PAUL MARTIN & SONS – DETENTION DESIGN 8-29-2019

755 AMERICAN

STORM

CALCULATIONS

GROSS AREA – $71,196\ ft^2 \times \frac{1\ AC}{43560\ ft^2} = 1.64\ AC.$

BUILDING AREA – $(80' \times 140') = 11,200\ ft^2 \times \frac{1\ AC.}{43560 ft^2} = 0.26\ AC.$

CONC AREA – $6525\ ft^2 + 2350\ ft^2 + 365\ ft^2 + 590\ ft^2 = 9830 ft^2$

$9830\ ft^2 \times \frac{1\ AC.}{43560\ ft^2} = 0.23\ AC.$

GRAVEL AREA = 1.64 A. – 0.26 A. – 0.23 A = 1.15 A

GRASS AREA/CROPLAND – $0\ ft^2 = 0$ A.

DESIGN FOR 2 YEAR STORM (24 HR STORM)

i = 2.60 IN/HR (30 MIN) TABLE OH-1 TR55OHIO

$C_{ROOF} = 0.90$ $C_{PAVEMENT} = 0.90$ $C_{GRAVEL} = 0.50$ $C_{GRASS} = 0.20$

$$C_{AVG} = \frac{(0.26)(0.90) + (0.23)(0.90) + (1.15\ A.)(0.50)}{1.64\ A.}$$

$C_{AVG} = 0.62$

PRE-DEVELOPMENT "C" = 0.20

POST-DEVELOPMENT "C" = 0.62

$Q_{2A} = (0.20)(2.60\ IN/HR)(1.64\ ACRES) = 0.85\ CFS$

$Q_{2B} = (0.62)(2.60\ IN/HR)(1.64\ ACRES) = 2.64\ CFS$

$$\frac{Q_{2B} - Q_{2A}}{Q_{2A}} = \frac{[(2.64\ CFS) - (0.85\ CFS)]}{(0.85\ CFS)} = 2.11;\ OR\ 211\%$$

STATE OF OHIO
DAVID L. GERINGER
E-46739
REGISTERED PROFESSIONAL ENGINEER

David L. Geringer

PAUL MARTIN - DETENTION DESIGN 9-3-2019

STORM FREQUENCY: BECAUSE STORMWATER RUNOFF INCREASED 211%

CRITICAL STORM = 25 YEAR FREQUENCY, 24 HR STORM

USE 8" PVC METER LINE w/2.5' HEAD

(SEE ENCLOSED CALCS)

REQUIRED DETENTION POND CAPACITY - 3757 ft^3

ADD 50% SAFETY FACTOR TO CAPACITY

VOLUME = 1.50 x 3757 ft^3

VOLUME = 5636 ft^3 REQUIRED

ACTUAL VOLUME = 6750 ft^3

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8/29/2019

Detention Design Meter Line Check

Data:

1. Length of Meter Line (L)	210	ft.
2. Slope of Meter Line (%)	0.157	%
3. Size of Meter Line (in.)	8	in.
4. Manning's N: PVC = 0.010 CMP = 0.024 CPT = 0.015	0.01	
5. Entrance Coeff. (Ke)	0.5	
6. Assumed Max. Head (H)	2.5	ft.
7. Hydr. Radius (R)	0.167	ft.
8. Radius	0.333	ft.
9. Area	0.349	sq. ft.
10. Perimeter	2.09	ft.

Assumed Head (H)	H x 2g	1 + Ke + (29n^2L/R^(4/3))	V^2	V	Area of Pipe (A)	Flow (Q.)	
0.50	32.2	8.14	3.96	1.99	0.349	0.69	
1.00	64.4	8.14	7.91	2.81	0.349	0.98	
1.50	96.6	8.14	11.87	3.44	0.349	1.20	
1.75	112.7	8.14	13.85	3.72	0.349	1.30	
2.00	128.8	8.14	15.82	3.98	0.349	1.39	
2.50	161	8.14	19.78	4.45	0.349	1.55	ASSUMED MAX HEAD
2.75	177.1	8.14	21.76	4.66	0.349	1.63	
3.00	193.2	8.14	23.74	4.87	0.349	1.70	
3.50	225.4	8.14	27.69	5.26	0.349	1.84	
4.00	257.6	8.14	31.65	5.63	0.349	1.96	
4.50	289.8	8.14	35.60	5.97	0.349	2.08	
5.00	322	8.14	39.56	6.29	0.349	2.20	
5.50	354.2	8.14	43.51	6.60	0.349	2.30	
6.00	386.4	8.14	47.47	6.89	0.349	2.41	
7.00	450.8	8.14	55.38	7.44	0.349	2.60	
8.00	515.2	8.14	63.29	7.96	0.349	2.78	
9.00	579.6	8.14	71.21	8.44	0.349	2.95	
10.00	644	8.14	79.12	8.89	0.349	3.10	
					Flow (Qmax)	3.10	

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Determination of Design Detention Volume

Data:

1. Gross Area (Sq. Ft.)	71196 sq. ft.			
2. Pavement Area (Sq. Ft.)	9830 sq. ft.			
3. Building Area (Sq. Ft.)	11200 sq. ft.			
4. Other Impervious Areas (Sq. Ft.)	50166 sq. ft.			
5. Total Impervious Area (Sq. Ft.)	21030 sq. ft.	(Runoff Co.)	0.90	18927 sq. ft.
6. Total Other Impervious Area (Sq. Ft.)	50166 sq. ft.	(Runoff Co.)	0.50	25083 sq. ft.
7. Net Pervious Area (Sq. Ft.)	0 sq. ft.	(Runoff Co.)	0.20	0 sq. ft.
8. Weighted Runoff coefficient	0.62			
9. Weighted Runoff coefficient x Area	1.01			
10.Rainfall Intensity	4.40 in/hr			
10. Quantity of Runoff (Qallow.)	1.44 c.f.s.			
11. Maximum Flow (Qmax.) (Determined by Assumed Max. Head)	1.55 c.f.s.			

Time of Concentration (tc)	Rainfall Intensity (in/hr.)	CwA A = Acres	Runoff Quantity (Qin)	Runoff Quantity (Qout)	Qin - Qout	(Qin-Qout) x tc x 60 (cu. ft.)	
20.0	4.40	1.01	4.45	1.55	2.90	3475	
30.0	3.60	1.01	3.64	1.55	2.09	3757	CONTROLS
40.0	3.00	1.01	3.03	1.55	1.48	3554	
50.0	2.60	1.01	2.63	1.55	1.08	3231	
60.0	2.30	1.01	2.32	1.55	0.77	2786	
70.0	2.10	1.01	2.12	1.55	0.57	2401	
80.0	1.90	1.01	1.92	1.55	0.37	1774	
90.0	1.70	1.01	1.72	1.55	0.17	905	
100.0	1.60	1.01	1.62	1.55	0.07	399	
110.0	1.50	1.01	1.52	1.55	-0.03	-228	
120.0	1.40	1.01	1.41	1.55	-0.14	-976	
130.0	1.30	1.01	1.31	1.55	-0.24	-1845	

Design Detention Volume	3757