
5. Drainage Plan - Contents and Standard Procedures for Medium Impact Projects

- a. Developments less than 5000 square feet impervious area may use the standard plans referenced in this section. If the project is located in a critical drainage area, in an environmentally sensitive area, or within a site presenting special problems, the plan must address the special circumstances and may require preparation by a licensed civil engineer.
- b. On slopes over 15%, use of infiltration trenches or runoff spreaders are prohibited. Saturation caused by infiltration of stormwater can cause instability and accelerated soil creep.
- c. Two alternative approaches to on site drainage control are available with the standard plans. One alternative uses an infiltration trench system, requiring an on-site perc test. (This perc test as described may be used to fulfill the requirements for Small Parcel submittals as well.) The other alternative uses an enclosed, subsurface detention system, discharging at an acceptable outfall location. Both approaches have several basic requirements in common.
 - i. Basic Requirements: For both approaches, the following requirements must be satisfied:
 - (1) Prepare a dimensioned site plan sketch of the entire property to scale; show north arrow and note scale.
 - (2) Show all locations where concentrated surface water enters the property, the present drainage route through the property, and present discharge from the property. A description of the type and magnitude of flow should be noted on the plan (for example, "intermittent flow during storms in shallow grass swale"). Show all other surface waters.
 - (3) Show locations of all existing and proposed buildings and other impervious surfaces and show their dimensions.
 - (4) For any route of concentrated flow which is to be changed, show the revised route and the type of channel to be provided. Structures are to be set back at least 10 feet from any closed drainage facility and 15 feet from the edge of any channel or pond. Note, also, that structures must be at least one-foot above the maximum water level in the channel. Stream changes require a State Hydraulic permit.
- d. Infiltration System
 - (1) Conduct at least one field perc test where each infiltration trench is to be located (see perc test instructions below). Show the location of the perc test(s) on the site plan, number each location, and note the design perc rate on the plans "Design Data" table.
 - (2) Use the following Table 1, to determine the required trench length(s) for each 1000 square feet of impervious surface and enter the length(s) in the "Design Data" table.
 - (3) Compute the impervious surface area which will drain to each infiltration trench and enter in the plan's "Design Data" table.

- (4) Compute the actual trench length required for the actual amount of impervious area draining to each infiltration trench and enter the numbers in the “Design Data” table.
 - (5) Add the proposed locations of infiltration trench(es) to the site plan. Dimension the trench(es) on the plan and draw them to scale and in the proper locations. The trenches are to be at least 10 feet from buildings and property lines. The trenches must be level, so they must generally follow the land contours. Trenches should generally be placed downslope from any existing or proposed buildings. Please consult Public Works if you have any questions regarding locations of trenches.
 - (6) Complete the plan by
 - (a) Show tight lines: from roof drains to the system catch basin(s); from the footing drains; and from any driveway drains. Roof drains may not be piped into footing drains.
 - (b) Adding any additional notes you want the builder to know.
 - (c) Filling in the title block with required information.
 - (7) Copy the plan and submit 3 copies with your application.
- i. Perc Test Procedure for Infiltration Systems
- (1) Dig a hole with an approximate diameter of 6 inches to a depth equivalent with the bottom of the proposed trench. The standard tool to use is the post-hole digger.
 - (2) After digging the hole, it is important to carefully scratch the bottom and sides of the hole to eliminate any smeared or sealed surfaces. Remove all loose material from the hole, and place two inches of course sand or fine gravel in the bottom. This is to prevent the bottom surface of the hole from being scoured when water is poured into it.
 - (3) Many soils will tend to swell and lose percolation capacity after being wetted for a period of time. The tendency for a soil to swell is dependent on the quantities of clays having a shrink-swell potential. Therefore, it is important that those soils be allowed to swell prior to performing the percolation test.
 - (4) If a soil is comprised almost entirely of sand (the majority of individual grains visible without magnification), soaking is not required.
 - (5) If the soil contains a significant amount of fine material, the hole must be soaked a minimum of 4 hours (continuous soaking for 24 hours is preferred). The soaking may require periodic addition of water. Percolation measurements are made 24 hours after the start of the soaking period.
 - (6) After soaking, the percolation rate is to be measured by one of the following methods:
 - (a) If water remains in the test hole, add or remove water so

- the water level is six inches above the gravel. Carefully measure the drop in water level over a 30 minute period. Use this data to calculate the perc rate in minutes per inch.
- (b) If no water remains in the hole after the soaking period, add water to six inches above the gravel. Measure the drop in water over a 30 minute period. Use this data to calculate the percolation rate in minutes per inch.
 - (c) If more than 2.5 inches of water drains out within 30 minutes, disregard the previous results. Retest by adding water to six inches above the gravel. Then measure the time it takes for the water to drop 2 inches and calculate the perc rate in minutes per inch.
- (7) It is important to use a six inch diameter hole for the perc tests. Other sizes need to be mathematically adjusted.

TABLE 1 INFILTRATION TRENCH LENGTH	
Perc Rate (minutes per inch)	Trench Length (feet) (Per 1000 square feet of contributing area)
1	15 (minimum)
2	18
3	21
4	24
5	26
6	28
7	29
8	30
9	31
10	32
11	33
12	34
13	34
14	35
15	35

e. Detention System

- (1) Add the proposed location of the underground detention pipe to the site plan (must be downhill from the impermeable surfaces which are to drain to it).
- (2) Select the outflow location (must be downhill from the detention pipe outlet):
 - (a) Where a well defined drainage channel drains the area to be developed, direct the outflow pipe to that channel provided the pipe and the channel at the discharge location are within the property.

- (b) Where a public storm drain or public drainage ditch is within or adjacent to the property, direct the outflow pipe to these facilities. Note that a catch basin is normally required where pipes connect.
 - (c) Where neither of the previous situations exists, perc tests must be performed to assess the feasibility of using the infiltration system. The infiltration system should be used where feasible. If this system is not feasible the detention system outflow must be dispersed over the natural discharge area(s) using runoff spreader(s).
- (3) Compute the impermeable surface area which will drain to the detention system and enter on the “Design Data” table.
 - (4) Choose a detention pipe diameter and find the required detention pipe length for impermeable surface area using Table 2. Enter the pipe diameter and length on the “Design Data” table.
 - (5) Find the required outlet orifice size for the impermeable surface area using Table 3. Enter the outlet orifice size on the “Design Data” table.
 - (6) Complete the plans by:
 - (a) Showing tight lines from roof drains to the system catch basin(s); from the footing drains; and from any driveway drains. Roof drains may not be piped into footing drains.
 - (b) Adding any additional notes you want the builder to know.
 - (c) Add either the runoff spreader detail or the system outlet detail, depending on which one is planned for use.
 - (d) Filling in the title block with required information.
 - (7) Copy the plan and submit 3 copies with your application.

Table 2 Detention Pipe Lengths (in feet)						
Impermeable Area (sq. ft.)	Required Volume (cu. ft.)	Pipe Diameter				
		12"	15"	18"	24"	30"
2000	50		40	28	16	10
2500	62		50	35	20	13
3000	75		60	42	24	15
3500	87		70	49	28	18
4000	100		80	56	32	21
4500	112		90	63	36	23
5000	125		100	70	40	25

Outlet Orifice Sizes	
Impermeable Area (sq. ft.)	Outlet Orifice Diameter (inches)
2000	5/8
2500	5/8
3000	3/4
3500	3/4
4000	7/8
4500	7/8
5000	7/8