

# F.14 Subsurface Detention

### F.14.1 Subsurface Detention Plan Standards

1. Verify that the plans include an appropriate sequence of construction that is specific to the construction of the subsurface detention SMP. Refer to Section 4.8.5 for guidance. [Section 2.3.1]
2. Verify that the plans include an appropriate cross-sectional detail for the subsurface detention SMP. [Section 2.3.1]

### F.14.2 Subsurface Detention Design Standards

1. Verify that the SMP drains within the acceptable 72-hour period after the 24-hour storm event. [Section 4.8.3, 1]
2. Verify that positive overflow is provided for large storm events, up to and including the 100-year, 24-hour storm event, or, if the project is exempt from Flood Control, the ten-year, 24-hour storm. [Section 4.8.3, 2]
3. Verify that overflow structures and pipes are designed to convey at least the ten-year, 24-hour storm event. [Section 4.8.3, 2]
4. Verify that the distance between subsurface detention basins and any adjacent private property line is at least ten feet. This includes lined basins. Exceptions can be made for water-tight vaults with their own structural integrity, such as concrete or fiberglass vaults. It is acceptable for SMPs to be located directly adjacent to the public right-of-way (ROW) (unless a deed restriction is put in place extending at least ten feet from the perimeter of the infiltrating SMP). [Section 4.8.3, 4]
5. Verify that the distance between subsurface detention basins and any building or retaining wall is at least ten feet. This includes lined basins. The following requirements and exceptions apply: [Section 4.8.3, 5]
  - a. For existing and proposed buildings with basements, the setback is measured from the basement wall and may be waived if the basin is a water-tight vault with its own structural integrity, such as a concrete or fiberglass vault.
  - b. For existing buildings without basements and existing retaining walls, the setback is measured from the foundation and may be waived if a signed and sealed geotechnical analysis is submitted that evaluates the impacts of residual infiltration and excavation on the existing foundation and determines it to be feasible.
  - c. For proposed buildings without basements and proposed retaining walls, the setback is measured from the foundation and may be waived if the foundation is proposed to be designed with the basin's proximity in mind.
6. Verify that pretreatment is provided for all runoff entering the subsurface detention SMP, including pretreatment of runoff from all inlets. At a minimum, this can be achieved through the use of sumps and traps for inlets, sump boxes with traps downstream of trench drains, and filter strips for overland flow. [Section 4.8.3, 6]

7. Verify that the storage area provides adequate storage to control release rates to meet all applicable Stormwater Regulations. All permanent pool areas must be excluded from the SMP's storage volume estimation. [Section 4.8.3, 9]
8. Verify that pipe, vault, grid and chamber storage areas are adequately bedded with stone to prevent settling or subsidence. [Section 4.8.3, 10a]
9. Verify that bedding thickness is not less than six inches. [Section 4.8.3, 10b]
10. Verify that foundations/footers are provided as warranted by system loading, geotechnical conditions, and manufacturer's recommendations. Foundation designs must be performed by an appropriate design professional. [Section 4.8.3, 10d]
11. Verify that the storage design accounts for potential loading from vehicles, as appropriate, based on expected maximum active loading, including consideration for emergency vehicles. [Section 4.8.3, 11]
12. Verify that the porosity values used for storage volume calculations are as follows: [Section 4.8.3, 13]
  - a. Soil media: 0.20
  - b. Sand: 0.30
  - c. Stone 0.40
  - d. Void space provided by linear chamber systems, plastic grids, or other related structures must be as specified by the manufacturer and noted in supporting documentation.
13. Verify that the stone storage layer, if proposed, is separated from soil media by a geotextile or pea gravel filter to prevent sand, silt, and sediment from entering the system. [Section 4.8.3, 14]
14. Verify that any impervious liner, if necessary, is not interrupted by structures within the basin footprint. The plans must indicate that the impervious liner is to be continuous and extend completely up the sides of any structures that are located within the lined basin footprint to the ground surface. If additional liner material must be added to extend up the structures, the additional liner sections are to be joined to the rest of the liner with an impervious seam per the manufacturers' recommendations. [Section 4.8.3, 16]
15. Verify that an adequate number of appropriately placed cleanouts, manholes, access panels, and other access features are provided to allow unobstructed and safe access to the subsurface detention SMP for routine maintenance and inspection of inflow, outflow, underdrains, and storage systems. [Section 4.8.3, 17]
16. Verify that an observation well is provided for a subsurface detention SMP that includes stone storage and that it meets the following requirements:
  - a. The observation well must be placed at the invert of the stone bed. [Section 4.8.3, 18a]
  - b. An observation well must be located near the center of the stone bed system to monitor the level and duration of water stored within the system (drain down time). [Section 4.8.3, 18b]
  - c. Adequate inspection and maintenance access to the observation well must be provided. [Section 4.8.3, 18c]
  - d. A manhole may be used in lieu of an observation well if the invert of the manhole is installed at or below the bottom of the SMP and the manhole is configured in such a way that stormwater can flow freely between the SMP and the manhole at the SMP's invert. [Section 4.8.3, 18d]
17. Verify that access features are provided for any subsurface detention SMP that is not comprised of a stone storage bed. [Section 4.8.3, 19a]

18. Verify that a sufficient number of access points in the SMP are provided to efficiently inspect and maintain the storage area. [Section 4.8.3, 19b]
19. For cast-in-place vault systems, verify that access features consist of manholes or grated access panels or doors. Grated access panels are preferred to maintain airflow. A minimum of 50 square feet of grate area is recommended for permanent pool designs. [Section 4.8.3, 19c]
20. For grid storage or other manufactured systems, verify that the manufacturer's recommendations are followed. [Section 4.8.3, 19d]
21. Verify that ladder access is provided for vaults greater than four feet in height. [Section 4.8.3, 19e]
22. Verify that header pipes, at minimum 36-inch in diameter, connected to manholes at each corner of the subsurface detention SMP are provided. Alternatively, smaller header pipes may be used if cleanouts are provided on the manifold/header pipe junction for each distribution pipe. The cleanouts must be on alternating sides of the SMP. [Section 4.8.3, 19f]

### **F.14.3 Subsurface Detention Material Standards**

1. Verify that stone designed for stormwater storage, if proposed, is specified on the plans as being uniformly graded, crushed, clean-washed stone, and that it is noted that PWD defines "clean-washed" as having less than 0.5% wash loss, by mass, when tested per the AASHTO T-11 wash loss test. AASHTO No. 3 and AASHTO No. 57 stones can meet this specification. [Section 4.8.4, 3]
2. Verify that sand, if proposed, is specified on the plans to be AASHTO M-6 or ASTM C-33 sand and to have a grain size of 0.02 inches to 0.04 inches. [Section 4.8.4, 4]
3. Verify that storage pipe, if proposed, is specified on the plans as meeting the following specifications:
  - a. Pipe used within the subsurface detention SMP must have a minimum inner diameter of four inches. [Section 4.8.4, 5a]
  - b. High-density polyethylene (HDPE) pipe must meet the specifications of AASHTO M252, Type S or AASHTO M294, Type S. [Section 4.8.4, 5b]
  - c. Any pipe materials outside the SMP are to meet the City Plumbing Code Standards. [Section 4.8.4, 5c]
4. Verify that geotextile, if proposed, is specified on the plans to consist of polypropylene fibers and to meet the following specifications (AASHTO Class 1 or Class 2 geotextile is recommended): [Section 4.8.4, 6]
  - a. Grab Tensile Strength (ASTM-D4632):  $\geq 120$  lbs
  - b. Mullen Burst Strength (ASTM-D3786):  $\geq 225$  psi
  - c. Flow Rate (ASTM-D4491):  $\geq 95$  gal/min/ft<sup>2</sup>
  - d. UV Resistance after 500 hrs (ASTM-D4355):  $\geq 70\%$
  - e. Heat-set or heat-calendared fabrics are not permitted
5. Verify that observation wells are specified on the plans as consisting of perforated plastic pipe with a minimum inner diameter of six inches. [Section 4.8.4, 8]
6. Verify that cleanouts are made of material with a smooth interior having an inner diameter that is no less than four inches and matches that of its connecting pipe up to eight inches. If the pipe is larger than eight inches in diameter, verify that the cleanout is eight inches in diameter. [Section 4.8.4, 9]