

REQUIREMENTS AND PROCEDURES
FOR
STORM DRAINAGE DESIGN



DRAINAGE

The design of storm sewer systems will be based upon the "Rational Method" using the equation $Q = CIA$ and the "Manning Formula". (A is less than 200 acres). Areas greater than these areas use State of Ohio Bulletin Number 43 Floods in Ohio.

- A. The rainfall intensity, "i" will be taken from the appropriate curve for the Toledo, Ohio, area as published in Technical Paper No. 25, of the U.S. Weather Bureau. "Rainfall Intensity-Duration-Frequency Curves for selected Stations in the United States and Puerto Rico" Government Printing Office, 1955.
- B. A maximum of $t = 20$ minutes and a minimum of $t = 15$ minutes shall be used as the time of concentration to the first pick-up point in the system, in residential areas.
- C. The following runoff coefficients shall be used in residential areas:

Average Lot Size	*Runoff Coefficient "C"
3999 sq. ft. or less	** 0.50
4000 sq. ft. to 5999 sq. ft.	0.40
6000 sq. ft. to 9000 sq. ft.	0.35
Over 9000 sq. ft.	0.30

* Includes right-of-way areas.

** These coefficients shall be used in residential areas unless actual coefficients are determined by engineering analysis.

Coefficients for areas other than residential shall be based on soil and surface conditions.

- D. Storm sewers shall be designed to flow just full for the 5 year intensity-duration-frequency curve.
- E. Catch basin type and spacing shall be designed using the 5 year intensity-duration-frequency curve. The maximum allowable width of the sheet gutter flow from the face of the curb shall be limited to 8 feet into the driving lane.
- F. An overall drainage area layout showing the limits of the contributing runoff area, broken down into areas contributing to each drainage pick-up point, shall be submitted with the paving and drainage plans. Drainage design within the development shall be adequate to handle the entire contributing watershed area, and its existing, proposed and probable future development, and not the area under submission only. When the design makes use of an existing storm sewer or open ditch, cross sections and profiles shall be submitted which show the existing conditions at least 500 feet downstream from the plat being considered. Subdivider shall provide a Registered Professional Engineers written statement attesting that the receiving channel is sufficient to accept design runoff from the developing parcel.

If future plat extensions will utilize the same drainage system, the overall drainage plan shall be submitted with the first plat paving plans. Reconstruction of receiving channel or retention ponds will be required should existing channel not be adequate to handle the increased, accelerated runoff.

- G. Complete drainage calculations shall be submitted for pipe size determinations, 10 year hydraulic gradient checks and catch basin type and spacing designs. All culverts will be designed for a 5 year frequency storm.
- H. Storm sewers and culverts shall be designed to conform to the requirements of Item 603 of the current State of Ohio, Department of Highways Construction and Materials Specifications. Pipe under pavement shall be Type "A" or "B" Conduit with Class "A" or "B" Bedding. The designer may indicate a particular kind of pipe by inserting the specification item number after the designation of the type of conduit. The use of metal pipe will not be permitted in industrial plats or in drainage systems subjected to runoff from industrial or industrial zoned areas. Depth of cover shall be the determining factor in selecting the proper strength of pipe when the pipe is layed by normal trenching methods. Minimum cover for Types "C" and "D" Conduit shall be 18 inches. Types "A" and "B" Conduit shall have a minimum cover of 12 inches, measured from the top outside crown of the pipe to the finished subgrade. All pipe to be placed in sandy soil will have joints as per Ohio Specifications Section 706.11.

- I. Granular material to be used for pipe backfilling shall meet the requirements of item 304.02, latest edition of Ohio D.O.T. Construction & Material Specifications.
- J. Grading plans will be required showing the proposed elevations at the building lines and back lot lines, drainage schematics and construction elevations.
- K. Dumped rock fill or better will be required at all sewer outlets and at both ends of culverts. Splash aprons are required when discharge velocity exceeds:
- | | | |
|-----|---------|------------------------------------------------------|
| 2.5 | Ft/Sec. | in sand and sandy loam |
| 3.0 | " | " silt loam |
| 3.5 | " | " sandy clay loam |
| 4.0 | " | " clay loam |
| 5.0 | " | " stiff clay, fine gravel and graded loam to cobbles |
| 5.5 | " | " graded silt to cobbles |
| 6.0 | " | " shale hardpan and coarse gravel |
- L. Storm sewer connections for footer tile and roof drains will be carried to within one foot of the right-of-way lines and shall be a minimum of 6" in diameter. Cross overs where more than one Lot is to be connected will be a minimum of 8" in diameter for double service and sized in accordance with volumes anticipated if for more than two services.
- M. Any Storm sewers connecting into State of Ohio drainage systems or crossing state highways shall be subject to approval by D.O.T.
- N. For manhole and catch basin locations, use the center of the structure.
- O. Cross sections shall show all cross overs, catch basins and manholes.