

11.09 STORM WATER DRAINAGE

- A. General. An adequate system of storm water drainage shall be constructed and installed consisting of pipes, tiles, manholes, inlets, and other necessary facilities that will adequately drain the development and protect roadway pavements and will prevent the accumulation of storm water at any place under normal conditions.
1. Any existing drain tiles encountered during construction must be left undisturbed or shall be attached to the proposed storm drainage system at locations indicated by the City Engineer.
 2. Drain tile located under roadways shall be replaced with concrete pipe, or ductile iron pipe, each with gasketed joint seals.
- B. Design. The following shall govern the design of any improvement with respect to the drainage and detention of storm water runoff.
1. Layout. Subdivision shall be designed in such a manner as to preserve and utilize natural streams, channels, and detention basins.
 2. Storm Water Release Rate. The allowable release rate of storm water for a 100-year storm from developments shall not exceed historic/pre-development discharge rates for a 10-year storm or the capacity of the receiving stream or drainage system, whichever is less.
 3. Storm Water Storage. Excess runoff from a 100-year/24-hour storm with an SCS Type II distribution shall be stored on site within appropriately designed detention facilities such that the allowable release rate is not exceeded and there is no ponding in streets or on buildable lot areas, except parking lots.

Parking Lots. The maximum stormwater ponding depth in any parking area shall not exceed six inches (6") for more than four (4) hours.
 4. Bypass Flow. Drainage systems shall have adequate capacity to pass through the development the runoff from all upstream areas for a 10-year storm.
 5. Backyard Swales. Backyard swales are permitted in residential areas subject to the following regulations:
 - a. Maximum and minimum slopes and general design criteria of the Federal Housing Administration's "Minimum Property Requirements" shall be acceptable except as herein modified.
 - b. No continuous swale shall have a length exceeding three hundred (300) feet before discharging into a storm sewer system.

- c. Minimum grade of the flowline shall be 0.5 percent.
 6. Storm Sewer Outfalls. Storm sewer outfalls shall be so designed such that when the receiving stream or drainage system is at full capacity, the storm sewer will continue to discharge at its design flow rate.
 7. Crown of Street Pavements. The crown of street pavements hereafter built adjoining or near streams, floodwater runoff channels, or basins shall be not lower than the established high-water elevation plus two (2) feet in the case of major streets, and plus one (1) foot in the case of other streets.
 8. Waterway Openings of Bridges and Culverts. Waterway openings of bridges and culverts hereafter built over streams of flood water runoff channels shall be designed with a waterway opening large enough to handle the flow from a one hundred (100) year frequency storm.
- C. Drainage Plan. A comprehensive drainage plan must be submitted to the City Engineer which incorporates the aforementioned rules and shall be accompanied by maps or other descriptive material showing the following:
1. The extent and area of each watershed tributary to the drainage channels in the subdivision.
 2. The street storm sewers and other storm drains to be built, the basis of their design, the outfall and outlet locations and elevations, the receiving stream or channel and its high-water elevation, and the functioning of the drains during high-water elevations.
 3. Existing streams and flood water runoff channels to be maintained and new channels to be constructed, their location, cross sections, and profiles.
 4. Existing culverts and bridges, drainage areas, elevation and adequacy of waterway openings, new culverts and bridges to be built, their materials, elevations, waterway openings, and basis of design.
 5. Existing detention ponds and basins to be maintained, enlarged, or otherwise altered and new ponds or basins to be built with dams and their design.
- D. Construction Requirements for Detention Ponds
1. Detention Ponds Containing Permanent Water.
 - a. Detention reservoirs containing permanent lakes must have a water area of at least one-half (1/2) acre and a minimum depth of ten (10) feet over at least twenty-five (25) percent of the total area. The

remaining lake area must have an average depth of at least three (3) feet and should have no extensive shallow areas.

- b. In excavated lakes, the underwater side slopes in the lakes must be stable. In the case of valley storage, natural slopes may be considered to be stable.
 - c. A safety ledge four (4) to six (6) feet in width is required and must be installed in all lakes approximately thirty-six (36) inches below the permanent water level.
 - i. In addition, a ledge twelve (12) to eighteen (18) inches above the permanent water line must be provided.
 - ii. The slope between the two ledges must be stable and of a material which will prevent erosion due to wave action such as stone or rip-rap.
 - d. The reservoir must be designed to provide for the easy removal of sediment which will accumulate in the lake during periods of reservoir operations.
 - e. Dikes shall be a minimum of four (4) feet wide with 3:1 side slopes or flatter. The top of the dike must be a minimum of one (1) foot above the peak stage for a 100-year storm. An emergency spillway shall be provided for storm runoff volume in excess of a 100-year/24-hour storm.
2. Dry Detention Basins. The dry detention basins must be designed to serve multi-purposed functions. Recreational facilities, aesthetic qualities, etc., as well as flood water storage must be considered in planning the reservoir.
3. Other Detention Storage.
- a. Underground Storage. All or a portion of the detention storage may be provided in underground or surface detention facilities to include basins, tanks, swales or oversized storm sewers.
 - b. Parking Lot Storage. Paved parking lots may be designed to provide temporary detention storage of storm water on all or a portion of their surfaces.
 - i. Outlets shall be designed so as to slowly empty the stored waters and depths of storage must be limited to a maximum of nine (9) inches.

- ii. Inlets shall be located in driving aisles whenever possible.
- 4. Safety Features. Design of detention storage facilities shall incorporate safety features, particularly at outlets, on steep slopes, and at any attractive nuisances to include, as necessary, fencing, hand rails, lighting, steps, grills, signs, and other protective or warning devices to restrict access during critical periods and to afford some measure of safety to both authorized and unauthorized persons.
 - a. Safety screens must be provided for any pipe or opening to prevent children or large animals from crawling into the structures. A maximum opening of six (6) inches is required.
 - b. Danger signs must be mounted at appropriate locations to warn of deep water, possible flood conditions during storm periods, and other dangers that exist. Fencing may be required if deemed necessary by the City Engineer.
 - c. All slopes and the bottom of dry detention ponds are to be sodded. All other areas are to be seeded.
- 5. Responsibility of Maintenance of Detention Ponds. The responsibility for maintenance during construction and thereafter shall be the responsibility of the developer/owner.
 - a. Maintenance shall consist of, but shall not be limited to, the clean up of accumulated debris, flotsam, or other materials and also the control of the growth of obnoxious weeds or the creation of conditions which support the growth of mosquitos or other insects.
 - b. Maintenance shall also consist of proper repairs to such items as inlet structures, outlet structures, side slopes, or other elements of the facility.
- E. Storm Water Storage Basins. The City shall maintain a complete listing of all storage basins for the storage and detention of storm water in the City, whether required under this Ordinance or otherwise, and may require each basin to be inspected periodically.
 - 1. Such inspection shall be performed at the owner's expense within ninety (90) days and shall be performed by an Engineer registered in the State of Illinois.
 - 2. A report shall be submitted to the City Engineer, including supporting calculations, stipulating the existing capacity of the storage basins.

3. The Building & Zoning Director may serve notice upon the record owner thereof to restore, repair, or properly maintain any such basin which does not retain its original storage capacity.
 4. In the event such notice has not been complied with on or before ninety (90) days after service thereof (unless such time period shall be extended by the Mayor and City Council), the City may perform such restoration, repair, or maintenance work as may be necessary to return such storm water storage basin to its original storage capacity; and the cost thereof shall be a lien in favor of the City upon the lots, tracts, or parcels benefited by the storm water storage basin and the City may file with the Recorder of Deeds of Grundy County, Illinois, a notice of lien citing this paragraph describing the necessary work performed and the reasonable cost thereof to the City. The lien may be foreclosed pursuant to the Illinois Compiled Statutes. The owner of the storm water storage basin may also be fined as set forth in this Ordinance.
 5. These regulations shall apply to all storm water storage basins existing on the date of the adoption of this Ordinance, as well as all future storm water storage basins.
- F. Storm Sewers. Storm sewers shall be constructed throughout the entire subdivision to carry off water from all inlets and catch basins and shall be connected to an adequate outfall.
1. Design.
 - a. The storm sewer system shall be separate and independent of the sanitary sewer system.
 - b. All storm sewers shall be designed by the Rational Method on the basis of a minimum ten (10) year storm frequency and shall be sized to adequately carry all tributary areas. Copies of the design computations, together with a drawing defining each drainage area, shall be submitted to the City Engineer.
 2. Velocity. Minimum velocity shall be three (3) feet per second and maximum velocity shall be ten (10) feet per second for all storm sewer installation.
 3. Spacing for Surface Collectors. Maximum spacing for surface collectors shall be four hundred (400) feet or as directed by the City Engineer.
 4. Inlets. Inlets shall be provided at all low areas and shall be provided so that surface water is not carried across or around any intersection of streets.

- 5. Allowable Materials for Storm Sewers.
 - a. Pipe materials shall be concrete pipe or reinforced concrete pipe.
 - b. Other materials for storm sewer construction may be used in special cases only upon approval by the City Engineer.
- 6. The minimum size for all storm sewers shall be twelve (12) inches.

G. Storm Sewer Structures.

- 1. Manholes.
 - a. Location. Manholes are utilized to provide access to continuous underground storm sewers for the purpose of inspection and cleanout and to permit a change in direction, grade and size of sewer. Typical locations where manholes should be specified are:
 - 1) Where two or more storm sewers converge.
 - 2) At intermediate points along tangent sections.
 - 3) Where pipe size changes.
 - 4) Where an abrupt change in alignment occurs.
 - 5) Where an abrupt change of the grade occurs.

Manholes should not be located in traffic lanes; however, when it is impossible to avoid locating manholes in a traffic lane, care should be taken to ensure it is not in the normal vehicle path.

- b. Spacing. The spacing of manholes should be in accordance with the following:

<u>Sizes of Pipe (Inches)</u>	<u>Maximum Distance (Feet)</u>
12-24	400
27-54	600
60-up	1000

- c. Types. A manhole, type A (Highway Standard 1527) with appropriate frame and lid should be provided for the following sewer sizes when the depth exceeds 4'.
 - 1) When the sewer pipe diameter is 18 inches or less, a 4-foot diameter manhole should be provided.
 - 2) When the sewer pipe diameter is 21 inches to 42 inches

inclusive, a 5-foot diameter manhole should be provided.

- 3) When the sewer pipe diameter is 48 inches or larger, a 6-foot diameter manhole (Standard 2395) or a reinforced concrete pipe tee (Standard 2263) or a special design manhole should be provided.

d. Hydraulic Losses. The following criteria should be used to estimate hydraulic losses in storm sewer manholes.

- 1) Allow a drop of 0.1 foot in a through manhole where there is no change in the diameter of the sewer pipe.
- 2) Allow a drop of 0.2 foot in the presence of one lateral or bend.
- 3) Allow a drop of 0.3 foot when two laterals are present.
- 4) In a through manhole where there is a change in the diameter of the sewer pipe, no loss should be allowed if 0.8 foot depth in each sewer pipe is attained by lowering the larger pipe.

e. Pipe Connections. The pipe tee and wye connections are permitted for connecting lateral lines from pavement inlets to main storm sewer lines provided the following conditions are met:

- 1) Manholes are provided at the required intervals.
- 2) The minimum lateral size is 12 inches or larger.
- 3) Precast connections are required unless designer verifies that the structural and hydraulic integrity of mainline sewer is not affected by field connection.

f. Junction Chambers. The junction of small sewers is made in manholes. On occasion, junction chambers of special design are required to joint two or more converging large size storm sewers. In design, a smooth transition is essential to prevent turbulence in flow which would cause eddies and deposition of solids. Normally, junction chambers should not be utilized when the trunk sewer is less than 42 inches in diameter.

2. Inlets.

a. Inlets are drainage structures utilized to collect surface water through

grate or curb openings and convey it to storm sewers or direct outlet to culverts and ditches. Grate inlets should be provided with appropriate frames and grates as provided in Section B of the Highway Standards.

An Inlet Type A (Standard 1683) should be utilized when the sewer pipe diameter is 15 inches or less and the depth of pipe is not more than 4 feet. For larger diameter pipes or where there is both an incoming and outgoing pipe in the inlet, a larger diameter inlet structure, such as Inlet Type B (Standard 2349) or a 3-foot, 4-foot, and 5-foot diameter catch basin or manhole should be specified. When such a structure is used in a shallow pipe situation, a precast reinforced concrete flat slab top, shown on Standard 2354, should be used in lieu of the standard conically tapered top.

- b. Inlets used for the drainage of roadway surfaces shall be combination inlets. These inlets consist of both a curb opening and a grate inlet acting as a unit.