2A-4 Stormwater Management Criteria

A. Minor and major design storms

Every urban area has two separate and distinct drainage systems, whether or not they are actually planned for and designed. One is the minor system corresponding to the minor (or ordinary) storm recurring at regular intervals, generally 2 to 10 years. The other is the major system corresponding to the major or extraordinary storm, generally 50 to 100-year, or greater storm event. Since the effects and routing of stormwater for the major storm may not be the same for the minor storm, all storm drainage plans submitted for approval should be submitted showing the routing path and effects of the major storm.

Table 1: Chance of a Storm Equaling or Exceeding a Given Frequency during a Given Time Period

	Time Period in Years					
Frequency (years)	1	5	10	25	50	100
2	50%	97%	99.9%	99.9%	99.9%	99.9%
5	20%	67%	89%	99.9%	99.9%	99.9%
10	10%	41%	65%	94%	99.9%	99.9%
25	4%	18%	34%	64%	87%	98%
50	2%	10%	18%	40%	60%	86%
100	1%	5%	9.6%	22%	39%	64%

1. **Minor storm provisions.** The minor storm drainage system should be designed to provide protection against regularly recurring damage, to reduce street and stormwater conveyance maintenance costs, to provide an orderly urban drainage system, and to provide convenience and protection to the urban residents. Storm sewer systems consisting of underground piping, natural drainage ways and other required appurtenances should be considered as part of the minor storm drainage system.

2. **Major storm provisions.** The major storm drainage system should be designed to not cause major property damage or loss of life from storm runoff expected from the major storm. The effects of the major storm on the minor drainage system should be noted.

B. Street flow criteria

1. **Street capacity for minor storms**

   a. Pavement encroachment for minor design storm should not exceed the limitations set forth in Table 1:

Table 2: Allowable Pavement Encroachment and Depth of Flow for Minor Storm Runoff

Street Classification	Maximum Encroachment[1]
Local	No curb overtopping. Flow may spread to crown of street.
Collector/Minor Arterial	No curb overtopping. Flow spread must not encroach to within 8 feet of the centerline of a two-lane street. The flow spread for more than two-lane streets must leave the equivalent of two 12-foot driving lanes clear of water; one lane in each direction. For one-way streets, a single 12-foot lane is allowed.
Major Arterials (4 lanes or greater)	No curb overtopping. Flow spread must not exceed 10 feet from the face of the curb of the outside lane. The flow spread for more than two-lane streets must leave the equivalent of two 12-foot driving lanes clear of water; one lane in each direction. For one-way streets, two 12-foot lanes are required. For special conditions, when an intake is necessary in a raised median, the flow spread should not exceed four feet from the face of the median curb for an inside lane.

   b. The storm sewer system will commence upstream from the point where the maximum allowable encroachment occurs. When the allowable pavement encroachment has been determined, the theoretical gutter carrying capacity for a particular encroachment will be computed using the modified Manning's formula for flow in a small triangular channel as shown in Figure 1, Section 2E-2. An "n" value of 0.016 will be used unless special considerations exist.

[1] Where no curbing exists, encroachment shall not extend past property lines.

2. **Street capacity for major storms.** The allowable depth of flow and inundated area for the major design storm should not exceed the limitations set forth in Table 2:

Table 3: Allowable Depth of Flow and Inundated Area for 100-Year Storm Runoff

Street Classification	Allowable Depth and Ponded Area
Local and Collector	The ponded area should not exceed the street right-of-way and the depth of water above the street crown should not exceed 6”. There may be situations where other restrictions are necessary.
Major and Minor Arterial	A 12’ lane is the minimum travel lane to be passable in the center of the street.

3. **Cross street flow.** Cross street flow (called cross pan) can occur by two separate means. One is runoff which has been flowing in a gutter and then flows across the street to the opposite gutter or inlet. The second case is flow across the crown of the street when the conduit capacity beneath the street is exceeded. If the inundated area exceeds the street right of way, flow easements must be obtained. The maximum allowable cross street flow depth based on the worst condition should not exceed the limitation stipulated in Table 3.

Table 4: Allowable Cross Street Flow

Street Classification	Initial Design Storm Runoff	100-Year Design Storm Runoff
Local	6” depth at crown or in cross pan	9” depth at crown or in cross pan
Collector	Where cross pans are allowed, depth of flow or in cross pan should not exceed 3”	6” depth at crown
Arterial	None	3” or less over crown

C. Design frequencies for conveyance facilities

Design storms for drainage facilities are described below. A minimum cleaning velocity of 3 fps should be used for the design storm. When detention or overland flow provisions for storms greater than 10 years are not available, regardless of the street system, the 100-year or greater storm is required for the design to minimize impact to private properties.

1. **Intakes.** Intakes should have a minimum capacity to convey the 5-year storm under developed conditions for local streets and minor collectors during the peak flow rate. The Jurisdictional Engineer may require 10-year frequency for intakes for major collectors, arterials, expressways and freeways.

2. **Storm sewers.** Storm sewers should have capacity to convey a 5-year storm under developed conditions within the pipe for local streets and minor collectors. The Jurisdictional Engineer may require 10-year frequency for storm sewers for major collectors, arterials, expressways and freeways. Provisions should be made for the minimum 100-year storm, greater in critical areas, when overland flow is not allowed or available to prevent damaging private property. Storm and/or surface water conveyance easements should be provided to the Jurisdiction.

For those storm sewers that will handle footing drains, the following discharge (Q) values should be used:

a. For less than 50 houses, Q = 5.0 gpm per house.

b. For greater than 50 houses, Q = 250 gpm plus 2.5 gpm per house for each additional house over 50.

3. **Culverts.** Culverts should have capacity to convey the following:

   a. 10-year storm without the headwater depth exceeding the diameter of the culvert.

   b. 50-year storm without the headwater depth exceeding one foot over the top of the culvert.

   c. 100-year storms should be conveyed through the culvert without the headwater depth exceeding one foot below the low point of the roadway/embankment, unless there are other, more restrictive elevations.

      For culverts that drain areas over two square miles, the Iowa Department of Natural Resources (IDNR) rules and regulations will apply.

4. **Ditches.** Ditches should have capacity to convey a 50-year storm within the ditch banks. Provisions should be made for the 100-year storm to flow overland within the flowage easement. Surface water flowage easements should be provided to the Jurisdiction for all designed drainageways. For ditches that drain areas over two square miles, the IDNR rules and regulations will apply.

5. **Detention basins.** Detention basins should have the capacity to retain a 100-year storm at critical duration. The top of the detention dike should be a minimum of one foot above the 100-year storage elevation. The detention basin design requires the IDNR approval for 18 acre-feet of storage or greater.