



*Engineering,*

**STORM DRAINAGE ANALYSIS**

**FOR**

**SIGWALT STREET APARTMENTS**

**45 S. CHESTNUT AVE.**

PREPARED FOR:

**CA VENTURES  
130 E. RAMDOLPH STREET, SUITE 2100  
CHICAGO, IL 60601  
312-800-5370**

PREPARED BY:

**RWG Engineering, LLC**

975 E. 22nd Street  
Wheaton, Illinois 60189  
(630) 774-9501

**JOB#291-127-16-301**

JULY 10, 2017

REVISION: August 16, 2017

REVISION: September 6, 2017

REVISION: December 15, 2017 (updated)

*PROJECT & SITE DESCRIPTION*

**FINAL ENGINEERING PLANS**

**Sigwalt Street Apartments**

**37 S. Chestnut Ave., Arlington Heights, Cook County, IL**

**Project Overview:**

The final engineering plans for Sigwalt Street Apartments include the development of a 0.909 acre site into a residential apartment building.

The proposed development is serviced by city water and sanitary sewer. The sanitary and watermain connections are both made along Sigwalt Street.

The entire 0.909 acre site has detention provided in the onsite StormTrap. Detention storage is calculated using village criteria since it is more restrictive than MWRD criteria. A release rate of 0.18 cfs/ac was used for the 100 year storm event. Runoff coefficients of 0.50 (pervious) and 0.95 (impervious) were used to calculate a composite "C" factor per village code. A minimum restrictor size of 2" was used.

VCBMP's are required by MWRD and are incorporated into the design for the entire project. A Soil Erosion and Sedimentation Control Plan is included with this phase of work and reflects perimeter silt fence and erosion control blanket. Erosion control measures are to be installed prior to commencement of demolition work and routinely augmented as work progresses.

**Original Existing Site Drainage Conditions:**

The existing 0.909 acre property is almost 100% pervious, covered by grass. Many years ago there was residential housing located on this property. It was demolished, and no previous development impervious area was taken into any calculations for this site.

Existing onsite storm sewer is present in the internal portion of the lot. This storm sewer will be removed and replaced with a proposed detention storage design.

**Proposed Site Drainage Conditions:**

The entire 0.909 acre parcel will be disturbed and undergo improvements with this project. All site runoff will be collected and delivered to an onsite storm water detention StormTrap. Storm

water detention, as previously stated, was calculated using Village of Arlington Heights criteria. Volume control requirements were calculated using MWRD criteria. In order to achieve volume control storage, a green roof and permeable pavers were added to the plans where possible. See below numbers as a summary to the enclosed calculations.

**Total Site "C" = 82**

**Required Detention Volume (Per Village Code) = 0.29 ac-ft**

**Provided Detention Volume (Per Village Code) = 0.29 ac-ft**

**Allowable Release Rate (Per Village Code) = 0.16 cfs (used to size detention)**

**Actual Release Rate (Per Village Code) = 0.27 cfs (with 2" restrictor)**

**Required Volume Control Storage (Per MWRD Ordinance) = 0.053 ac-ft**

**Provided Volume Control Storage (Per MWRD Ordinance) = 0.014 ac-ft**

*(See attached calculations)*

## CALCULATION OF COMPOSITE RUN-OFF COEFFICIENT

Designer:	<b>MRM</b>
Description:	<b>SIGWALT APARTMENTS</b>

TOTAL PROJECT AREA	0.909 Ac.
IMPERVIOUS AREA FOR TOTAL SITE	
BUILDING - IMPERVIOUS ONLY	0.606 Ac.
SIDEWALKS/PATIOS	0.027 Ac.
	0.633 Ac.
PERVIOUS AREA FOR TOTAL SITE	
GREEN ROOF	0.051 Ac.
PERMEABLE PAVERS	0.012 Ac.
GREEN SPACE	0.213 Ac.
	0.276 Ac.
TOTAL SITE AREA	0.909 Ac.
IMPERVIOUS AREA	0.633 Ac.
PERCENTAGE OF IMPERVIOUS	69.6 %
	USE 70%

**WITH 35% IMPERVIOUS AREA:**

PERVIOUS = 30% @ 0.50 =	0.1500
IMPERVIOUS = 70% @ 0.95 =	0.6650
COMPOSITE "C" =	0.815

<b>TOTAL COMPOSITE "C" FACTOR</b>	<b>0.82</b>
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## Runoff Curve Number

Project: Sigwalt Street Apartments  
 Location: Arlington Heights, Cook County, IL  
 File: 291-301

By: MRM Date: 12/15/2017  
 Checked: RWG Date: 12/15/2017

Circle One: Present Developed Description: 0.909-Acre Site Total

Soil Name and Hydrologic Group (Appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	Curve Number	Area	Product of Curve Number and Area
			<input checked="" type="checkbox"/> acres <input type="checkbox"/> sq. mi. <input type="checkbox"/> %	
C	Pervious Area - Open Space, Good Condition	74	0.213	15.762
C	Permeable Pavement	91	0.012	1.092
C	Permeable Green Roof	85	0.051	4.335
C	Impervious Area - Blding/patio/sw	98	0.633	62.034
<b>Totals =</b>			0.91	83.223

$$CN \text{ (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{83.223}{0.909} = 91.554$$

Use CN = 92

**RWG ENGINEERING, LLC.**

**975 E. 22nd Street**

**Wheaton, IL 60189**

**(630) 774-9501**

Detention Calculator  
Modified Rational Method

TELEPHONE (630) 774-9501		DESCRIPTION		MSD BASIN CALCULATION SHEETS		
Technical Bulletin 70 (7.58 in. - 100 Year Rainfall)						
DURATION	TIME	100 YR. INT	INFLOW RATE	STORED RATE	VOLUME	Area of site in acres: 0.91
(HOURS)	(MIN)	(IN/HR)	(CFS)	(CFS)	(ACRE-FT)	Trapped water area in acres: 0.00
0.50	30	5.60	4.15	3.98	0.17	Net area for release computation in acres: 0.00
0.67	40	4.92	3.64	3.48	0.19	Allowable release rate in CFS: 0.16
0.83	50	4.24	3.14	2.98	0.21	Unrestricted release rate in CFS: 0.00
1.00	60	3.56	2.64	2.47	0.21	Bypass release rate in CFS: 0.00
1.50	90	2.90	2.15	1.98	0.25	Total allowable release in CFS: 0.16
2.00	120	2.24	1.66	1.50	0.25	Developed runoff coefficient: 0.82
3.00	180	1.62	1.20	1.04	0.26	
4.00	240	1.40	1.03	0.87	0.29	
5.00	300	1.17	0.87	0.71	0.29	<b>Maximum volume in Acre-Ft = 0.29</b>
6.00	360	0.95	0.70	0.54	0.27	
7.00	420	0.88	0.65	0.49	0.29	
8.00	480	0.82	0.61	0.44	0.29	<===
9.00	540	0.75	0.56	0.39	0.29	
10.00	600	0.68	0.51	0.34	0.29	
11.00	660	0.62	0.46	0.29	0.27	
12.00	720	0.55	0.41	0.24	0.24	
13.00	780	0.52	0.39	0.22	0.24	
14.00	840	0.50	0.37	0.20	0.24	
15.00	900	0.47	0.35	0.18	0.23	
16.00	960	0.44	0.33	0.16	0.22	
17.00	1020	0.42	0.31	0.14	0.20	
18.00	1080	0.39	0.29	0.12	0.19	
19.00	1140	0.38	0.28	0.12	0.18	
20.00	1200	0.37	0.27	0.11	0.18	
21.00	1260	0.36	0.26	0.10	0.17	
22.00	1320	0.34	0.25	0.09	0.17	
23.00	1380	0.33	0.25	0.08	0.16	
24.00	1440	0.32	0.24	0.07	0.15	
		<b>% of site</b>	<b>"C" Factor</b>	<b>Composite "C"</b>		
<b>Open Water Area</b>		0.00	1.00	0.00		
<b>Impervious Area</b>		70.00	0.95	0.67		
<b>Pervious Area</b>		30.00	0.50	0.15		
<b>Total :</b>		<b>100.00</b>		<b>0.82</b>		

# ORIFICE WORKSHEET

Designer:	MRM
Description	STORMTRAP- 100 YR. RESTRICTOR

FLows ARE BASED ON THE FOLLOWING EQUATION:

$$Q = AC\sqrt{2gH}$$

Q = FLOW (cfs)  
 A = AREA (sqr.ft.)  
 C = Orifice Coefficient  
 g = 32.2 ft/sec<sup>2</sup>  
 H = Head (ft.)

**ORIFICE DATA:**

Orifice diameter(inches)	2.00	inches	Minimum size
Orifice area(square feet)	0.022	sqr. ft.	
Proposed invert elevation	686.00	ft.	
Centerline of flow	686.08	ft	
Orifice coefficient	0.61		

**RATING TABLE:**

Water Elevation (ft.)*	Head (ft.)	Q (cfs)
686.00	(0.08)	#NUM!
687.00	0.92	0.10
688.00	1.92	0.15
689.00	2.92	0.18
690.00	3.92	0.21
691.00	4.92	0.24
692.00	5.92	0.26
692.50	6.42	0.27
693.50	7.42	0.29
694.50	8.42	0.31
695.50	9.42	0.33
696.50	10.42	0.34

\*\*HWL of Stormtrap\*\*

\*Water elevation must be higher than centerline of flow

## WEIR FLOW CALCULATIONS

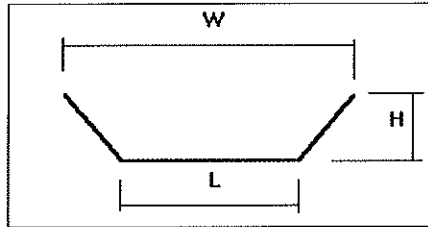
Designer:	MRM
Description:	100 YEAR - in CB No.27

BASED ON THE FOLLOWING EQUATION:

$$Q = \left[ K \times \frac{2}{3} \times L \times (2g)^{0.5} \times H^{1.5} \right] + \frac{1}{2} \left[ K \times \frac{8}{15} \times (2g)^{0.5} \times S_1 \times H^{2.5} \right] + \frac{1}{2} \left[ K \times \frac{8}{15} \times (2g)^{0.5} \times S_2 \times H^{2.5} \right]$$

WHERE:

- Q = DISCHARGE IN CFS
- K = WEIR COEFFICIENT
- L = LENGTH IN FEET
- g = 32.2 FT/SEC
- H = HEAD IN FEET
- S1 = LEFT SIDE SLOPE
- S2 = RIGHT SIDE SLOPE



WEIR DATA: OVERTFLOW CHANNEL AA-AA

- |                                |      |      |   |
|--------------------------------|------|------|---|
| 1. LENGTH, L                   | 6.00 | FEET |   |
| 2. WEIR COEFFICIENT, K (K<1.0) | 0.50 |      |   |
| 3. LEFT SIDE SLOPE, S (H:V)    | 0    | :    | 1 |
| 4. RIGHT SIDE SLOPE, S (H:V)   | 0    | :    | 1 |

5. RATING TABLE	HEAD (FEET)	DISCHARGE (CFS)
	0.20	1.44
	0.30	2.64
	0.40	4.06
	0.50	5.67
	0.60	7.46
	0.67	8.80
	0.75	10.42
	0.90	13.70
	1.00	16.05
	1.10	18.52
	1.20	21.10
	1.30	23.79
	1.40	26.59
	1.50	29.49



## VOLUME CONTROL CALCULATIONS

Designer:	MRM
Description:	PERMEABLE PAVERS/GREEN ROOF

### VOLUME CONTROL PROVIDED:

**PERMEABLE PAVERS:** 531 sf (0.012 ac)

$$VVa = (0.50) * (0.36) * (0.012ac) * (8"/12") = 0.00144 \text{ ac-ft}$$

$$VVb = (0.36) * (0.012ac) * (12"/12") = \underline{0.00432 \text{ ac-ft}}$$

**Total volume control of Permeable Pavers = 0.006 ac-ft**

**GREEN ROOF:** 2200 sf (0.051 ac)

$$VVa = (0.25) * (0.051ac) * (6"/12") = 0.0064 \text{ ac-ft}$$

$$VVb = (0.25) * (0.051ac) * (1.75"/12") = \underline{0.0020 \text{ ac-ft}}$$

**Total volume control of Permeable Pavers = 0.008 ac-ft**

**TOTAL VOLUME CONTROL PROVIDED: 0.014 AC-FT**

**STORM SEWER WORKSHEET**

Designer:	<b>MRM</b>
Description:	<b>SIGWALT APARTMENTS</b>

FREQUENCY: 10 YR.

ROUGH. COEFF. 0.013

RUNOFF COEFF: 0.82

MH-MH	ADDED		TOTAL		C X A	TIME		I IN/HR	Q CFS	PIPE DIA IN	PIPE SLOPE %	VEL FPS	L FT	CAP CFS	UPPER MH		LOWER MH	
	"C" AC	AREA AC	"C" AC	AREA AC		FLOW MIN	T/C MIN								RIM	INV	RIM	INV
Downstream pipe from StormTrap:									100 YR.									
27-9	0.82	0.91	0.82	0.91	0.75	0	10	10.02	7.47	18.00	0.81	5.35	31	9.45	694.00	686.00	693.55	685.75