.

B. When removing concrete adjacent to existing concrete or asphalt, saw cut concrete to be removed to a straight line.

C. When removing concrete adjacent to buildings, take care to not damage the building. Repair any damage incurred to the building with no additional compensation.

D. It is the Contractor’s responsibility to determine the best way to remove concrete at buildings. If the existing sidewalk is an integral part of the building, save the sidewalk as close to the building as possible, at the direction of the Town.

E. Where concrete sidewalk is removed over existing basement vaults, take care to not damage the structural components of the vault.

3.04 Structures

A. Where inlets, manholes, end sections, footings, and other structures are removed, backfill the void with granular backfill in accordance with Section 02220.

3.05 Piping

A. Unless otherwise directed, abandon existing storm sewer piping by either removing pipes completely or by filling completely with non-shrink grout.

B. Remove culvert pipes completely.

3.06 Disposal

A. Set aside all castings and grates which are not broken for pick up by the Town. If the Town does not claim the castings and grates, they shall become the property of the Contractor and shall immediately be removed from the site.

B. Remove debris from the site on a daily basis.

C. Dispose of all material in accordance with local, state, and federal rules, regulations, and ordinances. Obtain any permits necessary to properly dispose of materials and debris.

PART 4 - FIGURES

Not Used.

END OF SECTION 02050

# SECTION 02101 - STORM WATER POLLUTION PREVENTION AND EROSION CONTROL

## PART 1 - GENERAL

### 1.01 Summary

A. Section Includes

1. Temporary and permanent control measures used during the life of the contract to control water pollution, soil erosion, and siltation through the use of berms, dams, dikes, sediment traps, gravel, mulches, grasses, slope drains, and other erosion control devices or methods.
2. Temporary erosion control may include Work outside the construction limits such as borrow pit operations, equipment and material storage sites, and waste areas.

B. Related Sections

1. Section 02102 - Material Handling and Spill Prevention Plan
2. Section 02110 - Site Clearing
3. Section 02200 - Earthwork

### 1.02 References

A. Indiana Administrative Code (IAC), latest edition

B. Indiana Department of Transportation (INDOT) Standard Specifications, latest editions

1. Section 904 - Aggregates
2. Section 918 - Soil Fabrics

### 1.03 Definitions

A. Stabilized Areas: Disturbed areas which have established a minimum 70 percent uniform density of perennial vegetation coverage.

### 1.04 Submittals

A. Design Plans

1. Include a note on the design plans stating, "The Town of New Whiteland reserves the right to require additional onsite controls as deemed necessary to maintain compliance with state-issued MS4 and construction permits and the Town's Stormwater Management Ordinance. All erosion and sediment controls, best management practices and pollution prevention measures must be installed and maintained in accordance with the Indiana Stormwater Quality Manual."

B. Design Calculations

1. Turf Reinforcement Mat: Provide design calculations (i.e. flow velocity and shear stress) to demonstrate that the selected product is appropriate for the site conditions.

1.05 Quality Assurance

A. Regulatory Requirements

1. Provide grass seed containers bearing a seed label tag in accordance with the requirements of the Indiana Seed Law.
2. Provide fertilizer conforming to federal and state regulations and to the standards of the Association of Official Agricultural Chemists.
3. Comply with all federal, state, and local erosion control and pollution prevention laws.

B. Authority of Town: The Town has the authority to limit the surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow and fill operations, and to direct the Contractor to provide immediate permanent or temporary control measures to minimize contamination of adjacent streams or other watercourses, lakes, ponds and areas of water impoundment.

1.06 Delivery, Storage and Handling

A. Deliver grass seed in new and unopened containers or bags.

PART 2 - PRODUCTS

2.01 Materials

A. General: Provide materials in accordance with the requirements specified herein.

B. Temporary Grass Seed

1. Quick-growing species such as ryegrass, Italian ryegrass, or cereal grasses suitable to the area
2. Use grass species that will not compete with the grasses sown later for permanent cover
3. Application: apply temporary seeding to all disturbed areas to be left idle during the growing season unless other erosion control measures approved by the Town are used.

C. Permanent Grass Seed

1. Type, mixture, and quantity to meet the application rate
2. Contains no more than 5 percent inert matter
3. Contains no objectionable weeds

D. Sod

1. Free of weeds
2. Use within 1 week of its cutting - do not allow to dry out
3. Strongly rooted sod, a minimum of 2 years old
4. Capable of growth upon planting

E. Mulch

1. Hay, straw, fiber mats, netting, bark or wood fiber
2. Straw mulch shall consist of threshed straw of cereal grain such as oats, wheat, barley, rye, and rice.
3. Free of objectionable weeds, seeds, or other material that may be detrimental to the planting being established.
4. Application: Apply mulch to all areas that have been seeded and to disturbed areas to be left idle outside of the growing season unless other measures are indicated on the Drawings.
5. Application rates:
   a. Straw/hay mulch: 92 pounds per 1,000 square feet (2 ton/acre)
   b. Wood fiber mulch: 46 pounds per 1,000 square feet (1 ton/acre)
   c. Wood chips: 230 pounds per 1,000 square feet (5 ton/acre)

F. Fertilizer

1. Contains the minimum percentage of available nutrients (Nitrogen, Phosphorus, and Potash) based on soil content, seed mix and local conditions.
2. If local conditions do not indicate otherwise and soil testing is not required, provide 12-12-12 analysis fertilizer.
3. Application rate: as specified by the supplier

G. Topsoil

1. Provide topsoil meeting the requirements specified in Section 02200.

H. Erosion Control Blanket: Provide North American Green SC150 or approved equal.

I. Silt Fence

1. Posts shall be either 2-inch diameter wood or equivalent metal posts with a minimum length of 5 feet. Metal posts shall have projections for fastening wire to them.
2. Anchor stakes shall be 1-inch by 2-inch wood stakes or equivalent metal stakes with a minimum length of 1.5 feet.
3. Provide wire fence reinforcement for silt fences using standard strength filter cloth. Wire fence reinforcement shall be a minimum of 42 inches in height, be a minimum of 14 gauge, and have a maximum mesh spacing of 6 inches.
4. The fabric shall be purchased in a continuous roll, cut to the length of the barrier, to avoid the use of joints. When joints are necessary, splice filter fabric together only at a support post, wrap filter fabric around post to join, and seal securely.
5. Filter filtration tubes may be substituted for silt fence.

J. Fiber Filtration Tubes

1. Natural or man-made fiber filter media encased within cylindrical tubes composed of a photodegradable mesh.
2. Performance: slowing and filtering of suspended particles in storm water runoff. The tubes shall allow water to flow freely while providing filtration of suspended particles.

K. Riprap

1. Provide Revetment, Class 1, or Class 2 riprap in accordance with INDOT Standard Specification Section 904.

L. Geotextile Fabric for Use Under Riprap, Crushed Stone or Aggregate

1. Provide non-woven needle punched or heat bonded geotextile fabric consisting of strong, rot resistant, chemically stable long-chain synthetic polymer materials which are dimensionally stable relative to each other. The geotextile plastic yarn or fibers shall consist of at least 85 percent by weight of polyolefins, polyesters, or polyamides and resist deterioration from ultraviolet and heat exposure.
2. Provide geotextile meeting or exceeding the following requirements (Source: INDOT Standard Specifications 2012, Section 918.02)

| TEST | METHOD | REQUIREMENTS |
|---|---|---|
| Grab Strength | ASTM D4632 | 80 lb (355.8 N) |
| Seam Strength | ASTM D4632 | 70 lb (311.4 N) |
| Puncture Strength | ASTM D6241 | 25 lb (111.2 N) |
| Trapezoid Tear | ASTM D4533 | 25 lb (111.2 N) |
| Apparent Opening Size | ASTM D4751 | Sieve No. 50 max. |
| Permeability | ASTM D4491 | 0.1 mm/sec |
| Ultraviolet Degradation | ASTM D4355 | 70% strength retained |

M. Other: All other materials shall meet commercial grade standards and be approved by the Town before being incorporated into the project.

## PART 3 - EXECUTION

### 3.01 General

A. The site owner as identified in the stormwater permit shall be responsible for maintenance of soil erosion and sediment control measures throughout all phases of construction, and until final build-out of project is entirely complete, and no other

land disturbing activities will occur. The site owner shall be responsible to ensure that individual lot owners, subcontractors, developers and any other entities performing land disturbing activities comply with the approved construction plan. The project site owner shall maintain overall responsibility and shall be the point of contact regarding state permit compliance issues until the notice of termination is filed with IDEM.

B. Submit notice of termination (NOT) inspection request to Town prior to filing NOT with IDEM.

C. The Town will not perform building site inspections if erosion and sediment control plans are not adequately implemented.

3.02 Individual Building Lots

A. The individual lot operator, whether owning or acting as the agent, shall be responsible for erosion and sediment control requirement associated with activities on individual lots.

B. Divert stormwater runoff away from the building by grading the lawn to provide at least 6 inches of vertical fall in the first 10 feet in horizontal distance.

C. Install and maintain stable construction entrance in the proposed driveway location by using No. 2 washed stone. Maintain by adding fresh stone.

D. Clean up sediment that is tracked or washed onto roads daily. Flushing roads with water is not acceptable. Cleared sediment shall be redistributed or disposed of in a manner that is in compliance with all applicable statutes and rules.

E. Adjacent lots disturbed by an individual lot operator shall be repaired and stabilized with permanent surface stabilization. Side yard swales shall be graded as specified in the plans.

F. Final stabilization is met when all land disturbing activities have been completed and a uniform perennial vegetative cover with a density of 70 percent or greater has been established on all unpaved areas and areas not covered by permanent structures, or equivalent permanent stabilization measures have been employed.

G. Rear yard swales are not to be disturbed following final grading of swale. Install erosion control blanket over seed to reestablish vegetation in disturbed swales.

H. Place perimeter protection inside drainage easement lines.

3.03 Preparation

A. Do not start Work until the erosion and sediment control schedules and methods of operations for the applicable construction activities have been accepted by the Town.

B. Coordinate temporary erosion and sediment control measures contained herein with the permanent erosion control measures and soil stabilization methods as

specified as part of this contract to assure economical, effective, and continuous erosion and sediment control throughout the construction and warranty period.

3.04 Protection

A. Establish vegetation on disturbed soils.

B. Temporarily or permanently stabilize unvegetated areas that are scheduled or likely to be left inactive with measures appropriate for the season in order to minimize erosion potential.

C. For construction projects on agricultural land, final stabilization is accomplished by returning land to its preconstruction use.

D. Do not discharge pollutants such as sediments, fuels, lubricants, bitumen, raw sewage, or wash water from concrete mixing operations (concrete washout), water from trench or pit dewatering, and other harmful materials into or near storm water conveyances, wetlands, rivers, streams, and impoundments or into natural or manmade channels leading thereto.

E. Do not apply pesticides when working in or adjacent to a floodway, river, stream, ditch, or other storm water conveyance.

F. Properly dispose of all waste materials.

3.05 Installation - General

A. Incorporate all permanent erosion control features into the project at the earliest practical time. Except where future construction operations will damage slopes, perform the permanent seeding, mulching and other slope protection Work in stages as soon as substantial areas of exposed slopes can be made available.

B. Use temporary erosion and pollution control measures to correct conditions that develop during construction, that are needed prior to installation of permanent control features, or that are needed temporarily to control erosion that develops during normal construction practices.

C. Schedule and perform clearing and grubbing operations so that grading operations and permanent erosion control features can follow immediately thereafter if the project conditions permit; otherwise, install temporary erosion control measures between successive construction stages.

D. Limit the area of clearing and grubbing, excavation, borrow, and embankment operations in progress, commensurate with progress in completing the finish grading, seeding, mulching and other such permanent control measures in accordance with the accepted schedule. Should seasonal limitations make such coordination unrealistic, install temporary erosion control measures.

E. In the event temporary erosion and pollution control measures are required due to the Contractor’s negligence, carelessness, or failure to install permanent controls

as a part of the Work as scheduled or as ordered by the Town, perform such Work at Contractor's expense.

F. Maintain all erosion and sediment control practices during the construction period.

G. Whenever construction equipment must cross waterways at frequent intervals, and such crossings will adversely affect water quality in the waterway, provide temporary structures. Coordinate with Town regarding and prior to constructing such crossings. Comply with any and all regulations and permits for waterway crossings.

3.06 Installation - Erosion and Sediment Control Measures

A. Temporary Construction Entrance

1. Construct temporary construction entrances where needed to prevent tracking of soil or mud onto publicly or privately owned paved surfaces. Note locations on construction drawings.
2. Place temporary construction entrances at locations where construction vehicles will repeatedly access a disturbed or unpaved area from a paved roadway.
3. The contractor is responsible for locating and placing construction entrances to prevent tracking and to avoid disturbance to existing waterways.
4. Should tracking of soil occur, clear accumulated sediment from public and private driveways on a daily basis at a minimum and more frequently as sediment is tracked onto roadways.
5. Redistribute or properly dispose of collected sediments in a manner that is in accordance with all applicable statutes and regulations.
6. Do not rinse tracked material with water unless water is collected and disposed of properly.

B. Silt Fence

1. Install silt fence to provide sediment control at the top of slopes, at the down-gradient project limits, as periodic filter breaks on down slopes, at project limits and other locations indicated.
2. Install silt fence across a utility route in accordance with the following:
   a. At locations where the utility route runs uphill or downhill, install silt fence perpendicular to the direction of runoff and parallel to contour lines.
   b. Install a silt fence segment at every 5 feet in elevation change along the utility route. Less frequent intervals will be allowed if the Contractor can demonstrate erosion can be prevented and disturbed soil can be stabilized by other erosion control means such as mulching.
   c. Turn the ends of each silt fence segment in the uphill direction to collect sediment.
   d. Install silt fence segments from edge of land disturbance to edge of land disturbance.
3. Install silt fence along the length of the utility route in accordance with the following:

a. At locations where the utility route runs along the slope, install silt fence at the edge of the land disturbance on the downhill side of the utility route.
b. Silt fence installed along the utility route shall be continuous until the land disturbance termination point or the direction of the slope begins to be uphill or downhill with the utility route.
c. Turn the ends of each silt fence segment in the uphill direction to collect sediment.

C. Fiber Filtration Tubes

1. Install in accordance with manufacturer's instructions.
2. Use fiber filtration tubes for the slowing and filtering of storm water
3. Use the appropriate tube size for the slope and the distance between tubes as specified by the manufacturer
4. The tubes shall allow water to flow freely and provide filtration of suspended particles.

D. Dust Control

1. Use water to dampen surfaces to minimize dust and prevent wind erosion.
2. Do not rinse surfaces with water unless water is collected and disposed of properly.
3. Implement dust control methods on a routine basis where conditions warrant.
4. Provide water and dust suppression when requested by the Town.

E. Pumping Bags

1. Provide pumping bags to filter sediment from dewatering operations.
2. Properly dispose of used pumping bags.
3. Appropriately size the bags for the amount of flow.
4. Use pumping bags on an erosion resistant surface.
5. Do not discharge sediment-laden water from dewatering operations into or near storm water conveyances, wetlands, rivers, streams, and impoundments or into natural or manmade channels leading thereto. Refer also to Section 02102 for the disposal of sediment-laden water.

F. Outlet Protection:

1. Construct outlet protection to prevent erosion, provide energy dissipation and retain sediment in areas of concentrated flow where storm water conveyances outfall.
2. Place at pipe and channel outfalls.

G. Inlet Protection

1. Install inlet protection at all storm water inlets within the construction area, or in areas that receive runoff from disturbed areas, to prevent sediments, construction debris, and other potential storm water pollutants from entering storm sewer inlets and catch basins.

2. For inlets within a road or driving lane, equip the inlet protection practice with an overflow or bypass so ponding water does not cause unsafe driving conditions.
3. Remove accumulated sediment and debris collected by inlet protection practices and dispose of properly after every rain event.
4. When cleaning or removing inlet protection, do not place sediment and debris in a ditch, stream, wetland, waterway or storm water conveyance.

H. Riprap Check Dam: Install riprap check dams as needed to reduce erosion potential and capture potential pollutants in drainage channels or areas of concentrated flow.

I. Concrete Washout Area: Refer to Section 02102 for Concrete Washout requirements.

J. Temporary Slope Drains: When necessary, route runoff away from steep slopes through the use of a temporary slope drain.

K. Temporary Sediment Trap: Construct a temporary sediment trap to retain sediment in a pooling area. Construct the temporary sediment trap of an embankment or excavated area and provide a stone outlet structure.

L. Grass

1. Restore all non-paved surfaces that were disturbed during construction with permanent seeding or sod.
2. Prior to seeding disturbed areas must be graded and receive a minimum of 6 inches of topsoil. Use excavated material which meets the specified requirements for topsoil, or if the quantity of suitable topsoil is not sufficient, use topsoil obtained from another source.
3. Scarify the planting area to a minimum depth of 6 inches. Mix soil amendments such as fertilizer and lime if required, in the top 2 to 4 inches of topsoil with a disk or rake operated across the slope.
4. Apply seed uniformly with a drill or cultipacker seeder, or by broadcasting. Cover seed with topsoil a minimum of 1/2 inch. Cover newly seeded areas with anchored mulch or erosion control blanket.
5. Keep seeded and fertilized areas adequately watered to a minimum of 1-inch depth per week until germination of all seed is completed, and uniform grass cover is accomplished.
6. Immediately prior to installing sod, water the planting area with a fine spray to a minimum penetration of 1 inch.
7. Do not place frozen sod, and do not place sod on frozen or dry soil. Do not place sod when the air temperature is less than 32 degrees Fahrenheit.
8. Lay sod with closely fitted abutting joints without stretching and overlapping and stagger the ends of the strips. Trim and fit sod into irregular areas to eliminate gaps.
9. On slope areas, lay sod starting from the bottom of the slope and lay sod horizontal to the contour. Where slopes are greater than a horizontal to vertical ratio of 3 to 1, staple or stake each sod strip at the corners and in the middle.

10. After initial watering, tamp or roll sod with a roller to eliminate irregularities. Repeat watering at regular intervals to keep sod moist until it is rooted and to maintain growth until final acceptance.

M. Mulch: Anchor mulch unless held in place by a tackifier or netting.

N. Erosion Control Blanket

1. Where construction disturbs slopes equal or steeper than 3 to 1 or within drainage channels, protect bare slopes with an erosion control blanket.
2. When vegetation is to be established, place erosion control blanket over the seed and anchor according to manufacturer's instructions to prevent the seed from washing away.
3. Place erosion control blankets on seedbeds free of sticks, rocks and other objects larger than 1 inch.

3.07 Soil Stockpiles

A. Manage soil stockpiles for wind erosion, storm water erosion and sediment control.

B. Temporarily or permanently stabilize stockpiled soil that is scheduled or likely to be left inactive with measures appropriate for the season in order to minimize erosion potential.

C. Position stockpiles away from any ditch, stream, wetland, or storm water conveyance.

D. Properly dispose of soil that will not be used for the project.

3.08 Trench Excavation

A. Pile material from trench excavations in an area away from any ditch, stream, wetland or storm water conveyance and install silt fence around the material for sediment control.

B. Install inlet protection within the project area when excavated material is placed on a paved surface.

C. Following pipe installation, backfill trenches and temporarily or permanently stabilized all bare areas to prevent soil erosion.

3.09 Directional Drilling or Horizontal Boring Erosion and Sediment Control

A. Install silt fence around all Work areas at bore and receiving pits to control sediments.

B. Pile materials from ditch excavation away from ditches, streams, wetlands or storm water conveyances.

C. Properly dispose of material that is not used to back fill pits.

D. Filter pit dewatering discharge in accordance with 02102 for the Disposal of Sediment-Laden Water.

E. Seed and mulch disturbed soil surfaces.

3.10 Working Near Water Wells

Water well aquifers are to be protected from construction activities and potential pollution sources.

A. Identify water wells on the Drawings.

B. Implement erosion and sediment control practices to reduce sedimentation introduction into groundwater.

C. Position construction materials and equipment so that the area slopes away from wells.

D. Provide secondary containment for all chemicals, fuels or other liquids to capture spills or leaks.

E. Clean up spills with absorbents or dry methods. Do not allow spills to soak into the ground and do not wash off with water or detergents.

F. Properly dispose of waste materials.

3.11 Field Quality Control

A. Inspections

1. Inspect all erosion and sediment control measures in accordance with the state issued permit.
2. Conduct a weekly inspection of the construction site to identify areas contributing to storm water discharges associated with construction activity.
3. Inspect on a regular basis: disturbed areas, material storage areas and equipment storage areas that are exposed to precipitation for evidence of, or the potential for, pollutants leaving the project site or entering a storm drainage conveyance.
4. Inspect storm water discharge locations to determine if control measures are effective in preventing adverse impacts to receiving waters.
5. Observe erosion and sediment control devices to ensure that they are operating properly.
6. Inspect haul routes and construction entrance(s) daily for evidence of off-site vehicle tracking of sediments.
7. Inspect staging area to ensure that solid and liquid wastes are being properly disposed of and are not allowed to be discharged into storm water runoff.

3.12 Maintenance

A. Maintain all erosion and sediment control measures and perform the following maintenance procedures throughout the project and until such time as the

disturbed area has been completely stabilized or other provisions have altered the need for these measures.

1. Replace mulch materials to their original level when the level has been substantially reduced due to decomposition of the organic mulches and displacement or disappearance of both the organic and inorganic mulches.
2. Remove rubbish and channel obstructions from bare and vegetated channels within the project limits. Repair damage from scour or bank failure, rodent holes, and breaching of diversion structures. Remove deposits of sediment.
3. Immediately repair excessive wear, movement or failure of erosion control blankets.
4. Repair any damage to silt fence barriers immediately and monitor barriers daily during prolonged rainfall.
5. Repair or replace any filter fabric which has decomposed or become ineffective prior to its expected usable life.
6. Remove sediment deposits after each storm event. Remove sediment when deposits reach approximately half the height of a silt fence barrier.
7. Till and smooth to conform to the existing grade and reseed any sediment deposits remaining in place after erosion and sediment control measures are no longer required and have been removed.
8. Maintain construction entrances in a condition to prevent tracking or flowing of sediment onto roads. This could require periodic top dressing of the construction entrance with additional surface materials as conditions demand. Repair and clean out any features used to trap sediment and remove all sediment spilled, dropped, washed, or tracked onto road surfaces and dispose of properly.
9. Remove accumulated sediments and debris from inlet protection devices after each storm event.
10. Periodically remove concrete and residual liquid from the concrete washout area, as needed to maintain available space for the future washout and rainwater. Dispose of in accordance with Section 02102.
11. Repair all rills that may appear. Re-grade to eliminate rill and stabilize ground by seeding or other approved methods.
12. Remove and dispose of all temporary erosion and sediment control practices within 30 days after site stabilization is achieved or after the temporary practices are no longer needed.
13. Stabilize the site and reapply seed and mulch to achieve 70 percent density of cover on vegetated areas.

3.13 Schedules

A. Coordinate erosion and sediment control measures with construction activities so controls are in place before construction begins.

1. Install the temporary construction entrance and sediment traps or filters before clearing and grading begins.
2. Install temporary perimeter controls (e.g. silt fences and inlet protection) before clearing and grading begins.
3. Do not clear, grub or grade until it is necessary for construction to proceed. Maintain natural vegetation and vegetated buffers when practical to reduce the

need for control devices. Maintain all controls as described throughout the construction project and until upstream drainage areas are stabilized.

4. Permanently stabilize bare soils once construction activities cease in an area.

PART 4 - FIGURES

4.01 Associated Standard Details

| Detail No. | Description |
|---|---|
| EC-01 | Fiber Filtration Tubes |
| EC-02 | Fiber Filtration Tube Ditch Check |
| EC-03 | Riprap Check Dam |
| EC-04 | Construction Entrance |
| EC-05 | Dam and Pump Method |
| EC-06 | Erosion Control Blanket |
| EC-07 | Inlet Protection Bag |
| EC-08 | Curb and Gutter Inlet Protection |
| EC-09 | Inlet Protection |
| EC-10 | Silt Fence Inlet Sediment Barrier |
| EC-11 | Temporary Siltation Sump |
| EC-12 | Pumping Bag |
| EC-13 | Temporary Sediment Trap in Flow Line |
| EC-14 | Silt Fence |
| EC-15 | Horizontal Directional Drilling |
| EC-16 | Horizontal Bored Crossing |
| EC-17 | Tree Protection |
| EC-18 | Tree Protection Zone |

END OF SECTION 02101

SECTION 02102 – MATERIAL HANDLING AND SPILL PREVENTION PLAN

PART 1 - GENERAL

1.01 Summary

A. Section Includes: a plan outlining procedures to:

1. Help protect the health and safety of those working at the project site as well as the environment
2. Prevent the contamination of storm water runoff by onsite pollutants
3. Help prevent fuel and chemical spills
4. Provide a response procedure should a spill occur

B. Related Sections

1. Section 02101 – Storm Water Pollution Prevention and Erosion Control
2. Section 02110 – Site Clearing

1.02 References

A. 327 IAC 2-6.1 – Spills; Reporting, Containment, and Response

B. 327 IAC 2-10 – Secondary Containment of Aboveground Storage Tanks Containing Hazardous Materials

C. AWWA C651 – Disinfecting Water Mains

1.03 Definitions

A. Minor Spill: Approximately 10 gallons or less of pollutant with no contamination of ground or surface waters. Minor spills can generally be controlled by the first responder with help from other site personnel.

B. Major or Hazardous Spill: More than 10 gallons with the potential for death, injury, or illness to humans or animals or has the potential for surface or groundwater pollution.

C. Pollutants generated onsite may include gasoline, diesel fuel, oils, grease, paints, pesticides, nutrients, concrete washout, soil, solvents, paper, plastic, Styrofoam, metals, glass, and other forms of liquid or solid wastes.

1.04 Quality Assurance

A. Regulatory Requirements

1. Ensure material handling and storage associated with construction activity complies with the spill prevention and spill response requirements in Indiana Administrative Code 327 IAC 2-6.1.

2. Ensure aboveground storage tanks containing hazardous materials are stored appropriately according to the requirements in Indiana Administrative Code 327 IAC 2-10.
3. Dispose of contaminated soils, absorbents and spill cleanup materials in accordance with all Federal, State, and local regulations.
4. Do not use water to flush spilled material unless authorized by a Federal, State, or local agency.
5. Additional regulation or requirements may be required. Consult a spill response professional to ensure all appropriate and required steps have been taken.
6. Do not remove contaminated material from the site until approval is given by Emergency Response (when emergency response is required).

## PART 2 - PRODUCTS

Not Used.

## PART 3 - EXECUTION

### 3.01 Preparedness

A. Prepare a contact list of First Responders and the chain of command in the event of a spill on the site. Include names, contact numbers and information on circumstances requiring the initiation of the contact list and chain of command.

B. Maintain a list of qualified contractors, vacuum trucks, tank pumpers, and other equipment and businesses qualified to perform cleanup operations.

C. Provide a list and quantity of absorbent materials and supplies the Contractor will make available onsite in sufficient quantities to address minor spills.

D. Train construction personnel, equipment operators, subcontractors and other employees on proper fueling procedures, prevention of spills, spill response procedures, and communication procedures.

### 3.02 Spill Response

A. Minor Spills

1. Contain the spill to prevent material from entering the waterways and the storm or groundwater systems. Immediately clean up the spill with absorbent materials.
2. Do not flush with water, bury or allow soaking into the ground.
3. Tarps can be used to cover spilled material during rain events on land.
4. Use absorbent material to cleanup spills on land.
   a. Contain spills on impervious surfaces with a dry absorbent.
   b. Contain spills on clayey soils by constructing an earthen dike and dispose of as soon as possible to prevent migration deeper into the soil and groundwater. Remove contaminated soils.

5. Use containment booms to prevent the migration of spills on water.
    a. Contain spills on water with a containment boom and absorb with an oil-only boom, mechanical skimmer or other similar device.
    b. Outside agencies will determine additional cleanup measures.
    c. Report oil spills that cause a sheen upon the waters.
6. Place contaminated absorbents and soils into a container for later disposal. Ensure the lid is closed and mark or label the container for identification purposes.
7. Contact 911 if the spill could be a safety issue.
8. Contact supervisors and designated inspectors immediately.
9. Dispose of waste appropriately.

B. Major or Hazardous Spills

1. Control or contain the spill without risking bodily harm.
2. Temporarily plug or cover storm drains if possible, to prevent migration of the spill into the storm water system.
3. Use containment booms to prevent the migration of spills on water.
    a. Contain spills on water with a containment boom and absorb with an oil-only boom, mechanical skimmer or other similar device.
    b. Outside agencies will determine additional cleanup measures.
    c. Report oil spills that cause a sheen upon the waters.
4. Immediately contact the local Fire Department at 911 to report any hazardous material spill.
5. Contact supervisors and designated inspectors immediately. Contact county or municipal officials responsible for storm water facilities. The Contractor is responsible for having these contact numbers available at the job site. Submit a written report to the Town as soon as possible.
6. Contact the Indiana Department of Environmental Management (IDEM), Office of Emergency Response as soon as possible, but within 2 hours of discovery at 1-888-233-7745. Note the following information for future reports to the IDEM or the National Response Center (1-800-424-8802):
    a. Name, address and phone number of person making the spill report
    b. The location of the spill
    c. The date and time of the spill
    d. Identification of the spilled substance
    e. Cause of the spill
    f. Approximate quantity of the substance that has been spilled or may be further spilled and the amount recovered
    g. The duration and source of the spill
    h. Name and location of the damaged waters
    i. Name of spill response organization
    j. Measures taken in the spill response
    k. Other pertinent information

3.03 Spill Prevention and Material Handling Practices

A. Vehicle and Equipment Fueling

1. Purpose: To prevent fuel spills and leaks and to reduce or eliminate contamination of storm water and waterways.
2. Implementation
   a. Use offsite commercial fueling stations when possible. Use onsite vehicle and equipment fueling only where it is impractical to send vehicles and equipment offsite to a commercial fueling station.
   b. When performing fueling onsite provide a designated fueling area.
   c. Do not “top-off” fuel tanks.
   d. Keep available absorbent spill cleanup materials and spill kits in fueling areas and on fueling trucks.
   e. Use drip pans or absorbent pads during vehicle and equipment fueling, unless the fueling is performed over an impermeable surface in a dedicated fueling area.
   f. Inspect vehicles and equipment daily for leaks. Repair leaks immediately or remove them from the project site.
   g. Protect dedicated fueling areas from storm water run-on and runoff and locate them at least 50 feet away from the downstream drainage facilities, storm water conveyances or waterways.
   h. Perform fueling on level-grade areas.
   i. Protect fueling areas with berms and dikes to contain spills.
   j. Equip nozzles used in vehicle and equipment fueling with an automatic shut off.
   k. Do not leave fueling operations unattended.
   l. Avoid mobile refueling of construction equipment; rather transport the equipment to the designated fueling area.
   m. Store all petroleum products in tightly sealed containers which are clearly labeled.
   n. Observe Federal, State, and local regulations for any stationary above ground storage tanks.

B. Vehicle Maintenance Areas

1. Purpose: To prevent spills during the normal maintenance of construction machinery.
2. Implementation:
   a. As feasible, perform maintenance offsite in a covered facility with an impervious floor.
   b. Use a dedicated site for machinery maintenance.
   c. Locate maintenance areas at least 50 feet from storm water inlets or water bodies.
   d. Maintain spill kits and absorbent materials in close proximity to maintenance areas. Utilize drip pans and absorbent pads to prevent oils or other maintenance fluids from reaching the soil surfaces.
   e. Inspect equipment daily for leaks or worn hoses. Repair or replace as needed to prevent onsite spills.
   f. Properly dispose of all spilled fluids and fluids removed from machinery.

C. Solid Waste Management

1. Purpose: To prevent or reduce the discharge of pollutants to waterways or storm water from construction waste by providing designated waste collection areas and containers, arranging for regular disposal, and training employees and subcontractors.
2. Suitable Applications: Suitable for construction sites where the following wastes are generated or stored:
   a. Solid waste generated from trees and shrubs removed during land clearing, demolition of existing structures (rubble), and building construction
   b. Packaging materials including wood, paper and plastic
   c. Scrap or surplus building materials including scrap metals, rubber, plastic, glass pieces, and masonry products
   d. Domestic wastes including food containers such as beverage cans, coffee cups, paper bags, plastic wrappers, and cigarettes
   e. Construction waste including brick, mortar, timber, steel and metal scraps, pipe and electrical cuttings, non-hazardous equipment parts, Styrofoam, plastic and other packaging for construction materials
   f. Sediments and other materials collected in erosion and sediment control measures (silt fence, inlet protection, catch basin sumps, etc.)
   g. Natural debris such as excess soil, stone, sand, leaves, branches, brush or wood
3. Implementation:
   a. Develop a plan for proper waste disposal including the disposal of excess soil and excavated material. If a commercial disposal facility will not be utilized for soil disposal, then develop a Storm Water Pollution Prevention Plan for the selected disposal area.
   b. Select designated waste collection areas onsite.
   c. Inform trash-hauling contractors that only watertight dumpsters are acceptable for onsite use.
   d. Inspect dumpsters for leaks, and repair dumpsters that are not watertight.
   e. Provide an adequate number of containers with lids or covers to prevent loss of wastes from wind and to prevent the collection of rainwater.
   f. Collect site trash daily or more frequent if needed during demolition Work. Do not allow containers to overflow. Clean up immediately if a container spills, leaks or overflows.
   g. Remove solid waste promptly from erosion and sediment control devices.
   h. Ensure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acid, pesticides, additives, curing compounds) are not disposed of in dumpsters designed for construction debris.
   i. Do not hose out dumpsters on the construction site. Ensure that dumpster cleaning is conducted by the trash hauling contractor off site.
   j. Make sure that construction waste is collected, removed, and disposed of only at authorized disposal areas. Do not locate solid waste storage areas in areas prone to flooding or ponding.
   k. Locate solid waste dumpsters a minimum of 50 feet away from waterways, storm water inlets or other drainage facilities.
   l. Minimize the potential for spills or leaks to drain immediately into a waterway or drainage facility.
   m. Do not bury construction waste onsite.

n. Cover construction material hauled from the site in dump trucks with a tarpaulin.
o. Inspect construction waste areas regularly.

D. Fluids, Paints, Solvents and Other Chemicals Storage and Use

1. Purpose: To prevent spills during the use and storage of the materials.
2. Implementation
   a. Store materials in manufacturer's containers.
   b. Maintain Material Safety Data Sheets (MSDS) or Safety Data Sheets (SDS) on all products.
   c. Store materials in a weatherproof/vandal resistant locker or building.
   d. Keep materials away from flammable sources.
   e. Follow manufacturer's instructions for the proper use and storage of all materials.
   f. Do not perform washout of solvent from paint supplies near or into a waterway or storm water inlet. Wash water is to be disposed of as wastewater.
   g. Tightly seal and store paint containers and curing compounds when not required for use.
   h. Do not discharge excess paint to a waterway or storm system. Properly dispose of excess paint according to the manufacturer's instructions and in accordance with all Federal, State, and local regulations.

E. Secondary Containment

1. Provide secondary containment for aboveground storage tanks or storage areas containing hazardous materials that are located outside.
2. Provide secondary containment consistent with good engineering standards.
3. Provide secondary containment that is compatible with the hazardous materials being stored.
4. Provide secondary containment that will prevent a release from entering waters for a 72-hour period.
5. Secondary containment must meet one of the following:
   a. Double-walled tank,
   b. Dikes, berms, retaining walls, trenches, or
   c. Diversionary system
6. Provide secondary containment with a capacity to contain at least 110% of the volume of the largest aboveground tank or the volume of the largest aboveground tank plus enough freeboard to contain precipitation generated by a 25 year/24-hour rain event.
7. Provide secondary containment with a minimum 120-gallon capacity for storage area holding only drums.
8. Maintain the secondary containment to protect the integrity and capacity of the area.
9. Remove collected liquid in the secondary containment area within 72 hours of its discovery to maintain the capacity. Remove ice as soon as weather permits. Liquid that collects within the secondary containment area must meet all applicable requirements of the Water Quality Standards if discharged to waters of the state.

F. Disposal of Sediment-Laden Water

1. Purpose: To prevent the purposeful discharge of sediment-laden water from the project site.
2. Implementation:
   a. Do not discharge sediment-laden water from pumping operations into or near storm water conveyances, wetlands, rivers, streams, waterways and impoundments or into natural or manmade channels leading thereto.
   b. Discharge sediment-laden water from dewatering of trenches, or other excavations by means of a pump or similar means into a manufactured pumping bag for filtering in accordance with the manufacturer's recommendations unless the pumped water is routed through another erosion control measure such as a sediment trap or outlets onto a well-established vegetated area without eroding.
   c. Pumping operations moving clean water through a site are not required to have a pumping bag or similar device at the outlet.
   d. Protect the point of discharge to prevent soil erosion.

G. Concrete Washout Area

1. Provide a designated concrete washout area for use of washing out concrete trucks in order to contain potential storm water pollutants. Use one of the following methods:
   a. Construct a minimum 10-foot by 10-foot by 3-foot deep area (or larger as required to contain liquid and solid waste from concrete washout operations) with a polyethylene lining. Construct and prepare the base of the system so that it is free of rocks and other debris that may cause tears or punctures in the polyethylene lining.
   b. Install and maintain a pre-fabricated containment system in accordance with the manufacturer's instructions.
   c. Use a polyethylene-lined roll-off dumpster when other methods are not practicable.
   d. Subcontract with a concrete supplier that collects all washout water and pumps it back into the mixer drum for proper disposal off-site. In this instance, a concrete washout area would not be required.
2. Install orange safety fencing around concrete washout area perimeter. Post signage directing contractors and suppliers to the designated concrete washout location.
3. Locate washout areas at least 50 feet from storm drains, open ditches, or water bodies.
4. Inspect system daily and after each storm event. Inspect the integrity of the overall structure including, where applicable, the containment system. Inspect the system for leaks, spills, and tracking of soil by equipment. Inspect the polyethylene liner for failure. The liner may need to be replaced after every cleaning if removal of material has damaged the liner. Repair the concrete washout structure, as needed, or construct a new system.
5. Allow concrete wastes to set. Break up and properly dispose of hardened wastes. Liquid that collects in the washout area could be high in alkalinity and could contain pollutants. Liquid must be disposed of as wastewater. Upon removal of waste, inspect the structure.

6. Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stockpile or dispose of in the trash.
7. Discuss the concrete management techniques (such as handling of concrete waste and washout) with the ready-mix concrete supplier before any deliveries are made.
8. Incorporate requirements for concrete waste management into material supplier and subcontractors' agreements. Inspect construction activities on a regular basis to ensure suppliers, contractors, and others are utilizing designated washout areas. If concrete waste is being disposed of improperly, identify the violators and take appropriate action.
9. Perform washout of concrete trucks offsite or in designated areas only. Never dispose of washout from concrete trucks in a ditch, stream, wetland, waterway, or storm water conveyance.
10. Do not dump excess concrete onsite, except in designated areas.
11. When concrete washout systems are no longer required, close the concrete washout systems. Dispose of all hardened concrete and other materials used to construct the system. Backfill, grade, and stabilize any holes, depressions, and other land disturbances associated with the system.

H. Fertilizers

1. Apply fertilizers only in the minimum amounts recommended by the manufacturer.
2. Work fertilizers into the soil to limit exposure to storm water.
3. Store fertilizers in a covered area and transfer partially used bags to a sealable container to avoid spills.

I. Chlorinated Water

1. Neutralize and dispose of heavily chlorinated water following completion of the disinfection and testing of water lines in accordance with AWWA C651, Appendix C.

## PART 4 - FIGURES

Not Used.

END OF SECTION 02102

# SECTION 02110 - SITE CLEARING

## PART 1 - GENERAL

### 1.01 Summary

A. Section Includes: Furnishing all labor, tools, equipment and materials necessary to complete clearing and grubbing, removal of trees, stumps, and fences as applicable, and disposal of removed items and debris as described herein.

B. Related Sections

1. Section 02101 - Storm Water Pollution Prevention and Erosion Control
2. Section 02200 - Earthwork
3. Section 02220 - Trenching, Backfilling and Compaction for Utilities

## PART 2 - PRODUCTS

### 2.01 Topsoil

A. Topsoil shall be reasonably free from subsoil, debris, and stones larger than 1 inch in diameter.

B. Refer to Section 02200 for additional topsoil requirements.

## PART 3 - EXECUTION

### 3.01 Clearing

A. Remove trees, bushes, and fences only where they interfere with the new construction. Dispose of materials and debris at a location secured by the Contractor and in accordance with all applicable laws.

### 3.02 Grubbing

A. Remove any stumps, roots larger than 1-1/2 inches in diameter, vegetation, boulders, and other objectionable material within the limits of the construction area.

B. Remove tree stumps and roots to the following depth:

1. Within paved area: 24 inches below subgrade
2. Within building and structure areas: 36 inches below subgrade
3. Within lawn areas: 24 inches below subgrade

C. Scrape clean all areas to be stripped of topsoil. Remove all brush, weeds, grass, roots and other materials that will interfere with lawn maintenance.

D. Strip the construction area of all topsoil to its entire depth. Do not use topsoil for subgrade fill. Stockpile topsoil for use in finish grading operations in approved areas and protect from erosion.

E. Dispose of all rubbish and debris resulting from clearing and grubbing operations off the property and in accordance with all applicable laws. Do not burn any rubbish and debris onsite.

3.03 Trimming

A. Remove interfering branches without injury to tree trunks. Do not paint or cover wounds to the tree or pruned branches.

3.04 Protection

A. Protect existing trees and shrubbery in the construction area that are to remain. Remove and replace in kind all trees and shrubbery in the construction area that are to remain but that are damaged or killed during construction.

B. Tree Protection During Excavation - Adhere to the following procedure when installing underground electric, water, sewer lines and structures near trees.

1. When possible, avoid trenching inside the dripline of a tree.
2. Cut roots cleanly. Do not paint cut roots.
3. Backfill the trench as soon as possible. Do not leave the roots exposed to air.
4. Clean up around trees immediately after construction.

C. Protect existing utilities that are to remain.

PART 4 - FIGURES

Not Used.

END OF SECTION 02110

SECTION 02200 – EARTHWORK

PART 1 - GENERAL

1.01 Summary

A. Section includes:

1. Stripping, storage and redistribution of topsoil, cut and fill operations, and rough and finish grading
2. Excavation, backfilling, compaction, hauling, and disposal of materials
3. Dewatering operations

B. Related Sections

1. Section 02101 – Stormwater Pollution Prevention and Erosion Control
2. Section 02110 – Site Clearing
3. Section 02220 – Trenching Backfilling & Compaction for Utilities

1.02 References

A. ASTM D1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort

B. Indiana Department of Transportation (INDOT) Standard Specifications, latest edition

C. ASTM D2487 – Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)

1.03 Definitions

A. Pavement/Structure Loading Zone: The area within 5 feet of any edge of pavement, curb, gutter, sidewalk, building, structure, vault, tank, pad or other load bearing feature.

B. Structural Pad: The area within an imaginary line that extends downward from the outside edge of a footing, foundation, mat or other load-bearing feature at a 1H:2V slope.

C. Structural Fill: Material placed beneath foundations and structures and used to fill an excavation around the vertical sides of structures, and directly over structures.

D. Plastic Clay: Soil type CH with a Liquid Limit above 50.

E. Common Excavation: All excavation not classified as rock excavation or excavation that is otherwise classified.

F. Rock Excavation

1. Igneous, metamorphic, and sedimentary rock which cannot be excavated without blasting or the use of a modern power shovel of no less than one cubic yard capacity, properly used, having adequate power and in good running condition, or the use of other equivalent power equipment.
2. Boulders or detached stones each having a volume of one half (1/2) cubic yard or more.

G. Unclassified Excavation: Excavation of all materials of whatever character encountered in the work.

H. Borrow: Approved material required for the construction of embankments or other portions of the work, and obtained from offsite.

I. Unsuitable Material: Include frozen soil, relatively soft material, relatively wet material, deleterious material, plastic clays, or soils that exhibit a high organic content.

1.04 Submittals

A. Design Data (if applicable): Velocity and scour calculations for drainage swales and ditch lining

B. Test Results

1. Structural fill material testing and classification results, including: material source, natural and optimum moisture content, sieve analysis, maximum dry density, classification.
2. Test report on borrow material soil classification (if applicable)
3. Field compaction test results
4. Subgrade evaluations

1.05 Quality Assurance

A. Qualifications

1. Provide the services of a qualified testing laboratory to perform all laboratory tests and evaluations.
2. Provide the services of a qualified testing agency experienced in geotechnical engineering and field determinations of soil suitability for the evaluation of foundations, pavements, and structures subgrade soils and conditions.

1.06 Job Conditions

A. Maintain benchmarks, monuments, and other reference points, and replace any that are disturbed or destroyed.

1.07 Warranty

A. Refill and restore to the original grade settlement in the backfill which takes place within eighteen (18) months. Restore the surface area where settlement has occurred, including, but not limited to seeding; fertilizing; erosion control; and restoration of streets, drives, yards, and sidewalks.

B. Guarantee survival of all disturbed and replaced trees and shrubs during the warranty period.

PART 2 - PRODUCTS

2.01 Materials

A. Regular Backfill

1. Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487-06, or a combination of these groups; free of rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

B. Structural Fill

1. Clean, well-graded, coarse-grained granular material free of organic material, debris, deleterious materials, or frozen soils.
   a. Coarse-Grained Granular Material
      1) Less than 5%, by weight, passing a No. 200 sieve.
      2) 100% passing a 1" sieve.
      3) Coarse sands and gravel-sand mixtures, including variously graded sands and gravels. Soil types GW, GP, SW and SP are included in this class.
2. Lean Concrete
   a. Seven-Day Compressive Strength: 700 psi min
   b. Material meeting Section 03300.

C. Topsoil

1. Natural, fertile, agricultural soil, capable of sustaining vigorous plant and lawn growth.
2. Uniform composition throughout, without admixture of subsoil.
3. Free of stones, lumps, clods, and sticks larger than 1-inch; live plants and their roots, sticks, and other extraneous matter.

PART 3 - EXECUTION

3.01 Preparation

A. Clear areas as specified in Section 02110.

B. Remove all topsoil at construction areas. Stockpile topsoil for use in finish grading operation. Do not use topsoil for fill.

C. Before borrow or disposal operations begin, provide the Townplans for the control of water including measures to keep sediment from entering streams.

3.02 Excavation

A. Keep open excavations free of water and manage groundwater so as to not impact the work.

1. Prior to beginning excavations, provide dewatering equipment suitable for the groundwater conditions encountered.
2. Use diversion ditches, dikes, or other suitable means to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation.
3. Provide and maintain adequate pumping and other dewatering equipment to remove and dispose of surface and ground water entering excavations.
4. Filter the water from dewatering operations to remove sediment before discharge.

B. Protect open excavations by roping areas off, or with barricades or railings, to prevent injury to personnel. Comply with all applicable Occupational Safety and Health Administration (OSHA) regulations.

C. Excavate true to line and grade, and elevation at bottom of the excavation. Excavate to undisturbed structurally stable subsoil. No additional payments will be made for unauthorized excess excavation.

D. Excavate to the dimensions indicated for new construction plus sufficient space as applicable to permit erection of forms, shoring, masonry, foundations, structure installations, and excavation inspections.

E. Excavate below structures, slabs and pavement to permit placement of subbase material.

F. Provide shoring or piling as required to protect excavation bank.

G. Boulders, if encountered, must be disposed of outside of the construction area.

3.03 Contaminated Soils and Groundwater

A. If suspected contaminated soils or groundwater are discovered during excavation, inform the Town immediately and cease excavation.

B. Contact the corresponding regulatory agency based on the excavation location.

1. If the excavation is within the INDOT right-of way, contact INDOT Environmental Services Division (317-232-5113) and report the suspected contamination to the IDEM Emergency Response hotline (888-233-7745).

Follow INDOT Site Assessment Guidelines for proper investigation and handling of the suspected contaminated soils or groundwater.

2. If the excavation is outside of the INDOT right-of-way, the Town will report the suspected contamination to IDEM Emergency Response. IDEM may direct the Town to additional regulatory agencies depending on the nature of the suspected contamination.

C. Keep suspected contaminated soils separate from soils that appear to be "clean" or uncontaminated.

1. DO NOT place suspected contaminated soils, in environmentally sensitive areas such as waterways, floodways, wetlands, karst features, or stormwater conveyances.
2. Place suspected contaminated soil on a plastic tarp and cover with an additional plastic tarp or place in containers (e.g. drums) with a lid.
3. Place a berm around the covered stockpile to ensure that soils are not blown by wind or carried by stormwater.
4. Follow the direction of the regulatory agency in handling, storage, characterization, and disposal of contaminated soils.

D. Leave suspected contaminated groundwater in the excavated area.

1. If the suspected contaminated groundwater must be removed from the excavated area, pump to covered containers (e.g. drums or totes) for proper disposal.
2. Follow all federal, state and local disposal requirements for suspected contaminated groundwater.
   a. Discharging contaminated groundwater to a waterway or stormwater conveyance requires an emergency NPDES permit from IDEM's Office of Water Quality. The contaminated groundwater must meet the NPDES drinking water quality standards. Contaminated groundwater may not be discharged until the permit is obtained (typically 90 days).
   b. Discharging contaminated groundwater to the sanitary sewer requires local approval and analytical tests per the local sewer use ordinance or wastewater discharge requirements.

E. Any increase or decrease of cost resulting from encountering contaminated soils or groundwater will be adjusted in the manner provided in the General Conditions.

## 3.04 Subgrade Evaluation

A. Prepare all areas that will support foundations, floors, pavements, or newly placed structural fill prior to subgrade evaluation. Remove all loose surficial soil, topsoil, and other unsuitable materials at least 5 feet beyond the limits of the proposed pavement and structures when feasible.

B. Once excavations have reached the required elevations and dimensions, notify the Contractor's testing agency so the subgrade can be evaluated. Do not place fill

material until the subgrade and construction has been inspected and approved by the Contractor's testing agency.

C. Foundation subgrade evaluation

1. The Contractor's testing agency will test the exposed subgrade to confirm that a bearing surface of adequate strength has been reached.
2. Further excavate localized soft soil zones encountered at the bearing elevation until adequate support soils are encountered, or the minimum undercut depths are achieved, whichever is greater.
3. Replace the undercuts with compacted structural fill.
4. For each type of soil on which footings will be placed, conduct at least one bearing test for every 500 square feet of structure foundation, but in no case less than three tests, to verify required design bearing capacities.

D. Paved and slab area subgrade evaluation

1. Under observation of the Town and Contractor's testing agency, proof-roll the subgrade in the location of the new pavement and structures.
2. Proof rolling shall consist of repeated passes of a loaded pneumatic-tired vehicle such as a tandem-axle dump truck or scraper.
3. Any areas found to rut, pump, or deflect excessively must be compacted in place or undercut and replaced with compacted structural fill, as directed by the Town.

E. Minimum undercut depths to be provided if unsuitable soils, plastic clays, or other unsuitable subgrade conditions are encountered shall be as follows:

1. Subgrade under foundation: minimum 24" undercut
2. Subgrade under slabs: minimum 18" undercut
3. Subgrade under paved areas: minimum 12" undercut

3.05 Filling and Backfilling

A. General

1. Once the subgrade has been approved by the Contractor's testing agency and the Town, fill and/or backfill the excavations to the required grades.
2. Suspend earthwork operations when satisfactory results cannot be obtained because of rain, freezing weather, or other unsatisfactory conditions in the field.
3. Material shall be of the proper moisture content before compaction. Do not perform filling or backfill if the material is too wet to permit proper compaction.
4. Place layers in the deepest portion of the fill first. As placement progresses, construct layers approximately parallel to the finished grade line.
5. Place layers in successive horizontal layers for the full width of the section and at the loose lift thickness specified.

B. The Contractor is responsible for the stability of the fill above the top of footings. Do not backfill until walls are braced or shored and the Town has approved the

backfilling operation. If fill is to be provided on both sides of walls, fill on both sides at same time.

C. Install vapor barrier on drainage fill prior to installing slab-on-grade floor slabs. Place drainage fill under floor slabs, slabs on grade, walks, and paving to indicated depths but not less than four (4) inches in depth.

3.06 Compaction

A. General

1. Compact fill using equipment capable of compacting each lift its full depth. Maintain moisture at optimum content during compaction operations.
2. Provide compacting equipment of the design, weight, and quantity to obtain the required soil compaction. Under no circumstances will a bulldozer or similar tracked vehicle be used as compacting equipment.
3. Use water distribution equipment with suitable sprinkling devices to add moisture to the soil, if required.
4. Compact areas inaccessible to a roller by mechanical tampers. Operate the equipment in such a manner that hardpan, cemented gravel, clay, or other chunky soil material are broken up into small particles and become incorporated with the material in the layer.
5. Compaction by flooding is not acceptable.
6. If a fill area excavation extends beyond the limits of that fill area definition, continue with the same fill material and compaction across the entire excavation unless approved by Town.

B. Degree of Compaction

1. Compact to the limits specified below and in accordance with ASTM D1557.
2. Fill areas beneath footings, foundations, and mats (within the Structural Pad):
   a. From bottom of fill to within 12" of top of fill: Place Structural Fill in 8" maximum loose lifts and compact each layer to 100% of maximum dry density (ASTM D1557).
   b. Final 12" of fill: Place Structural Fill in 6” maximum loose lifts and compact each lift to 100% of maximum dry density (ASTM D1557).
3. Fill areas beneath floor slabs, adjacent to and within 5' of foundations, and over foundation (outside the Structural Pad but within the Structure Loading Zone):
   a. From bottom of fill to within 12" of top of fill: Place Structural Fill in 8" maximum loose lifts and compact to not less than 95% of maximum dry density (ASTM D1557).
   b. Final 12" of fill: Place Structural Fill in 6" maximum loose lifts and compact each lift to 100% of maximum dry density (ASTM D1557).
4. Fill areas adjacent to walls:
   a. Place Structural Fill in 8" maximum loose lifts and compact to 90% of maximum dry density (ASTM D1557) for fills not required to support structural loads above and compact to 95% maximum dry density (ASTM D1557) for fills required to support structural loads above.
5. Fill areas within the Pavement Loading Zone:

a. From bottom of fill to within 12” of top of fill: Place structural fill in 8” maximum loose lifts and compact each layer to 95% of maximum dry density (ASTM D1557).
b. Final 12” of fill: Place structural fill in 6” maximum loose lifts and compact each lift to 100% of maximum dry density (ASTM D1557).

6. For all other fill areas: Place regular backfill in 8" maximum loose lifts and compact each layer to 90% of maximum dry density (ASTM D1557).

C. Field Density Testing

1. Perform one field density test for every 500 square feet of fill on each lift, but in no case less than three tests, to ensure that adequate compaction is being achieved.

3.07 Proof Rolling of Fills

A. Perform proof rolling operations using a pneumatic tire roller conforming to the requirements of INDOT Specification 203.26.

B. Perform a minimum of two complete coverages.

C. Correct all roller marks, irregularities, and failures.

D. After completion of filling and compaction operation, proof roll area with smooth wheel vehicle to leave a smooth surface sealed to shed all water.

3.08 Grading

A. Furnish, operate, and maintain equipment necessary to control uniform layers, section, and smoothness of grade for maximum compaction and drainage.

B. Rough Grading

1. Evenly grade to an elevation 6 inches below the finish grade elevations indicated.
2. Protect all constructed items during grading operations, and repair if damaged.
3. All areas in the project, including excavated and filled sections and adjacent transition areas, shall be reasonably smooth, compacted, and free from irregular surface changes.
4. Provide a finish grade ordinarily obtainable from either blade-grader or scraper operations, unless otherwise specified.
5. The finished subgrade surface generally shall be not more than 0.3 feet above or below the established grade or approved cross-section, with due allowance for topsoil and seeding or sod as applicable.
6. The tolerance for areas within 10 feet of buildings shall not exceed 0.15 feet above or below the established sub-grade.
7. All ditches, swales and gutters as applicable shall be finished to drain readily.
8. Evenly slope the subgrade to provide drainage away from the building walls in all directions at a grade not less than ½-inch per foot.

9. Provide grade rounding at top and bottom of banks and at other breaks in grade.

C. Protection

1. Protect newly graded areas from the action of the elements.
2. Repair settlement or washing that occurs prior to acceptance of the work, and reestablish grades to the required elevations and slopes.
3. Fill to required subgrade levels any areas where settlement occurs.

D. Finish Grading

1. Proceed to finish elevations with a tolerance of plus or minus .04 ft. (1/2 inch).
2. Rake subsoil clean of stones and debris. Scarify to a depth of 3 inches.
3. Spread stockpiled topsoil over prepared subgrade to a minimum depth of six (6) inches, and roll until suitable for seeding or placement of sod as applicable.
4. Maintain surfaces and replace additional topsoil necessary to repair erosion.

E. Complete final restoration operations including grading, seeding, and/or other necessary treatments to blend the area into the surrounding landscape. Assure restored areas within 150 feet of the nearest right-of-way line are well drained.

F. No additional payments will be made for restoration of borrow areas. Drainage, location, or use of the pit, shall comply with existing laws, regulations, and ordinances. Under no conditions shall borrow sites detract from the appearance of the natural topographical features or increase any potential hazard.

PART 4 - FIGURES

4.01 Associated Standard Details

| Detail No. | Description |
|---|---|
| EW-01 | Side Yard Swale |
| EW-02 | Turf Armored Ditch |
| EW-03 | Hard Armored Ditch |
| EW-04 | Detention/Retention Ponds |

END OF SECTION 02200

# SECTION 02220 - TRENCHING, BACKFILLING AND COMPACTION FOR UTILITIES

## PART 1 - GENERAL

### 1.01 Summary

A. Section Includes: Performing surface preparation and excavation work as required for the installation of utilities and appurtenances including excavation, trenching, bedding, backfilling and other related work.

B. Related Sections

1. Section 02101 - Storm Water Pollution Prevention and Erosion Control
2. Section 02720 - Storm Sewer Systems

### 1.02 References

A. American Society for Testing and Materials (ASTM), latest editions

1. ASTM C403 - Standard Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance
2. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort
3. ASTM D6024 - Standard Test Method for Ball Drop on Controlled Low Strength Material (CLSM) to Determine Suitability for Load Application
4. ASTM D6103 - Standard Test Method for Flow Consistency of Controlled Low Strength Material (CLSM)

B. Indiana Department of Transportation (INDOT) Standard Specifications, latest edition

1. Section 213 – Flowable Backfill
2. Section 904 – Aggregates

C. Occupational Safety & Health Administration (OSHA) Regulations (Standards – 29 CFR), latest editions

1. Part 1926 – Safety and Health Regulations for Construction (excavations >20 feet deep)

### 1.03 Definitions

A. Bedding – Granular material placed beneath the pipe to establish line and grade and to provide pipe support.

B. Final (Trench) Backfill – Granular or other specified material placed from the top of the Initial Backfill to the top of the trench, or to just beneath the surface that is to be restored.

C. Granular Backfill – Class I material as described in 2.01 A.

D. Haunching – Granular or other specified material placed from the top of the bedding to the springline (center) of the pipe, installed uniformly in lifts on each side of the pipe, and shoveled under the sides of the pipe to provide resistance against soil and traffic loading.

E. Initial Backfill – Granular or other specified material placed from the springline of the pipe to the specified height above the crown of the pipe, to provide adequate pipe support and to protect the pipe from damage due to compaction of the final backfill.

F. Pavement/Structure Loading Zone - the area within 5 feet of any edge of pavement, curb, gutter, sidewalk, building, or other structure.

1.04 Submittals

A. Product Data

1. Class I material source and gradation
2. Flowable Fill Mix Design
    a. Provide mix design which includes:
        1) List of all ingredients
        2) Source of the materials
        3) Gradation of aggregates
        4) Names of admixtures and dosage rates
        5) Batch weights
        6) Mix design designation number
    b. If requested, provide a trial batch demonstration.
    c. Provide test data from a laboratory inspected by the Cement and Concrete Reference Laboratory that shows the proposed mix design is in accordance with the requirements listed in this specification.

B. Quality Control Submittals

1. Backfill Compaction Test Results
2. Flowable Fill Test Results
    a. Unconfined Compressive Strength
    b. Flow Consistency
    c. Setting and Early Strength
3. Delivery Tickets

1.05 Quality Assurance

A. Qualifications

1. Provide the services of a qualified, independent testing laboratory to perform all field tests.

1.06 Warranty

A. Refill and restore to the original grade settlement in the backfill which takes place within the 1-year warranty period at no additional cost to the Town. Restore the surface area where settlement has occurred, including, but not limited to seeding, fertilizing, erosion control and restoration of streets, drives, yards, and sidewalks.

B. Guarantee all disturbed and replaced trees and shrubs for a period of 1 year from date of substantial completion of project.

PART 2 - PRODUCTS

2.01 Bedding and Backfill Material Classifications

A. Class I: Angular, 6 to 40 millimeters (1/4 to 1-1/2 inches) graded stone such as crushed stone. No. 8 gravel possessing a minimum 50 percent mechanical crush count, and meeting the following nominal sizes and percents passing will be considered an equivalent Class I material:

1. 100 percent passing 1-inch sieve
2. 75-95 percent passing 3/4-inch sieve
3. 40-70 percent passing 1/2-inch sieve
4. 0-15 percent passing No. 4 sieve

B. Excavated Material: Excavated material suitable for use as trench backfill must be clean and free of rocks and frozen soil lumps larger than 6 inches, wood, debris, or other extraneous material.

C. Flowable Fill: Removable, self-leveling, self-compacting, flowable material with a minimum unconfined compressive strength (28 day) of 50 psi and a maximum unconfined compressive strength of 150 psi. Provide Removable Flowable Backfill material which meets the requirements of INDOT Standard Specifications Section 213 and Section 904 classification for Type 4 Structure Backfill.

2.02 Sheeting and Bracing

A. Provide sheeting, shoring and bracing capable of sustaining the lateral forces of the trench and pit banks and that comply with all applicable OSHA requirements. Protective systems for excavations 20 feet deep or greater must be designed and certified by a registered Professional Engineer.

PART 3 - EXECUTION

3.01 Preparation

A. Planning

1. Maintain traffic flow at all streets and service drives during construction.

2. Do not cut farm fences when gates are available within a reasonable distance to move equipment from one field to another.
3. Comply with the terms and limits of easements. Obtain property access permission prior to accessing or traversing yards or fields outside easements.

B. Protection

1. Before any excavation is started, provide adequate protection for all lawns, trees, landscape work, shrubs, fences, hydrants, sidewalks, utility poles, and other objects that are to remain in place.
2. Maintain such protection for as long as necessary to prevent damage from operations.
3. Movable items such as mailboxes and roadway signs may be temporarily relocated during construction. Reinstall movable items in their original location immediately after backfilling and compacting is complete. Replace movable items damaged during construction with new items at the Contractor's expense.
4. Verify the location of existing storm sewers, sanitary sewers, water mains, gas mains, electric ducts, telephone ducts, utility services, and other underground structures. Determine the exact location of and the means of protection for these facilities and structures. Protect, support and maintain operation of these facilities during construction.

C. Site Preparation

1. Complete site clearing and grubbing.
2. Remove existing pavement and walks from the areas of excavation.
3. Strip topsoil and vegetation from the areas of excavation.
   a. Clean topsoil may be stockpiled for reuse.
   b. Do not mix grass, weeds, roots, brush, and stones larger than 1-inch in diameter with stockpiled topsoil. Dispose of root contaminated topsoil.

3.02 Excavating

A. Excavate carefully and cautiously to avoid damaging existing underground utilities and structures.

1. Repair, or have repaired, existing utilities and structures broken or otherwise damaged during Construction.
2. Immediately bring to the attention of the Town any unforeseen conflicts with existing utilities exposed during excavation and preparation of trenches and pits.

B. Store excavated materials suitable and necessary for backfilling in a neat pile adjacent to the excavation in a manner that will not interfere with traffic. Do not place such materials at heights or within the proximity of excavations where they may cause earth slides or cave-ins. Do not stockpile excavated material closer than 2 feet from the top edge of the excavation wall at ground surface.

C. Remove excavated material not suitable for backfilling and excess suitable material from the job site. Dispose of the materials in accordance with all local, state, and federal regulations.

D. Provide and maintain adequate dewatering equipment to remove and dispose of surface and ground water entering excavations. Use appropriate measures to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation. Filter water from dewatering operations to remove sediment before discharge in accordance with Section 02101.

3.03 Contaminated Soils and Groundwater

A. If suspected contaminated soils or groundwater are discovered during excavation, inform the Town immediately and cease excavation.

B. Contact the corresponding regulatory agency based on the excavation location.

1. If the excavation is within the INDOT right-of way, contact INDOT Environmental Services Division (317-232-5113) and report the suspected contamination to the IDEM Emergency Response hotline (888-233-7745). Follow INDOT Site Assessment Guidelines for proper investigation and handling of the suspected contaminated soils or groundwater.
2. If the excavation is outside of the INDOT right-of-way, the Town must report the suspected contamination to IDEM Emergency Response. IDEM may direct the Town to additional regulatory agencies depending on the nature of the suspected contamination.

C. Keep suspected contaminated soils separate from soils that appear to be “clean” or uncontaminated.

1. DO NOT place suspected contaminated soils, in environmentally sensitive areas such as waterways, floodways, wetlands, karst features, or stormwater conveyances.
2. Place suspected contaminated soil on a plastic tarp and cover with an additional plastic tarp or place in containers (e.g. drums) with a lid.
3. Place a berm around the covered stockpile to ensure that soils are not blown by wind or carried by stormwater.
4. Follow the direction of the regulatory agency in handling, storage, characterization, and disposal of contaminated soils.

D. Leave suspected contaminated groundwater in the excavated area.

1. If the suspected contaminated groundwater must be removed from the excavated area, pump to covered containers (e.g. drums or totes) for proper disposal.
2. Follow all federal, state and local disposal requirements for suspected contaminated groundwater.
   a. Discharging contaminated groundwater to a waterway or stormwater conveyance requires an emergency NPDES permit from IDEM’s Office of

Water Quality. The contaminated groundwater must meet the NPDES drinking water quality standards. Contaminated groundwater may not be discharged until the permit is obtained (typically 90 days).

b. Discharging contaminated groundwater to the sanitary sewer requires local approval and analytical tests per the local sewer use ordinance or wastewater discharge requirements.

3.04 Sheeting and Bracing

A. Properly shore, sheet, brace, or cut back at the proper slope, all excavations to safely install utilities and to protect adjacent streets and structures.

B. The Contractor is responsible and accountable for all sheeting and bracing used and for damages to persons or property resulting from the improper quality, strength, placement, maintenance and removal of the sheeting, shoring, and bracing, including damage to trees, shrubs, walkways and other property.

3.05 Trenching

A. Excavate trenches to the depths and widths shown or as required for the proper installation of the pipe and appurtenances.

B. Excavate trenches for concrete box sections only as wide as is necessary to facilitate proper compaction of backfill material, provided the adjacent embankment material is structurally adequate to provide the necessary side support. Verification of sufficient bearing strength of underlying soil foundation material, based upon manufacturer's recommendations, shall be required for all reinforced concrete box section installations.

C. Excavate trenches in straight lines. Keep sides of trenches as near vertical as possible and properly sheet and/or brace, if required.

D. Provide a continuous, uniform bearing support for the pipe on bedding within the trench, dished to provide circumferential support to the lower third of each pipe. Dig out holes to receive pipe bells.

E. Remove rock and soft material encountered in the trench which, in the opinion of the Town is incapable of providing adequate bearing to support the pipe. Remove material to accommodate the minimum specified bedding depth below the required elevation and fill with Class I material as specified.

F. Do not open more than 50 feet of trench in advance of the installed pipe, unless otherwise directed or permitted by the Town.

G. Support all sewer, gas, water or other pipes or conduits crossing the trench to prevent damage and service interruptions. The manner of supporting such pipes or conduits will be subject to the approval of the Town or the inspector of the Utility involved.

H. Provide adequate sheeting and bracing in trenches and pits to protect life, property and the Work. Renew and maintain sheeting, planking, timbering, shoring, bracing, and bridging, and do not remove until sufficient backfill has been placed to protect the pipe.

I. Where rock is encountered in excavations, remove the rock by mechanical means. Use a rock trencher which produces excavated material commensurate to granular backfill, which can then be used as bedding for pipe in areas of rock excavation. Blasting is not permitted.

3.06 Trench Backfill

A. Specifications regarding trench backfilling also apply to excavated pits.

B. Do not backfill trenches until all piping and utilities in public rights-of-way have been inspected by the Town.

C. Backfill all trenches within State Highway right-of-way in accordance with INDOT Specifications. Backfill all trenches within the right-of-way of other public authorities having jurisdiction in accordance with requirements of the public authority.

D. For any trench that intersects any portion of the pavement loading zone use Class I backfill materials.

E. Comply with construction details for the placement of bedding and backfill materials for each pipe material.

F. Placement and Compaction Requirements:

1. Place Bedding, Haunching, and Initial Backfill materials in 6 to 8-inch balanced lifts to ensure proper compaction and filling of all voids.
2. Use procedures and equipment for the Standard Proctor compaction test in accordance with ASTM D698/AASHTO T99.
3. Outside the pavement/structure loading zone:
    a. Place final backfill in maximum 12-inch lifts.
    b. Compact each layer to a minimum of 90 percent of the maximum Standard Proctor dry density.
    c. Additional compaction if required to minimize settling. Limited mounding of backfill above finish grade may be performed to compensate for settlement with the approval of the Town.
    d. Place 6 inches of topsoil over areas to be seeded.
4. Within the pavement/structure loading zone:
    a. Place final backfill in 6 to 8-inch lifts, except place final 12 inches in 6-inch lifts.
    b. Compact each layer to 95 percent of the maximum Standard Proctor dry density, except the final 12 inches under pavement, compact each 6-inch lift to 100 percent of the maximum Standard Proctor dry density.
    c. Prepare upper portion of trench for pavement replacement as applicable.

5. Stone and unpaved driveways and alleys:
   a. Place final backfill in 6 to 8-inch lifts.
   b. Compact each layer to 95 percent of the maximum Standard Proctor dry density.
   c. Replace the last 12 inches of surface with the same material as the original surface unless otherwise specified and compact to 100 percent of the maximum Standard Proctor dry density.

G. Compaction Procedures

1. Place trench backfill in balanced lifts to ensure proper compaction and filling of all voids.
2. Class I material: Shovel slice or otherwise carefully place; walk or hand tamp into place.
3. Do not flood or puddle with water to consolidate backfill.
4. When compaction test results are unsatisfactory, re-excavate, re-compact the backfill and retest until the specified compaction is obtained.

H. Flowable Fill

1. Discharge the mixture from mixing equipment into the space to be filled. Do not float pipe when placing flowable fill. Bring the flowable fill up uniformly to the fill line. Keep each filling stage continuous.
2. Protect flowable fill from freezing until the material has stiffened and bleeding water has subsided. As the temperature nears freezing, additional curing time may be needed.
3. Concrete may be placed on the flowable fill as soon as bleeding water has subsided. Place all pavements on flowable fill according to manufacturer's recommendations.

I. Maintain backfilled trenches in a smooth and uniform condition until paving or seeding operations are completed.

3.07 Field Quality Control

A. Tests

1. Flowable Fill Tests: Perform the following tests for flowable fill:
   a. Unconfined Compressive Strength
   b. Flow Test: Conduct flow consistency testing in accordance with ASTM D6103 by filling a 3-inch diameter by 6-inch high open ended cylinder placed on a smooth, nonporous, level surface. Pull the cylinder straight up within 5 seconds and measure the spread of the fill. The diameter of the spread shall be 8 inches or more with no noticeable segregation.
   c. Setting and Early Strength Test: Determine whether the flowable fill has hardened sufficiently for loads to be applied and construction activities to continue by conducting one of the following tests:
      1) Penetration Resistance test in accordance with ASTM C403 – minimum value of 500 psi required for loading

2) Ball Drop test in accordance with ASTM D6024 – maximum indentation diameter of less than 3 inches required for loading

3.08 Material Disposal

A. All existing utility infrastructure and appurtenances (piping, structures, etc.) that are to be replaced or removed to allow for new construction are the responsibility of the Contractor unless otherwise directed by the Town. As these materials are excavated, remove them from the job site and dispose of them in accordance with applicable local, state and federal rules and regulations.

PART 4 - FIGURES

4.01 Associated Standard Details

| Detail No. | Description |
|---|---|
| TB-01 | Corrugated Metal Pipe (CMP) Trench |
| TB-02 | Flexible (HDPE, PP, PVC) Pipe Trench |
| TB-03 | Reinforced Concrete Pipe (RCP) Trench |

END OF SECTION 02220

SECTION 02224 – TRENCHLESS EXCAVATION – HORIZONTAL BORINGS

PART 1 - GENERAL

1.01 Summary

A. Section Includes: Horizontal boring of casing pipe and related Work beneath state and local highways and railroads.

B. Related Sections

1. Section 02200 - Earthwork
2. Section 02220 - Trenching, Backfilling and Compaction for Utilities
3. Section 02720 - Storm Sewer Systems

1.02 Submittals

A. Before beginning any work, submit the following items to the Town. Do not proceed with the work until such documents have been reviewed by the Town. The review by the Town of any plan or method shall not relieve the Contractor of his responsibility in any way.

1. Manufacturer's Certificate of Compliance certifying compliance with the referenced specifications and standards
2. Certified copies of reports of factory tests specified in this Section and required by the referenced standards
3. Plans and details describing materials and methods proposed by the Contractor for use in special crossings
4. Documentation of experience requirements per paragraph 1.03A.

1.03 Quality Assurance

A. Qualifications

1. Demonstrate experience and expertise in horizontal bore installation methods by providing a list of 6 references for whom similar Work has been performed prior to commencing any Work. Include a name and telephone number for each contact.
2. Provide documentation showing successful completion of at least 10,000 linear feet of horizontal bore installation of piping or obtain the services of an experienced horizontal bore subcontractor meeting the experience requirements of this section to supervise the installation prior to commencing any Work. Conventional trenching is not considered applicable experience.
3. Adequately train all supervisory personnel and ensure they have at least 4 years of experience in pipe installation by horizontal bore. Submit the names and resumes of all supervisory field personnel for review by the Town prior to commencing any Work.

B. Regulatory Requirements

1. Perform all horizontal bore Work in accordance with laws, permits, requirements and regulations of the authority having jurisdiction of the rights-of-way.
2. Give notification to the applicable agency or officials prior to the start of the Work and do not start the Work until all arrangements are completed and permission to start Work is given by the applicable agency or officials.
3. The Town or jurisdictional officials shall review, and modify if necessary, the scheduling of construction activities within the right-of-way in order to prevent interruption to traffic. The Contractor shall include the cost for such procedures in his Bid and shall not be entitled to any change in contract amount on account of such procedures.
4. Complete Work in a careful, workmanlike manner to the satisfaction of the jurisdictional officials and the Town.

C. General Procedures

1. Attend all meetings and provide data, reports, information, details, and construction schedules requested by the Town.
2. Notify the Town when each boring and receiving pit has been staked in the field. Provide a survey crew to obtain profiles along the length of each boring location. Do not proceed with the Work until the survey information is obtained for the respective boring location and is approved by the Town.

## PART 2 - PRODUCTS

### 2.01 Materials

A. Steel Pipe Casing

1. Welded steel pipe, new and unused, in accordance with ASTM A-139 Grade B for “Electric Fusion of Welded Steel Pipe” with a minimum yield of 35,000 psi.
2. The inside diameter shall be at least 6 inches greater than the largest bell diameter of the carrier pipe.
3. The casing pipe and joints shall be capable of withstanding the loads of traffic, pavement, subgrade and other dead loads.
4. The casing pipe and joints shall be constructed to prevent leakage of any matter from the casing or carrier pipe throughout its entire length including the ends of the casing pipe.
5. The minimum wall thickness of the casing pipe shall be as shown in the following table:

| Diameter of Casing | Minimum Wall Thickness (Inches) Under Highway | Under Railroad |
|---|---|---|
| Under 14" | 0.250 | 0.188 |
| 14" to 16” | 0.250 | 0.219 |
| 18" | 0.250 | 0.250 |
| 20" | 0.375 | 0.281 |

| | | |
|---|---|---|
| 22" | 0.375 | 0.312 |
| 24" | 0.375 | 0.344 |
| 26" | 0.375 | 0.375 |
| 28" to 30” | 0.500 | 0.406 |
| 32" | 0.500 | 0.438 |
| 34" to 36” | 0.500 | 0.469 |
| 38" to 42” | 0.500 | 0.500 |

6. The exterior walls of casing shall be coated with protective coal tar or bitumastic material, after the welding of each joint has been completed.
7. When casing is installed without benefit of a protective coating and the casing is not cathodically protected, the wall thickness shown above shall be increased to the nearest standard size, which is a minimum of 0.063 inch greater than the thickness shown except for diameter under 12-3/4 inches.
8. The diameter, gauge, ASTM specification and manufacturer's name must be marked on the exterior of each pipe length.
9. Install casing pipe spacers to provide uniform support throughout the entire length of the casing. Casing pipe spacers shall have stainless steel bands and risers, plastic liner and runners as manufactured by Cascade Waterworks Manufacturing Company or approved equal.

2.02 Concrete Pipe Casing

A. Reinforced concrete pipe may be used for a casing pipe in an open-cut and jacking method of installation.

B. Reinforced concrete pipe shall conform to the current ASTM Specification C-76, Class V, Wall C.

C. If concrete pipe is to be used for the jacking method, grout holes tapped for no smaller than 1 1/2-inch pipe spaced approximately 3 feet around the circumference and approximately 4 feet longitudinally shall be cast into the pipe at manufacture. These holes are for pressure grouting the voids behind the pipe.

PART 3 - EXECUTION

3.01 General

A. Before beginning any Work, submit to the Town plans and details describing the materials and methods proposed to be used for the Work. Do not proceed with the Work until such plans have been reviewed for conformity with the approved permit. The review by the Town of any plan or method shall not relieve the Contractor of his responsibility in any way.

B. Open trenches shall be properly sheeted and braced in accordance with all applicable OSHA requirements. Provide sheeting where necessary to provide safe working conditions for employees and protection for roads, structures and utilities.

C. Install welded steel pipe casing in accordance with approved jacking and boring methods. Maintain the lines and grades shown for the entire length of the steel casing.

3.02 Installation of Casing and Carrier Pipes

A. Excavate the boring pit providing a minimum clearance of 10 feet from the edge of the road right-of-way avoiding interruption to traffic. Excavation shall be in accordance with Section 02200.

B. Support existing, and replace damaged, structures or utilities encountered to the satisfaction of the Town. Maintain pits during casing and carrier pipe installation.

C. Bore or jack the casing pipe into place to satisfactory alignment and grade for its entire length.

D. After casing is installed, push successive lengths of carrier pipe through.

E. The material of carrier pipe and type of pipe joint fittings shall be as specified in other Sections for the type of pipe, whether water main, gravity sanitary sewer, storm sewer, force main, or electrical conduit. Employ suitable methods to maintain tight joints to the satisfaction of the Town.

F. Block up the ends of the casing pipe to prevent the entrance of foreign material but do not tightly seal.

G. Backfilling shall be as specified in Section 02220. Remove excess excavated material and debris from the site.

H. Each end of the casing pipe shall be referenced to a minimum of two (2) permanent reference points for Record Drawing purposes.

I. Casing under railroads shall be set with top not less than 5-1/2 feet below the base of the rails. Casing shall be a minimum of 99 feet long centered under the track and measured at normal angle to centerline of track.

3.03 Construction of Casing Pipe by Methods Other Than Jacking or Boring

A. The installation of the casing pipe by methods other than the jacking method must be performed in a manner which meets with prior approval of the authorities. Any expense incurred in connection with the construction of the crossing, removal, replacement, or maintenance resulting from the construction of the casing pipe and the conduit shall be at the expense of the Contractor.

PART 4 - FIGURES

4.01 Associated Standard Details

| Detail No. | Description |
|---|---|
| TL-01 | Casing Pipe |
| TL-02 | Casing Spacer |

END OF SECTION 02224

SECTION 02710 - UNDERDRAIN SYSTEMS

PART 1 - GENERAL

1.01 Summary

A. Section Includes: Furnishing and installing all underdrains, French drains, fittings, appurtenances, and other materials as specified herein.

B. Related Sections

1. Section 02220 – Trenching, Backfilling and Compaction for Utilities

1.02 References

A. American Association of State Highway and Transportation Officials (AASHTO), latest editions

1. AASHTO M252 - Standard Specification for Corrugated Polyethylene Drainage Pipe
2. AASHTO M294 - Standard Specification for Corrugated Polyethylene Pipe 300- to 1500-mm (12- to 60-in.) Diameter

B. American Society for Testing and Materials (ASTM), latest editions

1. ASTM C94 - Standard Specification for Ready-Mixed Concrete
2. ASTM D4355 - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus
3. ASTM D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity
4. ASTM D4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles
5. ASTM D4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
6. ASTM D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile
7. ASTM D4833 - Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products

C. Indiana Department of Transportation (INDOT) Standard Specifications, latest edition

1. Section 702 - Structural Concrete
2. Section 715 - Pipe Culverts, and Storm and Sanitary Sewers
3. Section 718 - Underdrains
4. Section 904 - Aggregates

1.03 Submittals

A. Product Data

1. Aggregate – source and gradation
2. Pipe
3. Geotextile
4. Concrete Mix Design for Concrete Collars
5. Concrete Mix Design for Outlet Protectors

B. Quality Assurance/Control Submittals

1. Video Inspection - DVD and runsheet logs

1.04 Delivery, Storage, and Handling

A. Pipe possessing defects including, but not limited to the following, will be rejected for installation:

1. Variations from straight centerline
2. Elliptical shape in round pipe
3. Lack of rigidity
4. Illegible markings as required herein
5. Deep or excessive gouges, dents, bends, or scratches on the pipe wall
6. Fractures, punctures, or cracks passing through the pipe wall
7. Damaged or cracked ends where such damage would prevent making a satisfactory joint

B. Geotextile possessing defects including, but not limited to the following, will be rejected for installation:

1. Rips or punctures passing through the material
2. Deterioration from light, temperature, or other unsatisfactory conditions

C. Storage and Protection

1. Protect plastic pipes from extreme temperatures and ultraviolet radiation.
2. Store gaskets in a cool location out of direct sunlight and free from contact with petroleum products.
3. Store and handle geotextiles in accordance with the manufacturer's recommendations. Do not expose geotextile to direct sunlight, ultraviolet rays, temperatures greater than 140 degrees Fahrenheit, mud, dirt, dust, or debris to the extent that its strength, toughness, or permeability requirements are diminished.

PART 2 - PRODUCTS

2.01 Aggregate Backfill

A. Provide coarse aggregates, class E or higher, in accordance with INDOT Standard Specification Section 904. Furnish aggregates No. 8, No. 5, and No. 2 with gradations in accordance with INDOT Standard Specification Section 904. Furnish washed aggregates where indicated on the standard detail.

B. Where indicated on the standard detail, washed pea gravel fill may be used.

2.02 Pipe and Accessories

A. Underdrain

1. Provide perforated corrugated polyethylene drainage pipe (PCPP) and fittings in accordance with AASHTO M252 (for 3 to 10-inch diameter) or AASHTO M294 (for 12 to 36-inch diameter).
2. Provide perforated Schedule 40 Polyvinyl Chloride (PVC) pipe in accordance with ASTM D1785.

B. Cleanouts

1. Provide non-perforated Schedule 40 PVC pipe and fittings in accordance with ASTM 1785.
2. Provide solid lid casting which is designed to fit in the pipe bell and sized appropriately for the diameter of pipe installed. Furnish model number R-4044 as manufactured by Neenah Foundry or approved equal.

C. Rodent Screen: Supply rodent screens in accordance with INDOT Standard Specifications Section 718.

2.03 Geotextile

A. Provide non-woven needle punched or heat bonded geotextile consisting of strong, rot resistant, chemically stable long-chain synthetic polymer materials which are dimensionally stable relative to each other. The geotextile plastic yarn or fibers shall consist of at least 85 percent by weight of polyolefins, polyesters, or polyamides, and shall resist deterioration from ultraviolet and heat exposure.

B. Geotextile shall meet or exceed the following requirements:

| TEST | METHOD | REQUIREMENTS |
|---|---|---|
| Grab Strength | ASTM D4632 | 80 lb (355.8 N) |
| Seam Strength (mfrd. & field) | ASTM D4632 | 70 lb (311.4 N) |
| Puncture Strength | ASTM D6241 | 25 lb (111.2 N) |
| Trapezoid Tear | ASTM D4533 | 25 lb (111.2 N) |
| Apparent Opening Size | ASTM D4751 | Sieve No. 50 max. |
| Permeability | ASTM D4491 | 0.1 mm/sec |
| Ultraviolet Degradation (150 hrs.) | ASTM D4355 | 70% strength retained |

2.04 Concrete Collars and Cradles

A. Provide ready-mixed concrete which meets the requirements of ASTM C94. Each cubic yard of concrete shall contain the following:

1. Cement: 6 bags minimum
2. Air content: 5 to 7 percent
3. Coarse aggregate size: 1-1/2 inches maximum
4. Slump: 3 to 5 inches
5. Compressive strength: 4,000 psi

2.05 Outlet Protectors

A. Provide Class A concrete in accordance with INDOT Standard Specifications Section 702.

PART 3 - EXECUTION

3.01 General

A. Provide all tools, labor, and equipment necessary for the safe and expeditious installation of all underdrains, French drains, and appurtenances as specified herein.

B. Perform all clearing, grubbing, excavation, trenching, bedding, and backfilling required in accordance with Section 02220 - Trenching, Backfilling and Compaction for Utilities.

3.02 Trenching

A. Trenches shall be excavated to the dimensions and grade required by the plans or as directed in the field by the Town.

B. Provide a minimum clearance of 4 inches on each side of the pipe for the width of the trench.

C. Excavate to design grade to provide a smooth, graded surface free of debris, large cavities, and exposed rocks greater than 3 inches in diameter.

3.03 Installation

A. After excavating to design grade, cut geotextile to a width sufficient to provide for non-tight placement in trenches and overlaps of the ends of adjacent rolls.

B. Avoid contamination of the geotextile during construction. If it becomes contaminated, remove and replace geotextile with new material.

C. Place the geotextile with the machine direction in the direction of water flow in the drainage system. It shall be placed loosely, but with no wrinkles or folds.

D. Overlap the ends and edges of subsequent rolls and parallel rolls of geotextile a minimum of 1 foot. The upstream geotextile shall always be overlapped over the downstream geotextile. Join seams which are required in the longitudinal direction by means of either sewing or overlapping. Overlapped seams shall have a minimum overlap equal to the width of the trench.

E. Place perforated pipe with the perforations facing down and securely join the pipe sections with the appropriate coupling, fitting or bands. Non-perforated pipe shall be laid with the bell end upgrade and with open joints wrapped with suitable material to permit entry of water or unwrapped.

F. Take necessary precautions to protect pipe and tile. All damaged sections shall be replaced by the Contractor for no additional payment.

G. Locate outlet pipe(s) as close as possible to the center of the outlet protector.

3.04 Backfilling

A. Placement of drainage aggregate shall proceed immediately following placement of the geotextile and underdrain.

B. Place aggregate in a manner which minimizes contamination of the underdrain pipe.

3.05 Field Quality Control

A. Inspection

1. Perform all television inspection in presence of Town.
2. Clean all new storm sewers prior to television inspection. The image shall be clear, so the interior condition of the pipe is easily evaluated.
3. Correct all unacceptable conditions found during the television inspection and re-televise until no unacceptable conditions are found.
4. Unacceptable conditions are conditions that adversely affect the ability of the system to function as designed or to be properly maintained and may include, but are not limited to, the following:
   a. Cracked or faulty pipe
   b. Misaligned or deformed pipe
   c. Debris or blockages in line
   d. Excessive gaps at joints

e. Bellies or sags with a depth greater than or equal to 10 percent of the pipe diameter (maximum of 3 inches) or a length greater than 25 feet

5. Submit copy of the televising recording (DVD format) within 14 calendar days of the inspection.

## PART 4 - FIGURES

4.01 Associated Standard Details

| Detail No. | Description |
|---|---|
| SW-01 | Drainage Swale with Underdrain |
| SW-16 | Underdrain Cleanout |
| SW-17 | Underdrain (Pavement) |
| SW-18 | Underdrain (Ditch/Earth) |

END OF SECTION 02710

SECTION 02715 - HYBRID DITCH SYSTEMS

PART 1 - GENERAL

1.01 Summary

A. Section Includes: Furnishing and installing all hybrid ditch pipes, drain basins, and appurtenances as specified herein.

B. Related Sections

1. Section 02220 - Trenching, Backfilling and Compaction for Utilities

1.02 References

A. American Association of State Highway and Transportation Officials (AASHTO), latest editions

1. AASHTO M252 - Standard Specification for Corrugated Polyethylene Drainage Pipe
2. AASHTO M294 - Standard Specification for Corrugated Polyethylene Pipe 300- to 1500-mm (12- to 60-in.) Diameter

B. American Society for Testing and Materials (ASTM), latest editions

1. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft$^3$ (600 kN-m/m$^3$))
2. ASTM D1784 - Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
3. ASTM D3212 - Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
4. ASTM D3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
5. ASTM D4355 - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus
6. ASTM D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity
7. ASTM D4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles
8. ASTM D4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
9. ASTM D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile
10. ASTM D4833 - Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products
11. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

C. Indiana Department of Transportation (INDOT) Standard Specifications, latest edition

1. Section 904 - Aggregates
2. Section 907 - Concrete, Clay, and Plastic Drainage Components
3. Section 918 - Soil Fabrics

1.03 Submittals

A. Product Data

1. Aggregate – source and gradation
2. Pipe
3. Castings
4. Geotextile

B. Shop Drawings

1. Structures

1.04 Delivery, Storage, and Handling

A. Pipe possessing defects including, but not limited to the following, will be rejected for installation:

1. Variations from straight centerline
2. Elliptical shape in round pipe
3. Lack of rigidity
4. Illegible markings as required herein
5. Deep or excessive gouges, dents, bends, or scratches on the pipe wall
6. Fractures, punctures, or cracks passing through the pipe wall
7. Damaged or cracked ends where such damage would prevent making a satisfactory joint

B. Geotextile possessing defects including, but not limited to the following, will be rejected for installation:

1. Rips or punctures passing through the material
2. Deterioration from light, temperature, or other unsatisfactory conditions

C. Storage and Protection

1. Protect plastic pipes from extreme temperatures and ultraviolet radiation.
2. Store gaskets in a cool location out of direct sunlight and free from contact with petroleum products.
3. Store and handle geotextiles in accordance with the manufacturer's recommendations. Do not expose geotextile to direct sunlight, ultraviolet rays, temperatures greater than 140 degrees Fahrenheit, mud, dirt, dust, or debris to the extent that its strength, toughness, or permeability requirements are diminished.

PART 2 - PRODUCTS

2.01 Aggregate Backfill

A. Provide double-washed coarse aggregate No. 8, class E or higher, in accordance with INDOT Standard Specification Section 904.

B. Provide fine aggregate No. 23 sand, in accordance with INDOT Standard Specification Section 904.

2.02 High Density Polyethylene (HDPE) Pipe

A. Pipe Material

1. Provide dual wall corrugated HDPE pipe and fittings, consisting of an annular outer corrugated pipe wall and a smooth inner wall, in accordance with ASTM F2648 and INDOT Standard Specification Section 907.
2. Provide perforated corrugated polyethylene drainage pipe (PCPP) and fittings in accordance with AASHTO M252 (for 3- to 10-inch diameter) or AASHTO M294 (for 12- to 36-inch diameter), ASTM F2648, and INDOT Standard Specification Section 907. Perforations shall be AASHTO Class II.
3. HDPE pipe and fittings material shall be either:
   a. Virgin high density polyethylene with a minimum cell class of 424420C for 4- to 10-inch diameter pipe or 435400C for 12- to 36-inch diameter, as defined in ASTM D3350
   b. Engineered compound of virgin and recycled high density polyethylene with a minimum cell class of 424420C for 4- to 10-inch diameter pipe or 435420C for 12- to 36-inch diameter, as defined in ASTM D3350
4. The flexibility factor of HDPE pipe shall not exceed 0.095.

B. Joints

1. Furnish HDPE pipe with bell and spigot joints in conformance with ASTM F2648.
2. Gasket material shall conform to ASTM F477.

C. Fittings

1. Provide fittings of the same manufacturer for each type of HDPE pipe.
2. Manufactured fittings such as wyes, tees, elbows, or adaptors will not be accepted for use in place of drain basins.

D. Pipe Markings

1. Each length of HDPE pipe shall be clearly marked with the following information at a minimum:
   a. Name of manufacturer or identification symbol
   b. Nominal pipe size
   c. Product/extrusion code

2.03 Pipe Accessories

A. Pipe to Structure Connections

1. Pipe penetration holes shall be either pre-formed by manufacturer or core drilled in the field.
2. Provide flexible neoprene molded boot or resilient seal which conforms to ASTM C923. Provide Kor-N-Seal boot as manufactured by National Pollution Control Systems, Inc. or approved equal. Provide resilient seal as manufactured by A-Lok or approved equal.

2.04 Precast Concrete Inlets, Catch Basins, and Accessories

A. Provide precast inlets, catch basins, and accessories as specified in Section 02720 – Storm Sewer Systems.

2.05 Drain Basins and Accessories

A. Structures

1. Provide PVC drain basins which are manufactured from PVC pipe stock, utilizing a thermo-molding process to re-form the pipe stock to the furnished configuration. Drainage pipe connection stubs shall be manufactured from PVC pipe stock and formed to provide a watertight connection with the specified type of pipe. The raw material shall conform to ASTM D1784 cell class 12454.
2. PVC structure joints shall conform to ASTM D3212. Flexible elastomeric seals shall conform to ASTM F477.
3. Provide Nyloplast drain basins as manufactured by Advanced Drainage Systems, Inc. or approved equal.

B. Castings

1. Furnish cast iron or ductile iron frames and covers to match the diameter of the drain basin installed. Road and highway grates shall meet minimum H-20 load rating.

2.06 Geotextile

A. Provide non-woven needle punched or heat bonded geotextile consisting of strong, rot-resistant, chemically stable long-chain synthetic polymer materials which are dimensionally stable relative to each other including selvedges.

B. Furnish geotextile which meets or exceeds INDOT Standard Specification Section 918 and the following requirements:

| *TEST* | *METHOD* | *REQUIREMENT* |
|---|---|---|
| Grab Strength | ASTM D4632 | 80 lb (355.8 N) |
| Seam Strength (mfrd. & field) | ASTM D4632 | 70 lb (311.4 N) |
| Puncture Strength | ASTM D4833 | 25 lb (111.2 N) |
| Trapezoid Tear | ASTM D4533 | 25 lb (111.2 N) |
| Apparent Opening Size | ASTM D4751 | Sieve No. 50 max. |
| Permeability | ASTM D4491 | 0.1 mm/sec |
| Ultraviolet Degradation (150 hrs.) | ASTM D4355 | 70% strength retained |

PART 3 - EXECUTION

3.01 Examination

A. Verification of Conditions

1. Before installing piping, verify location, depth, type of joint needed, and size of pipe to which connection is proposed.
2. Assure that lines can be run as proposed. Notify Town immediately for approval of any necessary deviation before lines are run.
3. Work all lengths of pipe into place without forcing.

3.02 Installation

A. General

1. Provide all tools, labor and equipment necessary for the safe and expeditious installation of all hybrid ditches, drain basins, and appurtenances specified herein.
2. Perform all clearing, grubbing, excavation, trenching, bedding, and backfilling required in accordance with Section 02220 - Trenching, Backfilling and Compaction for Utilities.

B. Bedding and Backfill

1. Place aggregate in a manner which minimizes contamination of the hybrid ditch pipe.
2. Place coarse aggregate bedding and backfill material in 6 to 8-inch balanced lifts to ensure proper compaction and filling of all voids. Hand tamp or "walk" aggregate into place.
3. Place fine aggregate backfill material in maximum 12-inch balanced lifts to ensure proper compaction. Compact each lift to 95 percent of Standard Proctor dry density in accordance with ASTM D698.

C. Pipe and Accessories

1. Lay hybrid ditch pipe uniformly to line and grade so that finished pipe will present a uniform conduit.
2. Set line and grade by means of laser beam and target for alignment and grade.
3. Lay pipe progressively upgrade in a manner to form close, concentric joints with smooth bottom inverts.
4. Maintain 18 inches of vertical separation and 10 feet of horizontal separation between new hybrid ditch pipe and new or existing water mains unless otherwise directed. Notify Town immediately of all instances where separation cannot be maintained.
5. After joint is made, place sufficient bedding material along each side of the pipe to prevent conditions that might tend to move the pipe off line or grade.
6. Temporarily plug installed piping systems at end of each day's Work or other interruption of progress on a given line. Plug shall be adequate to prevent entry of animals and entrance or insertion of deleterious materials and shall be installed in a manner satisfactory to the Town.
7. Securely attach fabricated branches for wyes and tees to wall of pipe in such a manner as to not restrict or otherwise interfere with flow characteristics of the pipe.
8. Install boot and saddle connectors for all taps to concrete and RCP pipe.
9. Ensure smooth trench bottom free from large exposed rocks greater than 3 inches in diameter, and cover trench bottom with geotextile as specified herein and No. 8 double-washed aggregate. Install pipe with perforations facing downward at a minimum grade of 0.10 percent and 2 feet minimum to 4 feet maximum cover. Cover PCPP with No. 8 double-washed aggregate to a minimum of 12 inches above the pipe crown. Fold geotextile around aggregate and backfill as specified in the standard details.
10. If any existing drainage tile systems are encountered during construction, reconstruct the tile to its original conditions or connect tile to the new storm drainage system as approved by the Town.

D. Drain Basins and Accessories

1. Join pipe bell spigot to the structure body by use of a swage mechanical joint.
2. Bed and backfill drain basins as specified for PVC pipe in Section 02200 - Trenching, Backfilling and Compaction for Utilities.
3. Install drain basins so axis of structure is vertical.
4. Unless otherwise indicated, set castings for all structures at finish grade level. Inline drain and drain basin bodies shall be cut to final grade. No brick, stone, or concrete block will be permitted to set the casting to the finish grade level. Adjust castings to the satisfaction of the Town, at Contractor's expense.
5. For H-20 load rate installations, pour a concrete ring under and around the grate and frame per the manufacturer's recommendations.
6. Remove all debris and excess soil from structures after installation and prior to flushing the storm sewer pipes, to the satisfaction of the Town.

E. Connection to Existing Structures

1. Core drill new pipe penetration at the proper location where the pipe enters the structure.
2. Install flexible neoprene molded boot or resilient seal to secure the pipe in the structure wall as noted in Article 2.03A.2 of this Section.

3.03 Field Quality Control

A. Tests

1. Deflection Test for Flexible Pipes
   a. Pipe materials considered flexible include the following:
      1) HDPE
      2) PCPP
   b. Perform testing in presence of Town.
   c. Perform deflection testing on all flexible pipes after the final backfill has been in place for at least 30 days.
   d. Perform deflection test using a mandrel pulled by hand. The mandrel (go/no-go) device shall be cylindrical in shape and constructed with 9 or 10 evenly spaced arms or prongs.
   e. No pipe shall exceed a vertical deflection of 5 percent. Uncover, replace, and retest any pipe not passing the deflection test until a satisfactory result is achieved.

B. Inspection

1. Television Inspection
   a. Televise all pipe segments in excess of 40 feet in length.
   b. Perform all television inspection in presence of Town.
   c. Clean all new pipe segments by “flooding” prior to television inspection. The image shall be clear so the interior condition of the pipe is easily evaluated.
   d. Correct all unacceptable conditions found during the television inspection and re-televise until no unacceptable conditions are found.
   e. Unacceptable conditions are conditions that adversely affect the ability of the system to function as designed or to be properly maintained and may include, but are not limited to, the following:
      1) Protruding taps
      2) Cracked or faulty pipe
      3) Misaligned or deformed pipe
      4) Debris in line
      5) Excessive gaps at joints
      6) Bellies or sags with a depth greater than or equal to 10 percent of the pipe diameter (maximum of 3 inches) or a length greater than 25 feet
   f. Submit copy of the televising recording (DVD format) within 14 calendar days of the inspection.

3.04 Cleaning

A. Clean all new pipe segments with high pressure water jet after installation and before testing.

PART 4 - FIGURES

4.01 Associated Standard Details

| Detail No. | Description |
|---|---|
| SW-03 | Hybrid Ditch Trench |
| SW-04 | Modified Hybrid Ditch Trench |
| SW-05 | Hybrid Ditch Trench at Inlet |
| SW-06 | Hybrid Ditch Trench Profile |

END OF SECTION 02715

# SECTION 02720 - STORM SEWER SYSTEMS

## PART 1 - GENERAL

### 1.01 Summary

A. Section Includes: Furnishing and installing all storm sewers, inlets, catch basins, manholes as specified herein.

B. Products Supplied But Not Installed Under This Section

1. Storm Sewer carrier pipe (installed by horizontal boring or directional drilling)

C. Related Sections

1. Section 02200 - Earthwork
2. Section 02220 - Trenching, Backfilling and Compaction for Utilities
3. Section 02224 - Trenchless Excavation - Horizontal Borings
4. Section 02226 - Trenchless Excavation - Directional Drilling

### 1.02 References

A. American Association of State Highway and Transportation Officials (AASHTO), latest editions

1. AASHTO M36 - Standard Specification for Corrugated Steel Pipe, Metallic-Coated for Sewers and Drains
2. AASHTO M170 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
3. AASHTO M199 - Standard Specification for Precast Reinforced Concrete Manhole Sections
4. AASHTO M207 - Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe
5. AASHTO M252 - Standard Specification for Corrugated Polyethylene Drainage Pipe
6. AASHTO M294 - Standard Specification for Corrugated Polyethylene Pipe 12- to 60-in. Diameter

B. American Society for Testing and Materials (ASTM), latest editions

1. ASTM A48 - Standard Specification for Gray Iron Castings
2. ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
3. ASTM A760 - Standard Specification for Corrugated Steel Pipe, Metallic-Coated for Sewers and Drains
4. ASTM A929 - Standard Specification for Steel Sheet, Metallic-Coated by the Hot-Dip Process for Corrugated Steel Pipe
5. ASTM C14 - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe

6. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
7. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
8. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections
9. ASTM C507 - Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe
10. ASTM C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals
11. ASTM C928 - Standard Specification for Packaged, Dry, Rapid-Hardening Cementitious Materials for Concrete Repairs
12. ASTM C990 - Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
13. ASTM C1433 - Standard Specification for Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers
14. ASTM C1577 - Standard Specification for Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers Design According to AASHTO LRFD
15. ASTM D1784 - Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
16. ASTM D2412 - Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading
17. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
18. ASTM D3212 - Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
19. ASTM D3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
20. ASTM D4101 - Standard Specification for Polypropylene Injection and Extrusion Materials
21. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
22. ASTM F679 - Standard Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings
23. ASTM F2648 - Standard Specification for 2 to 60 inch [50 to 1500 mm] Annular Corrugated Profile Wall Polyethylene (PE) Pipe and Fittings for Land Drainage Applications
24. ASTM F2764 - Standard Specification for 6 to 60 in. (150 to 1500 mm) Polypropylene (PP) Corrugated Double and Triple Wall Pipe and Fittings for Non-Pressure Sanitary Sewer Applications

C. Indiana Department of Transportation (INDOT) Standard Specifications, latest edition

1. Section 901 - PCC Materials
2. Section 904 - Aggregates
3. Section 907 - Concrete, Clay, and Plastic Drainage Components
4. Section 908 - Metal Pipe
5. Section 910 - Metal Materials

1.03 Submittals

A. Product Data

1. Pipe
2. End Sections
3. Structures
4. Castings

1.04 Delivery, Storage, and Handling

A. Pipe possessing defects including, but not limited to the following, will be rejected for installation:

1. Variations from straight centerline
2. Elliptical shape in round pipe
3. Lack of rigidity
4. Illegible markings as required herein
5. Bruised, broken, or otherwise damaged metallic or bituminous coating or liner, as applicable
6. Deep or excessive gouges, dents, bends, or scratches on the pipe wall
7. Fractures, punctures, or cracks passing through the pipe wall
8. Damaged or cracked ends where such damage would prevent making a satisfactory joint

B. Concrete pipe and structures possessing defects including, but not limited to the following, will be rejected for installation:

1. Fractures or cracks passing through the wall
2. Honeycombed or open texture which would adversely affect the function of the sections
3. Ends of sections are not normal to the walls and centerline of the section

PART 2 - PRODUCTS

2.01 Corrugated Metal Pipe (CMP)

A. Pipe Material

1. Provide CMP of continuous lock seam or welded seam construction from end to end of each length of pipe (helical corrugations), conforming to AASHTO M36 and INDOT Standard Specification Section 908.
2. Provide aluminum coated steel Type II corrugated pipe fabricated in accordance with ASTM A760 for the gauge indicated below:
   a. 14 gauge for 12- to 36-inch diameter
   b. 12 gauge for 42-inch and larger diameter
3. Provide zinc coated (galvanized) steel pipe manufactured in accordance with ASTM A760, fabricated from zinc-coated steel sheet material conforming to ASTM A929.

4. Sheet metal used to fabricate pipe shall be the same brand from the same manufacturer in any one length of finished pipe.

B. Joints

1. Supply external coupling bands with corrugations that mesh with the corrugations of the pipe and which conform to ASTM A760.
2. Provide coupling bands of the same gauge and coating material as the pipe for which the band is used.

C. Pipe Markings

1. Each length of CMP shall be clearly marked with the following information at a minimum:
   a. Name of manufacturer or identification symbol
   b. Alloy and temper
   c. Specified thickness
   d. ASTM designation
   e. Heat number
   f. Nominal pipe size

2.02 High Density Polyethylene (HDPE) Pipe (12 TO 36-INCH DIAMETER PIPE)

A. Pipe Material

1. Provide dual wall corrugated HDPE pipe and fittings, consisting of an annular outer corrugated pipe wall and a smooth inner wall, in accordance with ASTM F2648 and INDOT Standard Specification Section 907.
2. Pipe and fittings material shall be, in accordance with ASTM D3350, either:
   a. Virgin high density polyethylene with a minimum cell class of 435400C, or
   b. Engineered compound of virgin and recycled high density polyethylene with a minimum cell class of 435420C
3. Flexibility factor shall not exceed 0.095.
4. Provide SureLok ST as manufactured by Hancor, Inc.; N-12 ST as manufactured by Advanced Drainage Systems, Inc.; or approved equal.

B. Joints

1. Furnish HDPE pipe with bell and spigot joints in conformance with ASTM F2648.
2. Gasket material shall conform to ASTM F477.

C. Fittings

1. Provide fittings of the same manufacturer for each type of HDPE pipe.
2. Manufactured fittings such as wyes, tees, elbows, or adaptors will not be accepted for use in place of storm sewer manholes, inlets, catch basins, or drain basins.

D. Pipe Markings

1. Provide pipe with each length clearly marked with the following information:
   a. Name of manufacturer or identification symbol
   b. Nominal pipe size
   c. Product/extrusion code

2.03 Polypropylene Pipe (12 TO 60-INCH DIAMETER PIPE)

A. Pipe Material

1. Provide double wall polypropylene pipe with a smooth interior and annular exterior corrugations in accordance with ASTM F2764 for pipe sizes from 12-inch through 24-inch.
2. Provide triple wall polypropylene pipe with a smooth interior and exterior surface in accordance with ASTM F2764 for pipe sizes from 30-inch through 60-inch
3. Pipe shall have minimum stiffness of 46 psi when tested in accordance with ASTM D2412.

B. Fittings and Joints

1. Provide pipe joined with a gasketed integral bell and spigot joint meeting the requirements of ASTM F2764 for pipe sizes from 12-inch through 24-inch and ASTM F2764 for pipe sizes from 30-inch to 60-inch.
2. Fittings shall conform to ASTM F2764 and ASTM F2764.

C. Pipe Markings

1. Provide pipe with each length clearly marked with the following information:
   a. Name of manufacturer or identification symbol
   b. Nominal pipe size
   c. Product/extrusion code

2.04 Polyvinyl Chloride (PVC) Pipe (12 TO 36-INCH DIAMETER PIPE)

A. Pipe Material

1. Provide solid wall gravity flow PVC storm sewer pipe and fittings with bell and spigot joints with elastomeric seals and smooth inner walls in accordance with ASTM D3034 (SDR-35, 12-inch to 15-inch diameter), ASTM F679 (PS 46, 18- to 36-inch diameter), and INDOT Standard Specification Section 907.
2. Minimum cell class in accordance with ASTM D1784:
   a. Cell class 12364 for 12-inch to 15-inch diameter pipes
   b. Cell class 12454 for 18-inch to 36-inch diameter pipes.
3. Pipe shall have minimum stiffness of 46 psi when tested in accordance with ASTM D2412.
4. Provide Sani-21 as manufactured Diamond Plastics Corporation; Ring-Tite as manufactured by JM Eagle; or approved equal.

B. Joints

1. Furnish PVC pipe with flexible, gasketed compression type joints so that, when assembled, the gasket inside the bell is compressed radially on the pipe spigot to form a soil-tight seal. Assemble joints in accordance with the pipe manufacturer's recommendations and ASTM D3212.
2. The gasket shall conform to ASTM F477.

C. Fittings

1. Manufactured fittings such as wyes, tees, elbows, or adaptors will not be accepted for use in place of storm sewer manholes, inlets, catch basins, or drain basins.

D. Pipe Markings

1. Provide pipe with each length clearly marked with the following information:
   a. Name of manufacturer or identification symbol
   b. Trade name or trademark
   c. Nominal pipe size
   d. Production/extrusion code
   e. Material and cell class designation
   f. ASTM designation

2.05 Reinforced Concrete Pipe (RCP)

A. Pipe Material

1. Provide Class III, Wall B type RCP which conforms to ASTM C76, AASHTO M170, and INDOT Standard Specification Section 907.
2. Provide elliptical RCP which conforms to ASTM C507, AASHTO M207, and INDOT Standard Specification Section 907.

B. Joints

1. Provide RCP with tongue and groove joints with compression type rubber gasket which conforms to ASTM C443.

C. Fittings: Provide fabricated wye and tee branches.

2.06 Reinforced Concrete Box

A. Material

1. Provide reinforced concrete box structure sections in accordance with ASTM C1577 and INDOT Standard Specification Section 907.
2. Provide reinforce concrete box sections manufactured from a homogeneous concrete mixture in accordance with the test and design requirements of ASTM C1433. Box sections shall be cured in such a manner that the specified compressive strength of the concrete is achieved in 28 days or less.

3. Provide precast concrete sections with no more than 4 holes cast or drilled in the section for handling or laying.
4. Provide rapid setting patch material in accordance with ASTM C928 and INDOT Standard Specification Section 901 or precast concrete plugs for filling all holes used for handling.

B. Joints

1. Furnish reinforced concrete box sections with male and female ends designed to allow box sections to be laid together in a continuous line.
2. Provide joint membrane systems in accordance with INDOT Standard Specification Section 907.

C. Steel Reinforcement

1. The minimum cover of concrete over steel reinforcement shall be 1 inch.
2. The inside steel reinforcement shall extend into the male portion of the joint. The outside steel reinforcement shall extend into the female portion of the joint.
3. The clear distance of the end reinforcement steel must be greater than 1/2 inch, but less than 2 inches, from the end of the box section.

D. Structure Markings

1. Provide reinforced concrete box sections with each section clearly marked with the following information:
   a. Box section span and rise
   b. ASTM table number
   c. Maximum and minimum design earth cover
   d. Specification designation
   e. Date of manufacture
   f. Name or trademark of manufacturer
   g. Orientation of top of structure

2.07 Pipe Accessories

A. Metal End Sections

1. Provide metal end sections in accordance with AASHTO M36 and INDOT Standard Specification Section 908.
2. Provide trash guard with 1/2-inch diameter black steel bars. Last cross bar shall extend through bottom section for “hinge” effect so trash guard may be opened. Secure with 10 gage straps at top and bolt through bottom section. Plant fit trash guard configuration. Paint trash guard with high zinc coating after fabrication.

B. Concrete End Sections

1. Provide concrete end sections in accordance with INDOT Standard Specification Section 907.

2.08 Precast Concrete Manholes, Inlets, Catch Basins and Accessories

A. General

1. Provide precast concrete sections with no more than 3 holes cast or drilled in the section for handling.
2. Provide rapid setting patch material in accordance with ASTM C928 and INDOT Standard Specification Section 901 or precast concrete plugs for filling all holes used for handling.

B. Precast Concrete Manholes

1. Provide precast concrete manholes as follows:
   a. Cone section: eccentric cone section which conforms to ASTM C478
   b. Flat top: where necessary, provide flat top section which conforms to ASTM C478
2. Risers/barrels shall conform to ASTM C478, AASHTO M199, and INDOT Standard Specification Section 907.
3. Bases shall conform to ASTM C478, AASHTO M199, and INDOT Standard Specification Section 907.
4. Provide precast concrete floor or form with Class A concrete. Floor shall be sloped to the sewer invert.
5. Gaskets shall be 1/2-inch diameter flexible butyl rubber conforming to ASTM C990 for all manhole section joints. Provide Kent seal or approved equal.

C. Precast Concrete Inlets and Catch Basins

1. Provide precast concrete catch basins and inlets to the dimensions as shown on the standard details.

D. Castings

1. Provide cast iron frames and covers in accordance with ASTM A48 Class 35B and INDOT Standard Specification Section 910. Pre-approved castings are listed in Table 2-1. All other castings must be approved by the Town on a case-by-case basis.

**Table 2-1: Standard Stormwater Castings**

| Structure Type | Casting Type | Neenah Model | EJ Model |
|---|---|---|---|
| Manhole | Flat lid | R-1772 | 1022-Z1 |
| Manhole | Flat grate | R-2502 | 1020-N |
| Manhole | Beehive grate | R-2560-E1 | 1205-02 |
| Manhole | Curb grate | R-3286-8V | 7520-M2-T1 |
| Inlet/Catch Basin | Ditch grate | R-4215-C | 6610 |
| Inlet/Catch Basin | Curb grate | R-3286-8V | 7520-M2-T1 |
| Inlet/Catch Basin | Roll curb grate | R-3501-H4 | |
| 12” Pipe Inlet/Catch Basin | Beehive grate | R-4350-B | 6532 |
| 15” Pipe Inlet/Catch Basin | Beehive grate | R-4350-C | 6533 |
| 18” Pipe Inlet/Catch Basin | Beehive grate | R-4350-D | 6534 |
| 24” Pipe Inlet/Catch Basin | Beehive grate | R-4350-E | 6536 |

2. Supply all frames and covers from one manufacturer.
3. Furnish frames and covers which are rated for traffic, of non-rocking design, and have machined horizontal and vertical bearing surfaces.
4. Storm manhole covers shall have the words “STORM SEWER” cast in recessed letters 2 inches in height.
5. Provide inlet and catch basin frames and covers cast with the words “NO DUMPING, DRAINS TO STREAM” cast in raised or recessed letters 1 inch in height and shall have a symbol of a fish cast with the message.

E. Pipe to Structure Connections

1. Pipe penetration holes shall be either pre-formed by manufacturer or core drilled in the field.
2. For concrete pipe and RCP, provide non-shrink grout mixture of 2 parts No. 23 fine aggregate in accordance with INDOT Standard Specification Section 904 and 1 part Portland cement.
3. For HDPE, Polypropylene, and PVC pipe, provide flexible neoprene molded boot or resilient seal which conforms to ASTM C923.
   a. Boot shall be Kor-N-Seal as manufactured by National Pollution Control Systems, Inc. or approved equal.
   b. Seal shall be resilient seal as manufactured by A-Lok or approved equal.

PART 3 - EXECUTION

3.01 Examination

A. Verification of Conditions

1. Before installing piping, verify location, depth, type of joint needed, and size of pipe to which connection is proposed.
2. Assure that lines can be run as proposed. Notify Town immediately for approval of any necessary deviation before lines are run.
3. Work all lengths of pipe into place without forcing.

3.02 Installation

A. Storm Sewer Pipe and Accessories

1. Lay storm sewer pipe uniformly to line and grade so that finished storm sewer will present a uniform conduit.
2. Set line and grade by means of laser beam and target for alignment and grade.
3. Lay storm sewer pipe progressively upgrade in a manner to form close, concentric joints with smooth bottom inverts.
4. Maintain 18 inches of vertical separation and 10 feet of horizontal separation between new storm sewer and new or existing water mains unless otherwise directed. Notify Town immediately of all instances where separation cannot be maintained.
5. After joint is made, place sufficient bedding material along each side of the pipe to prevent conditions that might tend to move the pipe off line or grade.
6. Temporarily plug installed piping systems at end of each day's Work or other interruption of progress on a given line. Plug shall be adequate to prevent entry of animals and entrance or insertion of deleterious materials and shall be installed in a manner satisfactory to the Town.
7. Securely attach fabricated branches for wyes and tees to wall of pipe in such a manner as to not restrict or otherwise interfere with flow characteristics of the pipe.
8. Complete all field-cutting of pipe in a neat, trim manner using a hand or power saw. Field cutting of closed profile pipe requires any exposed channels be sealed in accordance with the manufacturer's recommendation.
9. Install trash guards on all pipe end sections 18 inches and larger in diameter.
10. If any existing drainage tile systems are encountered during construction, reconstruct the tile to its original conditions or connect tile to the new storm drainage system as approved by the Town.

B. Precast Concrete Manholes, Inlets, Catch Basins, and Accessories

1. Unless otherwise indicated, provide 0.1 foot sewer invert drop through manholes.
2. Keep structure excavations free from water during construction.
3. Fill all areas excavated below the depth required for the manhole base with compacted granular backfill or No. 8 crushed stone at Contractor's expense.
4. Install precast concrete risers and adjusting rings in such combination that the manhole frame will be at the proper elevation. Supply a minimum of 1 adjusting ring for each manhole. Adjusting rings shall be a minimum of 4 inches and maximum of 12 inches in height. Supply precast concrete riser sections for adjustment greater than 12 inches in height.
5. Install manhole frame to grade and centered.
6. Install precast concrete base, risers, cone, and flat top sections so that the axis of the manhole is vertical.
7. Install precast concrete inlets and catch basins so that the axis of the structure is vertical.
8. Install gaskets for joints in accordance with the manufacturer's recommendations. Wrap riser joints with external joint seals in accordance with manufacturer's recommendations.

9. Prior to backfilling, fill all holes used for handling with rapid setting patch material or with precast concrete plugs secured with Portland cement mortar.
10. Unless otherwise indicated, set castings for all structures at finish grade level. Adjust castings to the satisfaction of the Town, at Contractor's expense.
11. Remove all debris and excess soil from structures after installation and prior to flushing the storm sewer pipes, to the satisfaction of the Town.

C. Doghouse Manholes

1. The following requirements are in addition to Article 3.03B.
   a. Excavate sufficiently below existing pipe where doghouse manhole is to be placed, in order to allow for placement of crushed stone bedding and minimum base section thickness.
   b. Use forms for pouring concrete base; do not use earth trench in lieu of forms.
   c. Install steel reinforcement and pour concrete base
   d. Pour concrete around existing pipe.
   e. Saw cut cleanly and remove the top half of existing pipe after manhole is constructed.

D. Connection to Existing Structures

1. Core drill new pipe penetration at the proper location where the pipe enters the structure.
2. For concrete pipe and RCP, fill the annular space between the pipe and structure wall with grout as noted in Article 2.08E.2 of this Section.
3. For HDPE and PVC pipe, install flexible neoprene molded boot or resilient seal to secure the pipe in the structure wall as noted in Article 2.08E.3 of this Section.

3.03 Field Quality Control

A. Tests

1. Deflection Test for Flexible Pipes
   a. Pipe materials considered flexible include the following:
      1) HDPE
      2) Polypropylene
      3) PVC
   b. Perform testing in presence of Town.
   c. Perform deflection testing on all flexible pipes after the final backfill has been in place for at least 30 days.
   d. Perform deflection test using a mandrel pulled by hand. The mandrel (go/no-go) device shall be cylindrical in shape and constructed with 9 or 10 evenly spaced arms or prongs.
   e. No pipe shall exceed a vertical deflection of 5 percent. Uncover, replace, and retest any pipe not passing the deflection test until a satisfactory result is achieved.

B. Inspection

1. Television Inspection
   a. Televise all mainline storm sewers (manhole to manhole).
   b. Televise all lateral storm sewers (manhole to inlet, inlet to inlet, etc.) in excess of 40 feet in length.
   c. Perform all television inspection in presence of Town.
   d. Clean all new storm sewers prior to television inspection. The image shall be clear so the interior condition of the pipe is easily evaluated.
   e. Correct all unacceptable conditions found during the television inspection and re-televise until no unacceptable conditions are found.
   f. Unacceptable conditions are conditions that adversely affect the ability of the system to function as designed or to be properly maintained and may include, but are not limited to, the following:
      1) Protruding taps
      2) Cracked or faulty pipe
      3) Misaligned or deformed pipe
      4) Debris in line
      5) Infiltration/exfiltration
      6) Excessive gaps at joints
      7) Bellies or sags with a depth greater than or equal to 10 percent of the pipe diameter (maximum of 3 inches) or a length greater than 25 feet
   g. Submit copy of the televising recording (DVD format) within 14 calendar days of the inspection.

3.04 Cleaning

A. Clean all new storm sewers after installation and before testing to the satisfaction of the Town.

PART 4 - FIGURES

4.01 Associated Standard Details

| Detail No. | Description |
|---|---|
| GE-01 | General Utility Location Plan & Section |
| GE-02 | Minimum Crossover and Separation Requirements for Sewer & Water Mains |
| GE-03 | Gravity Sewer Repair |
| SW-02 | French Drain |
| SW-07 | Metal Pipe End Section |
| SW-08 | Precast Concrete End Section |
| SW-09 | Trash Guard |
| SW-10 | Standard Storm Manhole |
| SW-11 | Type 1 Storm Manhole |
| SW-12 | Inlet Type A |
| SW-13 | Inlet Type E |
| SW-14 | Yard Inlet |
| SW-15 | PVC Inline Drain |

END OF SECTION 02720

# SECTION 02902 - LANDSCAPING FOR UTILITIES

## PART 1 - GENERAL

### 1.01 Summary

A. Section Includes

1. Providing topsoil, fertilizer, seed, mulch, sod, trees, bushes, ornamental plants, fencing and related items shown or specified.
2. Repairing or replacing mailboxes, fences, planters, lawn areas and other items and areas damaged or destroyed during construction of the Work.
3. Soil testing

B. Related Sections

1. Section 02101 - Storm Water Pollution Prevention and Erosion Control

### 1.02 References

A. American Society for Testing and Materials (ASTM), latest editions

1. ASTM D997 – Standard Specification for Emulsified Asphalt

### 1.03 Definitions

A. Lawn Areas: grassed areas which are cut and maintained on a routine basis, including lawns at homes and businesses and grass shoulders of streets, roads, and highways.

### 1.04 Submittals

A. Submit soil testing results to the Town

### 1.05 Warranty

A. Regrade, reseed, and restraw as necessary and when requested, to satisfaction of Town during the one-year warranty period.

B. Guarantee all disturbed and replaced trees, shrubs, and ornamental plants during the one-year warranty period.

## PART 2 - PRODUCTS

### 2.01 Lawn Products

A. Limestone: as specified in Section 02101

B. Fertilizer: as specified in Section 02101

C. Grass (permanent seed or sod): as specified in Section 02101

D. Mulch: as specified in Section 02101

E. Erosion control blanket: as specified in Section 02101

F. Wood cellulose fiber shall not contain any growth or germination-inhibiting factors and shall be dyed an appropriate color to facilitate visual metering during application. Composition on air-dry weight basis shall be: 9 to 15 percent moisture, pH range from 4.5 to 6.0.

G. Asphalt adhesive shall be emulsified asphalt. Adhesive shall meet the requirements of ASTM D977 for Grade SS- 1.

2.02 Items Damaged or Destroyed

A. Replacement fences, mailboxes, planters, and other items shall be:

1. new and unused,
2. the same type as the items removed, and
3. of equal or better quality as the items being replaced when the items were new.

B. Remove and relocate undamaged fence, mailboxes, planters, and other items when possible. Coordinate locations with property owner.

PART 3 - EXECUTION

3.01 General

A. Replacement of underbrush in fields and woods, along farm fences and roads, and in similar areas is not required, unless otherwise requested by the Town.

3.02 Grading

A. Fine grade all non-paved areas disturbed during construction. Areas shall be smooth and uniform.

3.03 Soil Testing

A. Soil testing is required for project area disturbance that exceeds one and one half (1.5) acres, in order to determine soil amendments needed, such as fertilizer and lime. Contractor shall coordinate soil testing services and implement the resulting recommendations.

3.04 Grass

A. Apply grass seed or install sod as specified in Section 02101.

B. Seed between February 15 and June 1 and between August 15 and November 1. Do not sow seed during adverse weather conditions. Do not broadcast seed during

high wind. Do not sow seed when the moisture content of the soil is too low or too high for seed germination.

3.05 Hydroseeding

A. Hydroseeding may be incorporated to seed areas steeper than a ratio of horizontal to vertical of 3 to 1. Add seed and fertilizer to water and thoroughly mix at the rates specified by professional landscape contractor. Wood cellulose fiber mulch shall be added at the rates recommended by the manufacturer after the seed, fertilizer and water have been thoroughly mixed, to produce a homogeneous slurry. Apply slurry under pressure, uniformly over the entire area. The hydroseeded area shall not be rolled.

3.06 Planting Trees and Other Plants

A. Plant trees and ornamental plants during the proper time and under the proper conditions for the particular tree or plant as determined by local practice.

B. Plant trees and other plants in the proper manner for the particular tree or plant being planted.

C. Keep trees and plants properly watered until growth is assured.

3.07 Fencing and Other Restoration

A. Locate fences, mailboxes, planters, and other items in the same location that the item had been prior to construction.

B. Erect wire and board fences plumb and on straight lines. Wire fences shall have the proper tension for the type of wire fence restored. Other fences and items shall be properly erected or constructed.

C. Set mailboxes, posts, poles, and similar items plumb.

D. Restore planters and similar items to the same shape the items had been prior to construction.

3.08 Erosion Control Blanket Installation

A. Erosion control blanket shall be used in areas where construction activities have disrupted vegetation in drainage ditch bottoms, and other areas where steep grade prohibits revegetation by standard seeding methods. In the case of drainage ditches, the erosion control blanket must extend up the sides of the ditch to 1 foot above the ordinary high-water mark or to top of bank.

3.09 Clean-Up

A. Clean up the job site following landscaping. Remove rubbish, excess materials, temporary structures, and equipment. Leave the work in a neat and presentable condition.

PART 4 - FIGURES

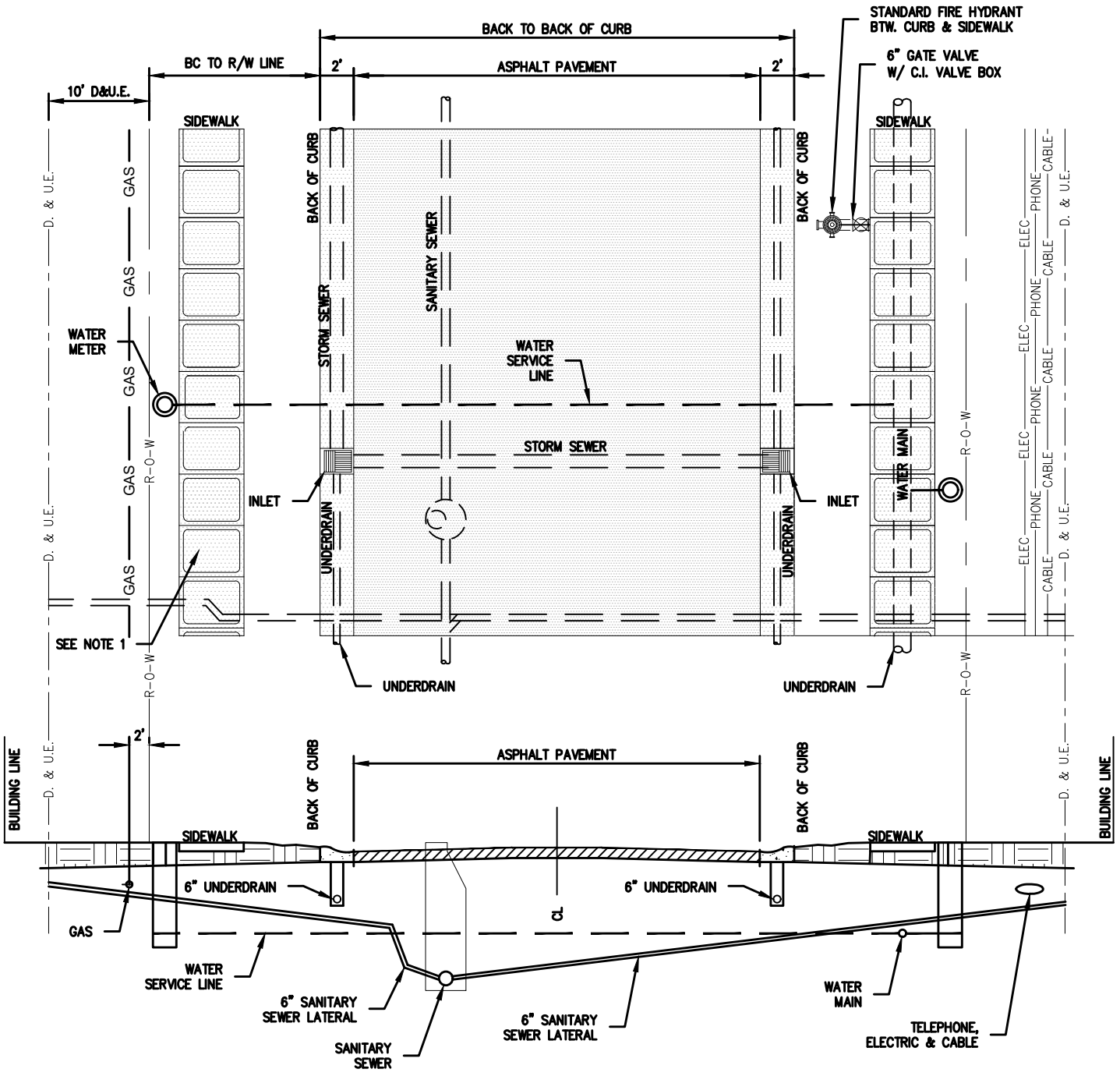
Not Used

END OF SECTION 02902

# CONSTRUCTION DETAILS

MAY 2020

Town of New Whiteland
Indiana



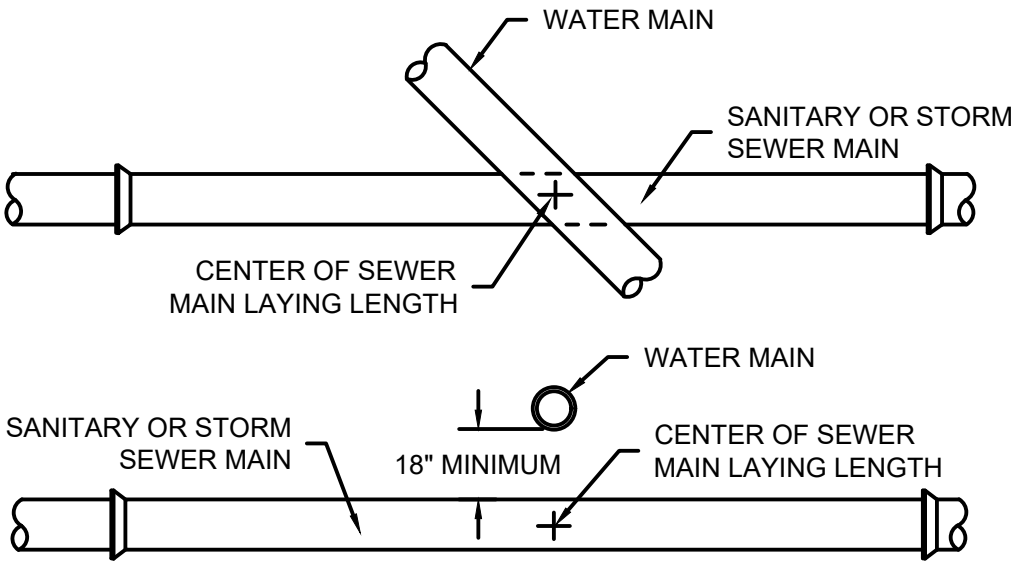

NOTES:

1. MANHOLES MAY BE LOCATED IN STREET, 5' FROM EDGE OF PAVEMENT.
2. LOCATE ALL PRIVATE UTILITIES OUTSIDE PUBLIC RIGHT-OF-WAY.
3. TERMINATE PRIVATE SERVICE LATERALS BETWEEN THE DRAINAGE & UTILITY EASEMENT AND BUILDING SETBACK LINE.
4. IN ORDER TO REDUCE THE NUMBER OF ROAD CUTS, THE TOWN PREFERS PRIVATE SERVICE LATERALS FOR ADJACENT LOTS TO BE PLACED IN THE SAME TRENCH, BEGINNING AT THE WYE CONNECTION TO THE SEWER MAIN AND TERMINATING AT THE ADJOINING PROPERTY LINE AS DESCRIED IN NOTE 3.

# GENERAL UTILITY LOCATION PLAN & SECTION

SCALE: NONE

**TOWN OF NEW WHITELAND**
**DETAIL NO. GE-01**
**DATE: MAY 2020**



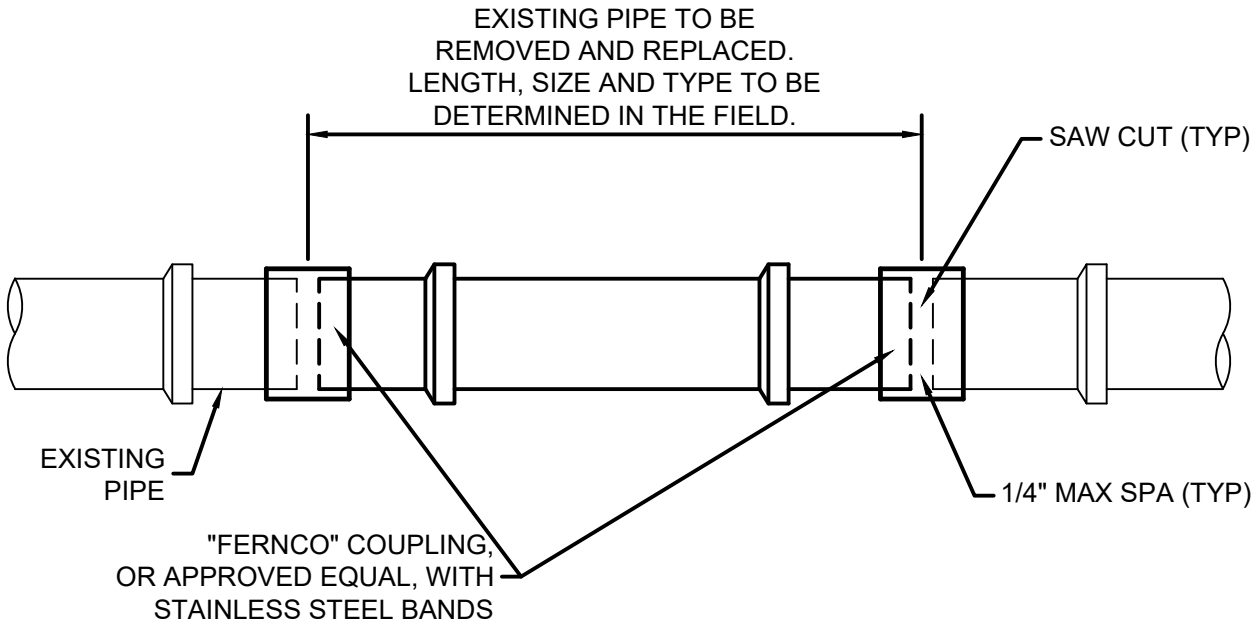

NOTES:

1. WATER MAIN AND SEWER MINIMUM SEPARATION: 18" VERTICAL SEPARATION 10'-0" HORIZONTAL SEPARATION.
2. WHERE WATER MAIN AND SEWER SEPARATION IS LESS THAN 18" VERTICAL OR 10' HORIZONTAL, THE SEWER MUST BE DUCTILE IRON, SDR-21 PVC, OR CONCRETE ENCASED.

# MINIMUM CROSSOVER AND SEPARATION REQUIREMENTS FOR SEWER AND WATER MAINS

SCALE: NONE

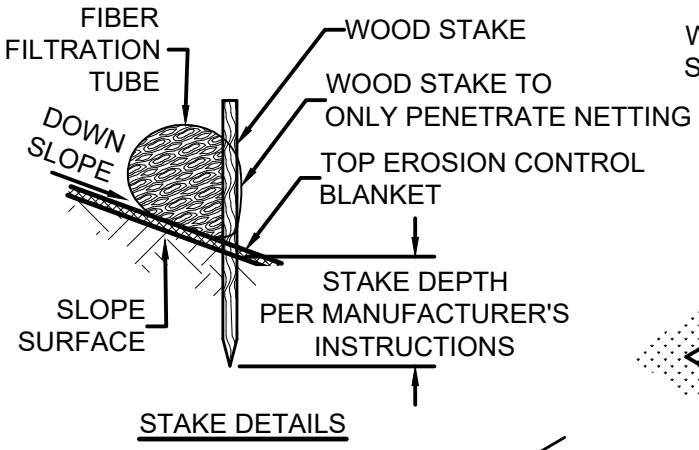
**TOWN OF NEW WHITELAND**
**DETAIL NO. GE-02**
**DATE: MAY 2020**



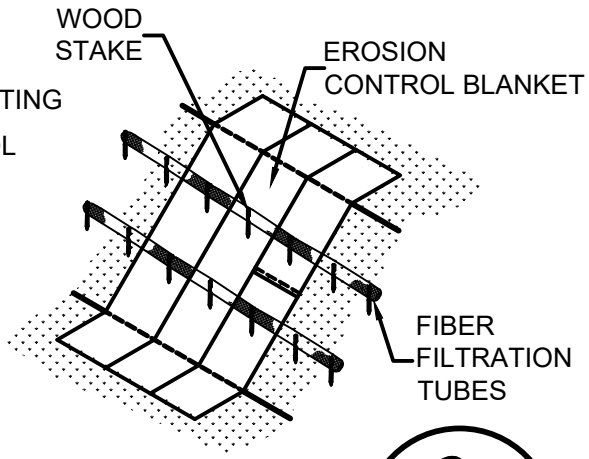

# GRAVITY SEWER REPAIR

SCALE: NONE

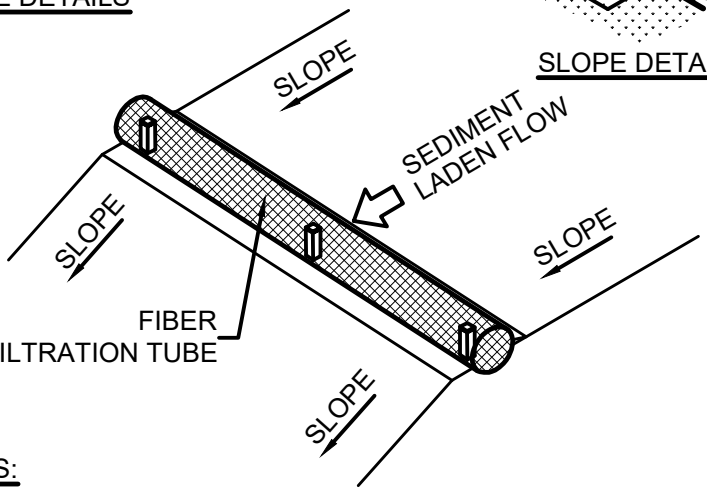
**TOWN OF NEW WHITELAND**
**DETAIL NO. GE-03**
**DATE: MAY 2020**

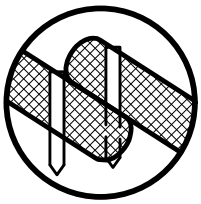



STAKE DETAILS




SLOPE DETAIL



VIEW OF
OVERLAPPED TUBES

APPLICATIONS:

1. TOP OF SLOPES.
2. AT PROJECT PERIMETER.

INSTALLATION:

1. INSTALL IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
2. USE THE APPROPRIATE SIZE, LENGTH AND DISTANCE BETWEEN TUBES AS SPECIFIED BY THE MANUFACTURER.
3. ENTRENCH PER MANUFACTURER'S INSTRUCTIONS.

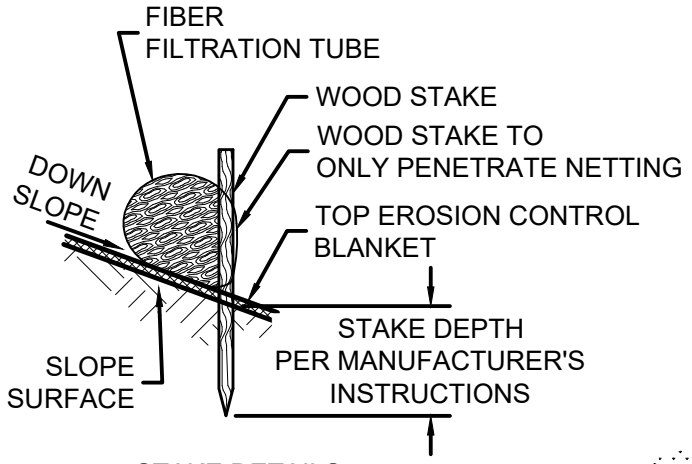
MAINTENANCE:

1. REMOVE ALL ACCUMULATED SEDIMENT WHEN IT REACHES 1/4 THE HEIGHT OF THE TUBE.
2. REPAIR ERODED AND DAMAGED AREAS.
3. IF PONDING BECOMES EXCESSIVE DUE TO REDUCED FILTERING CAPACITY, REMOVE THE TUBE AND EITHER RECONSTRUCT OR REPLACE WITH NEW PRODUCT.
4. INSPECT WITHIN 24 HOURS OF A RAIN EVENT AND AT LEAST ONCE EVERY 7 CALENDAR DAYS.

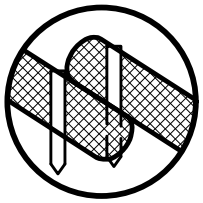
# FIBER FILTRATION TUBES

SCALE: NONE

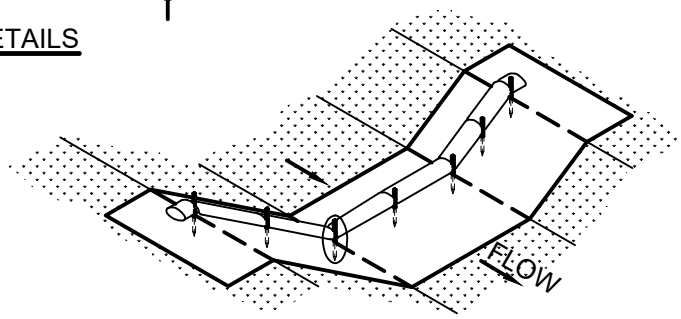
**TOWN OF NEW WHITELAND**
**DETAIL NO. EC-01**
**DATE: MAY 2020**




STAKE DETAILS



VIEW OF
OVERLAPPED TUBES




CHANNEL DETAIL

APPLICATIONS:

1. DOWN-GRADIENT OF A PROJECT LIMITS.
2. ACROSS DITCHES OR SWALES.
3. TO SLOW FLOWS AND FILTER SEDIMENTS.

INSTALLATION:

1. INSTALL IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
2. USE THE APPROPRIATE SIZE, LENGTH AND DISTANCE BETWEEN TUBES AS SPECIFIED BY THE MANUFACTURER.
3. ENTRENCH PER MANUFACTURER'S INSTRUCTIONS.

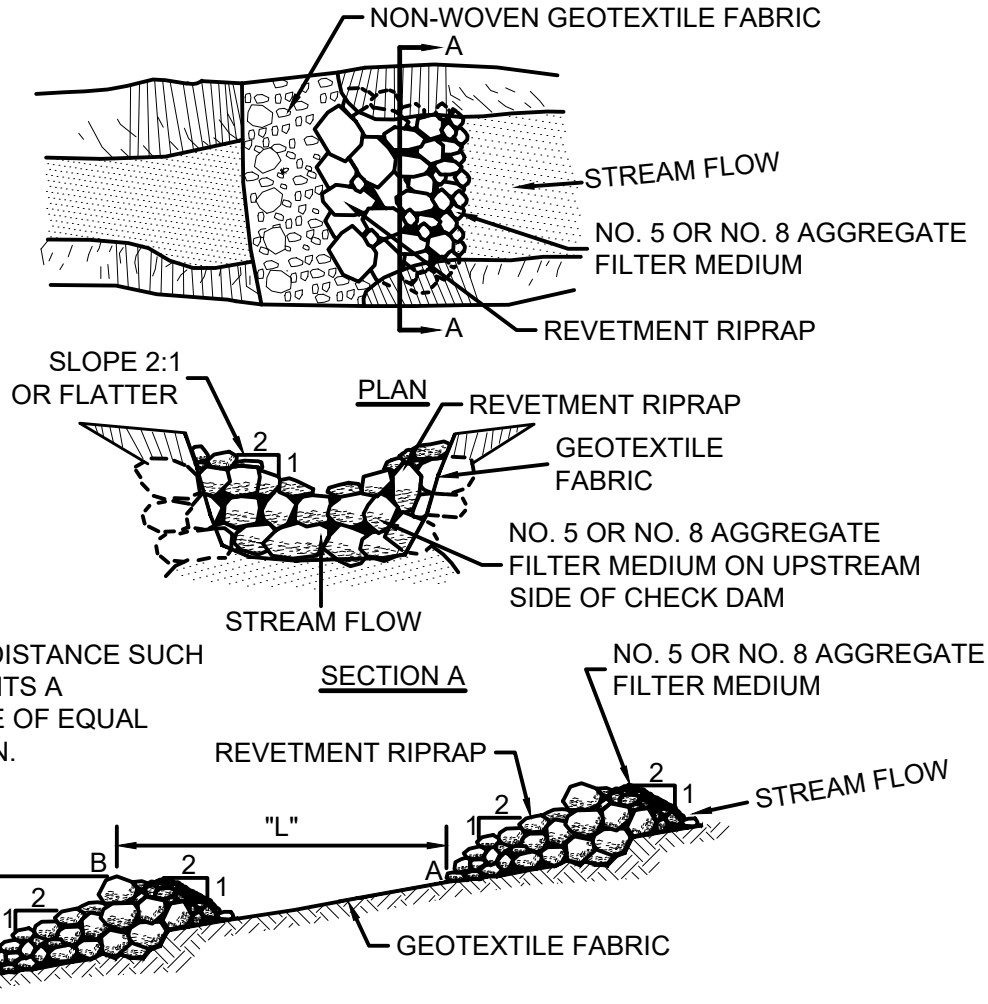
MAINTENANCE:

1. REMOVE ALL ACCUMULATED SEDIMENT WHEN IT REACHES 1/4 THE HEIGHT OF THE TUBE.
2. REPAIR ERODED AND DAMAGED AREAS.
3. IF PONDING BECOMES EXCESSIVE DUE TO REDUCED FILTERING CAPACITY, REMOVE THE TUBE AND EITHER RECONSTRUCT OR REPLACE WITH NEW PRODUCT.
4. INSPECT WITHIN 24 HOURS OF A RAIN EVENT AND AT LEAST ONCE EVERY 7 CALENDAR DAYS.

# FIBER FILTRATION TUBE DITCH CHECK

SCALE: NONE

**TOWN OF NEW WHITELAND**
**DETAIL NO. EC-02**
**DATE: MAY 2020**




NOTES:

1. SPACE CHECK DAMS AS SHOWN IN SITE EROSION CONTROL PLAN.
2. INSTALL AN EROSION RESISTANT LINING IN THE CHANNEL BELOW THE LOWER MOST DAM THAT EXTENDS A MINIMUM OF 6' DOWNSTREAM.

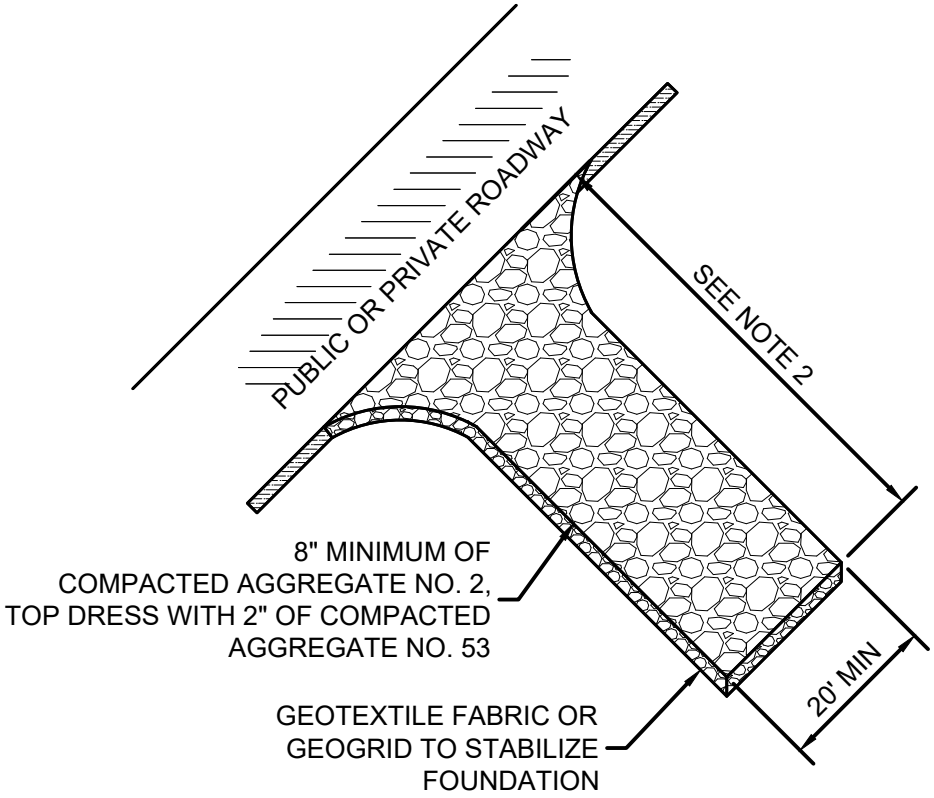
MAINTENANCE:

1. INSPECT WITHIN 24 HOURS OF EACH RAIN EVENT AND AT LEAST ONCE EVERY 7 CALENDAR DAYS.
2. REMOVE ACCUMULATED SEDIMENT WHEN IT REACHES 1/2 THE HEIGHT OF THE DAM.
3. ADD RIPRAP AND AGGREGATE AS NEEDED.
4. WHEN DAMS ARE NO LONGER NEEDED, REMOVE RIPRAP AND AGGREGATE, AND STABILIZE THE CHANNEL.

# RIPRAP CHECK DAM

SCALE: NONE

**TOWN OF NEW WHITELAND**
**DETAIL NO. EC-03**
**DATE: MAY 2020**




NOTES:

1. PLACE CONSTRUCTION ENTRANCE AS SHOWN ON THE PLANS AND AT ALL TEMPORARY CONSTRUCTION DRIVES THAT ARE INSTALLED.
2. FOR LARGE SITES (2 ACRES OR LARGER) THE MINIMUM LENGTH IS 150'. FOR SMALLER SITES (LESS THAN 2 ACRES) THE MINIMUM LENGTH IS 50'.
3. PROVIDE CULVERT OR OTHER METHODS AS NECESSARY TO MAINTAIN POSITIVE DRAINAGE.

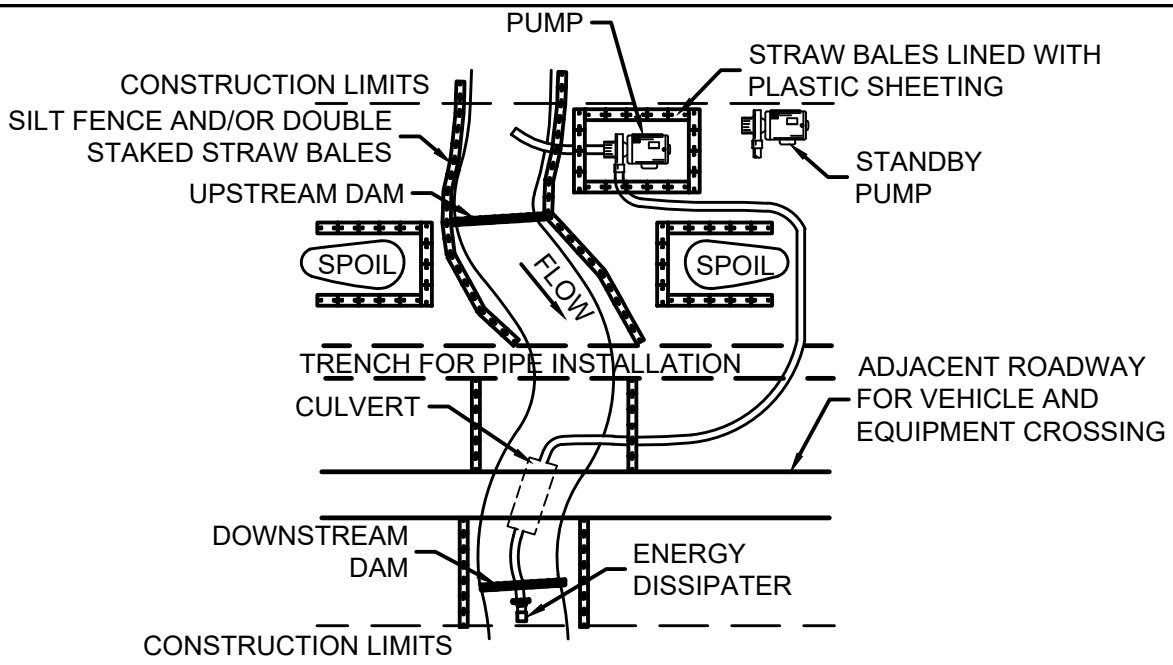
MAINTENANCE:

1. INSPECT DAILY AND REPLACE DISPLACED STONE.
2. IMMEDIATELY REMOVE MUD AND SEDIMENT TRACKED ONTO ADJACENT ROADWAY.
3. RESHAPE PAD AS NEEDED FOR DRAINAGE AND RUNOFF CONTROL.
4. AT COMPLETION OF PROJECT COMPLETELY REMOVE AND RESTORE SITE TO ORIGINAL CONDITIONS, OR AS APPLICABLE USE FOR BASE OF NEW PERMANENT DRIVE, MAINTAINING DESIGN ELEVATIONS AND SECTION.

# CONSTRUCTION ENTRANCE

SCALE: NONE

**TOWN OF NEW WHITELAND**
**DETAIL NO. EC-04**
**DATE: MAY 2020**




INSTALLATION:

1. USE THE DAM AND PUMP METHOD ON NARROW WATER COURSES WITH LOW STREAM FLOW. THE DAM AND PUMP METHOD IS NOT REQUIRED WHEN NO STREAM FLOW IS PRESENT.
2. IF FISH PASSAGE IS A CONCERN, DO NOT USE THE DAM AND PUMP METHOD.
3. INSTALL SILT FENCE OR DOUBLE STAKED STRAW BALES PARALLEL TO BOTH SIDES OF THE STREAM PRIOR TO EXCAVATION.
4. THE DAM AND PUMP METHOD INVOLVES DAMMING THE STREAM BEFORE EXCAVATING IN ORDER TO PREVENT INTERRUPTING DOWNSTREAM FLOW BY PUMPING THE WATER SIMULTANEOUSLY WITH DAM CONSTRUCTION.
5. CONSTRUCT UPSTREAM AND DOWNSTREAM DAMS OF SANDBAGS, STEEL PLATES, AQUADAMS OR CLEAN AGGREGATE WITH PLASTIC LINER.
6. HAVE TWO PUMPS ON HAND, EACH SIZED WITH THE PUMPING CAPACITY OF THE ANTICIPATED STREAM FLOW, TO ENSURE STANDBY FUNCTION. ONE OF THE PUMPS MUST BE ONSITE AS A BACKUP PUMP OF EQUAL OR GREATER CAPACITY AT ALL TIMES IN CASE THE PRIMARY PUMP FAILS.
7. PUMP WATER ACROSS THE CONSTRUCTION AREA THROUGH A HOSE AND ONTO AN ENERGY DISSIPATION DEVICE BACK INTO THE DRY STREAM BED DOWNSTREAM.
8. PLACE THE PUMP IN AN IMPERMEABLE, BERMED AREA ON THE UPSTREAM SIDE OF THE CONSTRUCTION SITE TO PREVENT ANY SPILLED FUEL FROM ENTERING THE WATERCOURSE.
9. MONITOR THE PUMPING OPERATION AT ALL TIMES, AND ADJUST THE PUMP AS NECESSARY TO MAINTAIN AN EVEN FLOW OF WATER ACROSS THE WORK AREA. MAINTAIN NEAR-NORMAL WATER LEVELS UPSTREAM AND DOWNSTREAM OF THE CROSSING.
10. PUMP AND FILTER STANDING WATER THAT IS ISOLATED IN THE CONSTRUCTION AREA BY THE DAMS, OR ANY STREAM WATER THAT LEAKS AROUND THE DAMS OR SEEPS FROM THE GROUND.
11. UTILIZE AN ADJACENT ROADWAY FOR VEHICLE AND EQUIPMENT CROSSINGS.

MAINTENANCE:

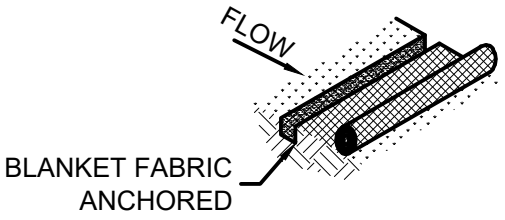
1. FOLLOW GENERAL MAINTENANCE PRACTICES FOR SILT FENCE, STRAW BALES, AND PUMPING BAG (IF NEEDED).
2. CONTINUOUSLY MONITOR DAMS FOR PROPER SEAL.
3. ADJUST THE DAMS AS NECESSARY TO PREVENT LARGE VOLUMES OF WATER FROM SEEPING AROUND THE DAMS AND INTO THE CONSTRUCTION WORK AREA.
4. INSPECT AT LEAST ONCE EVERY 7 CALENDAR DAYS.

# DAM & PUMP METHOD

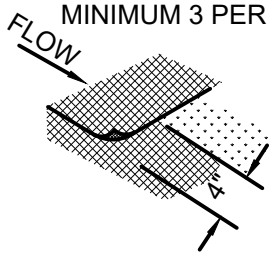
SCALE: NONE

**TOWN OF NEW WHITELAND**
**DETAIL NO. EC-05**
**DATE: MAY 2020**

① BURY UPSLOPE END OF BLANKET IN A TRENCH 6" DEEP BY 6" WIDE.

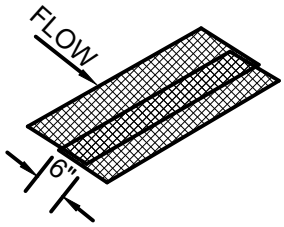


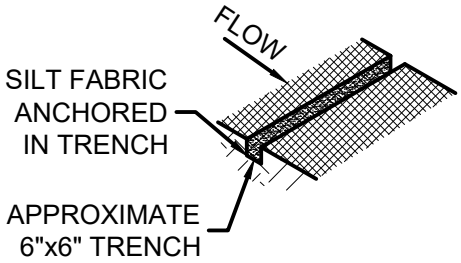

② USE A 4" OVERLAP WHEREVER TWO WIDTHS OF BLANKET ARE APPLIED SIDE BY SIDE. STAPLE PATTERN: MINIMUM 3 PER SQUARE YARD.

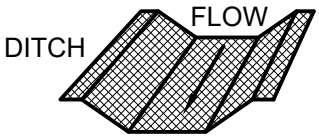


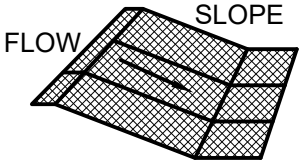

③ USE A 6" OVERLAP WHEREVER ONE ROLL OF BLANKET ENDS AND ANOTHER BEGINS.

④ CHECK SLOTS SHOULD BE MADE EVERY 18'. INSERT A FOLD OF THE BLANKET INTO A TRENCH 6" WIDE BY 6" DEEP AND TAMP FIRMLY. LAY THE BLANKET SMOOTHLY ON THE SURFACE OF THE SOIL: DO NOT STRETCH THE BLANKET, AND DO NOT ALLOW WRINKLES. INSTALL STAPLE 20" ON CENTER IN TRENCH.




PLACE BLANKET PARALLEL TO THE DIRECTION OF FLOW. DO NOT JOIN STRIPS IN THE CENTER OF THE DITCH. USE CHECK SLOTS AS REQUIRED.

PLACE BLANKET PARALLEL TO THE DIRECTION OF FLOW AND ANCHOR SECURELY. BRING BLANKET TO A LEVEL AREA BEFORE TERMINATING THE INSTALLATION.

PRODUCT:

1. NORTH AMERICAN GREEN SC150, OR EQUAL.

NOTES:

1. PROTECT THE SLOPES WITH AN EROSION CONTROL BLANKET WHERE CONSTRUCTION DISTURBS SLOPES EQUAL OR STEEPER THAN 3:1.

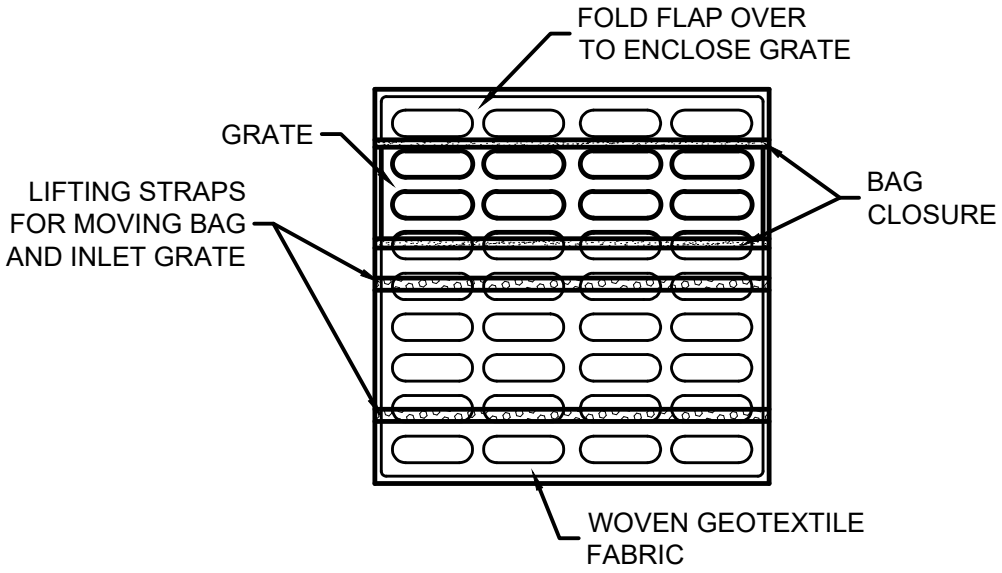
MAINTENANCE:

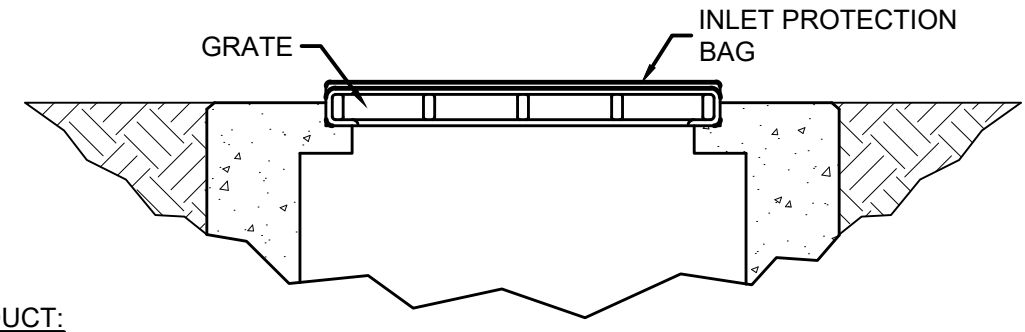
1. INSPECT FOR EROSION AFTER EACH STORM EVENT DURING VEGETATION ESTABLISHMENT, AND AT LEAST ONCE EVERY 7 CALENDAR DAYS.
2. IF ANY AREAS SHOW EROSION, PULL BACK THAT PORTION OF THE BLANKET, ADD SOIL, RESEED, RELAY AND STAPLE THE BLANKET.
3. CHECK AREAS PERIODICALLY AFTER VEGETATION ESTABLISHMENT.

# EROSION CONTROL BLANKET

SCALE: NONE

**TOWN OF NEW WHITELAND**
**DETAIL NO. EC-06**
**DATE: MAY 2020**




PRODUCT:

1. DANDY BAG, OR APPROVED EQUAL.

INSTALLATION:

1. THE EMPTY INLET PROTECTION BAG SHOULD BE PLACED OVER THE GRATE AS THE GRATE STANDS ON END.
2. TUCK THE ENCLOSURE FLAP INSIDE TO COMPLETELY ENCLOSE THE GRATE.
3. HOLDING THE LIFTING DEVICES (DO NOT RELY ON LIFTING DEVICES TO SUPPORT THE ENTIRE WEIGHT OF THE GRATE), PLACE THE GRATE INTO ITS FRAME.

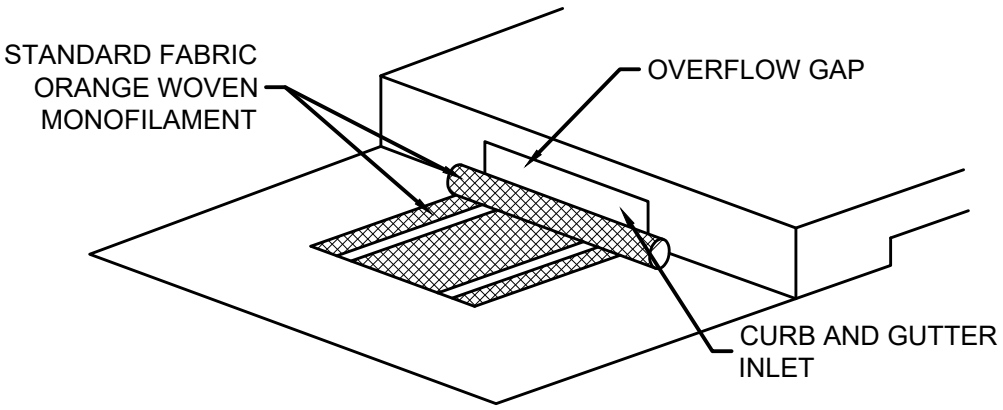
MAINTENANCE:

1. REMOVE ALL ACCUMULATED SEDIMENT AND DEBRIS FROM SURFACE AND VICINITY OF UNIT AFTER EACH STORM EVENT.
2. REMOVE SEDIMENT THAT HAS ACCUMULATED WITHIN THE CONTAINMENT AREA OF THE INLET PROTECTION BAG AS NEEDED.
3. INSPECT WITHIN 24 HOURS OF A RAIN EVENT AND ONCE EVERY 7 CALENDAR DAYS.

# INLET PROTECTION BAG

SCALE: NONE

**TOWN OF NEW WHITELAND**
**DETAIL NO. EC-07**
**DATE: MAY 2020**




DESIGN CONFORMS TO ALL
SHAPES OF CONCRETE CURBS

PRODUCT:

1. DANDY CURB SACK, OR APPROVED EQUAL.

INSTALLATION:

1. REMOVE THE GRATE FROM THE CATCH BASIN AND STAND ON END.
2. CRADLE THE GRATE BETWEEN THE UPPER AND LOWER STRAPS.
3. INSERT THE GRATE INTO THE INLET WITH THE LIFTING DEVICES. LOWER BACK EDGE WITH TUBE INTO PLACE. TUBE SHOULD PARTIALLY BLOCK THE CURB HOOD OPENING.

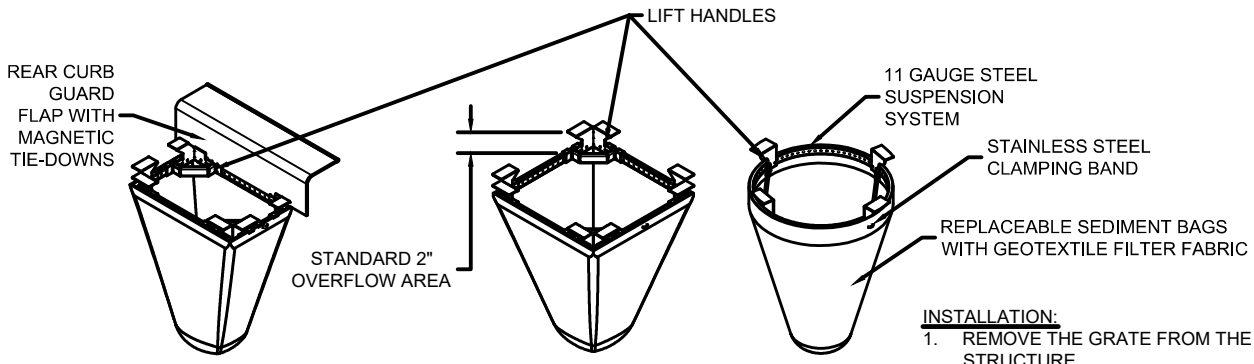
MAINTENANCE:

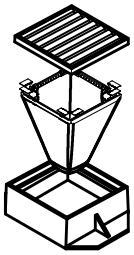
1. REMOVE ALL ACCUMULATED SEDIMENT AND DEBRIS FROM SURFACE AND VICINITY OF UNIT AFTER EACH STORM EVENT.
2. REMOVE THE SEDIMENT THAT HAS ACCUMULATED WITHIN THE FABRIC AS NEEDED.
3. INSPECT WITHIN 24 HOURS OF A RAIN EVENT AND AT LEAST ONCE EVERY 7 CALENDAR DAYS.

# CURB & GUTTER INLET PROTECTION

SCALE: NONE

**TOWN OF NEW WHITELAND**
**DETAIL NO. EC-08**
**DATE: MAY 2020**



| INLET FILTER SPECIFICATIONS | | |
|---|---|---|
| WOVEN GEOTEXTILE SEDIMENT BAG SPECS (2 FT VOL) | | |
| MATERIAL PROPERTY | TEST METHOD | VALUE (AVG) |
| GRAB TENSILE | ASTM D4632 | 255 X 275 |
| PUNCTURE STRENGTH | ASTM D4833 | 135 LB |
| TRAPEZOIDAL TEAR | ASTM D4533 | 75 LB |
| UV RESISTANCE | ASTM D4355 | 90% |
| APP OPEN SIZE (AOS) | ASTM D4751 | NO. 20 SIEVE |
| PERMITTIVITY | ASTM D4491 | 1.5 $S^{-1}$ |
| WATER FLOW RATE | ASTM D4491 | 200 GPM/SQFT |
| SEDIMENT REMOVAL EFFICIENCY (8% MIX) | ASTM D7351 | 82% |

SOURCE: FLEX STORM INLET FILTER

INSTALLATION:

1. REMOVE THE GRATE FROM THE DRAINAGE STRUCTURE.
2. CLEAN THE LEDGE DRAINAGE STRUCTURE TO ENSURE IT IS FREE OF STONE AND DIRT.
3. DROP IN THE INLET FILTER THROUGH THE CLEAR OPENING AND BE SURE THE SUSPENSION HANGERS REST FIRMLY ON THE INSIDE LEDGE.
4. REPLACE THE GRATE.
5. FOR CURB BOX INLET FILTERS: INSERT INLET FILTER AS DESCRIBED ABOVE IN COMBINATION WITH THE CURB BOX FLAP IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.

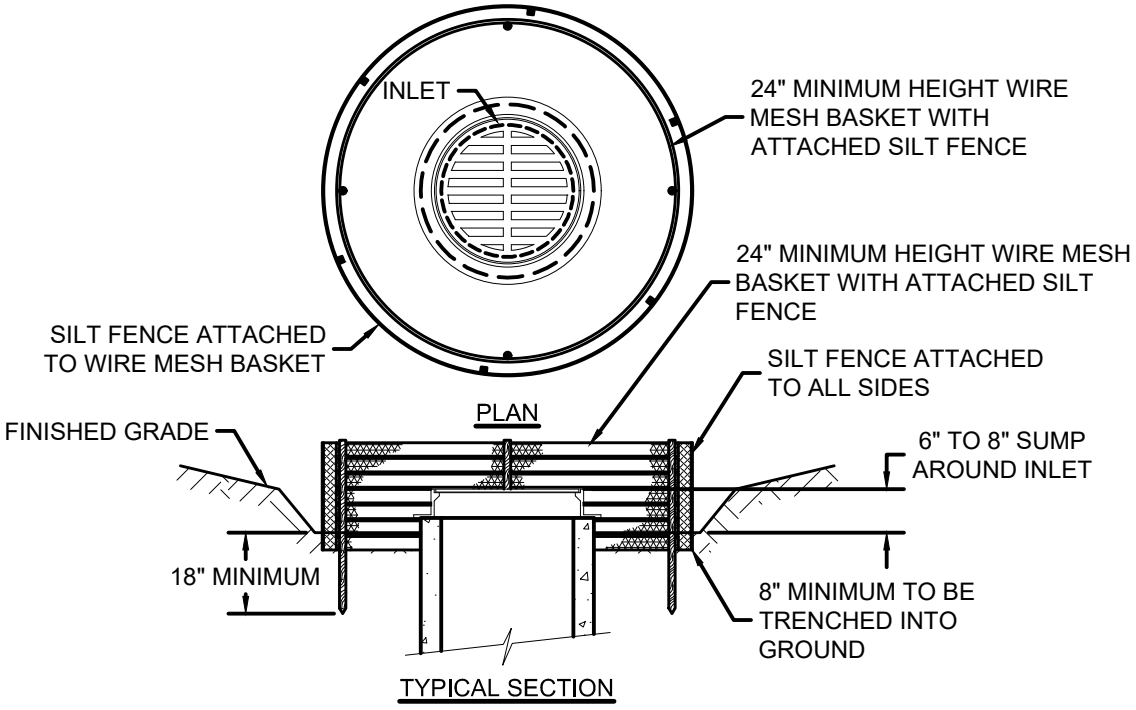
MAINTENANCE:

1. INSPECT THE INLET FILTER DAILY AND AFTER EACH STORM EVENT AND EMPTY IF THE SEDIMENT BAG IS MORE THAN HALF FILLED WITH SEDIMENT AND DEBRIS, OR AS DIRECTED BY THE ENGINEER.
2. REMOVE THE GRATE AND LIFT THE INLET FILTER FROM THE DRAINAGE STRUCTURE. DISPOSE OF ACCUMULATED SEDIMENTS AND DEBRIS PROPERLY. MATERIAL SHALL NOT BE DISCHARGED TO THE STORM SEWER SYSTEM.
3. REMOVE ANY CAKED ON SILT FROM THE SEDIMENT BAG AND REVERSE FLUSH THE BAG FOR OPTIMAL FILTRATION.
4. REPLACE THE BAG IF THE INNER FILTER MEMBRANE IS TORN.

# INLET PROTECTION

SCALE: NONE

**TOWN OF NEW WHITELAND**
**DETAIL NO. EC-09**
**DATE: MAY 2020**




NOTES:

1. SYNTHETIC FILTER FABRIC SHALL BE A PERVIOUS SHEET OF WOVEN OR NON-WOVEN GEOTEXTILE FABRIC AND SHALL BE CERTIFIED BY THE MANUFACTURER OR SUPPLIER AS CONFORMING TO THE FOLLOWING REQUIREMENTS:
   a. TEXTILE STRENGTH AT 20% (MAXIMUM) ELONGATION, PER ASTM D4632.
   b. WOVEN EXTRA STRENGTH - 50 LB/LIN IN. (MINIMUM), NON-WOVEN EXTRA STRENGTH - 70 LB/IN. (MINIMUM).
   c. WOVEN STANDARD STRENGTH - 30 LB/LIN IN. (MINIMUM), NON-WOVEN STANDARD STRENGTH - 50 LB/IN. (MINIMUM).
   d. APPARENT OPENING SIZE (AOS) (U.S. SIEVE) - NO. 30 PARTICLE SIZE OF 0.6 mm (MAXIMUM), PER ASTM D4751.
   e. PERMITTIVITY - 0.05 $S^{-1}$ (MAXIMUM), PER ASTM D4491.
2. WHEN STANDARD STRENGTH FILTER FABRIC IS USED WITH A WIRE MESH SUPPORT FENCE FASTEN THE FABRIC SECURELY TO THE UPSLOPE SIDE OF THE POSTS USING HEAVY DUTY 1" WIRE STAPLES, TIE WIRES OR HOG RINGS. THE WIRE SHALL EXTEND INTO THE TRENCH A MINIMUM OF 2" AND SHALL NOT EXTEND MORE THAN 36" ABOVE THE ORIGINAL GROUND SURFACE.

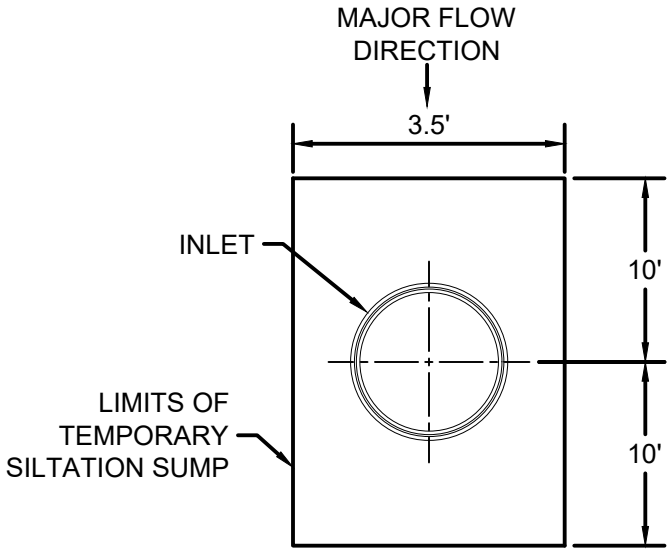
MAINTENANCE:

1. INSPECT WITHIN 24 HOURS OF A RAIN EVENT AND DAILY DURING PROLONGED RAINFALL. INSPECT AT LEAST ONCE EVERY 7 CALENDAR DAYS.
2. REPLACE THE FABRIC PROMPTLY IF THE FABRIC DECOMPOSES OR BECOMES INEFFECTIVE. IMMEDIATELY MAKE ANY REQUIRED REPAIRS.
3. REMOVE SEDIMENT DEPOSITS FROM THE POOL AREA AFTER EACH STORM EVENT AND WHEN IT REACHES HALF THE HEIGHT OF THEE BARRIER.
4. SPREAD ANY SEDIMENT DEPOSITS REMAINING IN PLACE AFTER THE SILT FENCE IS NO LONGER REQUIRED, AND DRESS TO CONFORM WITH THE FINISHED GRADING.

# SILT FENCE INLET SEDIMENT BARRIER

SCALE: NONE

**TOWN OF NEW WHITELAND**
**DETAIL NO. EC-10**
**DATE: MAY 2020**

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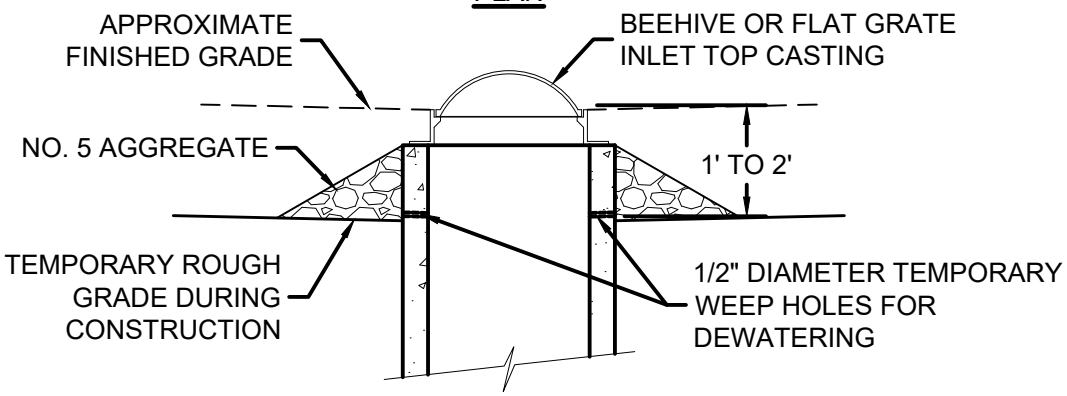



TYPICAL SECTION

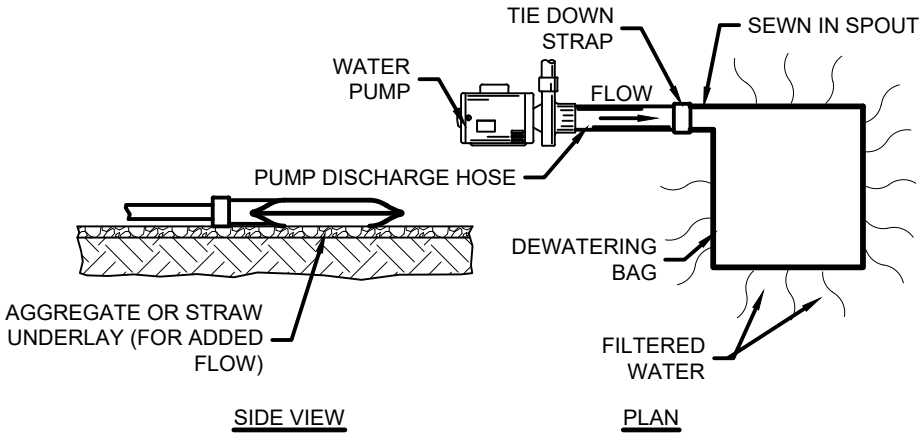
MAINTENANCE:

1. INSPECT THE EXCAVATED SILTATION SUMP WEEKLY AND AFTER EACH 1/2" RAINFALL EVENT, AND REPAIR AS NECESSARY UNTIL THE CONTRIBUTING DRAINAGE AREA HAS BEEN PERMANENTLY STABILIZED.
2. REMOVE SEDIMENT WHEN TEMPORARY SUMP AREA IS APPROXIMATELY HALF FULL OF SEDIMENT.
3. REMOVE AND REPLACE AGGREGATE AROUND INLET STRUCTURE WEEP HOLES WHEN DRAINAGE INTO INLET STOPS.
4. WHEN THE CONTRIBUTING DRAINAGE AREA HAS BEEN PERMANENTLY STABILIZED SEAL THE WEEP HOLES, REMOVE THE SEDIMENT, RESTORE THE TEMPORARY SUMP AREA WITH TOP SOIL, COMPACT AND GRADE TO THE FINISHED GRADE ELEVATION, AND STABILIZE.
5. ALTERNATE INLET PROTECTION WILL BE REQUIRED WHEN THE AREA DRAINING TO THE INLET IS NOT FULLY STABILIZED.

# TEMPORARY SILTATION SUMP

SCALE: NONE

**TOWN OF NEW WHITELAND**
**DETAIL NO. EC-11**
**DATE: MAY 2020**




| MECHANICAL PROPERTIES | TEST METHOD | UNITS | INDUSTRY STANDARD |
|---|---|---|---|
| GRAB TENSILE STRENGTH | ASTM D4632 | kN (LB) | 0.9 (205) X 0.9 (205) |
| GRAB TENSILE ELONGATION | ASTM D4632 | % | 50 X 50 |
| PUNCTURE STRENGTH | ASTM D4833 | kN (LB) | 0.58 (130) |
| MULLEN BURST STRENGTH | ASTM D3786 | kPa (PSI) | 2618 (380) |
| TRAPEZOID TEAR STRENGTH | ASTM D4533 | kN (LB) | 0.36 (80) X 0.36 (80) |
| UV RESISTANCE | ASTM D4355 | % | 70 |
| APPARENT OPENING SIZE | ASTM D4751 | Mm (US STD SIEVE) | 0.180 (80) |
| FLOW RATE | ASTM D4491 | 1/MIN/M² (GAL/MIN/FT²) | 3866 (95) |
| PERMITTIVITY | ASTM D4491 | $S^{-1}$ | 1.2 |

MAINTENANCE:

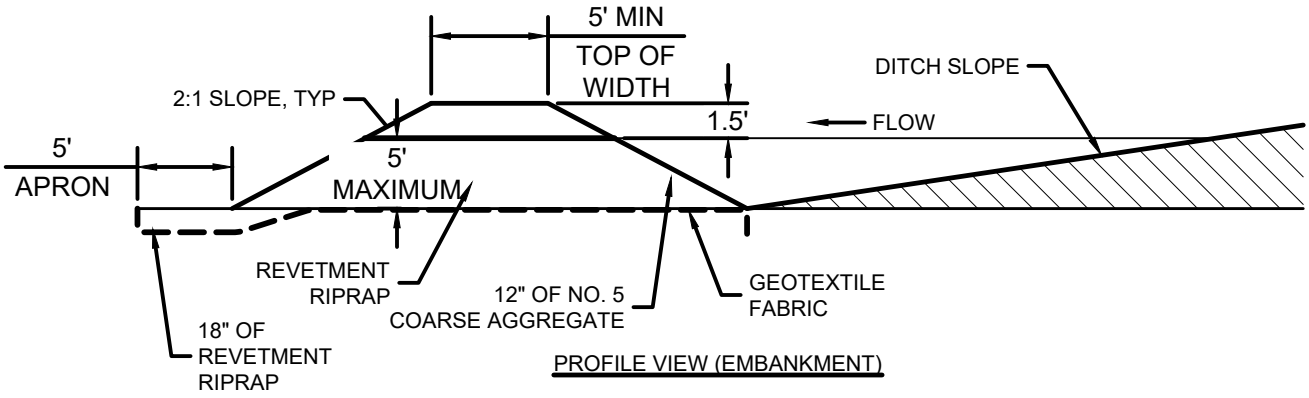
1. DURING THE ACTIVE DEWATERING PROCESS, INSPECTION OF THE PUMPING BAG SHOULD BE REVIEWED FREQUENTLY. SPECIAL ATTENTION SHOULD BE PAID TO THE BUFFER AREA FOR ANY SIGN OF EROSION AND CONCENTRATION OF FLOW. OBSERVE WHERE POSSIBLE THE VISUAL QUALITY OF THE EFFLUENT AND DETERMINE IF ADDITIONAL TREATMENT CAN BE PROVIDED.
2. DISPOSE OF ACCUMULATED SEDIMENT REMOVED DURING PUMPING OPERATIONS IN CONFORMANCE WITH THE SPECIFICATIONS.
3. REPLACE THE BAG OR DISPOSE OF SILT WHEN HALF FULL OF SEDIMENT OR WHEN SEDIMENT HAS REDUCED THE FLOW RATE TO AN IMPRACTICAL RATE.

SOURCE:
KRISTAR
DANDY DEWATERING BAG
SEDCATCH

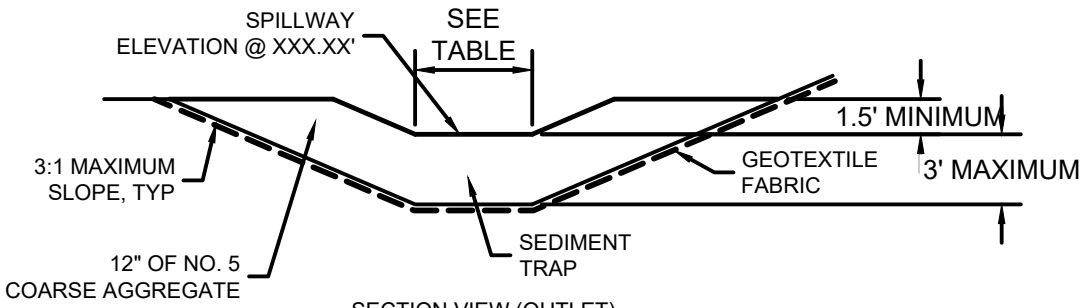
# PUMPING BAG

SCALE: NONE

**TOWN OF NEW WHITELAND**
**DETAIL NO. EC-12**
**DATE: MAY 2020**




PROFILE VIEW (EMBANKMENT)




SECTION VIEW (OUTLET)

NOTES:

1. THIS AREA MAY BE EXCAVATED BELOW PLANNED DITCH GRADE TO ACHIEVE SEDIMENT TRAP CAPACITY. DO NOT EXCAVATE TO BELOW THE BOTTOM ELEVATION OF SEDIMENT TRAP RIPRAP.
2. NO. 8 AGGREGATE IS ACCEPTABLE IF NO. 5 IS UNAVAILABLE.

MAINTENANCE:

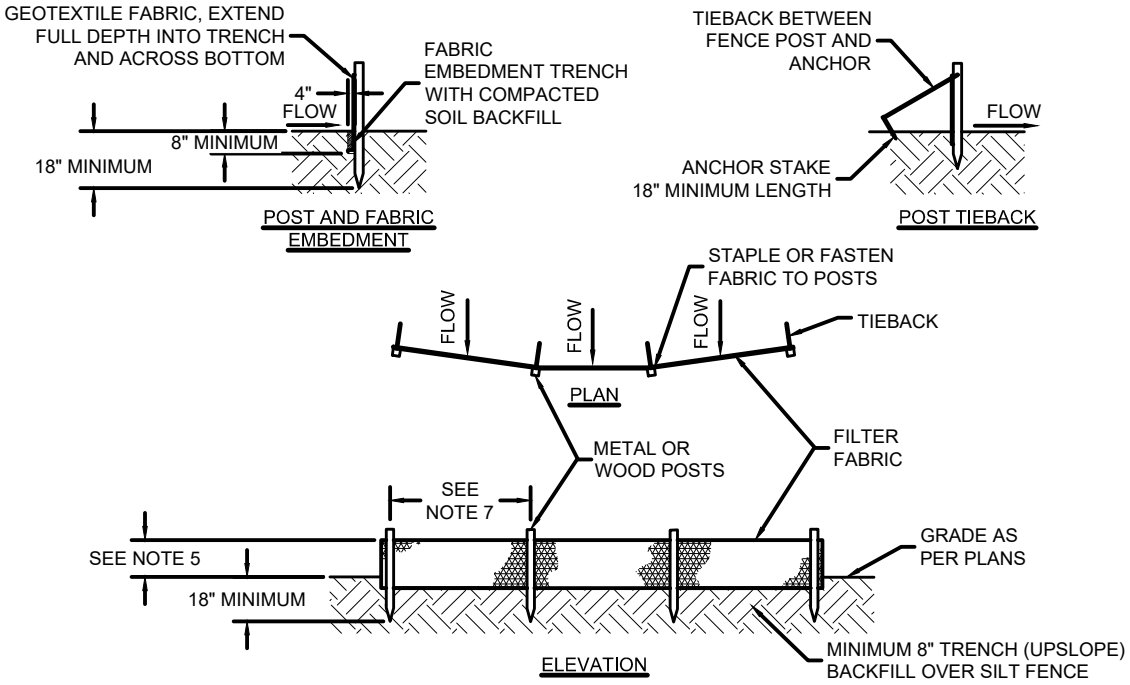
1. INSPECT WITHIN 24 HOURS OF A RAIN EVENT AND AT LEAST ONCE EVERY 7 CALENDAR DAYS.
2. CHECK FOR EROSION AND REPAIR IMMEDIATELY.
3. REMOVE ACCUMULATED SEDIMENT.
4. REPLACE AGGREGATE AND SEED AS NECESSARY.
5. AFTER ALL DISTURBED AREAS HAVE BEEN STABILIZED, REMOVE ACCUMULATED SEDIMENT AND THE EMBANKMENT STRUCTURE, SMOOTH THE SITE TO BLEND WITH ADJOINING AREAS, AND STABILIZE WITH SEED AND MULCH OR OTHER APPROPRIATE COVER.

| SPILLWAY WIDTH TABLE | |
|---|---|
| DRAINAGE AREA | MIN BOTTOM WIDTH |
| 1 ACRE | 4 FT |
| 2 ACRES | 6 FT |
| 3 ACRES | 8 FT |
| 4 ACRES | 10 FT |
| 5 ACRES | 12 FT |

# TEMPORARY SEDIMENT TRAP IN FLOW LINE

SCALE: NONE

**TOWN OF NEW WHITELAND**
**DETAIL NO. EC-13**
**DATE: MAY 2020**




NOTES:

1. SYNTHETIC FILTER FABRIC SHALL BE A PERVIOUS SHEET OF WOVEN OR NON-WOVEN GEOTEXTILE FABRIC AND SHALL BE CERTIFIED BY THE MANUFACTURER OR SUPPLIER AS CONFORMING TO THE FOLLOWING REQUIREMENTS:
   a. TEXTILE STRENGTH AT 20% (MAXIMUM) ELONGATION, PER ASTM D4632.
   b. WOVEN EXTRA STRENGTH - 50 LB/LINEAR INCH (MINIMUM), NON-WOVEN EXTRA STRENGTH - 70 LB/INCH (MINIMUM).
   c. WOVEN STANDARD STRENGTH - 30 LB/LINEAR INCH (MINIMUM), NON-WOVEN STANDARD STRENGTH - 50 LB/INCH (MINIMUM).
   d. APPARENT OPENING SIZE (AOS) (U.S. SIEVE) - NO. 30 PARTICLE SIZE OF 0.6 mm (MAXIMUM), ASTM D4751.
   e. PERMITTIVITY - 0.05 $S^{-1}$ (MAXIMUM), ASTM D4491.
2. POSTS FOR SILT FENCES SHALL BE EITHER 2"X2" SQUARE WOOD OR EQUIVALENT METAL POSTS WITH A MINIMUM LENGTH OF 5'. METAL POSTS SHALL HAVE PROJECTIONS FOR FASTENING WIRE TO THEM.
3. ANCHOR STAKES FOR SILT FENCES SHALL BE 1"x2" WOOD (PREFERRED) OR EQUIVALENT METAL WITH A MINIMUM LENGTH OF 18".
4. WIRE FENCE REINFORCEMENT FOR SILT FENCES USING STANDARD STRENGTH FILTER CLOTH SHALL BE A MINIMUM OF 42" IN HEIGHT, A MINIMUM OF 14 GAUGE, AND SHALL HAVE A MAXIMUM MESH SPACING OF 6".
5. THE HEIGHT OF THE BARRIER SHALL BE A MINIMUM OF 18" AND A MAXIMUM OF 30".
6. THE FABRIC SHALL BE PURCHASED IN A CONTINUOUS ROLL CUT TO THE LENGTH OF THE BARRIER TO AVOID THE USE OF JOINTS. WHEN JOINTS ARE NECESSARY, FILTER FABRIC SHALL BE SPLICED TOGETHER ONLY AT A SUPPORT POST, WITH A MINIMUM 6" OVERLAP, AND SECURELY SEALED.
7. POSTS SHALL BE SPACED A MAXIMUM OF 6' APART AT THE BARRIER LOCATION AND DRIVEN SECURELY INTO THE GROUND (MINIMUM OF 18"). WHEN STANDARD STRENGTH FABRIC IS USED WITH THE WIRE SUPPORT FENCE, POST SPACING SHALL NOT EXCEED 8'.
8. THE SPACING OF TIEBACKS SHALL EQUAL THE SPACING OF THE POSTS. ADDITIONAL POST DEPTH OR TIEBACKS MAY BE REQUIRED IN UNSTABLE SOILS.
9. A TRENCH SHALL BE EXCAVATED APPROXIMATELY 4" WIDE AND A MINIMUM OF 8" DEEP ALONG THE LINE OF POSTS AND UPSLOPE FROM THE BARRIER.
10. WHEN STANDARD STRENGTH FILTER FABRIC IS USED WITH A WIRE MESH SUPPORT FENCE IT SHALL BE FASTENED SECURELY TO THE UPSLOPE SIDE OF THE POSTS USING HEAVY DUTY 1" WIRE STAPLES, TIE WIRES OR HOG RINGS. THE WIRE SHALL EXTEND INTO THE TRENCH A MINIMUM OF 2" AND SHALL NOT EXTEND MORE THAN 36" ABOVE THE ORIGINAL GROUND SURFACE.
11. THE STANDARD STRENGTH FILTER FABRIC, WITHOUT A WIRE MESH SUPPORT FENCE, SHALL BE STAPLED OR WIRED TO THE FENCE, AND A MINIMUM 8" OF THE FABRIC SHALL BE EXTENDED INTO THE TRENCH. THE FABRIC SHALL NOT EXTEND MORE THAN 36" ABOVE THE ORIGINAL GROUND SURFACE. DO NOT STAPLE FILTER FABRIC TO EXISTING TREES.
12. WHEN EXTRA STRENGTH FILTER FABRIC OR BURLAP AND POST SPACING IS LESS THAN THE MAXIMUM SPECIFIED SPACING OF 6', THE WIRE MESH SUPPORT FENCE MAY BE ELIMINATED.
13. BACKFILL THE TRENCH AND COMPACT THE SOIL OVER THE FILTER FABRIC.
14. REMOVE SILT FENCES WHEN THEY HAVE SERVED THEIR USEFUL PURPOSE, BUT NOT BEFORE THE UPSLOPE AREA HAS BEEN PERMANENTLY STABILIZED.
15. SILT FENCE SHALL NOT BE USED AS A DIVERSION AND SHALL NOT BE INSTALLED ACROSS A STREAM, CHANNEL, DITCH, SWALE, ETC.

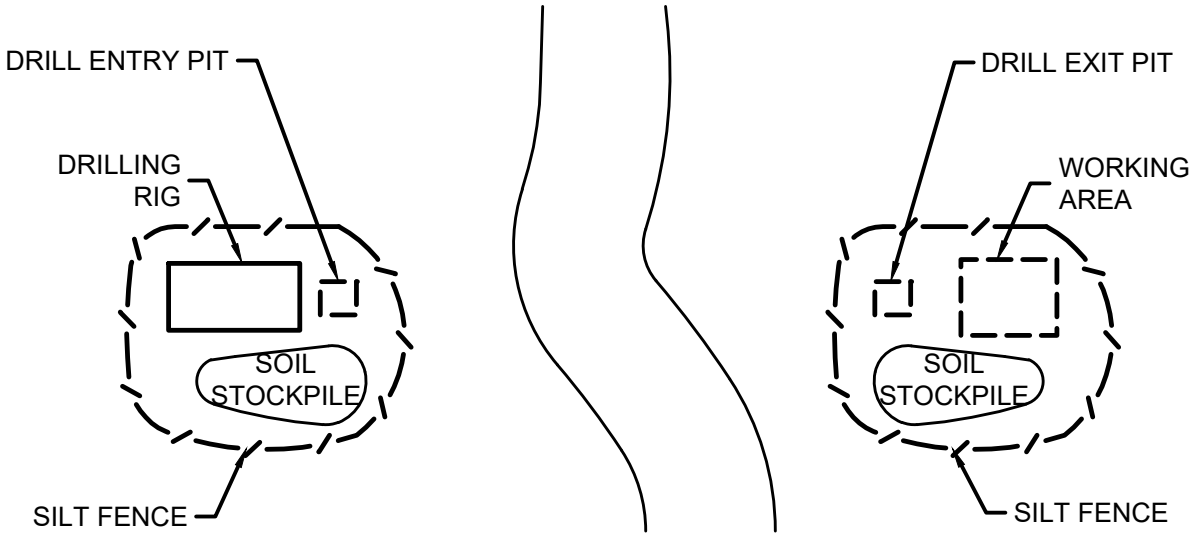
MAINTENANCE:

1. INSPECT AFTER EACH RAINFALL AND DAILY DURING PROLONGED RAINFALL. INSPECT AT LEAST ONCE EVERY 7 CALENDAR DAYS.
2. REPLACE OR REPAIR FABRIC IMMEDIATELY IF IT DECOMPOSES OR IS INEFFECTIVE.
3. SEDIMENT DEPOSITS SHOULD BE REMOVED AFTER EACH STORM EVENT. THEY MUST BE REMOVED WHEN DEPOSITS REACH APPROXIMATELY HALF THE HEIGHT OF THE BARRIER.
4. SPREAD ANY SEDIMENT DEPOSITS REMAINING IN PLACE AFTER THE SILT FENCE IS NO LONGER REQUIRED AND DRESS TO CONFORM WITH THE FINISHED GRADING.

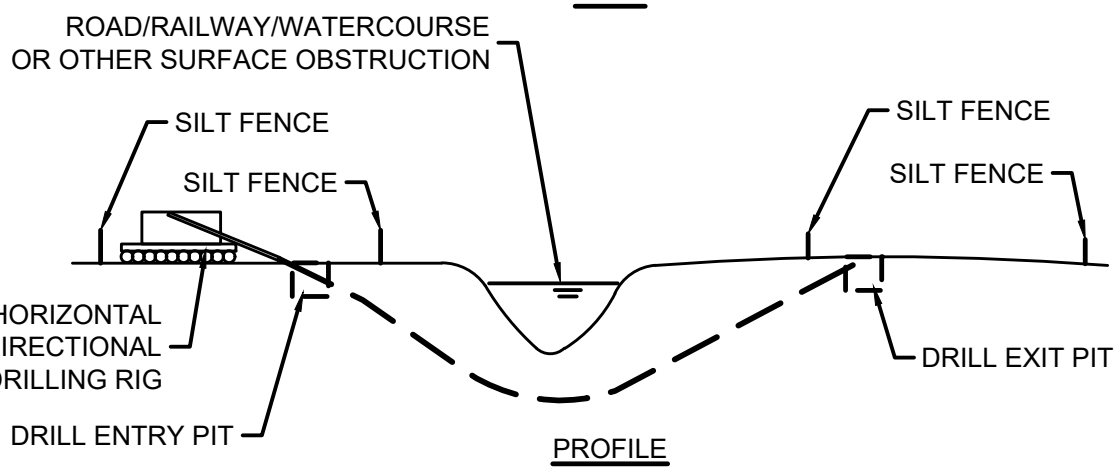
# SILT FENCE

SCALE: NONE

**TOWN OF NEW WHITELAND**
**DETAIL NO. EC-14**
**DATE: MAY 2020**




PLAN




PROFILE

NOTES:

1. INSTALL SILT FENCE PRIOR TO ANY EXCAVATION.
2. FILTER WATER FROM BORE PIT DEWATERING, AND DO NOT DIRECTLY DISCHARGE TO ANY DITCH, STREAM, WETLAND OR STORM WATER CONVEYANCE. REFER TO PUMPING BAG DETAIL.
3. PLACE SOIL STOCKPILES WITHIN THE SILT FENCE BOUNDARY.
4. SOIL FROM STOCKPILES SHALL BE USED FOR BACKFILL OR DISPOSED OF PROPERLY.
5. RESEED AND MULCH ALL DISTURBED SOIL SURFACES.
6. ENVIRONMENTAL PROTECTION TO BE PROVIDED AS NECESSARY TO CONTAIN ANY DRILLING FLUID SPILLS.

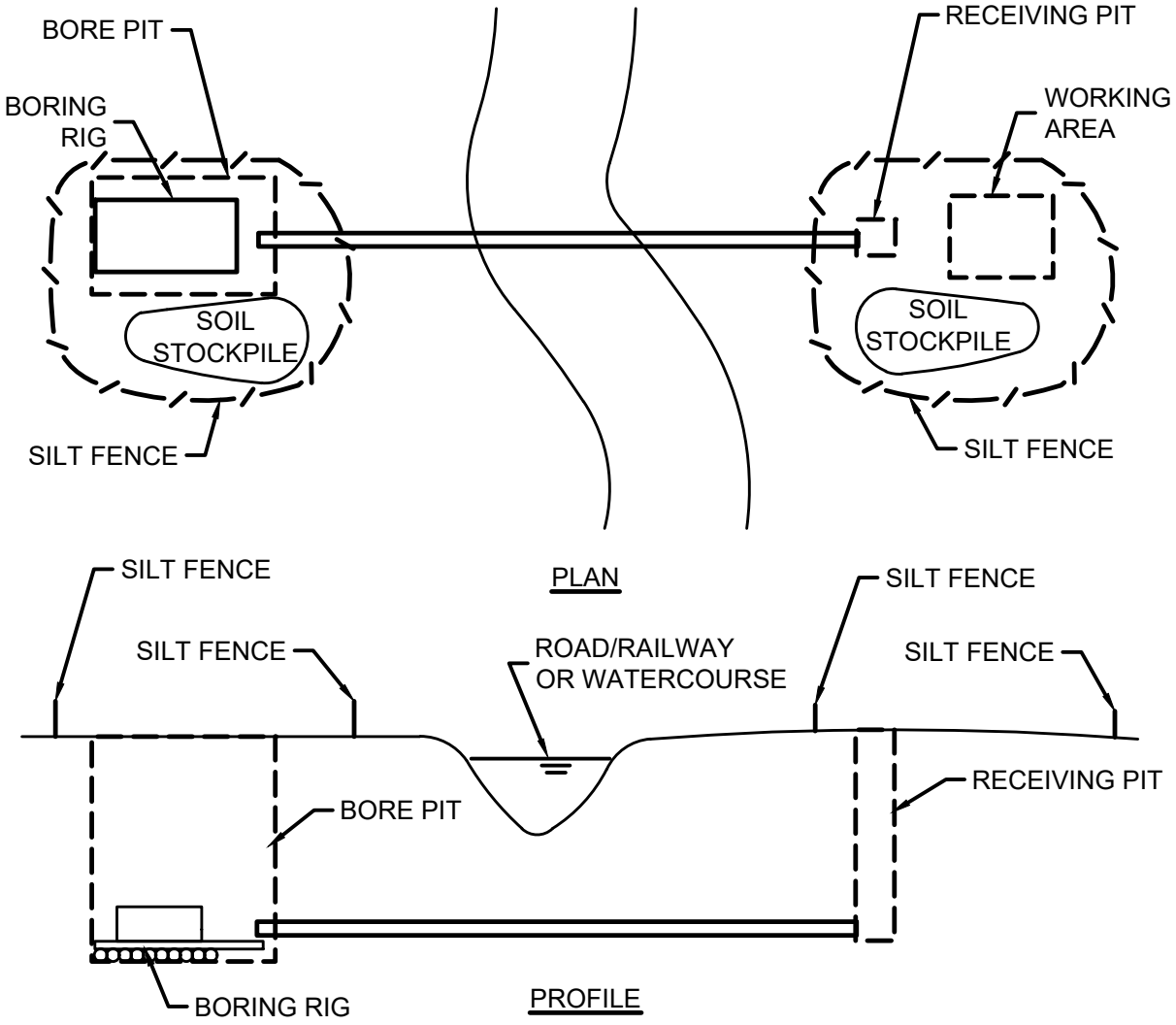
MAINTENANCE:

1. INSPECT SILT FENCE BARRIERS AFTER EACH RAINFALL, AND REPAIR OR REPLACE IMMEDIATELY.
2. REMOVE SEDIMENT DEPOSITS FROM THE SILT FENCE AFTER STORM EVENTS.

# HORIZONTAL DIRECTIONAL DRILLING

SCALE: NONE

**TOWN OF NEW WHITELAND**
**DETAIL NO. EC-15**
**DATE: MAY 2020**




NOTES:

1. INSTALL SILT FENCE PRIOR TO ANY EXCAVATION.
2. FILTER WATER FROM BORE PIT DEWATERING, AND DO NOT DIRECTLY DISCHARGE TO ANY DITCH, STREAM, WETLAND OR STORM WATER CONVEYANCE. REFER TO PUMPING BAG DETAIL.
3. PLACE SOIL STOCKPILES WITHIN THE SILT FENCE BOUNDARY.
4. SOIL FROM STOCKPILES SHALL BE USED FOR BACKFILL OR DISPOSED OF PROPERLY.
5. RESEED AND MULCH ALL DISTURBED SOIL SURFACES.
6. PROVIDE ENVIRONMENTAL PROTECTION AS NECESSARY TO CONTAIN ANY DRILLING FLUID SPILLS.

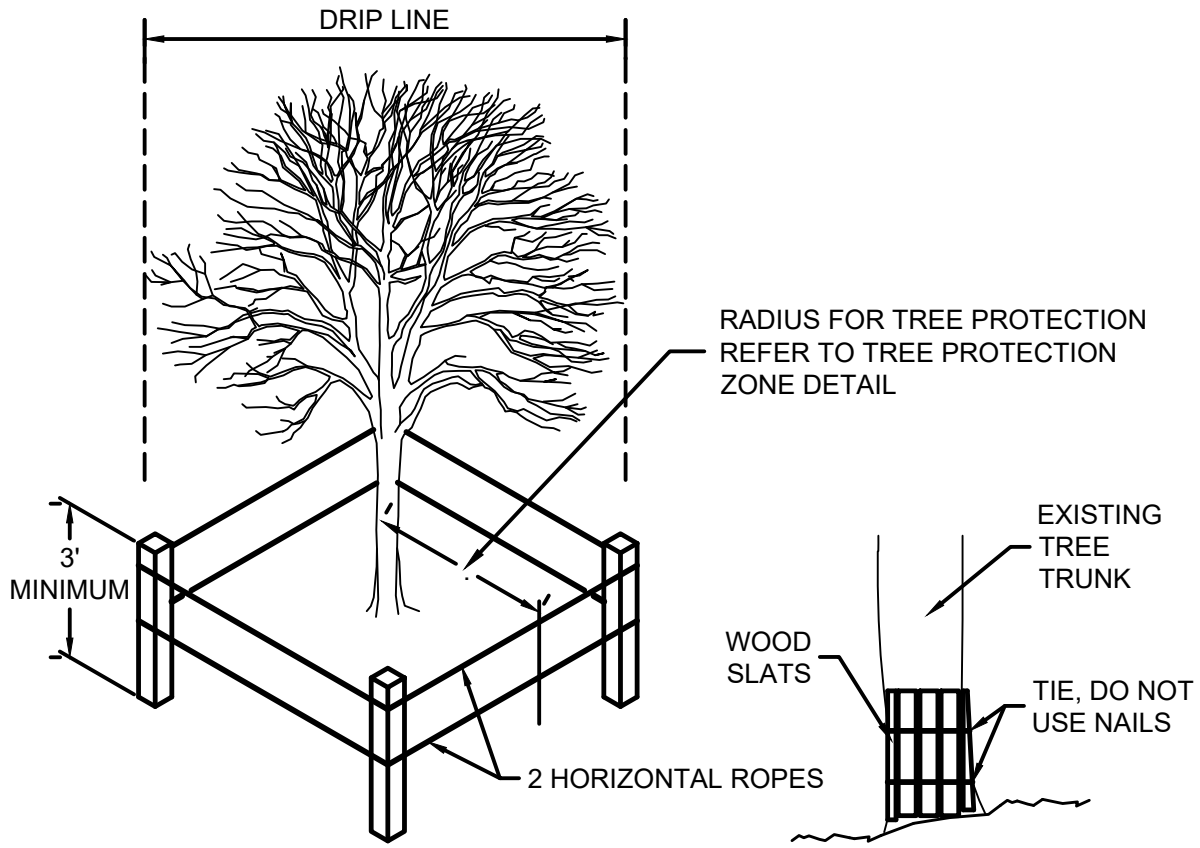
MAINTENANCE:

1. INSPECT SILT FENCE BARRIERS AFTER EACH RAINFALL. REPAIR OR REPLACE IMMEDIATELY.
2. REMOVE SEDIMENT DEPOSITS FROM THE SILT FENCE AFTER STORM EVENTS.

# HORIZONTAL BORED CROSSING

SCALE: NONE

**TOWN OF NEW WHITELAND**
**DETAIL NO. EC-16**
**DATE: MAY 2020**




OPTION 1

OPTION 2

NOTES:

1. PROTECT TREES WHERE NOTED ON THE DRAWINGS DURING EXCAVATION TO PROTECT TREE ROOTS.
2. OPTION 1 SHALL BE THE STANDARD TREE PROTECTION METHOD. MULTIPLE TREES MAY BE PROTECTED BY A SINGLE SET OF PERIMETER ROPES PROVIDED THE APPROPRIATE TREE PROTECTION ZONE IS MAINTAINED FOR EACH TREE.
3. OPTION 2 TREE PROTECTION METHOD MAY BE USED TO PREVENT BARK REMOVAL OR DAMAGE TO THE TRUNK OF THE TREE.

MAINTENANCE:

1. INSPECT AT LEAST ONCE EVERY 7 CALENDAR DAYS.
2. REPAIR PERIMETER BARRIERS IF DAMAGED.
3. INSPECT FOR DAMAGE FROM CONSTRUCTION ACTIVITIES. REPAIR WOUNDS SIMPLY BY REMOVING DAMAGED BARK AND WOOD TISSUE. DO NOT USE TREE PAINT.
4. CABLE AND BRACE ANY TRUNK SPLITS, WEAK FORKS, AND LARGE LIMBS.

# TREE PROTECTION

SCALE: NONE

**TOWN OF NEW WHITELAND**
**DETAIL NO. EC-17**
**DATE: MAY 2020**

MINIMUM PROTECTION ZONE SIZES SHOWN BELOW ARE BASED ON MEASUREMENT OF TREE STEM DIAMETER AT 4.5 FEET ABOVE THE GROUND (DIAMETER AT BREAST HEIGHT - DBH). FOR TREES WITH MULTIPLE STEMS (TRUNKS) AT THE MEASURING HEIGHT, THE DBH MEASUREMENTS ARE ADDED TOGETHER TO CREATE AN OVERALL SUM DBH FOR THAT TREE.

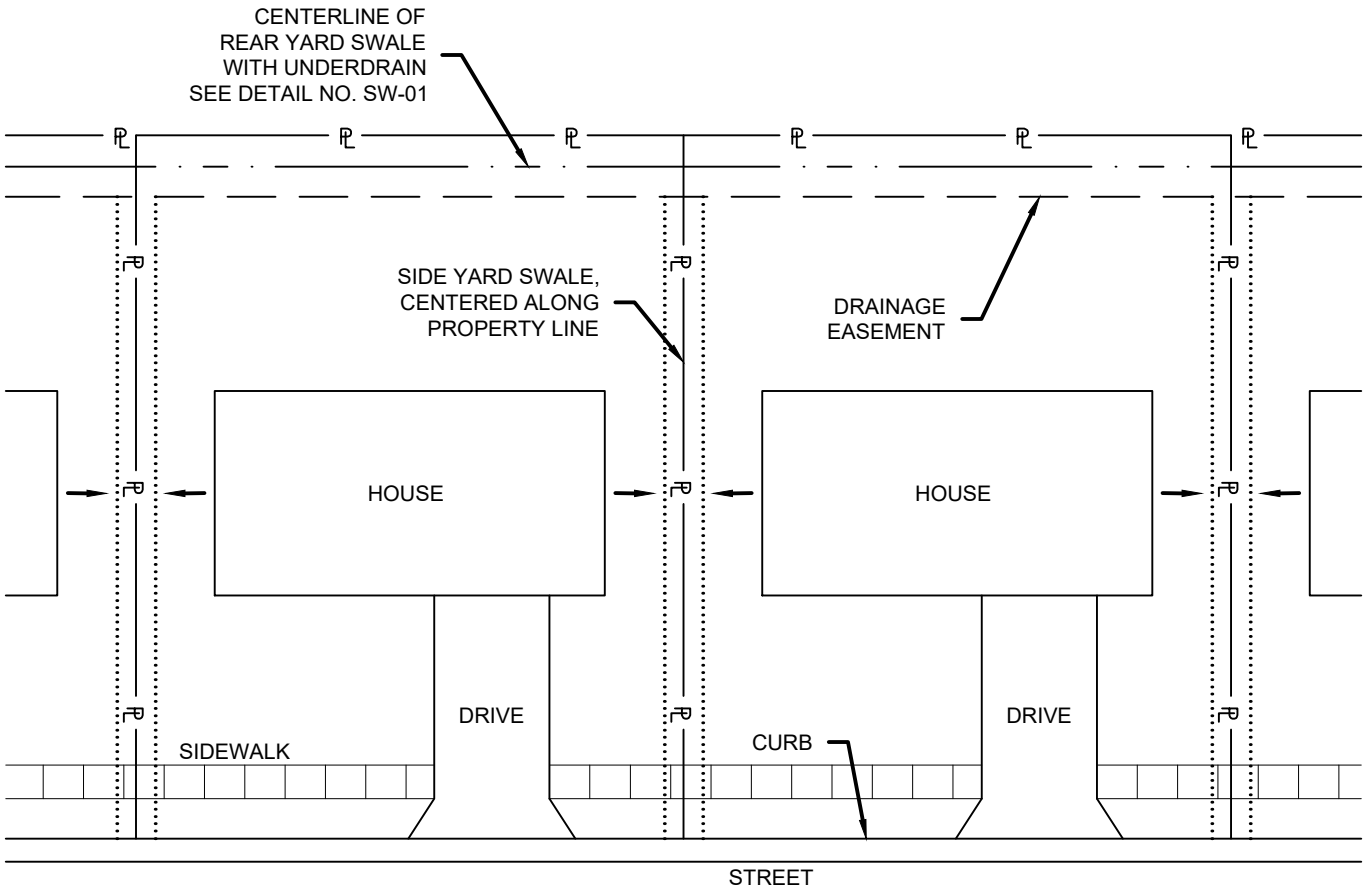
| TREE DIAMETER (DBH) | TREE PROTECTION ZONE (RADIUS FROM TRUNK) |
|---|---|
| 1" | 2' |
| 2" | 2' |
| 3" | 3' |
| 4" | 3' |
| 5" | 4' |
| 6" | 5' |
| 7" | 6' |
| 8" | 7' |
| 9" | 8' |
| 10" | 8' |
| 11" | 9' |
| 12" | 10' |
| 13" | 11' |
| 14" | 12' |
| 15" | 13' |
| 16" | 13' |
| 17" | 14' |
| 18" | 15' |
| 19" | 16' |
| 20" | 17' |
| 21" | 18' |
| 22" | 18' |
| 23" | 19' |
| 24" | 20' |
| 25" | 21' |

| TREE DIAMETER (DBH) | TREE PROTECTION ZONE (RADIUS FROM TRUNK) |
|---|---|
| 26" | 22' |
| 27" | 23' |
| 28" | 23' |
| 29" | 24' |
| 30" | 25' |
| 31" | 26' |
| 32" | 27' |
| 33" | 28' |
| 34" | 28' |
| 35" | 29' |
| 36" | 30' |
| 37" | 31' |
| 38" | 32' |
| 39" | 33' |
| 40" | 33' |
| 45" | 38' |
| 50" | 42' |
| 55" | 46' |
| 60" | 50' |
| 65" | 54' |
| 70" | 58' |
| 75" | 63' |
| 80" | 67' |
| 85" | 71' |
| 90" | 75' |

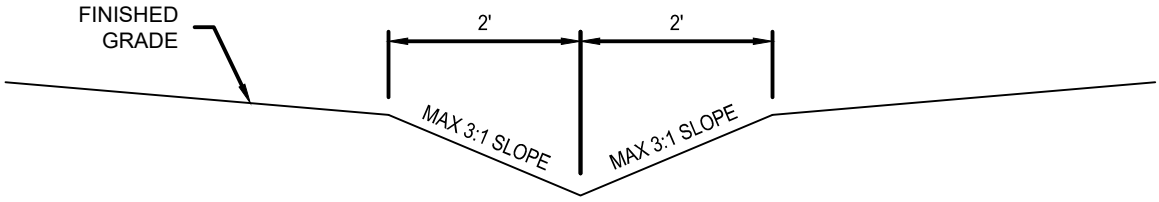
# TREE PROTECTION ZONE

SCALE: NONE

**TOWN OF NEW WHITELAND**
**DETAIL NO. EC-18**
**DATE: MAY 2020**




PLAN VIEW



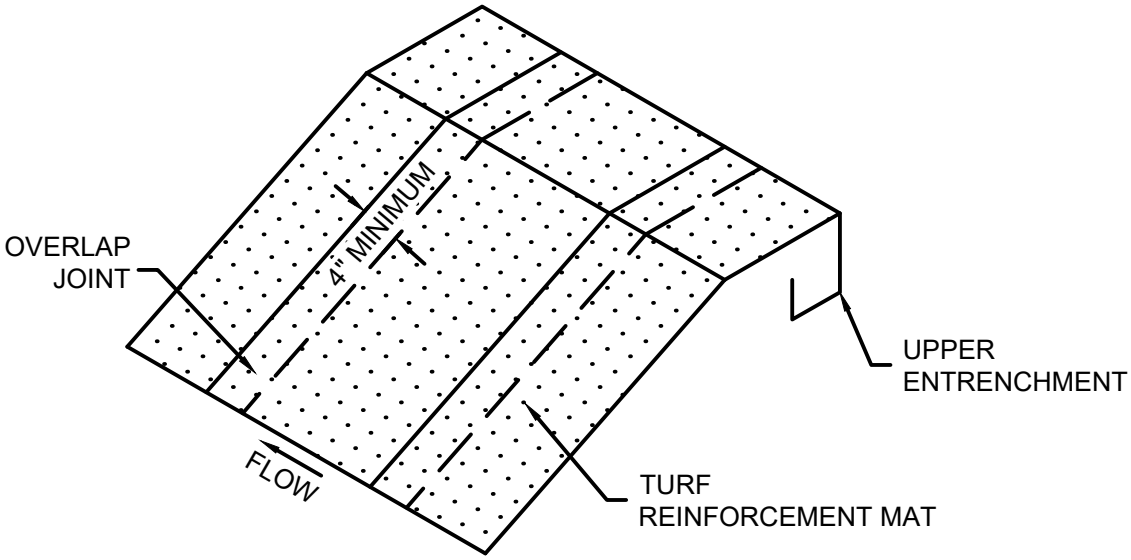

SECTION VIEW

NOTES:
1. SIDE YARD AND REAR YARD SWALES WITH PERCENT SLOPE AND FLOW DIRECTION MUST BE SHOWN ON GRADING PLAN.

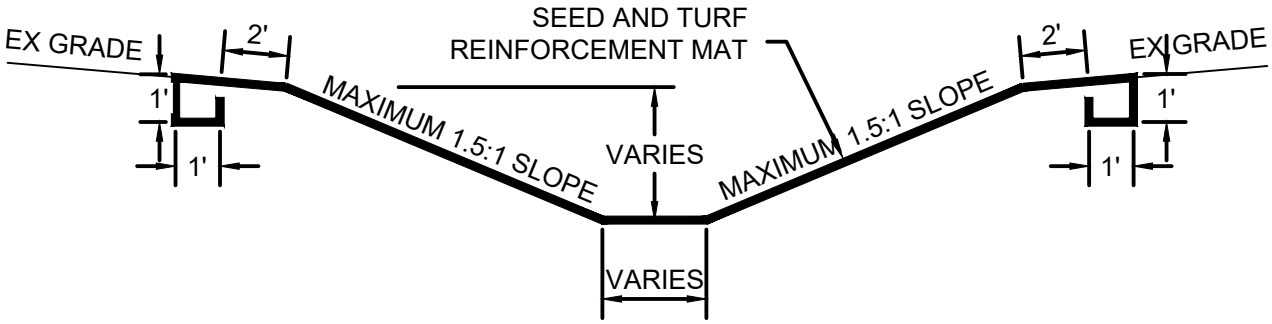
# SIDE YARD SWALE

SCALE: NONE

**TOWN OF NEW WHITELAND**
**DETAIL NO. EW-01**
**DATE: MAY 2020**




ISOMETRIC VIEW

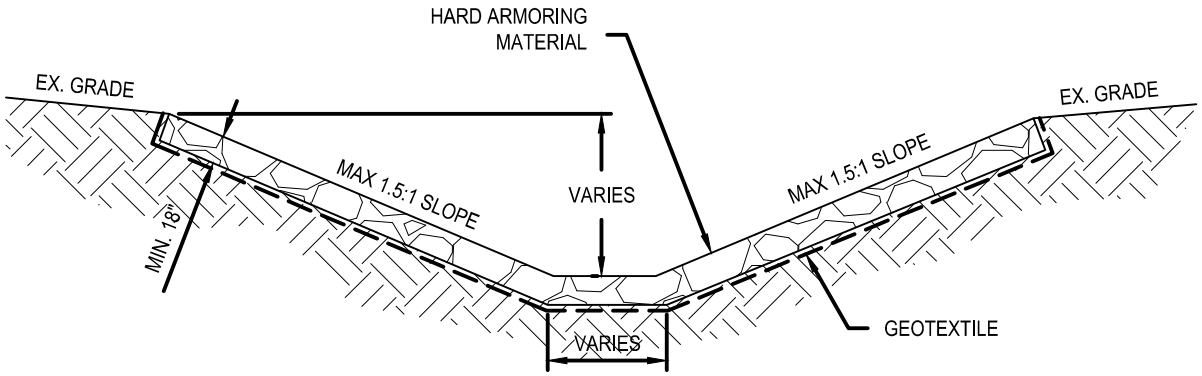



SECTION VIEW

# TURF ARMORED DITCH

SCALE: NONE

**TOWN OF NEW WHITELAND**
**DETAIL NO. EW-02**
**DATE: MAY 2020**




NOTES:

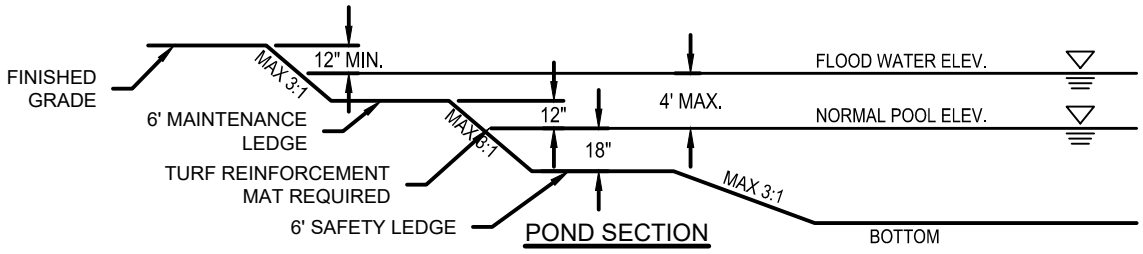
1. TURF ARMORING IS PREFFERED METHOD OF SCOUR PROTECTION AND BANK STABILIZATION, WHERE APPLICABLE.

2. PROVIDE RIPRAP (REVETMENT, CLASS I, OR CLASS II GRADATION PER INDOT) OR ARMORFLEX HARD ARMOR.

# HARD ARMORED DITCH

SCALE: NONE

**TOWN OF NEW WHITELAND**
**DETAIL NO. EW-03**
**DATE: MAY 2020**




NOTES:

1. GENERAL
   A. DETENTION/RETENTION PONDS SHALL MEET THE REQUIREMENTS OF THE JOHNSON COUNTY STORMWATER TECHNICAL STANDARDS MANUAL UNLESS OTHERWISE NOTED.

2. ACCESS
   A. PROVIDE INGRESS AND EGRESS FROM A NEARBY ROAD INTO THE POND.

3. PRETREATMENT
   A. WHEN PRETREATMENT IS USED, A STORMWATER TREATMENT QUALITY UNIT SHALL BE INSTALLED UPSTREAM OF DETENTION/RETENTION PONDS.

4. INLET PIPING
   A. EXPOSED INLET PIPES REQUIRE TRASH GUARD PROTECTION ON END OF PIPE END SECTION. REFER TO DETAIL NO. SW-10.

5. OUTLET
   A. THE OUTLET CONTROL STRUCTURE AND PIPING SHALL BE DESIGNED TO OPERATE SIMPLY AND EFFECTIVELY WITH MINIMAL MAINTENANCE. THE OUTLET STRUCTURE SHALL BE POSITIONED IN AN ACCESSIBLE LOCATION FOR MAINTENANCE.

   B. OUTLET LOCATION MUST BE APPROVED BY THE TOWN OF NEW WHITELAND.

6. DETENTION (DRY) POND DESIGN
   A. AN UNDERDRAIN IS REQUIRED.

   B. MAXIMUM GROUND SLOPE SHALL BE 3H:1V. PROTECT SIDE SLOPES WITH TURF REINFORCEMENT MAT.

   C. STORAGE OF STORMWATER ON ROADWAYS IS NOT ACCEPTABLE FOR ANY STORM EVENT.

7. POND SAFETY SIGNS
   A. PROVIDE SIGN WITH MINIMUM SIGN AREA OF 1 SQ. FT. AND A MAXIMUM SIGN AREA OF 4 SQ. FT.

   B. SIGN MUST BE CONSTRUCTED OF A PERMANENT MATERIAL, EITHER WOOD OR METAL.

   C. AT MINIMUM, POND SAFETY SIGNS MUST HAVE THE WORDS "DANGER", "NO SWIMMING", "STAY OFF ICE " AND MUST HAVE "NO SWIMMING" AND "STAY OFF ICE " SYMBOLS. WARNING MAY ALSO PROHIBIT TRESPASSING, WADING OR OTHER RECREATIONAL ACTIVITIES THAT WOULD INVOLVE A PERSON ENTERING A POND.

   D. THE SIGN COLOR WILL BE DETERMINED BY THE HOMEOWNERS' ASSOCIATION OR DEVELOPER.

   E. INSTALL SIGNS NO MORE THAN 500 FEET APART. IF POND HAS LESS THAN 3,000 SQ. FT. OF WATER SURFACE AREA, A MINIMUMOF 2 SIGNS ARE REQUIRED. IF POND HAS GREATER THAN 3,000 SQ. FT. OF WATER SURFACE AREA, A MINIMUM OF 4 SIGNS ARE REQUIRED. A SIGN MUST BE PLACED AT ALL PUBLIC ACCESS AREAS TO THE POND.

   F. EACH DEVELOPER OF THE CONSTRUCTION AREA AND SUBSEQUENT HOMEOWNERS' ASSOCIATION OR PROPERTY OWNERS' ASSOCIATION SHALL BE RESPONSIBLE FOR THE COST OF MAINTENANCE AND REPLACEMENT IF THEIR POND SAFETY SIGN(S) MUST BE REPLACED FOR ANY REASON.

8. MAINTENANCE
   A. A PERPETUAL MAINTENANCE AGREEMENT SHALL BE REQUIRED WITH THE TOWN OF NEW WHITELAND TO INCLUDE ALL COMPONENTS OF POND OPERATION AND MAINTENANCE. THE OPERATION AND MAINTENANCE (O&M) MANUAL FOR POST-CONSTRUCTION WATER QUALITY MEASURES, AS REQUIRED UNDER THE TOWN'S STORMWATER MANAGEMENT ORDINANCE SHALL BE AN INTEGRAL COMPONENT OF THE PERPETUAL MAINTENANCE AGREEMENT.

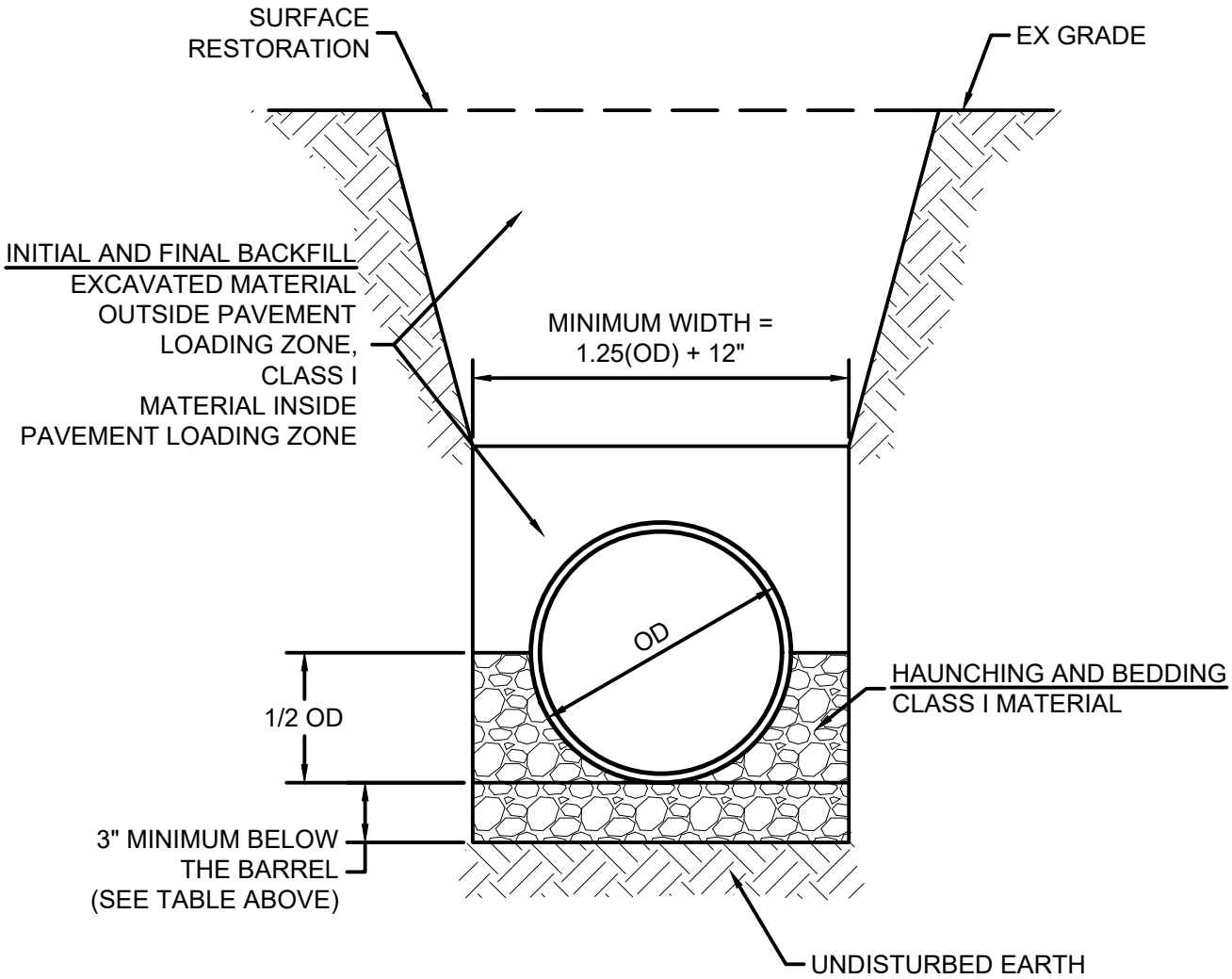
   B. POND MAINTENANCE INCLUDING, BUT NOT LIMITED TO, REMOVAL OF TRASH AND UNSIGHTLY VEGETATIVE GROWTH, MOWING, LANDSCAPING, AERATION, BANK PROTECTION, FOREBAY CLEAN-OUT, AND SEDIMENT REMOVAL SHALL BE CONTINUOUS FOR ALL DEVELOPMENTS.

# DETENTION-RETENTION PONDS

SCALE: NONE

**TOWN OF NEW WHITELAND**
**DETAIL NO. EW-04**
**DATE: MAY 2020**

| PIPE SIZE | 27" AND SMALLER | 30" TO 60" | 66" AND LARGER |
|---|---|---|---|
| BEDDING BELOW THE PIPE BARREL | 3" | 4" | 6" |

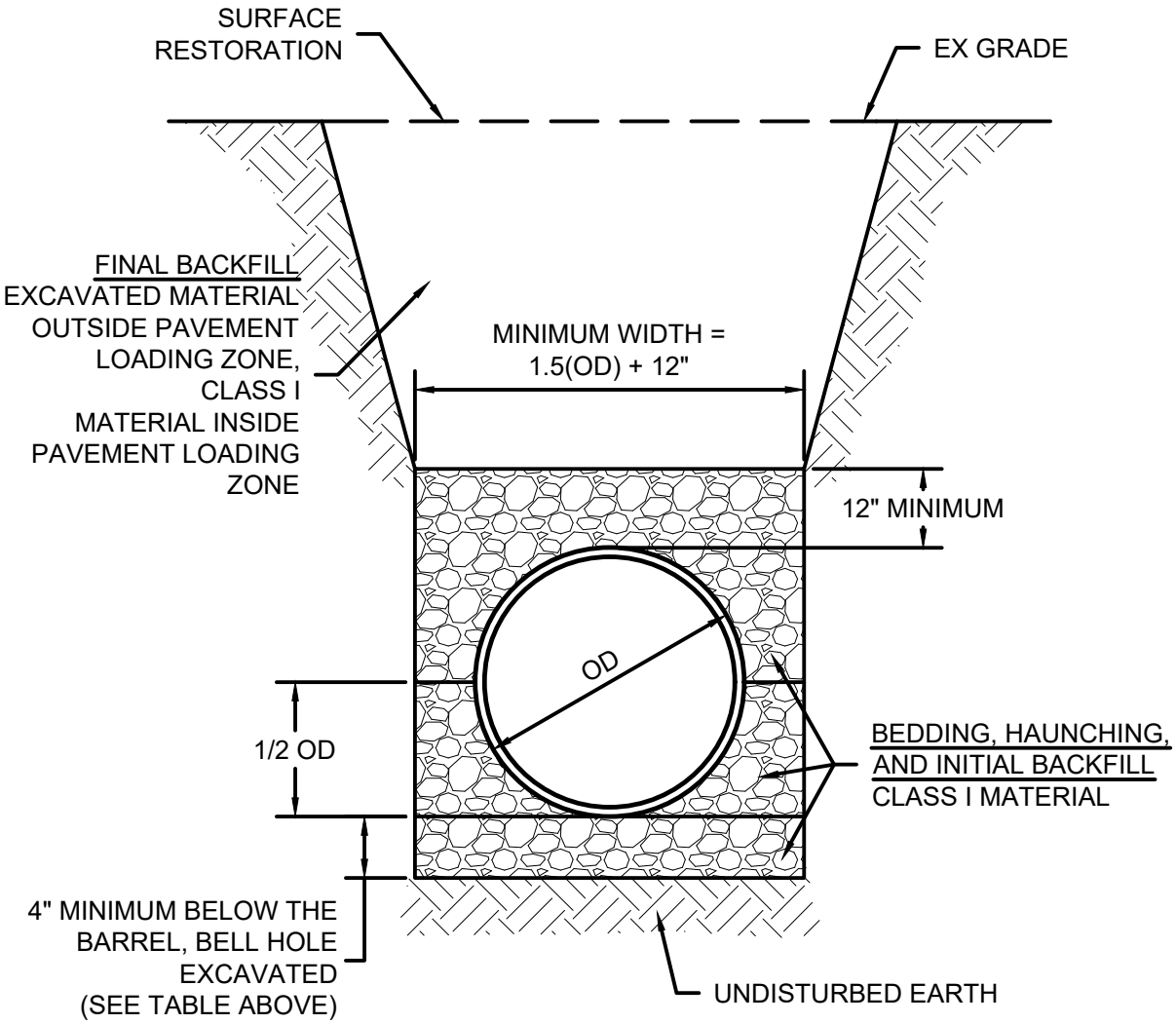



# CORRUGATED METAL PIPE (CMP) TRENCH

SCALE: NONE

**TOWN OF NEW WHITELAND**
**DETAIL NO. TB-01**
**DATE: MAY 2020**

| PIPE SIZE | 8" TO 16" | 18" TO 30" | 33" AND OVER |
|---|---|---|---|
| BEDDING BELOW THE PIPE BARREL | 4" | OD / 4 | 8" |

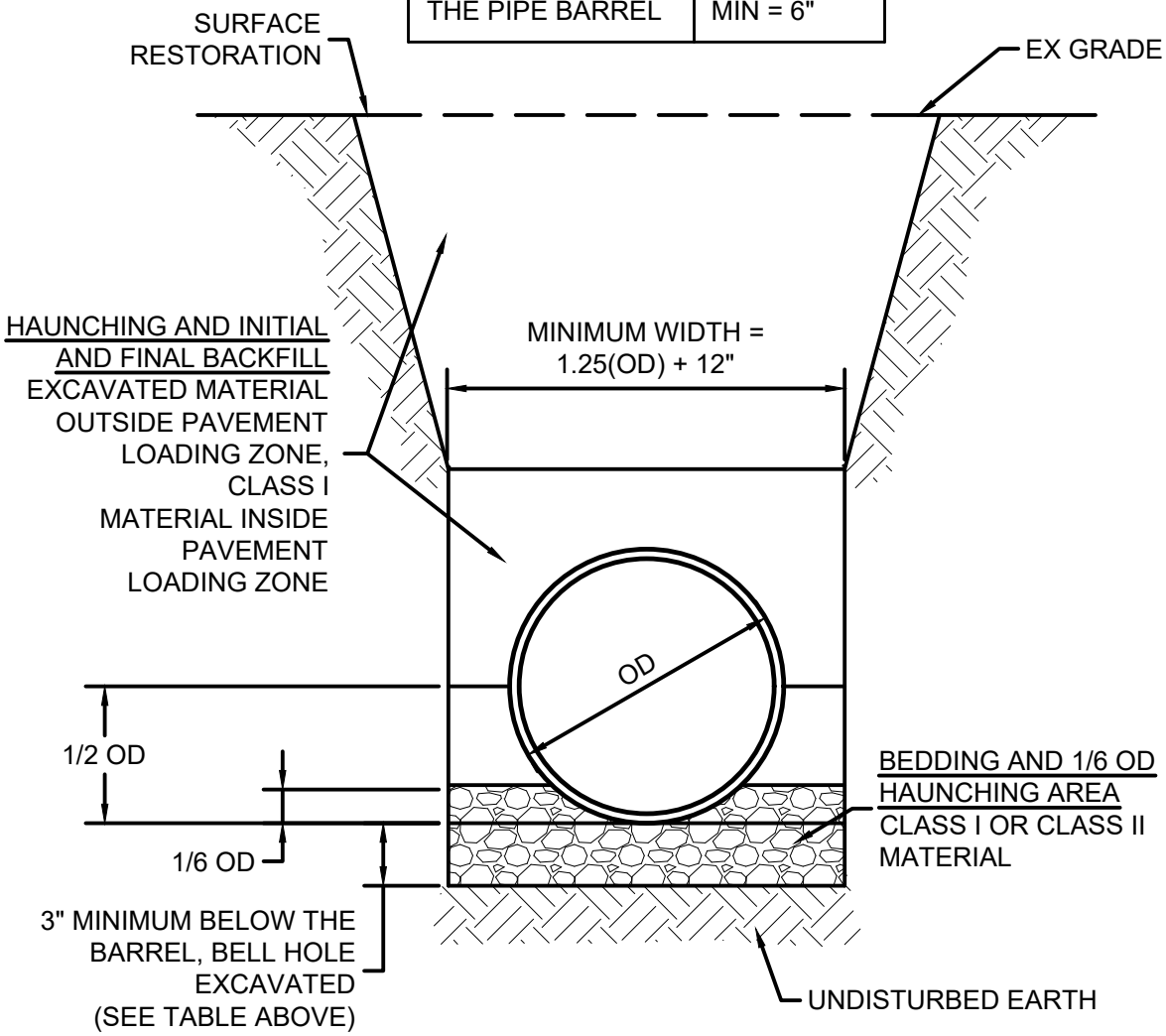



# FLEXIBLE (HDPE, PP, PVC) PIPE TRENCH

SCALE: NONE

**TOWN OF NEW WHITELAND**
**DETAIL NO. TB-02**
**DATE: MAY 2020**

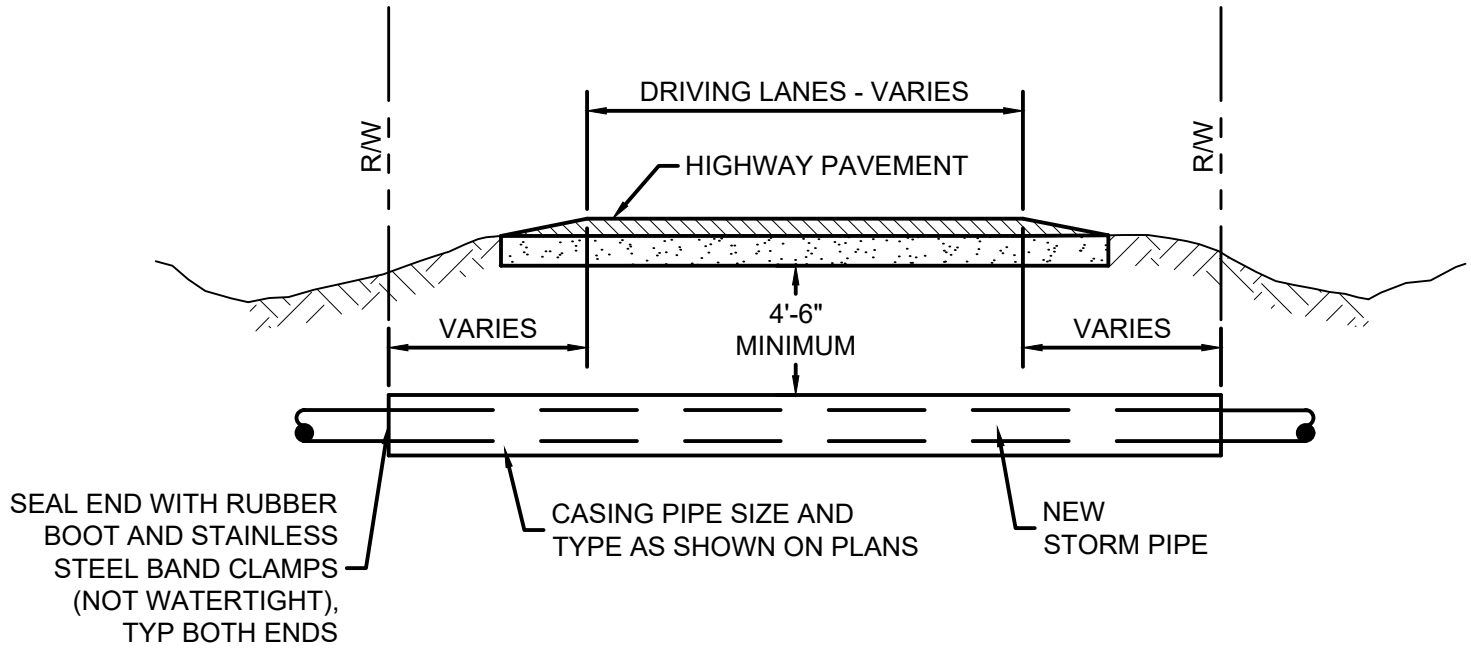
| SOIL FOUNDATION | |
|---|---|
| BEDDING BELOW THE PIPE BARREL | OD / 24 MIN = 3" |
| ROCK FOUNDATION | |
| BEDDING BELOW THE PIPE BARREL | OD / 12 MIN = 6" |




# REINFORCED CONCRETE PIPE (RCP) TRENCH

SCALE: NONE

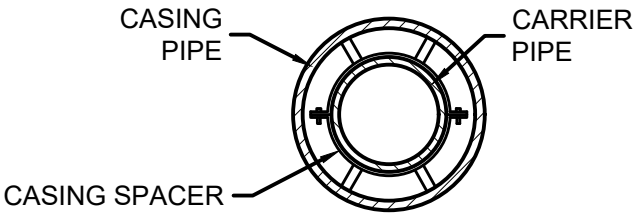
**TOWN OF NEW WHITELAND**
**DETAIL NO. TB-03**
**DATE: MAY 2020**




# CASING PIPE

SCALE: NONE

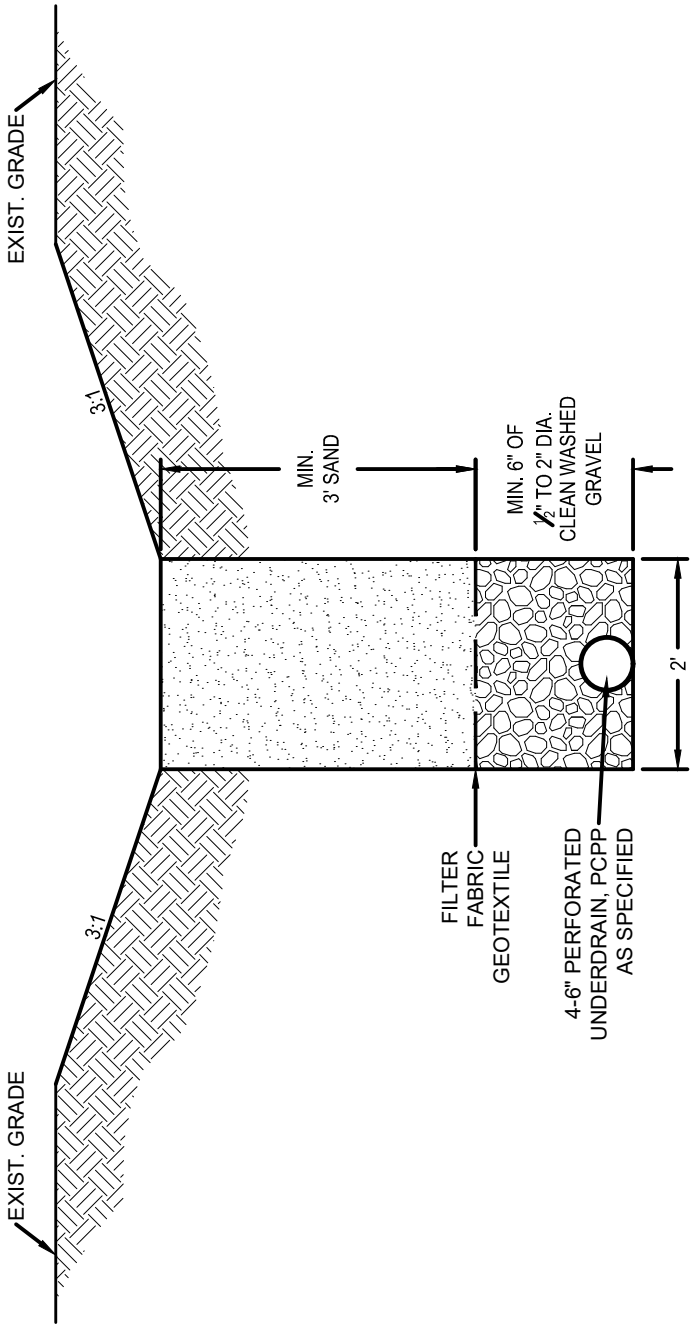
**TOWN OF NEW WHITELAND**
**DETAIL NO. TL-01**
**DATE: MAY 2020**




# CASING SPACER

SCALE: NONE

**TOWN OF NEW WHITELAND**
**DETAIL NO. TL-02**
**DATE: MAY 2020**

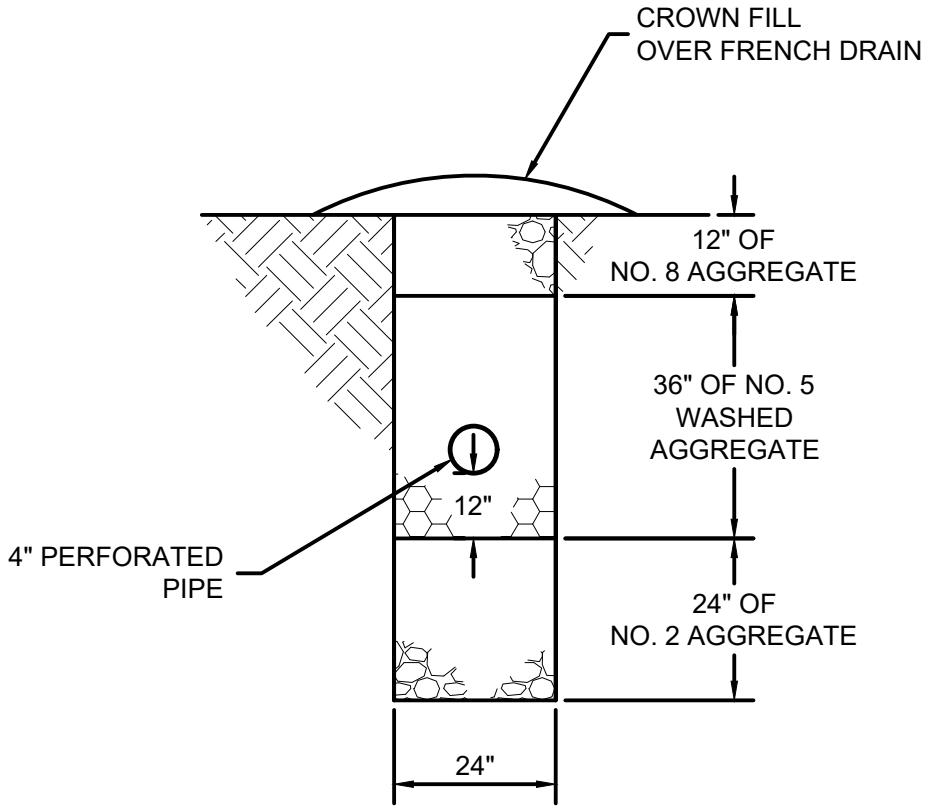



NOTE:
WHERE SWALE PROFILE SHOWS LESS THAN 4' OF UNDERDRAIN COVER, THE GRAVEL DEPTH SHALL BE REDUCED TO 6" AND SAND DEPTH REDUCED AS NECESSARY TO 30" MINIMUM, UNLESS INCREASED WIDTH IS APPROVED BY THE ENGINEER.

# DRAINAGE SWALE WITH UNDERDRAIN

SCALE: NONE

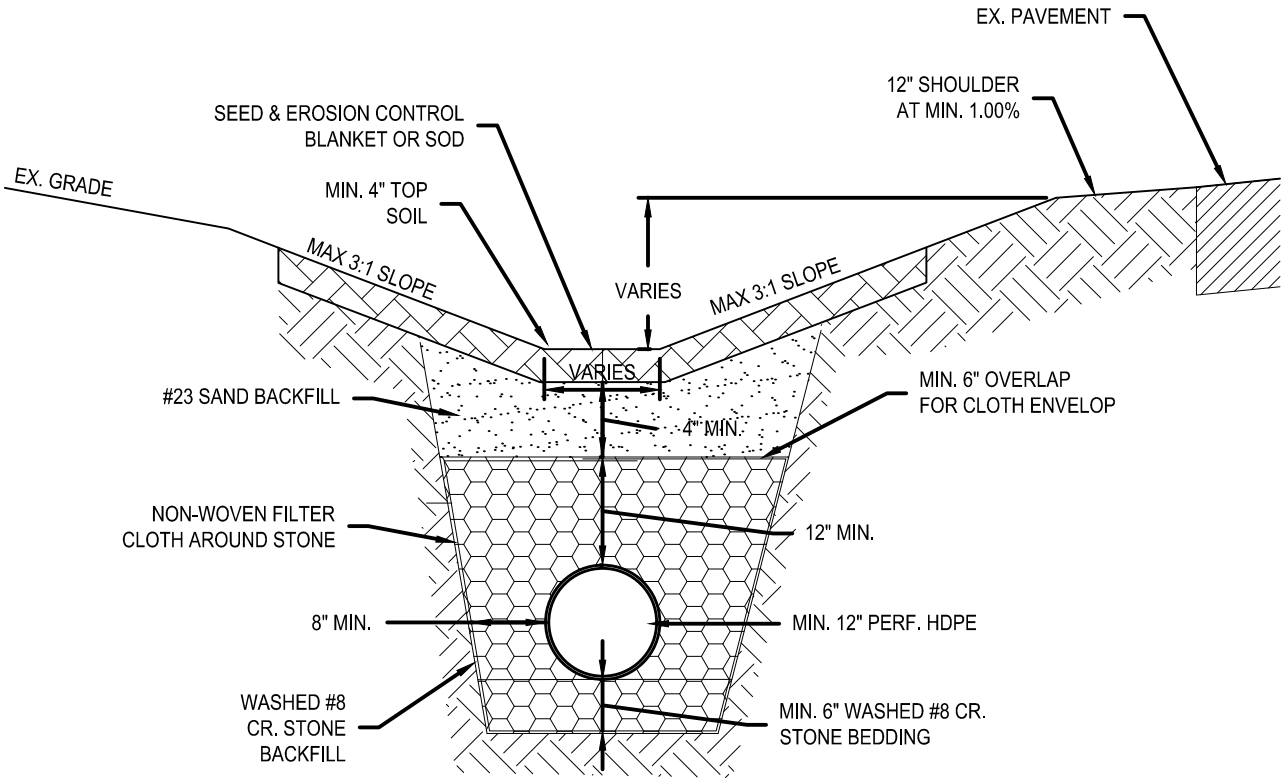
**TOWN OF NEW WHITELAND**
**DETAIL NO. SW-01**
**DATE: MAY 2020**




# FRENCH DRAIN

SCALE: NONE

**TOWN OF NEW WHITELAND**
**DETAIL NO. SW-02**
**DATE: MAY 2020**

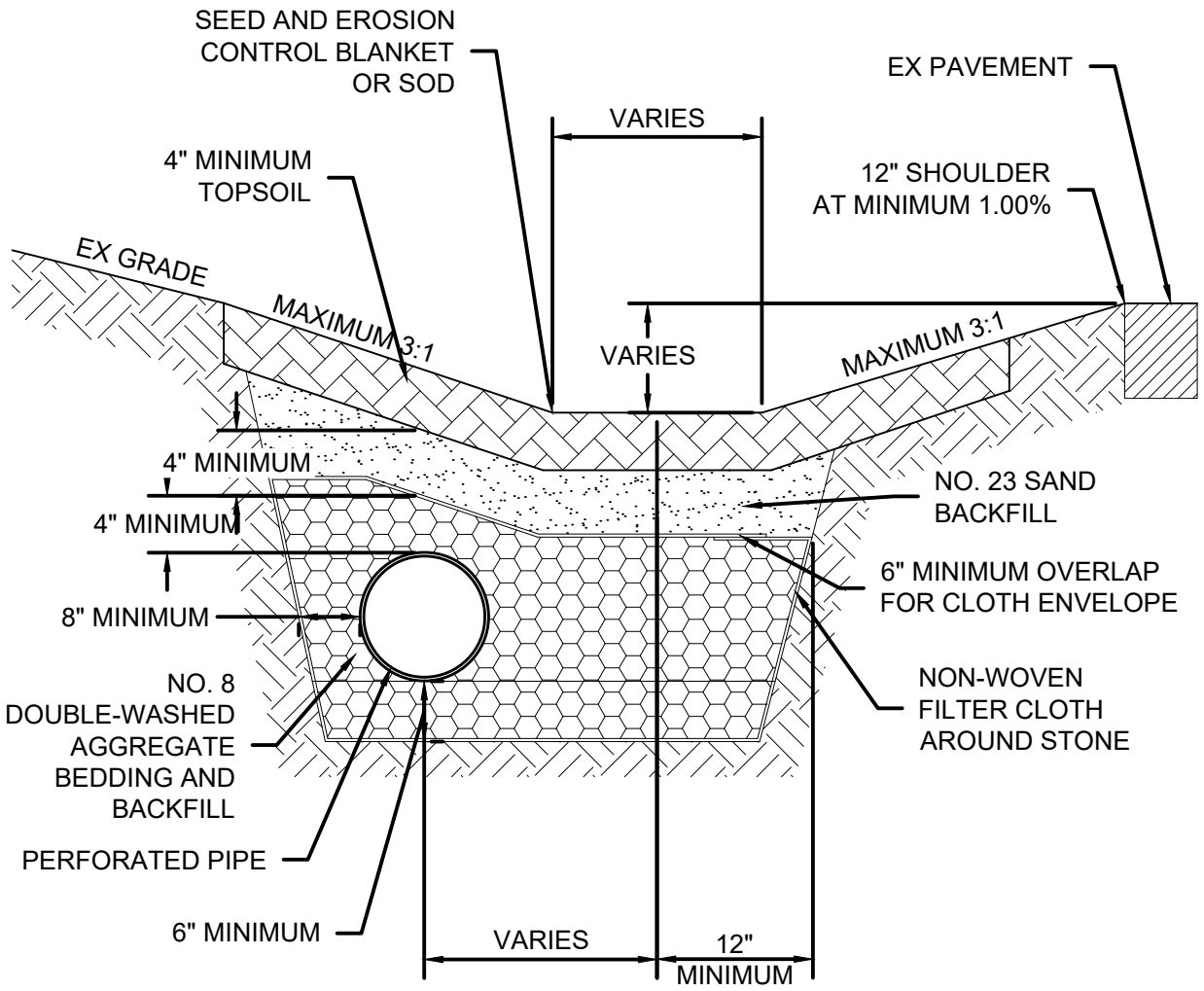



NOTES:
1. PIPE LOCATED DIRECTLY UNDER DITCH CENTERLINE.

# HYBRID DITCH TRENCH

SCALE: NONE

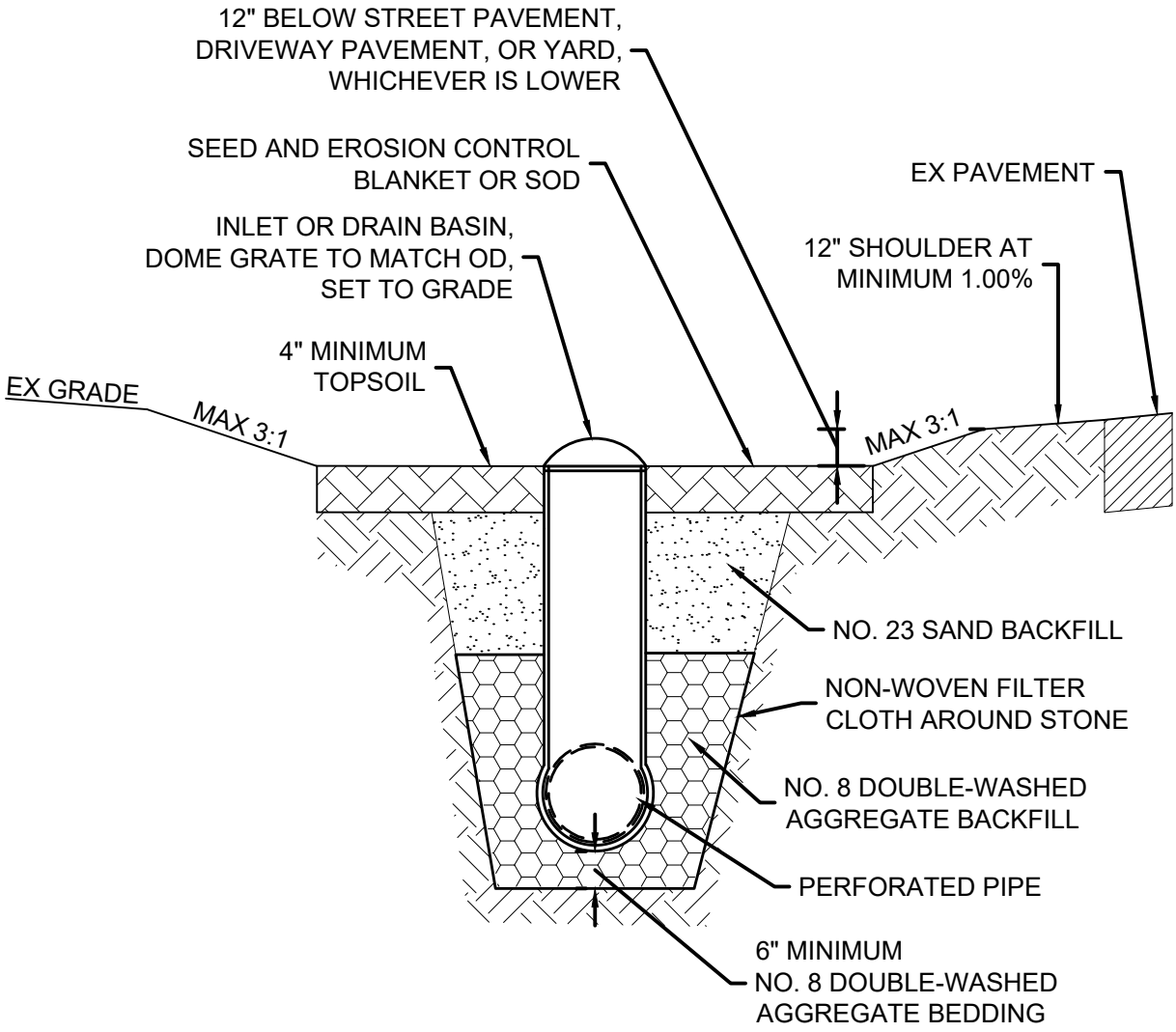
**TOWN OF NEW WHITELAND**
**DETAIL NO. SW-03**
**DATE: MAY 2020**




# MODIFIED HYBRID DITCH TRENCH

SCALE: NONE

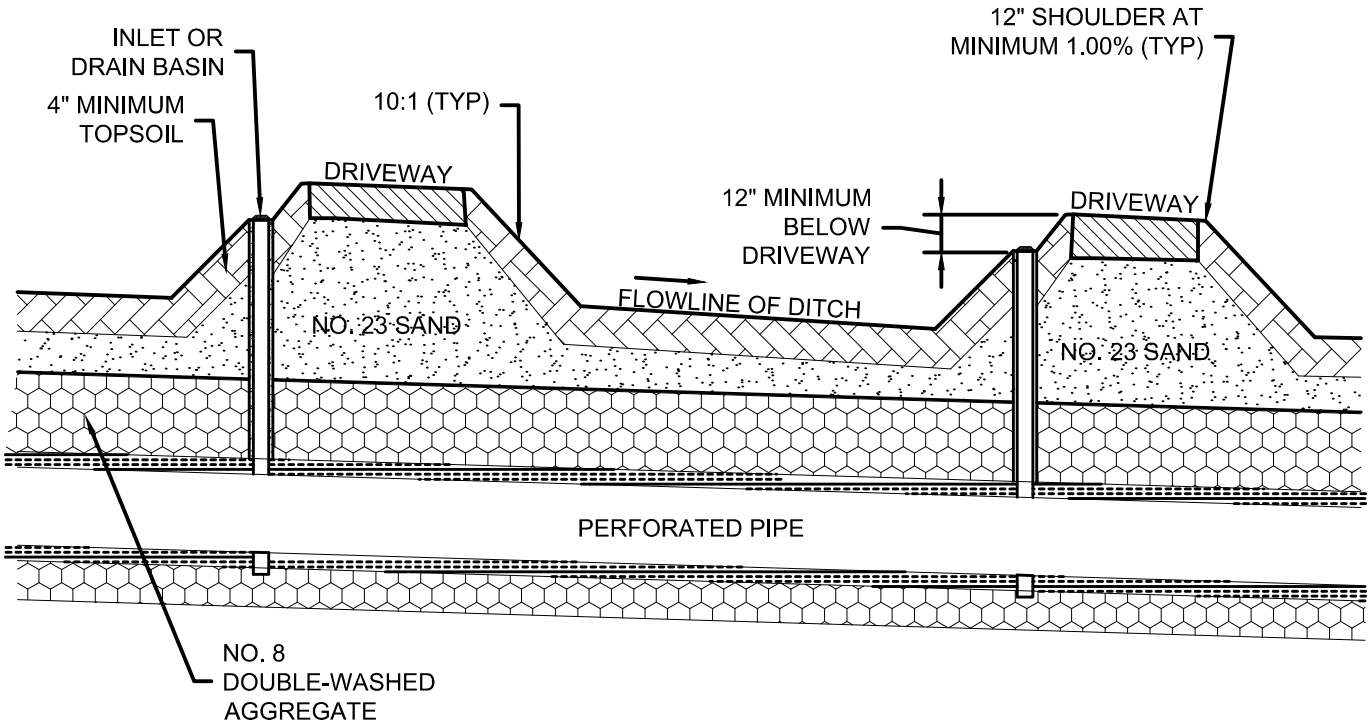
**TOWN OF NEW WHITELAND**
**DETAIL NO. SW-04**
**DATE: MAY 2020**




# HYBRID DITCH TRENCH AT INLET

SCALE: NONE

**TOWN OF NEW WHITELAND**
**DETAIL NO. SW-05**
**DATE: MAY 2020**

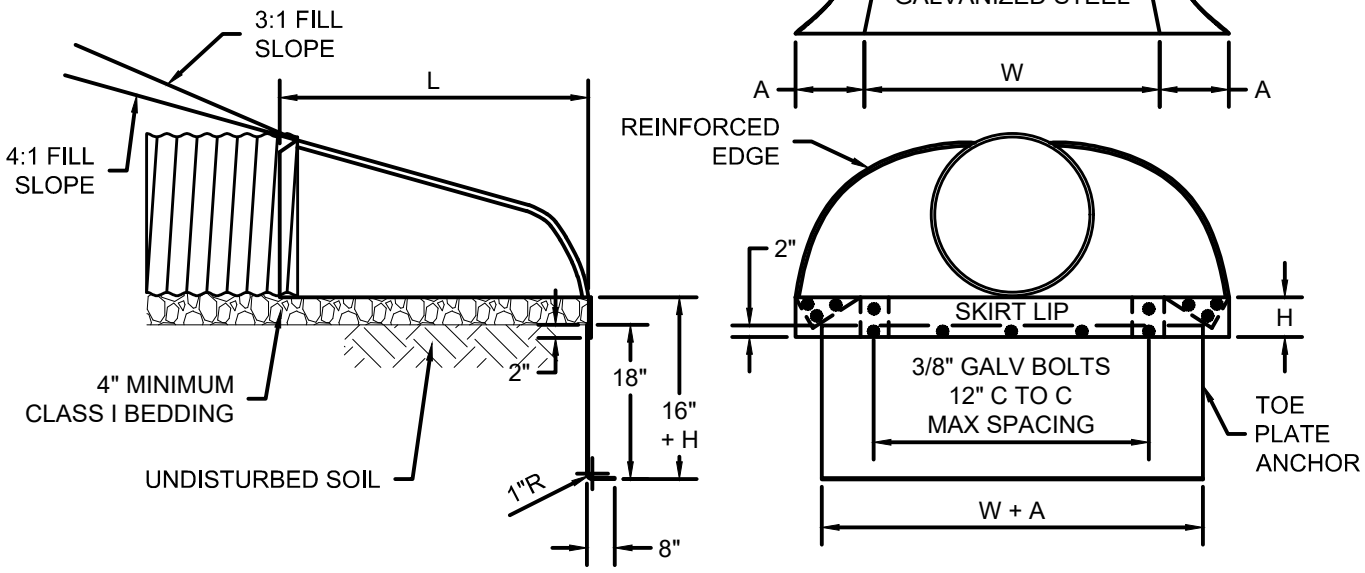



# HYBRID DITCH PROFILE

SCALE: NONE

**TOWN OF NEW WHITELAND**
**DETAIL NO. SW-06**
**DATE: MAY 2020**

| PIPE DIA | END SECT THICK | DIMENSIONS | | | | | SLOPE APPROX | BODY |
|---|---|---|---|---|---|---|---|---|
| | | A (1"±) | B (MAX) | H (1"±) | L (1½"±) | W (2"±) | | |
| 12" | .064" | 6" | 6" | 6" | 21" | 24" | 2½:1 | 1 PC |
| 15" | .064" | 7" | 8" | 6" | 26" | 30" | 2½:1 | 1 PC |
| 18" | .064" | 8" | 10" | 6" | 31" | 36" | 2½:1 | 1 PC |
| 21" | .064" | 9" | 12" | 6" | 36" | 42" | 2½:1 | 1 PC |
| 24" | .064" | 10" | 13" | 6" | 41" | 48" | 2½:1 | 1 PC |
| 30" | .079" | 12" | 16" | 8" | 51" | 60" | 2½:1 | 1 PC |
| 36" | .079" | 14" | 19" | 9" | 60" | 72" | 2½:1 | 2 PC |



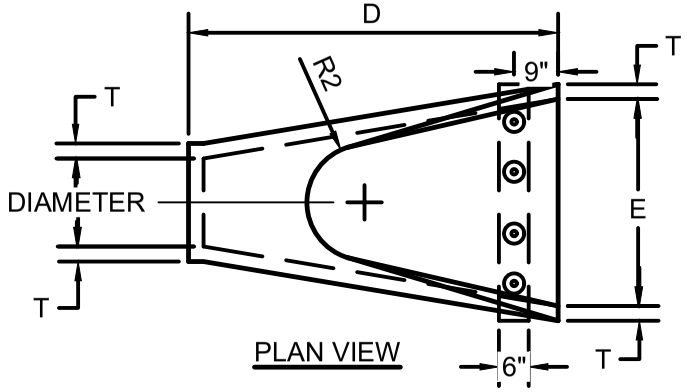

# METAL PIPE END SECTION

SCALE: NONE

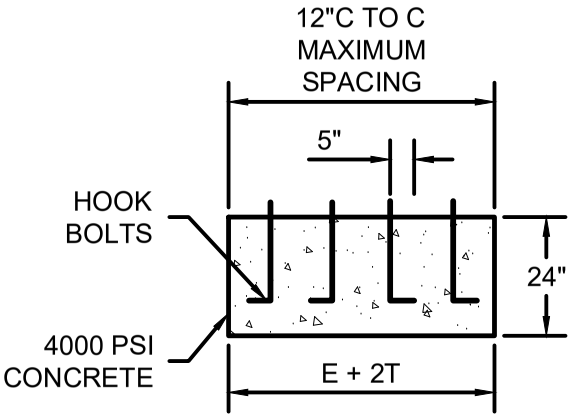
**TOWN OF NEW WHITELAND**
**DETAIL NO. SW-07**
**DATE: MAY 2020**

# PRECAST CONCRETE END SECTION

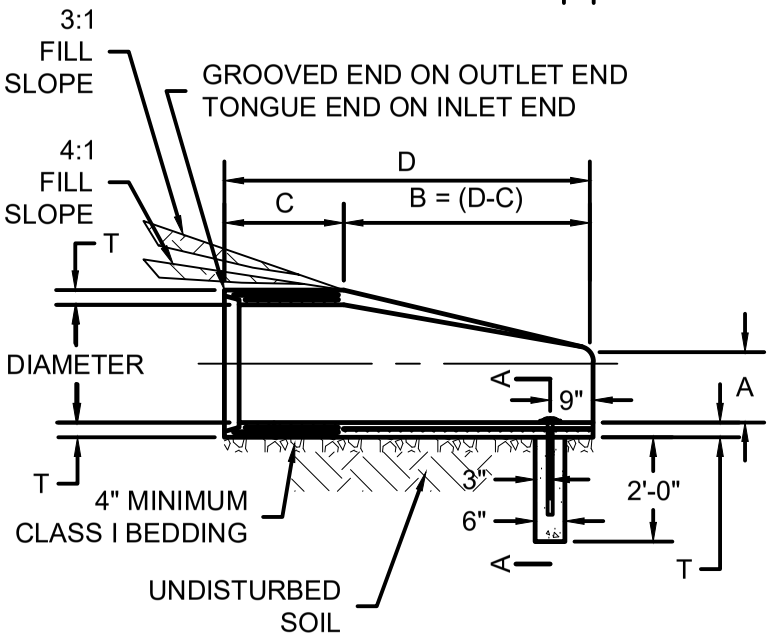
SCALE: NONE




PLAN VIEW



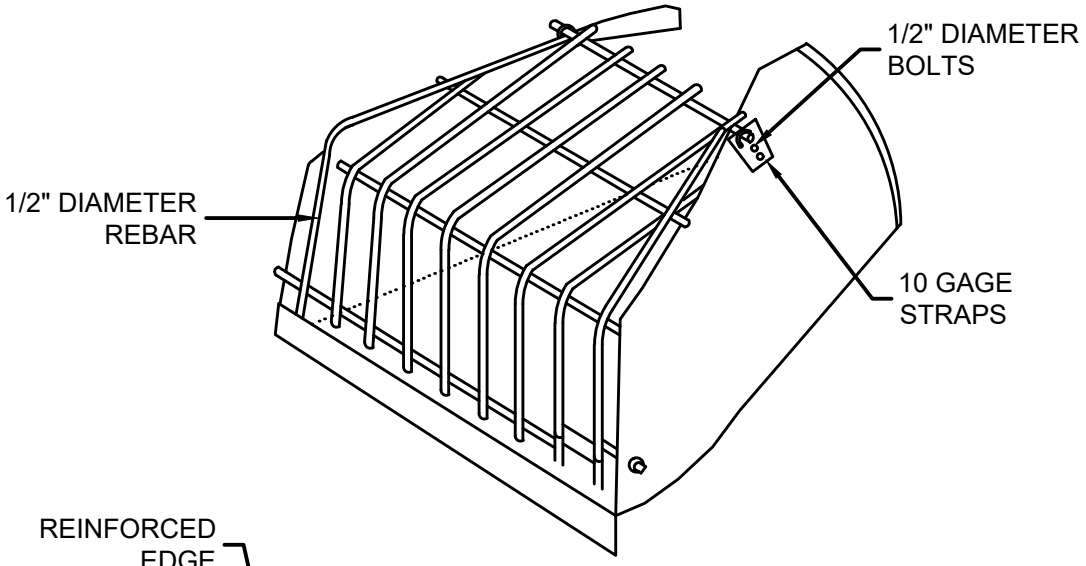

SECTION A
CONCRETE PIPE TOE ANCHOR

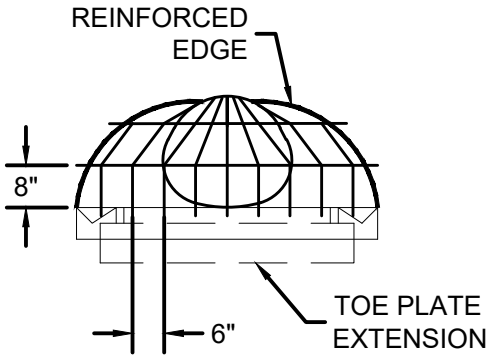



LONGITUDINAL SECTION

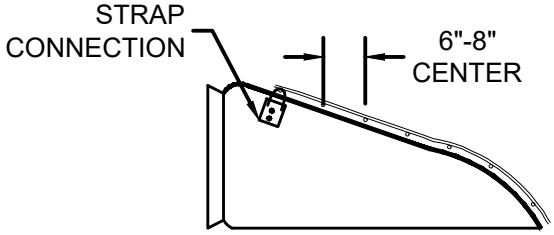
| DIA | T (MIN) | A* | C* | D* | E* | $R_1$ | $R_2$ | APPROX WEIGHT |
|---|---|---|---|---|---|---|---|---|
| 12" | 2" | 5" | 51" | 74" | 24" | 10.125" | 9" | 800 |
| 15" | 2.25" | 7" | 48" | 75" | 30" | 12.5" | 11" | 1100 |
| 18" | 2.5" | 11" | 49" | 74" | 36" | 15.5" | 12" | 1300 |
| 21" | 2.75" | 11" | 42" | 75" | 42" | 16.125" | 13" | 1500 |
| 24" | 3" | 12" | 32" | 75" | 48" | 16.375" | 14" | 1800 |
| 27" | 3.25" | 13" | 29" | 75" | 54" | 18.563" | 14.5" | 2100 |
| 30" | 3.5" | 14" | 22" | 75" | 60" | 18.5" | 15" | 2400 |
| 33" | 3.75" | 15" | 42" | 99" | 66" | 23.75" | 17.5" | 4100 |
| 36" | 4" | 17" | 37" | 99" | 72" | 24.625" | 20" | 4200 |
| * TOLERANCE ± | | | | | | | | |

**TOWN OF NEW WHITELAND**
**DETAIL NO. SW-08**
**DATE: MAY 2020**




ELEVATION

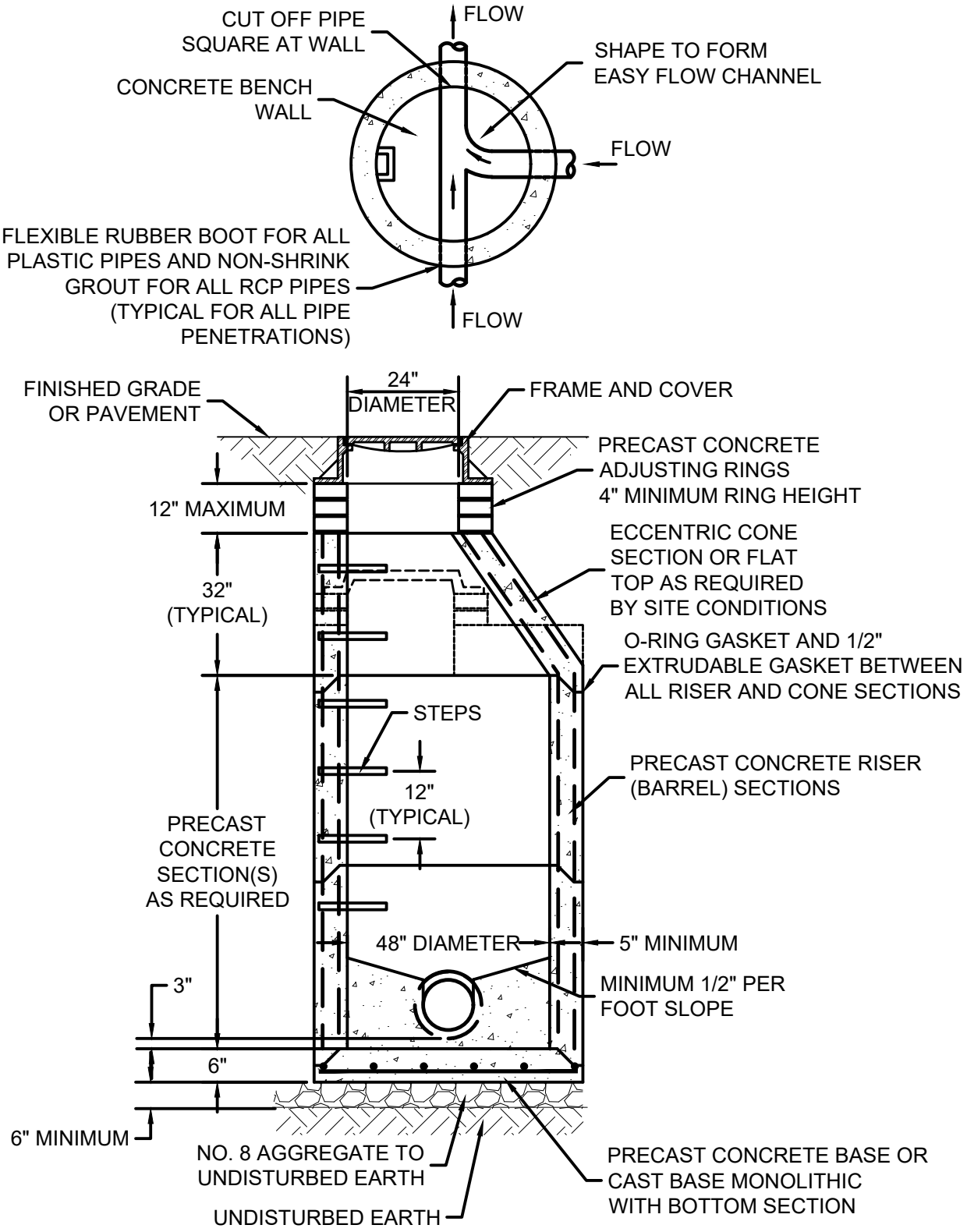



CROSS SECTION

# TRASH GUARD

SCALE: NONE

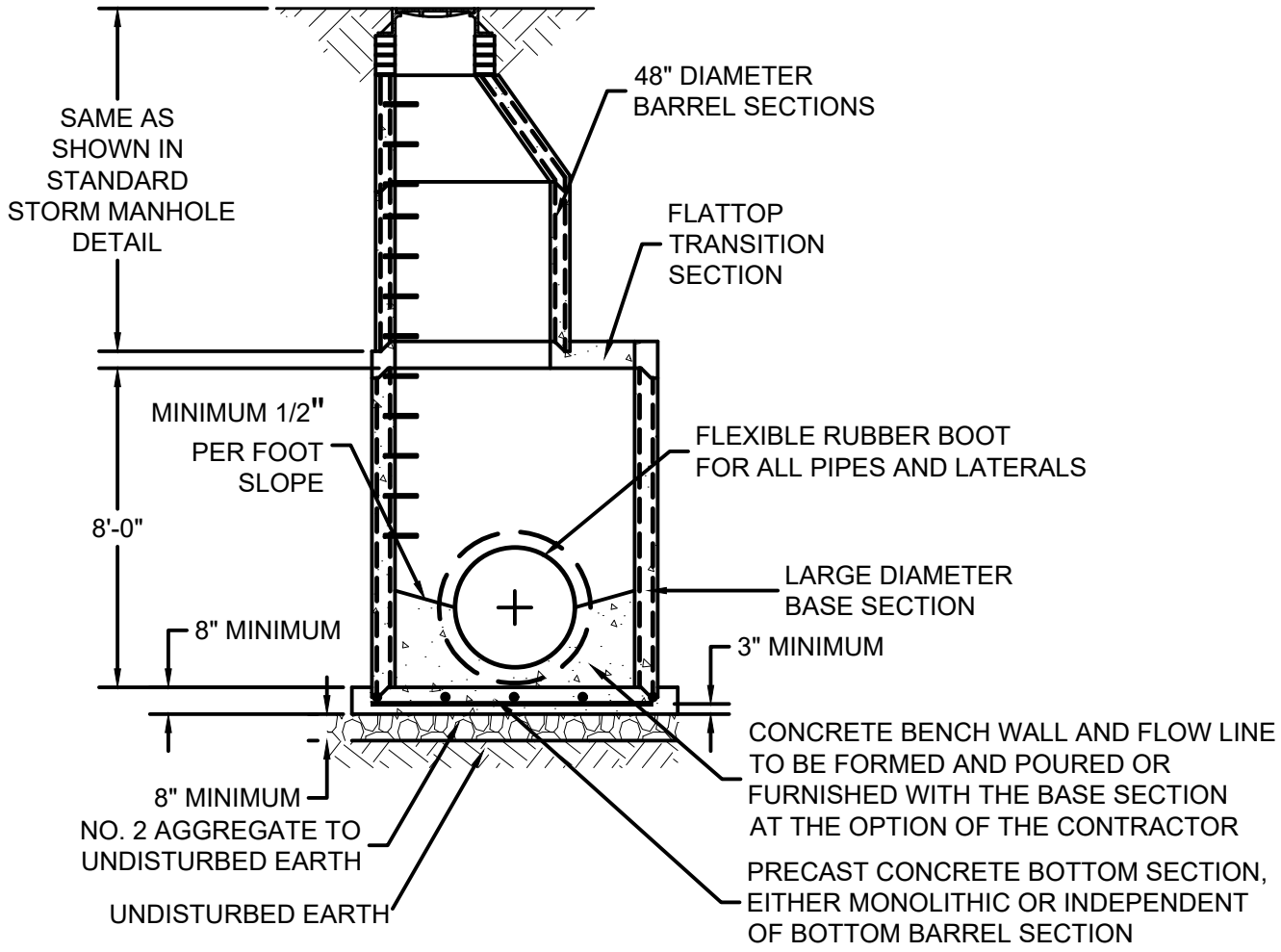
**TOWN OF NEW WHITELAND**
**DETAIL NO. SW-09**
**DATE: MAY 2020**




# STANDARD STORM MANHOLE

SCALE: NONE

**TOWN OF NEW WHITELAND**
**DETAIL NO. SW-10**
**DATE: MAY 2020**

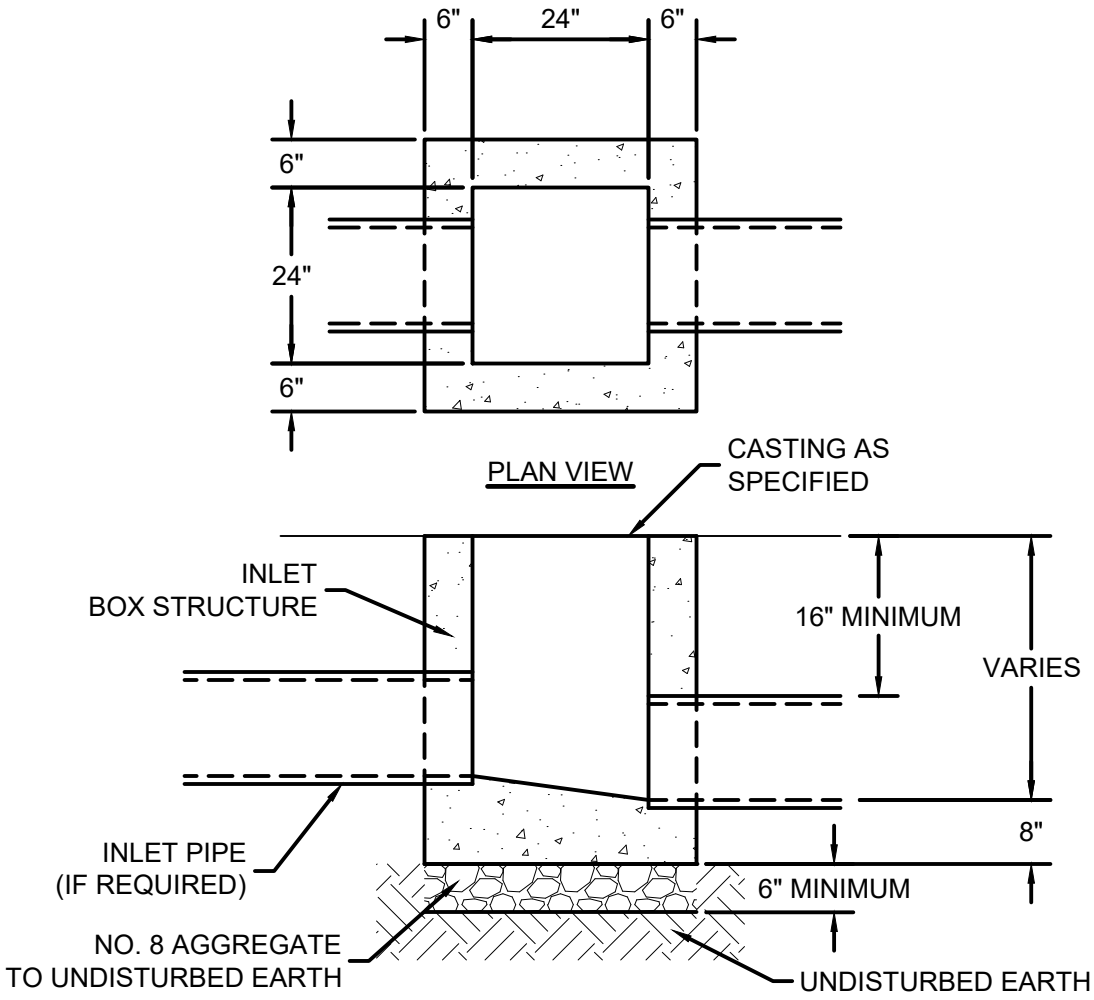



| STRUCTURE DATA SCHEDULE | | |
|---|---|---|
| STRUCTURE DIAMETER | PIPE DIAMETER | APPLICATION |
| 60" | 24" TO 33" | HORIZONTAL PIPE DEFLECTION GREATER THAN 45° UP TO 90° |
| 60" | 27" TO 36" | HORIZONTAL PIPE DEFLECTION STRAIGHT THRU MANHOLE UP TO 45° |
| 72" | 36" | HORIZONTAL PIPE DEFLECTION GREATER THAN 45° UP TO 90° |
| 72" | 42" TO 48" | HORIZONTAL PIPE DEFLECTION STRAIGHT THRU MANHOLE UP TO 45° |
| 84" | 42" | HORIZONTAL PIPE DEFLECTION GREATER THAN 45° UP TO 90° |
| 96" | 48" | HORIZONTAL PIPE DEFLECTION GREATER THAN 45° UP TO 90° |

# TYPE 1 STORM MANHOLE

SCALE: NONE

**TOWN OF NEW WHITELAND**
**DETAIL NO. SW-11**
**DATE: MAY 2020**



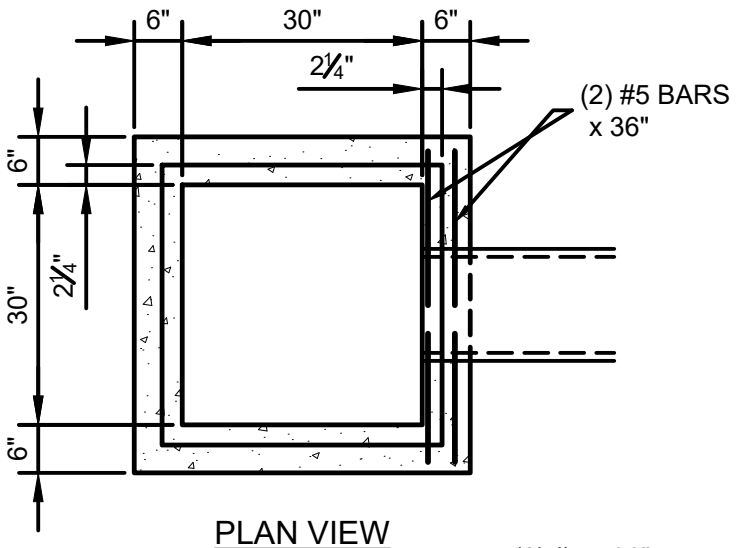

NOTES:

1. CATCH BASIN TYPE A CALLED FOR ON STRUCTURE DATA TABLE SHALL HAVE 30" SUMP BELOW INVERT OF LOWEST PIPE.

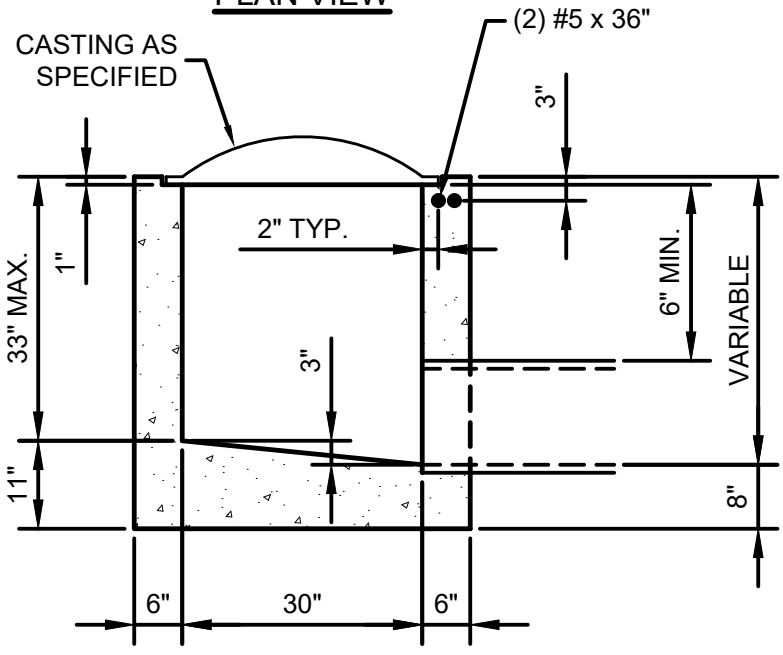
# INLET TYPE A

SCALE: NONE

**TOWN OF NEW WHITELAND**
**DETAIL NO. SW-12**
**DATE: MAY 2020**




PLAN VIEW

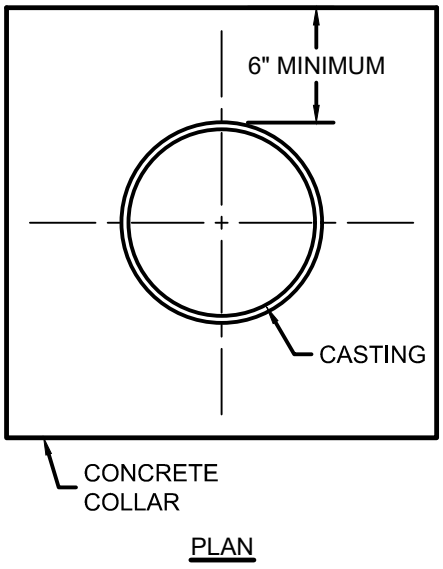



ELEVATION VIEW

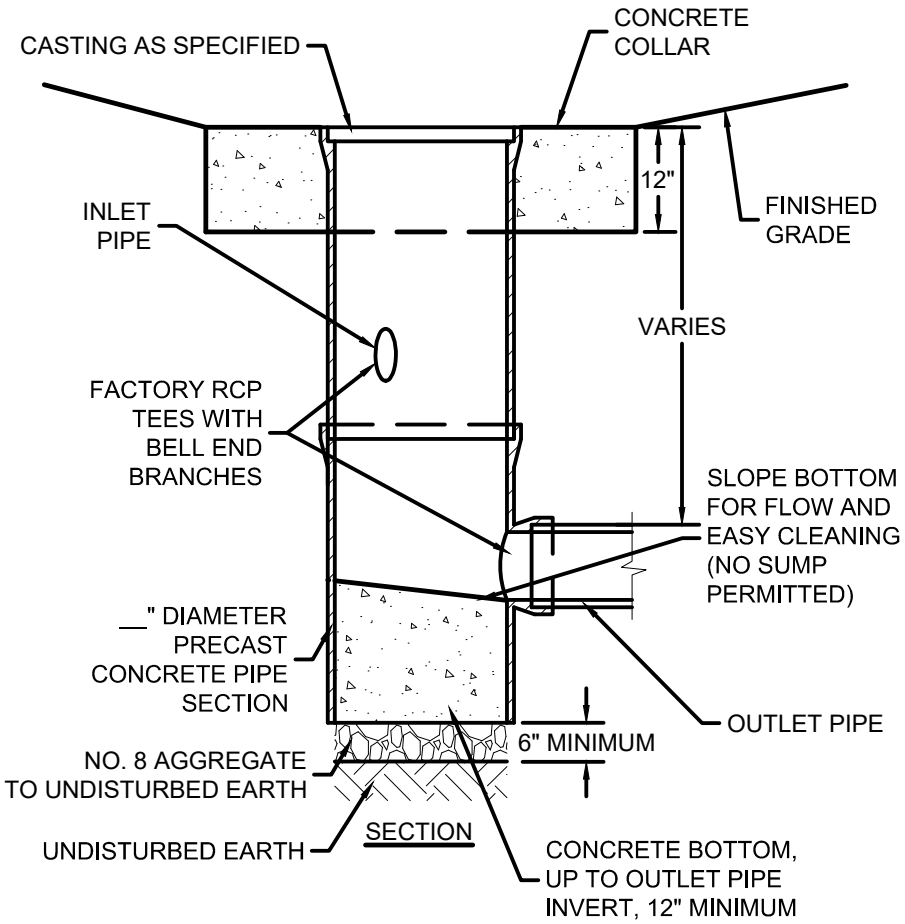
# INLET TYPE E

SCALE: NONE

**TOWN OF NEW WHITELAND**
**DETAIL NO. SW-13**
**DATE: MAY 2020**




PLAN

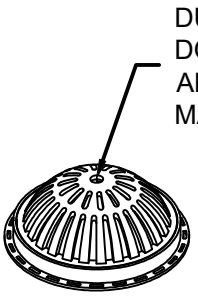



SECTION

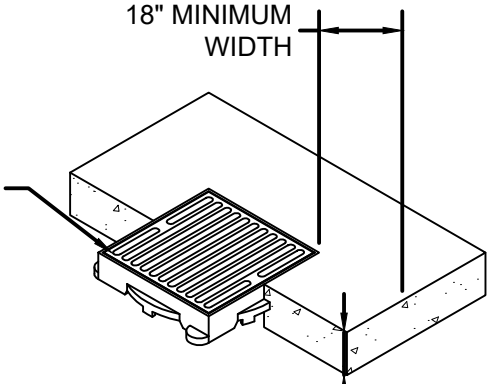
# YARD INLET

SCALE: NONE

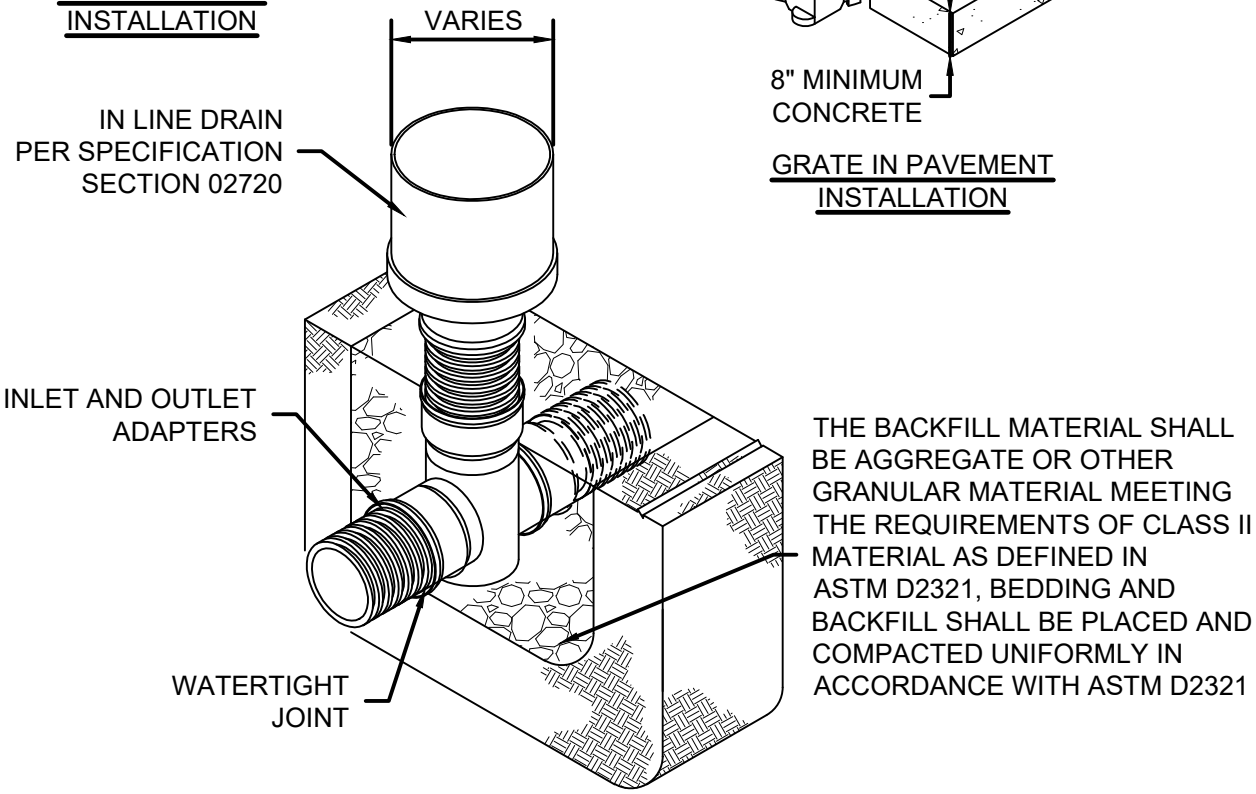
**TOWN OF NEW WHITELAND**
**DETAIL NO. SW-14**
**DATE: MAY 2020**




GRATE IN TURF
INSTALLATION



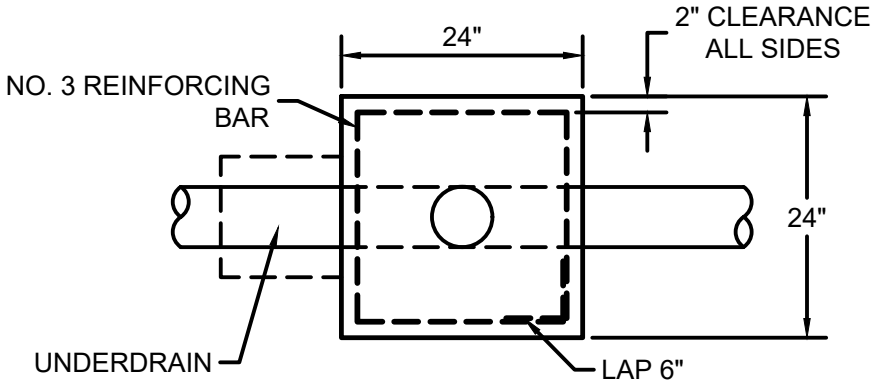

GRATE IN PAVEMENT
INSTALLATION



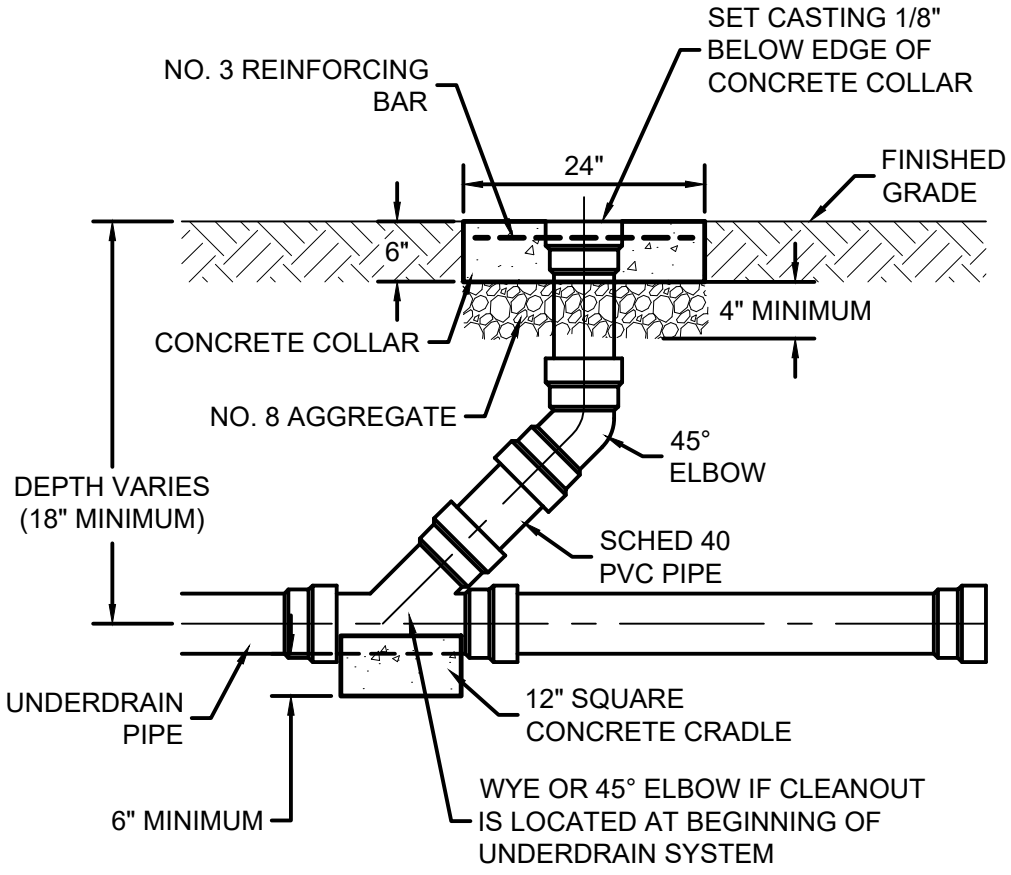

# PVC INLINE DRAIN

SCALE: NONE

**TOWN OF NEW WHITELAND**
**DETAIL NO. SW-15**
**DATE: MAY 2020**




PLAN VIEW

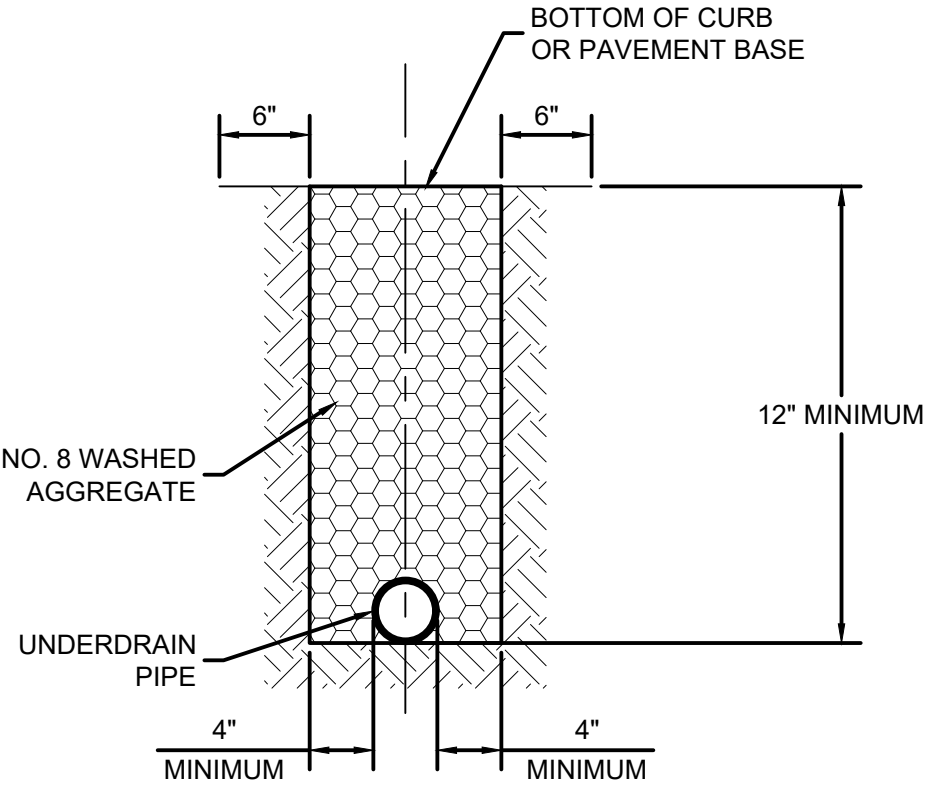



ELEVATION VIEW

# UNDERDRAIN CLEANOUT

SCALE: NONE

**TOWN OF NEW WHITELAND**
**DETAIL NO. SW-16**
**DATE: MAY 2020**

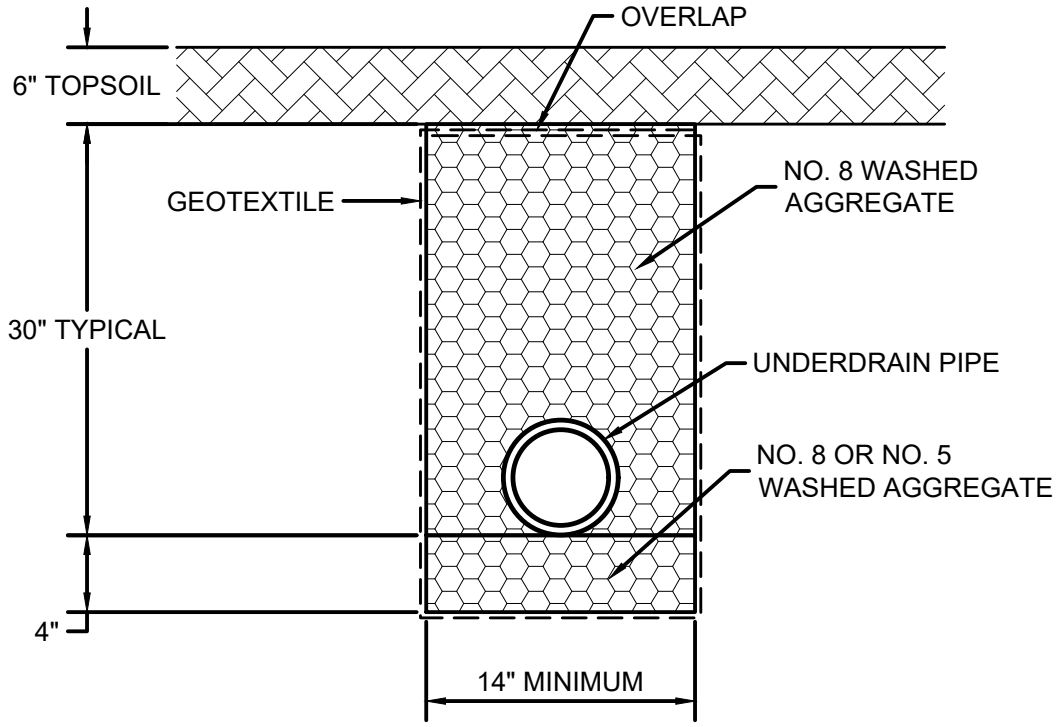



NOTES:
1. INSTALLATION IS REQUIRED BOTH SIDES OF PAVEMENT.
2. GEOTEXTILE FILTER SOCK REQUIRED.

# UNDERDRAIN (PAVEMENT)

SCALE: NONE

**TOWN OF NEW WHITELAND**
**DETAIL NO. SW-17**
**DATE: MAY 2020**




NOTES:
1. GEOTEXTILE FILTER SOCK REQUIRED.

# UNDERDRAIN (DITCH-EARTH)

SCALE: NONE

**TOWN OF NEW WHITELAND**
**DETAIL NO. SW-18**
**DATE: MAY 2020**