



GENESEE COUNTY DRAIN COMMISSIONER'S OFFICE

-DIVISION OF SURFACE WATER MANAGEMENT

JEFFREY WRIGHT
COMMISSIONER

G-4608 BEECHER ROAD, FLINT, MI 48532
PHONE (810) 732-1590 FAX (810) 732-1474

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Effective immediately

STORM SEWER DESIGN PARAMETERS FOR GENESEE COUNTY

IN AN EFFORT TO STANDARDIZE DESIGN PROCEDURES FOR STORM SEWERS AND OPEN CHANNELS IN GENESEE COUNTY, THE GENESEE COUNTY DRAIN COMMISSIONER HAS DEVELOPED THESE STANDARDS. IT IS HOPED THAT THESE STANDARDS WILL FACILITATE PLANNING FROM BOTH THE POSIITON OF THE DESIGN AND REVIEWING ENGINEER.

IT IS RECOGNIZED THE DESIGN CONDITIONS VARY AND THERE IS NO SUBSTITUTE FOR THE JUDGEMENT OF AN EXPERIENCED ENGINEER. IN ALL CASES THIS JUDGEMENT SHOULD BE APPLIED.

MANY STREAMS LOCATED IN THIS COUNTY DO NOT HAVE STREAM GAGING DATA AVAILABLE OR THE PERIOD OF RECORD IS NOT OF SUFFICIENT LENGTH TO ALLOW THE DESIGN ENGINEER TO ESTIMATE FLOOD FLOWS BY USING FLOOD-FREQUENCY ANALYSIS AS DEVELOPED BY U.S.G.S. PRIOR TO DESIGN OF ANY STORM DRAIN IMPROVEMENT OR ENCLOSURE THE CONSULTANT SHALL INVESTIGATE ANY GAGING STATION, PARTIAL RECORD GAGING STATION OR CREST STAGE GAGES ON THE DESIGN BASIN FOR AVAILABLE PERTINENT DATA ON FLOOD FLOWS.

WHERE INSUFFICIENT DATA IS PRESENT TO DEVELOP BASIN HYDROLOGY BY THE ABOVE METHOD THE CONSULTANT SHALL DETERMINE FLOWS ALONG THE BASIN BY THE S.C.S. METHOD, THE RATIONAL METHOD, THE BRATER METHOD OR A COMBINATION OF ANY OF THE ABOVE NAMED METHODS. THE BASIN HYDROLOGY SHALL BE APPROVED BY THE GENESEE COUNTY DRAIN COMMISSIONER'S OFFICE PRIOR TO PROCEEDING WITH THE FINAL DESIGN OF A GIVEN PROJECT.

DESIGN PROJECTS SHALL BE DEVELOPED IN ACCORDANCE WITH THE FOLLOWING FLOOD FREQUENCIES.

- A. 100 YEAR STORM ON BASIN DEVELOPMENT PROJECT TO YEAR 2000:
1. CULVERTS OR BRIDGES CROSSING STATE HIGHWAYS OR EXPRESSWAYS WHERE THE UPSTREAM DRAINAGE AREA IS IN EXCESS OF 2 SQUARE MILES.
 2. DETENTION PONDS.
 3. DRAINAGE ENCLOSURES IN EXCESS OF 100 FEET WHERE THE UPSTREAM DRAINAGE AREA IS IN EXCESS OF 2 SQUARE MILES.

- B. 50 YEAR FLOOD FLOWS WITH BASIN DEVELOPMENT TO YEAR 2000:
1. ENCLOSED STORM SEWERS IN NEW PROPOSED PLATS.
- C. 25 YEAR FLOOD FLOWS WITH BASIN DEVELOPMENT TO YEAR 2000:
FOR IMPROVEMENTS IN THIS CATEGORY, THE CONSULTANT SHALL DESIGN THE STRUCTURE WITHOUT APPRECIABLY ALTERING THE FLOOD STAGE OF THE CHANNEL. THE EFFECT OF THE 100 YEAR FLOOD FLOW MUST ALSO BE SHOWN.
1. COUNTY ROAD CROSS CULVERTS AND BRIDGES.
 2. OPEN CHANNEL DEVELOPMENT OR IMPROVEMENT (FLOW TO BE CONTAINED WITHIN THE CHANNEL).
 3. DRAIN ENCLOSURES WHERE THE DRAINAGE AREA IS GREATER THAN 300 ACRES BUT LESS THAN 2 SQUARE MILES.
- D. 10 YEAR FLOOD FLOWS WITH BASIN DEVELOPMENT TO YEAR 2000:
1. OPEN CHANNELS, CULVERTS OR DRAIN ENCLOSURES WHERE THE DRAINAGE AREA IS NOT IN EXCESS OF 300 ACRES.

FLOW ESTIMATION: HYDROLOGY

MANY DIFFERENT METHODS OF ARRIVING AT A GIVEN CFS FOR A SELECTED SPOT IN A DRAINAGE OUTLET HAVE BEEN DEVELOPED OVER THE YEARS. BECAUSE OF ITS GENERAL RECOGNITION AND WIDE USE WITHIN THE COUNTY, THE DRAIN COMMISSIONER WILL ACCEPT THE RATIONAL METHOD FOR FLOW COMPUTATION **WHERE THE DRAINAGE AREA IS LESS THAN 100 ACRES.** ENGINEERS ELECTING TO USE THIS METHOD FOR LARGER DRAINAGE AREA WILL BE REQUESTED TO ALSO USE AN ALTERNATE METHOD FOR COMPARISON.

THE FOLLOWING CRITERIA SHALL BE USED IN DETERMINING THE VARIABLES OF THE RATIONAL FORMULA $Q=CIA$.

1. **AREA** - THE AREA OF A BASIN OR SUB-BASIN SHALL BE DETERMINED BY USE OF 2' CONTOUR MAPS AVAILABLE AT THE COUNTY OFFICE WITH AN APPROPRIATE FIELD CHECK OR BY USE OF ESTABLISHED COUNTY DRAIN MAPS ON FILE AT G-4608 BEECHER RD.
2. **INTENSITY** - THE RAINFALL INTENSITY - DURATION FREQUENCY CURVES ATTACHED SHALL BE USED FOR STORM DRAIN DESIGN IN GENESEE COUNTY. COMPUTATION OF AN ACCURATE TIME OF CONCENTRATION IS CRITICAL TO THE USE OF THESE CURVES. FOR URBAN STORM SEWERS AT TIME OF CONCENTRATION SHALL BE THE

SUMMATION OF THE INLET TIME PLUS THE TIME OF FLOW IN THE SEWER. FOR URBANIZED AREA A MINIMUM INITIAL TIME OF 20 MINUTES SHALL BE ACCEPTABLE FOR DESIGN AND FOR AVERAGE RURAL BASINS AN INITIAL TIME OF CONCENTRATION OF 30 MINUTES WILL PRESENT AN ADEQUATE TIME FOR STORM FLOWS TO PEAK. THE FLOW TIME IN AN ENCLOSED SYSTEM SHALL BE CALCULATED BY STANDARD DESIGN CHARTS. FOR CHANNEL VELOCITY THE STANDARD MANNING EQUATION $V=1.486 R^{2/3} S^{1/2}$ SHALL BE ACCEPTED. A CHART LISTING ACCEPTED N VALUES FOR STORM SEWER DESIGN IS ENCLOSED FOR USE IN DESIGN ANALYSIS.

3. **RUNOFF COEFFICIENT** - THE BASIN DEVELOPMENT SHALL BE PROJECTED TO THE YEAR 2000 AND THE RUNOFF COEFFICIENT MUST BE DETERMINED ON THE BASIS OF THIS PROJECTED DEVELOPMENT USING THE FOLLOWING:

A	FLAT UNDEVELOPED LANDS, FARMS, NONWOODED	0.25
B	WOODLANDS & SLOPED UNDEVELOPED LAND	0.30
C	PARKS, CEMETARIES, PLAYGROUNDS, DISTURBED GROUND	0.35
D	RESIDENTIAL	0.40
E	APARTMENTS, CONDOMINIUMS OF LT. MANUFACTURER	0.50
F	COMMERICAL AND INDUSTRIAL	0.70
G	IMPERVIOUS AREAS (PARKING, ROOF, ETC..)	0.95
H	OPEN WATER	1.00

OUTLET CONDITIONS

ALL STORM SYSTEMS SHALL BE DESIGNED TO EXIT INTO AN OUTLET WITH SUFFIEICIENT CARRYING CAPACITY TO CARRY THE ADDITIONAL DESIGN FLOW.

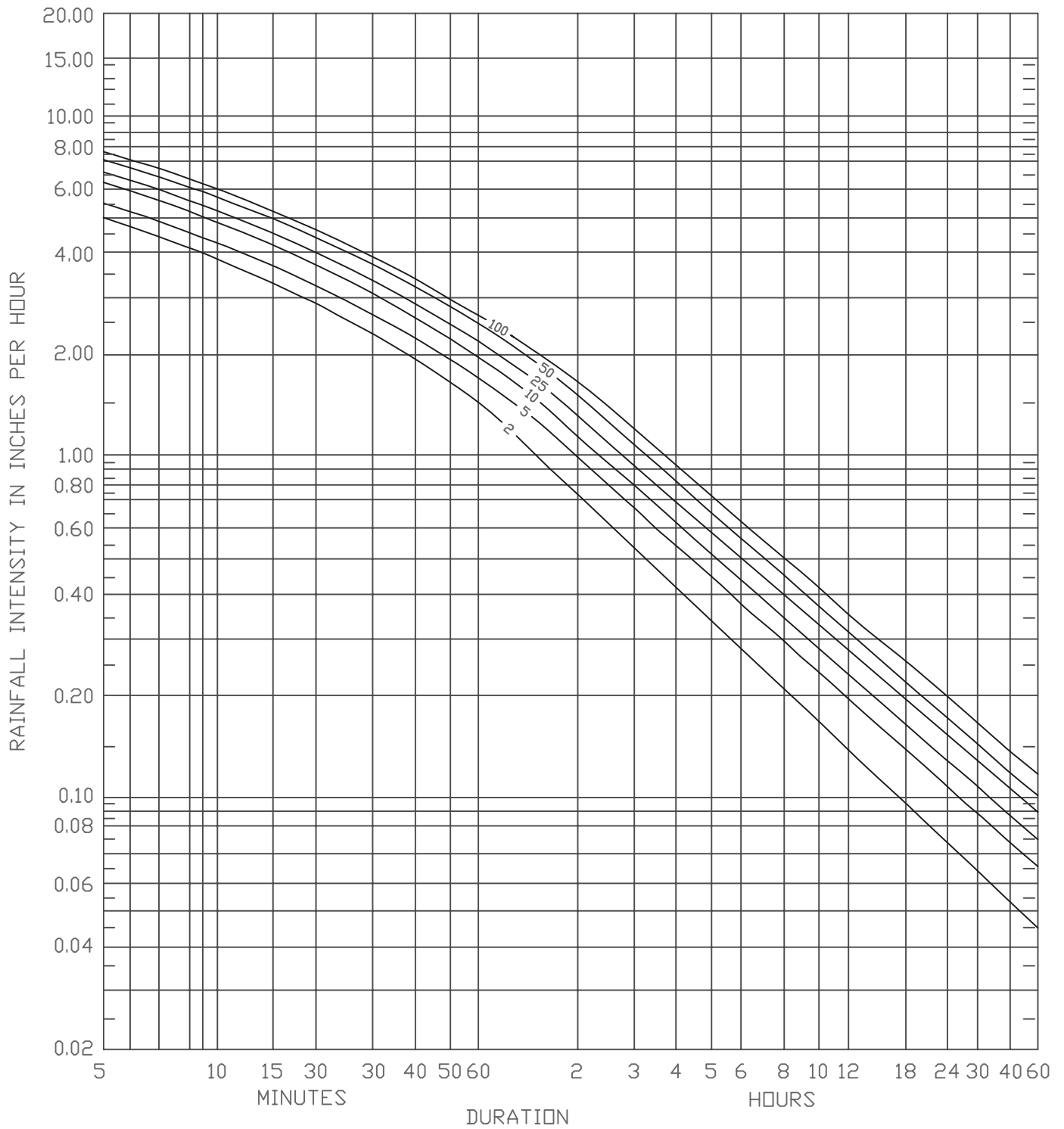
THE DESIGNER SHALL ANALYZE THIS CONDITION AND SUBMIT DATA SUBSTANTIATING HIS CONCLUSIONS. THIS INFORMATION SHALL BE SUBMITTED TO THE DRAIN COMMISSIONER ALONG WITH THE REQUIRED DESIGN FORMS.

IN THE EVENT THE DESIGNER DOES NOT HAVE SUFFICIENT CAPACITY IN THE OUTLET THE FOLLOWING CRITERIA SHALL APPLY:

1. THE SYSTEM SHALL BE DESIGNED TO OUTLET ONLY EXISTING RUNOFF. EXISTING RUNOFF SHALL CONSIST OF ALL WATER

PRESENTLY CONTRIBUTED TO THE DRAINAGE DISTRICT. THIS SHALL MEAN THE 2-YEAR STORM UNDER EXISTING CONDITIONS USING AGRICULTURAL LAND. (C= 0.25) ALL EXCESS SHALL BE RETAINED ON SITE FOR DURATION OF TIME NECESSARY TO PASS THE DESIGN STORM WITH DOWNSTREAM FLOODING. **THE OUTLET DISCHARGE SHALL NOT EXCEED 0.2 CFS/ ACRE UNDER ANY EVENT.**

2. THE TOWNSHIP SHALL PETITION THE DRAIN COMMISSIONER TO IMPROVE THE OUTLET TO THE REQUIRED SIZE TO PASS THE ADDITIONAL WATER AT THE DESIGN STORM. IN THE EVENT THIS PETITION IS NOT SUCCESSFUL CRITERIA #1 ABOVE SHALL APPLY.



RAINFALL INTENSITY - DURATION - FREQUENCY CURVES FOR FLINT, MI