

NOTE:

THE RAINFALL INTENSITIES FOR THE ONE YEAR STORM WERE COMPILED USING THE RAINFALL FREQUENCY ATLAS OF THE MIDWEST (HUFF AND ANGEL, 1992). THE INTENSITIES SHOWN ARE FOR ZONE 9, SOUTHEAST MINNESOTA. THIS ZONE IS THE MOST CONSERVATIVE OF THE FOUR ZONES WHICH REPRESENT THE METRO AREA.

THE RAINFALL INTENSITIES FOR ALL OTHER STORM FREQUENCIES WERE COMPILED USING THE NWS TECHNICAL MEMORANDUM HYDRO-35 (FREDERICK, ET AL. 1977) FOR ZONE 1, SOUTHERN MINNESOTA. THIS WAS DONE BY LISA SAYLER OF THE MNDOT CENTRAL OFFICE HYDRAULIC SECTION.

<p>TOTAL TIME OF CONCENTRATION</p> $t_c = t_o + t_t$ <p>t_c = TOTAL TIME OF CONCENTRATION t_o = OVERLAND FLOW TIME</p> $t_t = \frac{L}{\frac{3600 \times 1.49 \times R_h^{2/3} \times S^{1/2}}{n}}$ <p>t_t = TRAVEL TIME (MIN.) SHALLOW CONCENTRATED FLOW OR GUTTER FLOW</p> <p>Rh = AREA / PERIMETER (HYDRAULIC RADIUS) S = SLOPE FT./FT. L = LENGTH WHICH RUNOFF MUST TRAVEL (FT.) V = ESTIMATED OR CALCULATED VELOCITY (FT./S)</p>	<p>RATIONAL METHOD</p> $Q = CIA = (\sum CA)I$ <p>Q = DISCHARGE (CFS) C = RUNOFF COEFFICIENT REPRESENTING A RATIO OF RUNOFF TO RAINFALL I = RAINFALL INTENSITY (IN/HR) A = DRAINAGE AREA (ACRES)</p> <p>USE A 10 YEAR RAIN EVENT FOR ALL PIPE DESIGN</p>																					
<p>SHEET FLOW OR OVERLAND FLOW</p> $t_t = .007 \times (n \times L)^{0.8} / (P2^{0.5} (S^{0.4}))$ <p>n = MANNING'S ROUGHNESS COEFFICIENT</p> <p>P2 = (INCHES) TWO-YEAR FREQUENCY, 24 HOUR RAINFALL</p> <p>P2 = 2.75"</p> <p>S = SLOPE FT./FT. L = LENGTH WHICH RUNOFF MUST TRAVEL (FT.)</p>	<p>MINNEAPOLIS STORM DRAIN DESIGN STANDARDS S.C.S. TR-55, REVISED 1986</p> <table border="0"> <tr> <td>2 YEAR,</td> <td>24 HOUR RAINFALL (INCHES)</td> <td>2.75</td> </tr> <tr> <td>5 YEAR,</td> <td>24 HOUR RAINFALL (INCHES)</td> <td>3.50</td> </tr> <tr> <td>10 YEAR,</td> <td>24 HOUR RAINFALL (INCHES)</td> <td>4.20</td> </tr> <tr> <td>10 YEAR,</td> <td>1 HOUR RAINFALL (INCHES)*</td> <td>2.30</td> </tr> <tr> <td>25 YEAR,</td> <td>24 HOUR RAINFALL (INCHES)</td> <td>4.80</td> </tr> <tr> <td>50 YEAR,</td> <td>24 HOUR RAINFALL (INCHES)</td> <td>5.30</td> </tr> <tr> <td>100 YEAR,</td> <td>24 HOUR RAINFALL (INCHES)</td> <td>5.90</td> </tr> </table> <p>* 10 YEAR, 1 HOUR RAINFALL (INCHES), USED IN 1997 FLOOD REPORT</p>	2 YEAR,	24 HOUR RAINFALL (INCHES)	2.75	5 YEAR,	24 HOUR RAINFALL (INCHES)	3.50	10 YEAR,	24 HOUR RAINFALL (INCHES)	4.20	10 YEAR,	1 HOUR RAINFALL (INCHES)*	2.30	25 YEAR,	24 HOUR RAINFALL (INCHES)	4.80	50 YEAR,	24 HOUR RAINFALL (INCHES)	5.30	100 YEAR,	24 HOUR RAINFALL (INCHES)	5.90
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MINNESOTA RAINFALL DATUM
 MINNEAPOLIS DESIGN REFERENCE
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	<p>MINNEAPOLIS DEPARTMENT OF PUBLIC WORKS</p>	<p>RAINFALL DATA</p>	<p>STANDARD PLATE NO. SEWR-6012</p>		
				<p>DRAWN: DCD</p>	<p>DATE: 5/03</p>
				<p>APPROVED: HRS</p>	<p>DATE: 2/09</p>