

# DRAINAGE WORKS STANDARDS MANUAL

## MUNICIPALITY OF THE COUNTY OF ANNAPOLIS

### **PURPOSE:**

The purpose of Municipality of the County of Annapolis Drainage Works Standards Manual is to define Development Planning, Engineering Design and Construction Standards for the development of public drainage works within the Municipality.

The functional objectives of drainage works are to minimize inconvenience associated with precipitation runoff to people and to minimize property damage and to prevent damage to structures during major flood situations.

### **APPLICATION:**

The specifications herein apply to the development of drainage works that are to be owned and operated by the Municipality of the County of Annapolis.

### **DESIGN STANDARD:**

#### **Hydrological Design**

All developments shall be planned to incorporate drainage works with the capability to accommodate surface runoff (drainage) from both major and minor runoff events. Major runoff events are those that can be expected to occur with a statistical 100 year return frequency. Minor events are those with a statistical 5 year return frequency.

Developments may incorporate two types of drainage systems. The types of drainage systems are referred to hereinafter as an Overland Flow System and as a Piped System.

All developments shall be served by an Overland Flow System.

The use of a Piped System is optional, except if the streets are developed with curbs, in which case a Piped System shall be developed, in addition to the Overland Flow System.

An Overland Flow Drainage System shall incorporate ditches (including road ditches), swales and culverts.

A Piped Drainage System shall incorporate catch basins, catch basin leads and storm sewers.

Piped Drainage Systems shall be designed to intercept and transport drainage from runoff events with a minimum 5 year return frequency. Piped Drainage Systems shall discharge to Watercourses or to overland Flow Drainage Systems.

Overland Flow Drainage Systems shall be designed to intercept and transport drainage from a minimum 100 year return frequency event. Overland Flow Systems shall be capable of intercepting and transporting the drainage to a Watercourse without causing water to be stored on or to flow across private property.

Designs shall be undertaken using the Rational Method or using nationally recognized and accepted digital computer models.

## Hydrological Design (continued)

Precipitation and snow melt related factors for planning and design purposes shall be based on data from the weather station at CFB Greenwood. Design factors relating topographic slopes, land use and ground surface treatments, runoff vs infiltration characteristics, velocity of flow, surface runoff detention, etc. shall reflect worse case situations and shall be consistent with nationally accepted practice. Notwithstanding nationally accepted practice, the maximum inlet time, i.e. the duration of time, from a design perspective, for water falling on a catchment area to reach the inlet of the drainage system, shall not exceed 25 minutes.

All Drainage System designs shall comply with guidelines, standards and regulations of the Nova Scotia Department of the Environment.

## Piped Drainage System Design

### **Sewer Capacity:**

Storm sewer and catch basin lead pipes shall be designed to carry the estimated peak hydraulic load. Manning's Formula shall be used to calculate pipe capacity.

### **Minimum Pipe Sizes:**

No storm sewer shall be less than 300 mm in diameter. No catch basin lead shall be less than 250 mm in diameter.

### **Depth:**

No storm sewer or catch basin lead shall be installed less than 1.2 metres below finished grade.

### **Slopes:**

Storm sewers and catch basin leads shall be laid at a uniform slope between manholes and between catch basins and manholes.

All storm sewers and catch basin leads shall be designed to create minimum and maximum velocities of flow of 0.6 and 4.5 metres per second, respectively, at design hydraulic loadings.

### **Manholes:**

No manholes shall be less than 1200 mm in diameter.

Manhole spacing and the distance between any catch basin and a manhole shall not exceed 120 metres.

Energy losses in manholes shall be compensated for by allowing a 30 mm drop through each manhole.

### **Catch Basins:**

No catch basin shall be less than 900 mm in diameter.

Catch basin spacing and the number of catch basins required to intercept runoff shall be determined by dividing the calculated peak runoff rate by the inlet capacity of the catch basin cover, with a maximum submergence of 50 mm. The inlet capacity of a catch basin cover shall not exceed 0.03 cubic metres per second.

## Overland Flow Drainage System Design

### Ditch and Swale Capacity:

Ditches and swales shall be designed to provide the capacity to carry the estimated peak hydraulic load for the Major Runoff Event. Ditch and swale capacity shall be calculated using Manning's Formula.

### Culvert Capacity:

Culverts shall be designed to transport (receive, carry and discharge) the design peak hydraulic load. The design of culverts shall consider inlet and outlet control conditions and shall be based on the applicable condition. The head pond and tail pond requirements (which ever apply) to satisfy the operating requirements of the culvert shall be reflected in the elevation at which the culvert is designed, relative to the elevations of the banks of the ditches.

Culvert sizes and installation elevations shall be designed for all driveways.

### Minimum Culvert Size:

No culvert shall be less than 450 mm in diameter.

### Ditch Depths:

Depths of ditches, including roadside ditches, shall be between 0.75 and 1.0 metres.

### Ditch Slopes:

Ditch and swale slopes shall be designed to limit flow velocities to between 0.3 and 2.0 metres per second under Minor Runoff Event hydraulic loading conditions.

### Ditch Lining Materials:

All ditches, including roadside ditches, shall be lined to prevent erosion under Minor Runoff Event hydraulic loading conditions. Lining materials shall be selected on the basis of low rate velocity estimates.

### Culvert Head-walls:

Head-walls shall be designed for both ends of all culverts.

Head-walls shall incorporate appropriate riprap designs for the discharge ends of all culverts.

## CONSTRUCTION STANDARD

All drainage works shall be constructed in accordance with the *Standard Specification for Municipal Services*, as produced jointly by the Nova Scotia Consulting Engineers Association and the Nova Scotia Road Builders' Association.