

## **SUBSUBSECTION 13.7 DRAINAGE DESIGN CRITERIA**

### **13.7A DESIGN CRITERIA**

1) General

Proposed drainage facilities shall be enclosed and designed to accommodate surface runoff from proposed land development as well as the entire upstream drainage area.

2) Design of Storm drainage systems shall be in accordance with the Stormwater Management Plan requirements of Section 5.5 and based on the design guidance provided in that section.

3) Alternative Open Drainage System

In certain circumstances the Commission may permit an open drainage system as shown on Plate 6 where such system would be more consistent with the surrounding neighborhood and where the Commission, upon recommendation from the Town Engineer, determines that such a system would be more appropriate to the particular site. This determination shall be based upon at least the following factors and the applicant shall submit a report that addresses each of these items as part of the Subdivision application:

- a) The depth to ground water;
- b) The location of the site in the watershed and the amount of overland flow anticipated;
- c) The design of the storm drainage system the surrounding street system;
- d) The natural features of the site (such as slopes and depth to ledge) that would permit or restrict the construction of open swales;
- e) The proposed density of the subdivision including proposed lot size;
- f) The impacts of ground water recharge that may result from the proposed drainage system; the Commission and/or the Town Engineer may require the applicant to provide data, reports, studies, test borings, and other information to make this determination;

- g) Roadway intersections, where a closed drainage system may be more acceptable;
- h) Location of open space;
- i) The type of roadway swale linings proposed;
- j) The potential for erosion and sedimentation on the site as well as both temporary and permanent erosion control measures.

4) Drainage Easements and Rights to Discharge

Where the discharge of stormwater shall be onto or through private property, perpetual drainage easements and discharge rights, in favor of the owner of the road, shall be secured by the applicant. Where drainage easements are required, they shall have a minimum width of thirty (30) feet. For open channels, flared end sections/headwalls, and other outlet protection measures, they shall extend a minimum of fifteen (15) feet beyond the outside edge of such measures.

5) Capacity Within Roadway

Storm drainage systems within the roadway, exclusive of culverts and bridges carrying flows under the road, shall be designed to safely accommodate flows resulting from storms of the maximum intensity which can be expected to occur on an average of once in ten (10) years (10-year storm) without being surcharged.

6) Capacity Under Roadways

Culverts crossing under roadways shall be designed to accommodate the following flows:

a) Minor Structures

These shall include pipe, box culverts or bridges providing for the drainage of adjacent lands less than one square mile in area in which there is no established watercourse. These structures shall be designed to pass a 25-year frequency discharge without flooding or damaging the highway or adjacent property.

b) Small Structures

These shall include pipe, box culverts or bridges providing for the drainage of adjacent lands less than one square mile in area in which there is an established watercourse. These structures shall be designed to pass a 50-year frequency discharge with one foot of freeboard, and without flooding or damaging adjacent property. The effects of a discharge equal to the 100-year frequency storm shall be checked. Where such effects are likely to cause damage to persons or property, structures shall be designed to alleviate these problems.

c) Large Structures

These shall include pipe, box culverts or bridges for the drainage of adjacent lands one square mile or larger in area. These structures shall be designed to pass a 100-year frequency discharge with a minimum one foot under clearance, relative to the low chord of the upstream face of the structure, and shall not create a backwater, which will flood or endanger property or roads upstream.

**13.7B MINIMUM PIPE SIZES**

1) Surface Drainage

All pipe carrying surface drainage or a combination of surface drainage and subsurface drainage (groundwater) shall have a minimum internal diameter of fifteen (15) inches.

2) Subsurface Drainage

All subsurface drainage pipes used exclusively for intercepting groundwater shall have a minimum internal diameter of six (6) inches.

**13.7C CATCH BASINS**

1) General

Catch basins shall be provided in order that surface water will not travel along the roadway curb line without interception for more than 350 feet from the roadway high point and 300 feet between successive inlets on roads with grades up to and including 5%. On roads with grades exceeding 5%, the spacing from the high point and between inlets shall be reduced to 250 feet. Catch basins shall also be installed at all low points, roadway

intersections and at the lower end of all cul-de-sacs. Catch basins located within the paved roadway shall be Type "C".

2) Off-Road Locations

Where it is necessary to provide catch basins in off-road locations outside of the limits of pavement, they shall have Type "C-G" heads and shall have no sumps.

3) Inlet Capacity

Where additional inlet capacity is necessary, the installation of double catch basins, curved grates, or more closely spaced catch basins shall be required.

### **13.7D MANHOLES**

1) General

In general, a manhole is less preferable to a catch basin and should only be provided where the use of a catch basin is not feasible.

2) Places

Manholes shall be provided at each change of drainage pipe slope or horizontal alignment, at all pipe junctions and otherwise at intervals of approximately 350 feet on long lengths of pipe where catch basins are not used.

### **13.7E FLARED END SECTIONS/HEADWALLS**

1) General

The inlets and outlets of all exposed drainage conduits shall be protected with flared end sections except where hydraulic, or other considerations necessitate the use of a headwall. When headwalls are provided, they shall be of reinforced concrete construction. Wing walls shall be provided when required to contain and protect the adjacent earthen slopes and/or direct the flow of water entering or leaving the conduit. Outlet protection shall be provided in accordance with the standards outlined in the "Connecticut Guidelines for Soil Erosion and Sediment Control".

### **13.7F OPEN CHANNELS**

1) General

In general, open channels shall be avoided, except in conjunction with an approved roadway design incorporating open drainage systems, and as may be required at storm drainage system outlets to convey storm water discharges to an acceptable outlet. Where open channel flow is required, the channel shall be properly designed to safely carry the design flow. Open channels shall be in the form of a trapezoid having a bottom width of at least two feet and side slopes of not less than two feet horizontal to one foot vertical. The channel shall be seeded and protected with erosion control blankets, sodded, riprapped or otherwise stabilized as the flow quantities and velocities require.

2) Stabilization of Open Channels

Special attention shall be given to the stabilization of open channels in the immediate vicinity of pipe inlets and outlets, bridges, at bends and curves and at other critical locations as required to prevent scouring, erosion and/or siltation of watercourses and culverts, and undermining of drainage structures.

3) Criteria

Hydraulic design of open channels and design of bed and bank stabilization shall be done in accordance with the applicable criteria of the most current edition of the Federal Highway Administration publication entitled "Design of Roadside Drainage Channels".

### **13.7G UNDERDRAINS**

1) General

The installation of subsurface drainage systems or underdrains will be required beneath the edge of pavement of a proposed street wherever the ground water is known to be less than three (3) feet below the proposed finished grade of the street. Underdrains shall also be installed where localized seeps or springs are observed within the proposed street lines during construction or where otherwise required by the Town Engineer.

### **13.7H CONNECTION OF PRIVATE DRAINS**

1) General

Unless otherwise approved by the Director of Public Works, private storm drains, yard drains, area drains, footing drains, curtain drains, underdrains, basement drains or other drains of any kind, shall not be permitted to discharge upgradient or into a town road or road proposed to be dedicated to the town at a future date. Any such private drains shall be connected to storm drainage structures. When such a connection is not possible or practical, they may be connected directly to an existing or proposed storm drain if approved by the Director of Public Works. Where direct connections are made, they shall utilize appropriate fittings, and be preceded by an access extended to grade. Such access shall be located within a town road right-of-way or easement, and shall have a minimum diameter of twelve inches, or as otherwise deemed necessary to provide direct observation and to facilitate sampling. All access structures shall be provided with a secure top to preclude accidental entry. The following notation shall be placed on all design drawings where the connection of private drains are proposed; "Private drains are the sole responsibility of the owner and the Town of Hebron shall assume no responsibility for any maintenance, replacement and/or repair. The owner of the drain shall hold the Town of Hebron harmless for any damage or injuries resulting from such connection."