Water Quality Rules: Storm Water Infiltration System location guidelines for MnDOT ROW

Technical Memorandum 14–06–ENV–01

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We all have a stake in A→B
2013 NPDES Permit Requirements

- Increase of 1 or more acres of **impervious surface** triggers Stormwater Treatment Requirements
  - Water Quality Volume
  - Retained On Site
    - (infiltration or other volume reduction practice)
- Treatment Methods;
  - Primary – Infiltration
  - Secondary – where infiltration prohibited use Other Reduction practices
  - Tertiary – everything else
Implementing Infiltration on MnDOT ROW

- Additional MnDOT areas of concern:
  - Use of roadbed for infiltration practices
  - Infiltration practices adjacent to foundations
  - Proximity to private septic systems
  - Proximity to private wells

- Specialty offices involved:
  - Environmental Stewardship
  - Hydraulics
  - Bridge Standards
  - Geotechnical/Foundations LRFD
  - Pavement Design

- Incorporate into a Technical Memorandum
Technical Memorandum Locating Infiltration on MnDOT ROW

- Storm Water Infiltration System Location Guidelines for MnDOT ROW
- Technical Memorandum No. 14-06-ENV-01
- July 9, 2014 – July 9, 2019 unless superseded.
  - Incorporate in Drainage Manual?
- Preserve infrastructure
- Protect investment
- Safety of the traveling public
- Protect environment

http://dotapp7.dot.state.mn.us/edms/download?docId=1423130
Pavement Design Guidance

- Office Memorandum
- Steve Henrichs, Assistant Pavement Design Engineer
- Materials & Research, Maplewood

Guidelines for Storm Water Infiltration Locations with Regards to Pavement Infiltration System Sections
  - Effects of water on Pavement Design
  - Locating infiltration adjacent to pavement sections
Effects of water in pavement & subgrade

- Causes cracking
- Deteriorates pavement
- Causes differential frost heaving

Portland Cement Concrete (PCC)

Hot Mixed Asphalt (HMA)
Reduces Strength of Base and Subgrade and Reduces Pavement Performance

MnPAVE Fatigue Life = 25 Years

MnPAVE Saturated Fatigue Life = 8 Years
- **Topsoil**
- **Paved Shoulder**
- **Shouldering**
- **Paved Mainline**
- **C/L**
- **Aggregate Base**
- **Top of Subgrade (Grading Grade)**
- **Backfill Subcut with Granular Material (Subbase)**
- **Backfill Subcut with Select Grading Material**
- **Subcut Drain**
Rural Roadway Section

1 to 2 (V:H) Slope

Base & Subbase

No Infiltration Area
(Between Dotted Lines)

Urban Roadway Section

No Barrier

With Impermeable Barrier

12 ft

12 in

Base & Subbase (hatched)

Impermeable Barrier

No Infiltration Area
(Between Dotted Lines)

1 to 2 (V:H) Slope
Bridge Foundations, Structural Walls, and Reinforced Soil Slopes (RSS)

- Not designed to accommodate the additional groundwater flow that could result from stormwater infiltration.
Granular backfill
Saturated soils
Hydrostatic pressure
  - Tips walls → failure
  - Washout backfill → failure
Bridge Foundations, Structural Walls, and Reinforced Soil Slopes (RSS)

- Do not design infiltration BMPs that:
  - infiltrate into structural backfill associated with a wall or structural elements such as:
    - reinforced zone behind a MSE wall or
    - structural backfill behind a cantilever wall.
  - increase subsurface flows toward structures.
  - increase hydrostatic pressure behind a wall, RSS, or foundation.
  - are located adjacent to a wall, RSS, or foundation.
Bridge Foundations, Structural Walls, and Reinforced Soil Slopes (RSS)

- Infiltrate only into
  - native soils capable of infiltration or
  - engineered materials designed to facilitate infiltration.

- Additional background information located MnDOT Geotechnical Manual, Appendix H
  http://www.dot.state.mn.us/materials/geotechnicalmanual.html
  - Minimum distance of separation
Bridge Foundations, Structural Walls, and Reinforced Soil Slopes (RSS)
Exclusion Zone Near Reinforced Soil Slopes (RSS)

PLAN VIEW OF RSS
(RSS MAY BE CONSTRUCTED AT ANGLES OTHER THAN 45°)

MINIMUM OFFSET DISTANCES FOR INFILTRATION PONDS
- BEHIND
- ALONGSIDE
- IN FRONT OF
- EARTH RETAINING STRUCTURES
  (BRIDGE ABUTMENT, CIP WALL, MSE WALL)

ELEVATION VIEW OF RSS
(45° SHOWN)
Bridge Foundations, Structural Walls, and Reinforced Soil Slopes (RSS) 
Exclusion Zone Near Earth Retaining Structures

**PLAN VIEW**

**ELEVATION VIEW**

**MINIMUM OFFSET DISTANCES FOR INFILTRATION Ponds**
- Behind
- Alongside
- In front of earth retaining structures (bridge substructure, CIP wall, MSE wall)

Do not locate infiltration basins in the exclusion zone (extends in front, behind, and alongside structure)

Approach panel (bridge substructure case) or wall backslope (CIP, MSE wall) match proposed grading plans

Back face

Front face of earth retaining structure

Back face of earth retaining structure

Ground line

CIP wall footing shown
Environmental Considerations

- Environmental considerations as listed in the MPCA 2013 NPDES Construction Storm water General Permit.
- The following locations identify where infiltration is not feasible due to site conditions or where infiltration of stormwater could have negative environmental consequences.
- Stormwater infiltration is not allowed at the following locations where there is:
  - vehicle fueling and maintenance, i.e. Truck Stations.
  - less than three (3) feet of separation distance from the bottom of infiltration system to the elevation of the seasonally saturated soils or the top of bedrock.
  - contaminated soil and/or groundwater.
  - predominately Hydrologic Soil Group D (clay) soils.
  - 1,000 feet up-gradient, or 100 feet down-gradient of karst terrain.
  - within a Drinking Water Supply Management Area (DWSMA) unless approved by city/township.
  - soil infiltration rates are more than 8.3 inches per hour and cannot be designed and modified to be less than 8.3 inches per hour.
Many infiltration sites require regular maintenance to function properly.

Locations should be selected that are accessible.
- Design to accommodate maintenance activities including safe access and mowing.

Locate away from areas where snow and ice control will interfere with operation or reduce service life of the infiltration BMP.

Provide a maintenance plan.

Verify that sufficient operations resources are available to maintain operation of stormwater infiltration BMP.
Only use infiltration BMPs where the following design criteria can be met or mitigated.

◦ Provide pretreatment before discharging into an infiltration BMP.
◦ Accommodate or bypass flows greater than the design discharge.
◦ Handle discharge if not infiltrating as designed.
◦ Locate Infiltration BMPs that create a road hazard outside the clear zone.
◦ Locate 200 feet or more from a private water supply well.
◦ Locate 100 feet or more from a septic system.
◦ Locate 100 feet or more from buildings or building foundations.

Protect infiltration areas from sediment and compaction during construction.
QUESTIONS