

Stormwater Operations and Maintenance Guide

Underground Treatment Systems

Introduction

Underground treatment systems vary across a wide spectrum with some working functionally like an extended detention basin (EDB), some working as filters, and others as proprietary devices used only for pretreatment. In general, underground systems receive concentrated stormwater flows which are then treated for pollutants including sediment, trash, and even oils/greases using internal mechanisms and processes.

Underground Treatment System Components

Underground Treatment Systems have different layouts, but some common components include:

Inflow point (inlets)

The inflow point is where runoff enters the system through a storm sewer pipe, roof downspout, surface channel, curb-cut or as “distributed” surface overflow. Inflow points should have a vertical drop to allow positive drainage into the feature.

Vegetated area/media

Some underground systems include vegetation/media through which treatment takes place.

Filters

Some underground systems include internal apparatus including filters which provide treatment.

Underdrain

Underdrains are used in some underground systems.

Engineering Details are only a representation of feature design and may not officially be accepted as City of Thornton Standard Details.

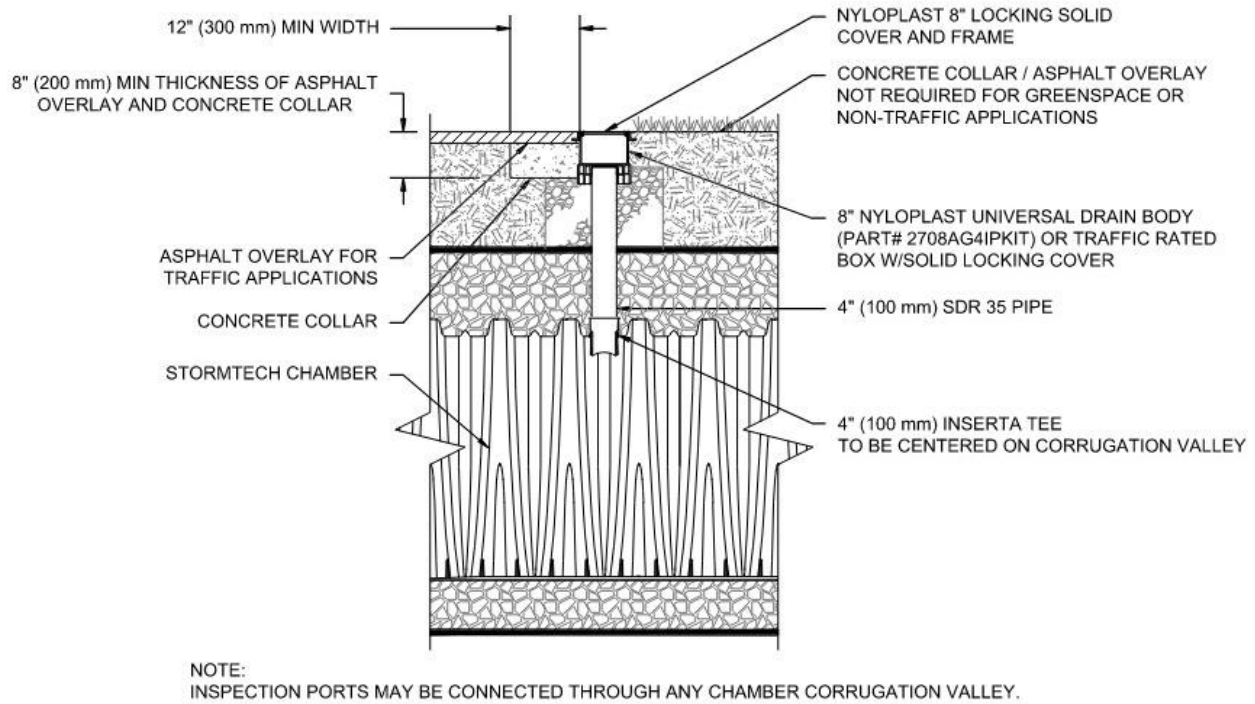


Figure Underground Detention 4-inch PVC inspection port detail (not to scale)

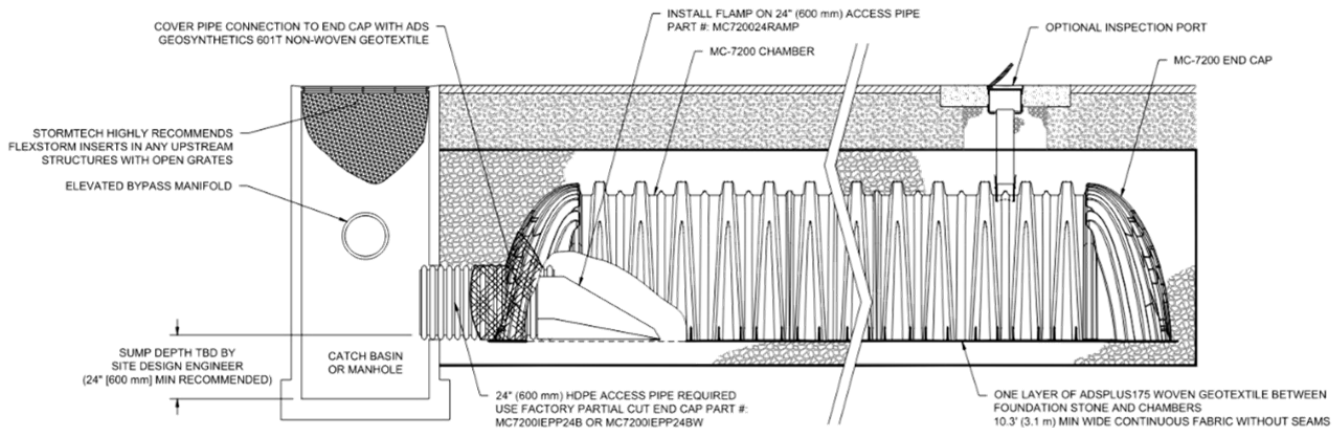


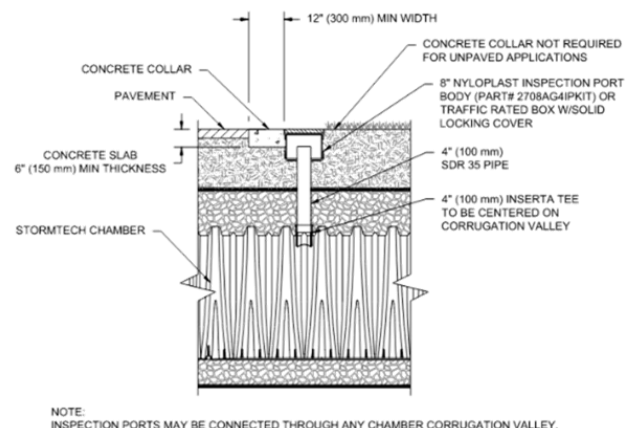
Figure MC-7200 Isolater Row plus detail (not to scale)

INSPECTION & MAINTENANCE

- STEP 1) INSPECT ISOLATOR ROW PLUS FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
- A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
- A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
- A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
- A.4. LOWER A CAMERA INTO ISOLATOR ROW PLUS FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
- A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR PLUS ROWS
- B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
- B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS THROUGH OUTLET PIPE
- i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
- ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
- B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- STEP 2) CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45° (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED
- STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.
- STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

- INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
- CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.



Inspections

Inspect underground treatment systems at least twice annually, observing the amount of sediment/ debris inside the system and checking for clogging in the vegetated area/media. For the first two years of newly constructed features, this frequency is reduced to quarterly. City of Thornton recommends confined space training for anyone entering an underground system.

Sediment/Trash/Debris Removal

Inflow Points/Forebays

Ensure inflow points to the underground system are kept clear of trash and debris. Filters—For systems with internal filters ensure they are inspected at each biannual visit and are replaced per manufacturer specifications.



Not acceptable

Isolator Row

If the system uses an isolator row check the inspection port (usually in the middle third of the row), to determine levels of accumulated sediment and debris at least biannually. If the isolator row is 1/3 full or more it should be cleaned out.



Not acceptable

Underdrain

If the underground system utilizes an underdrain they should be inspected for clogging through inspection ports and/or the Outlet Structure at each biannual inspection.

Outlet Structure

If the system includes an outlet structure ensure the well screen and orifice plate are clear of debris and in place at least biannually.

Mowing and Plant Care:

For underground systems involving vegetation, ensure weeds are mitigated and proper irrigation is maintained.

Summary of Underground Treatment System Maintenance Activities

Forebay/Trickle Channel/Micropool/Outlet Structure Cleaning

- Frequency: as needed after significant rain events; minimum of twice annually
- Look for: clogged features; ponding water
- Action: remove and dispose of debris/trash/sediment to allow outlet to function properly

Major sediment removal

- Frequency: as needed based upon inspections
- Look for: large quantities of sediment/ reduced system capacity
- Action: Remove and dispose of sediment and repair vegetation or replace sand as needed

Mowing

- Frequency: twice annually
- Look for: excessive grass height/aesthetics
- Action: no less than 6-inch grass height

Structural repair

- Frequency: as needed based on inspections
- Look for: deterioration and/or damage to structural components such as broken concrete, damaged pipes, outlet structure
- Action: Structural repair to restore the structure to its original design

Trash/debris removal

- Frequency: twice annually
- Look for: trash and debris in EDB
- Action: remove and dispose of trash and debris

Stormwater Quality Feature Inspection Checklist

Feature: _____ Date: _____

Inspected by: _____

Type of Inspection: ☐ Routine ☐ Storm Event _____ (# of days since event)

General Observations:

- Is water flowing?
- Standing water (more than 48 hours after the last storm event)?
 - Depth:
- Any evidence of obstructions or erosion in vicinity of the feature that could affect performance?

General Conditions:

- Do the feature sides/slopes/bottom show signs of settling, cracking, sloughing or other problems?
- Do the embankments, emergency spillway (if applicable), or side slopes show any erosion or instability?
- Is there any evidence of animal burrowing or other activity that could contribute to instability or increased erosion?
- Is there evidence of encroachment into or improper use of the feature?
- Do vegetated areas need mowing or thinning i.e. grass, cattails, willows, trees etc.?
- Are there areas that need to be re-vegetated?
- Is there general accumulation of trash, debris and/or litter to be removed around the feature?
- Any signs of vandalism or other activity that could affect performance of the feature?
- Unusual Algae blooms? (May signal too many nutrients in runoff; identify dog activity and clippings management)

Structural Conditions:

- Are the pipes/inlets going into or out of the feature clogged or obstructed?
- If applicable are concrete trickle channels in the feature clogged, undercut or damaged? (Detention Ponds)
- If applicable is the filter media evenly distributed and unclogged? (Rain Gardens, Sand Filters, etc.)
- If applicable is the underdrain clear of sediment or debris; as viewed through inspection port? (Rain Gardens, Sand Filters, Underground features)
- If applicable is there debris or other obstructions directly in front of or inside the Outlet Structure/Overflow?
- If applicable is the orifice and/or trash rack obstructed? (Detention Ponds)
- Is there any structural damage to the outlet structure?
- Do any safety features, such as fences, gates or locks need repair or replacement?
- If applicable, do the Stormwater Educational Signage features need cleaning or repair?

Overall Feature Condition

- ☐ Feature has numerous or severe issues which could impact water quality or public safety and needs immediate repair.
- ☐ Feature has minor issues and needs maintenance.
- ☐ Feature has no issues of note.

Notes: