



SSOE, INC. ARCHITECTS • ENGINEERS

1050 Wilshire Dr. Suite 260
Troy, MI 48084
Telephone: (248) 643-6222
Fax: (248) 643-6225

10-YEAR STORM SEWER DESIGN SHEET
KROGER FUEL CENTER J956
FRANKLIN, IN

DESIGN BY: J.S.
CHECKED BY: C.H.
DATE REVISED: 12/16/2011
FILE NAME: Rational Storm Design J956
PROJECT #: 012-00144-00

DRAINAGE AREA	FROM	TO	AREA Acres	C _w	INDIV.	A* C LATERAL 1	TOTAL A* C	FLOW INDIV. min.	TIME ACCUM. min.	STORM RETURN PERIOD years	RAIN INTENSITY in/hr	FLOW CAPACITY REQUIRED cfs	PIPE SIZE in.	HYD. RADIUS ft	PIPE SLOPE %	MANNING PIPE COEF. n	FULL FLOW CAPACITY PROVIDED cfs	FLOW VELOCITY ft/s	SEWER LENGTH ft.	FLOW TIME min.	LOSSES IN MH ft.	FALL IN SEWER ft.	INVERT U/S ft.	INVERT D/S ft.	10 YR HYDRAULIC SLOPE %	10 YR HYDRAULIC GRADE LINE U/S ft	RIM ELEV U/S ft	COVER U/S ft	RIM TO HGL U/S ft	10 YR HYDRAULIC GRADE LINE D/S ft	RIM ELEV D/S ft	COVER D/S ft	RIM TO HGL D/S ft
VI	TD 1	EX CB 1	0.12	0.89	0.10	0.00	0.10	5.00	5.00	10 YR.	6.07	0.63	8	0.12	1.96	0.013	3.84	4.84	48	0.17	0.1	0.94	747.76	746.82	0.27	747.61	748.32	0.56	0.71	747.48	747.88	1.06	0.40
IV	TD 3	TD 2	0.11	0.83	0.09	0.00	0.09	5.00	5.00	10 YR.	6.07	0.57	8	0.12	1.99	0.013	3.87	4.88	58	0.20	0	1.15	747.69	746.53	0.22	747.33	748.25	0.56	0.92	747.20	747.70	1.17	0.50
V	TD 2	EX CB 1	0.09	0.90	0.08	0.00	0.08	5.00	5.00	10 YR.	6.07	0.47	8	0.12	0.82	0.013	2.48	3.13	81	0.43	0	0.66	747.14	746.48	0.15	747.26	747.70	0.56	0.44	747.14	747.88	1.40	0.74
III	TD 6	TD CB	0.24	0.90	0.21	0.00	0.21	5.00	5.00	10 YR.	6.07	1.29	8	0.12	0.87	0.013	2.56	3.23	124	0.64	0	1.08	749.14	748.22	1.14	750.30	749.70	0.56	-0.60	748.89	749.91	1.69	1.02
II	TD 5	TD CB	0.07	0.88	0.06	0.00	0.06	5.00	5.00	10 YR.	6.07	0.37	8	0.12	0.49	0.013	1.92	2.42	29	0.20	0	0.14	749.19	749.05	0.09	749.74	749.75	0.56	0.01	749.71	749.91	0.86	0.20
	TD CB	EX CO 5	0.00	0.00	0.00	0.27	0.27	5.00	5.20	10 YR.	6.03	1.65	8	0.25	20.15	0.013	20.62	15.54	9	0.01	1	1.81	747.74	745.93	1.85	746.76	749.91	1.50	3.15	746.60	749.79	3.19	3.19
2I/5	EX CO 5	EX CO 6	0.03	0.90	0.03	0.37	0.40	5.00	5.21	10 YR.	6.03	2.39	8	0.29	4.00	0.013	9.93	6.92	19	0.05	2	0.76	745.93	745.17	3.88	746.57	749.79	3.19	3.22	745.84	749.45	3.61	3.61
V	EX CO 6	EX CB 1	0.09	0.90	0.08	0.50	0.58	5.00	5.26	10 YR.	6.02	3.47	8	0.29	4.89	0.013	11.09	7.65	36	0.08	0	1.76	745.17	743.41	8.20	747.03	749.45	3.61	2.42	744.08	747.88	3.80	3.80
Q (FLOW CAPACITY REQUIRED BY RATIONAL METHOD FORMULA) = CIA Q = PEAK RATE OF RUN-OFF IN CFS C = COEFFICIENT OF RUN-OFF I(10 YR) = K/(t+b)= 170/(23+T) (Per Steel Formula) T = TIME OF CONCENTRATION = 5 MINUTES														STRUCTURE LEGEND CB= CATCH BASIN CO= CLEAN OUT TD= TRENCH DRAIN MH= MANHOLE (C = 0.20 FOR LAWN AREAS) (C = 0.90 FOR PAVEMENT & ROOF AREAS) (C = 1.00 FOR WATER SURFACE AREAS) FULL FLOW CAPACITY BY MANNING'S FORMULA																			

PROPOSED C _w VALUES						
drainage area #	total area sf	total area ac	pervious area sf	impervious area sf	water surface sf	Weighted Area C _w
I	3,552	0.08	-	3,552	-	0.90
II	2,997	0.07	80	2,917	-	0.88
III	10,304	0.24	-	10,304	-	0.90
IV	4,893	0.11	480	4,413	-	0.83
V	3,718	0.09	-	3,718	-	0.90
VI	5,077	0.12	85	4,992	-	0.89
TOTALS	30,541	0.70	645	29,896	-	0.89
C-Value for green areas = 0.20 C-Value for pavement and roofs = 0.90 C-Value for water surface = 1.00						

UC 1
WATER INV US
DIST TO UC 1
TP WATER @ UC 1
IE ST US
DIST TO UC 1

UC 2
SAN INV US
DIST TO UC 1
TP SAN @ UC 1
IE ST DS
DIST TO UC 1

UC 3
SAN INV US
DIST TO UC 1
TP SAN @ UC 1
IE ST DS
DIST TO UC 1

Steel Formula

FREQUENCY YEARS	COEFFICIENTS	REGION						
		1	2	3	4	5	6	7
2	K	206	140	106	70	70	68	32
	b	30	21	17	13	16	14	11
5	K	247	190	131	97	81	75	48
	b	29	25	19	16	13	12	12
10	K	300	230	170	111	111	122	60
	b	36	29	23	16	17	23	13
25	K	327	260	230	170	130	155	67
	b	33	32	30	27	17	26	10
50	K	315	350	250	187	187	160	65
	b	28	38	27	24	25	21	8
100	K	367	375	290	220	240	210	77
	b	33	36	31	28	29	26	10

Refer to page 21-83 in the Standard Handbook for Civil Engineers for information on the region and the formula being used to generate rainfall intensity.

Steel Formula: $I = K / (t + b)$

2	3.925926
5	4.517241
10	5.151515
25	5.75
50	6.756757
100	7.073171



Figure 20.5 Steel Formula Rainfall Regions