

## **CHAPTER 19: HYDROLOGIC DESIGN STANDARDS**

**19.00 Introduction and Goals**

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**19.00 INTRODUCTION AND GOALS**

The purpose of this chapter is to provide information on methods commonly used in the City of Champaign to develop runoff estimates for stormwater design such as the design of storm sewers, swales, ditches, culverts, bridges, and detention basins.

**19.01 ADMINISTRATION**

- A. This chapter applies to hydrologic design for detention basins and other storm drainage facilities (storm sewers, swales, ditches, culverts, bridges) within the City limits and the 1-1/2 mile extra territorial jurisdiction.
- B. Hydrologic design calculations shall be reviewed by the City of Champaign through one of the following:
  - 1. subdivision plan review
  - 2. grading and drainage plan review
  - 3. construction plan review (typically public improvements)

**19.02 STANDARDS**

The following standards apply to Hydrologic Design:

- A. **Referenced Standards:** Design standards for hydrologic design shall comply with these regulations and with the provisions of the IDOT Drainage Manual, and the City of Champaign Stormwater Management Regulations (Municipal Code Chapter 29.5, see Appendix B of this manual), latest editions, unless otherwise stated by this manual.
- B. **Rainfall Data:** Rainfall duration and frequency distributions shall be taken from Illinois State Water Survey (ISWS) Bulletin 70 or ISWS Circular 172 or most recent ISWS equivalent, unless the use of other local data is approved in writing by the City Engineer.
- C. **Rainfall Recurrence Interval:** The design rainfall recurrence interval shall be set by the design application as follows:

Detention	100 year
Emergency Overflow Routing	100 year
Bridges	100 year
Underpasses	50 year
Swales, Ditches, and Culverts	30 year
Storm Sewers	10 year

- D. **Design:**
  - 1. Choose an applicable hydrologic design method according to the IDOT Drainage Manual Figure 4-001, included as Standard Attachment Number 19.01. More complex hydrologic design methods, such as TR-20 or HEC-1, may always be substituted for less complex methods when selecting appropriate design methods.
  - 2. Hydrologic design calculations shall include contour map(s) clearly showing the design drainage area(s), stormwater facilities, storm sewers, swales, ditches, culverts, bridges and receiving stormwater facilities. Critical spot elevations, invert

elevations, pervious and impervious areas shall be clearly indicated. See Subdivision Regulations for other subdivision plan submittal requirements.

3. Submittals shall include design calculations, drainage basin areas and surface types, rainfall data used, critical storm duration and justification of duration selection.
4. See Chapter 23 for detention routing and design requirements.

### **19.03 STANDARD ATTACHMENTS**

The following items are attached as reinforcement or amendments to policies stated above:

Standard Attachment Number 19.01 – Figure 4-001 IDOT Drainage Manual

CHAPTER 4 – HYDROLOGY

4-000 GENERAL

4.001 Introduction

The design of each highway drainage facility requires the determination of discharge-frequency relationships. Some facilities require a determination of a momentary peak flow rate while others require a runoff hydrograph providing an estimate of runoff volume. The momentary peak flow rates are most often used in the design of bridges, culverts, roadside ditches, and small storm sewer systems. Drainage systems involving detention storage, pumping stations and large or complex storm sewer systems require the development of a runoff hydrograph.

The methods of computing peak discharges and flood hydrographs, which the Division of Highways recommends, are presented in the following sections. The type of highway drainage facility that each method is applicable for is shown on Figure 4-001.

		METHOD				
		USGS*	Rational	SCS		HEC1
				TR55	TR20	
Drainage Area Limitation		0.2-10.000 sq. mi.	<200 Ac.	<2000A c.	None	None
FACILITY DESCRIPTION	Stream Flow	1		5	2,3	2,3
	Bridges, Culverts & Channels					
	Roadway Design					
	Storm Sewers, Roadside Ditches & Appurtenant Culverts		1	5	3	3
	Pumping Stations		4	5	1	1
	Detention Basins		5	5	1	1

1. Acceptable standard or customary method
2. Alternate when 1 is not applicable
3. Preferred for complex facilities or when hydrograph is needed
4. Method may be used for preliminary evaluation
5. May be used for small off right-of-way detention systems which will not impact sensitive flood situations