New Apartment Dwelling-Low Rise Building

178 Carruthers Avenue

Ottawa, Ontario

Revised Storm Water Management Report

By

Mohamad Salame, P.Eng.

Kamco Technique Ltee.
60 Grand Avenue North
Cambridge, Ontario
N1S 2K9

Seal and Signature of Engineer: ______________________________

Date: 17 February 2015

TABLE OF CONTENTS

Appendices

1. Project Location

This report addresses the stormwater management requirements for a proposed residential building development in which located at 178 Carruthers Avenue Ottawa, Ontario, intersection of Carruther and Scott Avenue. The location of the site is shown in Figure-1 below.

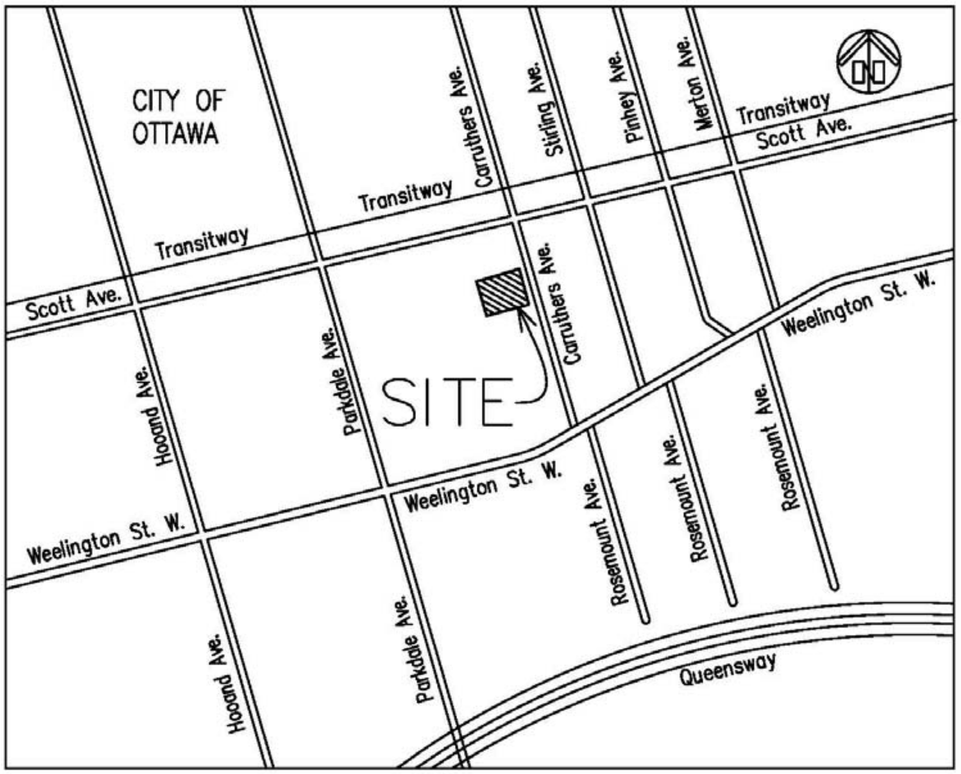


Figure 1: Location of site

2. Scope of report

The purpose of this report is to study stormwater management design criteria typically provided in such plans are to:

1. Preserve groundwater and base flow characteristics
2. Prevent undesirable and costly geometric change in the watercourse
3. Prevent any increase in flood risk potential
4. Protect water quality for human uses.
5. Calculate and describe the control measures taken for proposed development to control rain and storm water run-off on the entire property.
6. Identify all issues that require facilities, City of Ottawa for approvals, including impacts of drainage to the Streets.

3. Methodology

In order to successfully complete the storm water management study for this site, the following specific tasks were undertaken:

1) Calculate the allowable runoff rates using rational method.
2) Determine the percent impervious of the site Post-development value = 0.9.
3) Calculate post development runoff hydrographs.
4) Revise the site grades to attain the required on-site storage capacity for run off required.
5) Pre-development value = 0.5 chosen based on the Project site locations.

4. Existing site surface conditions

The site consists of 566.7 square meters (0.05667 ha) fronting on Carruthers Avenue. The existing building is to be demolished and new proposed residential building four storey low rise is to be built at this location with site services and parking area.

There is an existing building complete with parking and landscaped back yard areas. The existing site is graded to slope towards northwest of the property Figure-2, surface runoff water is naturally conveyed toward northwest property along neighbors properties and roads without any existing storm surface runoff water management facilities.

The existing sewers services and Hydro wires services will up upgrading as illustrating in plans to serve the new proposed development.

New proposed storm water management facilities (SWM) has to be implemented to satisfy the criteria outlined by City of Ottawa and control measures have to be incorporated in the design for quality and quantity of the storm water leaving the subject site.

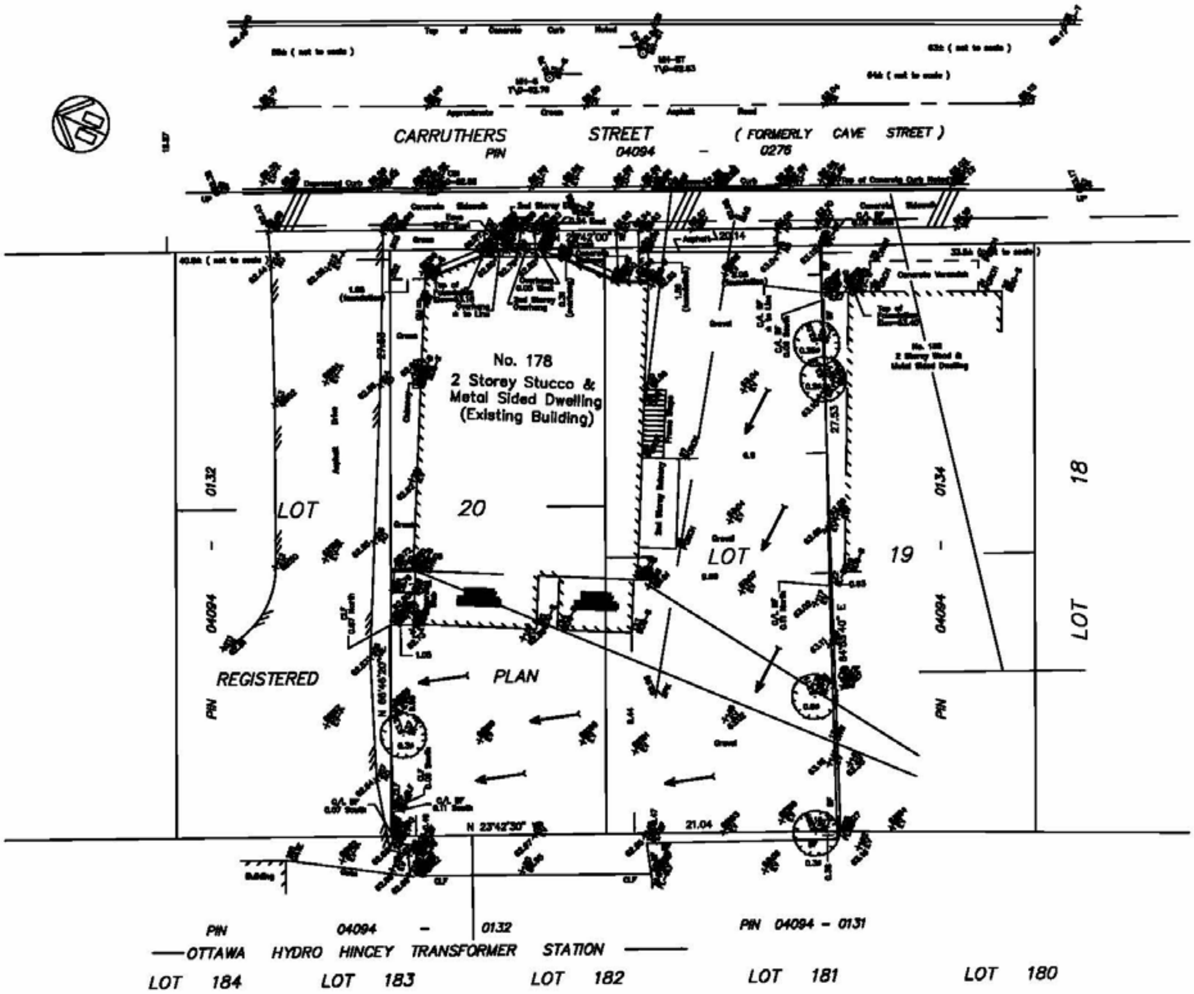


Figure 2: Existing site plan

5. Post development conditions

The design of storm sewers computed in accordance with jurisdiction of the City of Ottawa.

The extent of the proposed development consists of proposed new four storey apartment dwelling-low rise building consists of 20 residential units, and upgrade driveways, parking lot and site grading.

Proposed building

Following are the criteria of post development conditions:

Used Description	Area (square meters)	Percentage
Total building roof area	275 m^2	48.5 %
Paved services	239.1 m^2	42.2 %
Landscaped, etc.	52.6 m^2	9.3 %
Total Area	566.7 m^2 (0.14 Acres) (0.05667 ha)	100 %

6. Rainfall Intensity Duration – Frequency Curve Equation

An IDF (Intensity Duration Frequency) curve is a statistical of the expected rainfall intensity for a given duration and storm frequency. In Ottawa, the IDF curve is derived from Meteorological Services of Canada (MSC) rainfall data taken from the Macdonald-Cartier airport. Rainfall collected from 1967 to 1997 was analyzed using the Gumbel Distribution.

The intensity duration frequency equations and data are used for calculating required storm water storage capacity to limit the peak flow. Equation of IDF curves is:

$$\mathbf{I = A / (Td+B)^C}$$

I is rainfall intensity in mm/hr
T is time in hours (use 10 minutes for time of concentration)
A, B and C are the shown as below:

Return Period (years)	A (min)	B (min)	C (min)
2	732	6.199	0.810
5	998	6.053	0.814
10	1174	6.014	0.816
50	1569	6.014	0.819
100	1735	6.014	0.820

Method of calculations by using Rational Method:

$$\mathbf{Q = 0.0028\ C\ I\ A}$$

Where

Q = Runoff Volume, in m^3 / sec
A = Area contributing to runoff. In Ha

I = Rainfall intensity in mm/hr
C = Runoff Coefficient, dimensionless

Time of Concentration (T.C.) = 10 minutes

Refer to appendices for the computer printout calculations.

A) Water Service:

New watermain supply line is proposed as shown on drawing C2. The proposed water meter is to be located in the mechanical room prior to design and recommendation from mechanical consultant engineer in accordance with the jurisdiction of the City of Ottawa.

B) Sanitary Service:

New sanitary sewer is proposed as shown on drawing C2. The mechanical consultant engineer shall prepare complete mechanical (plumbing design) drawings and connect the main sanitary line to the proposed main complete with clean out located inside the building as shown on drawing C2.

C) Storm Service:

New storm service required most consideration due to increase in impervious surface and grading, resulting increase in storm water run-off from the site. Rational method was used in the calculation, runoff coefficient for impervious surfaces is 0.9 is required and corrected for high intensity storms.

The required quantity of water retained over the site from the post development conditions proposed to be stored over the roof. For storm of higher than 100 years storm event intensity, the water will flow towards the road and nothing will discharge to neighboring properties.

Storm water discharged and controlled from proposed site development via orifice place installed downstream of control manhole and the oil grit separator will clean and remove suspended solids leaving clean water discharged to street sewers.

In addition to quantity measures, quality of storm water discharge also considered. Each existing catch basin over the landscaped area or street will be provided with sump to prevent any heavy object into sewer system. Each catch basin will also be provided with goss trap to stop floating items into sewer system.

D) Erosion and Sedimentation Control:

In order to minimize the effects of erosion during the grading of the site, sediment control fencing shall be installed around any stockpiles and around catch basin during construction phase.

Any sediment that is tracked onto the road way during the course of construction will be cleaned by the contractor.

E) Water Quantity Control:

In order to achieve the storm water management requirements for the site, runoff generated from the areas will be controlled with installation of one orifice at outlet of control manhole.

Refer to the enclosed drawings C1, C2, C3, C4 and storm sewer design sheet for an illustration of the proposed system and discharge calculation.

Orifice Equation:

Q = Cc A sqrt (2g(H – 2/3 D))

Where

Cc coefficient of contaction (0.630)
H head relative to the invert of the orifice
D orifice diameter
G gravitianal acceleration (9.810)

Refer to appendix for each storm event calculations.

Per and Post Development Flows vrs. Storages Summary Table-1

	Event	Control flow rate (m^3/s	Release rate (m^3/s)	Allowable release rate (m^3/s)	Provided volume storages (m^3)	Required volume storages (m^3)
Pre-Development	5 yr. Event	0	0	0	0	0
	100 yr. Even	0	0	0		
Post Development	5 yr. Event	0.14	0.0083	0.0083	3.7	3.7
	100 yr. Event	0.2	0.0083	0.0141	11.0	10.4

The pre-development and post development release rate generated from areas are the same and storage requirements for post development will be controlled with installation

100-yrs. event 75 mm diameter orifice plate as indicated on drawings. The orifice will control storages on site and acceptable rate discharge to meet the current site conditions.

There will be no external drainage flowing towards the site and proposed water storage ponding does not occur in the parking area for 5 or 100 year storm events.

Based on site use, the total impervious percentage values is 98% when determining required storages for each storm event in pre and post developments.

The proposed storm water management system for this site development will maintain the pre development (existing) surface and ground water divides for all design storms up to and including the 100 year event of post development.

One Hundred Year Storm Event:
The requested maximum allowable release rate for the one hundred year storm event for the site is 0.0141 m^3/s with the most restrictive ICD that can be practically used. The post-development release rate for the 5-year storm event is to be 0.0083 m^3/s. This is smaller than the requested release rate but it is the best results the can be practically achieved.

Five Year Storm Event:
The maximum allowable release rate for the five year storm event for the site is 0.0083 m^3/s. The post-development release rate for the 5-year storm event is calculated to be 0.0083 m^3/s. Therefore the maximum post development release rate for the 5-year storm used for the site is achieve the post development release rate.

7. Storage provided

Roof storage = 11.0 m^3
Parking storage = 0 m^3

Proposed total water storages on site (for 100 years event) = 11.0 m^3

Required 100 yr. storm event storage = 10.4 m^3

100-year event level watercourse capacity flow from the entire site areas is graded to be surface runoff through control flow roof drains and adequately can be discharge through the storm sewers system.

9. Conclusion and recommendations

In conclusion, the site development will be provided with a complete storm drain system, site grading and existing sidewalks surface elevations (see C-1 drawing). Storm water shall discharge into existing storm sewer system.

1) In conclusion, the site development will be provided with a complete storm drain system, site grading and existing sidewalks surface elevations (see C-1 drawing).
2) Post development release rate is calculated and water is discharge as shown on C1 drawings to match existing site condition.
3) In general the post-development run-off rate increased from pre-development due to increase of proposed site hard surfaces.
4) The new proposed SWM facilities designed to control the release rate as indicated through control flow roof drains and discharged to the street sewers system.
5) The runoff release rate to the street prior to post development is covering areas from the entire roof.
6) The site will be fully developed as detailed on the site servicing plans and Architectural drawings.
7) The site grading is undertaken according to the proposed elevations, details and erosion control measures shown on the enclosed engineering drawing.
8) Upon completion of construction, the site shall be confirmed to the design criteria specified to meet the City of Ottawa requirements.
9) In my opinion, the storm surface runoff water flow from the new proposed building and parking area will be adequate and will not impact on the performance of existing flow capacity or cause an increase on existing street's main sewers.
10) The storm water management facilities shall be installed as detailed on the enclosed engineering drawings.
11) The proposed storm water management system for this site development will maintain the post development for all design storms up to and including the 100 year events to match the pre developments flow rates.
12) Post development external storm water discharge path shall remain to match existing as shown on plan.
13) Existing eternal flow path is out of our scope of this report and site development.
14) Site inspection during construction is required by a professional engineer.

I have included storm water management design calculations for this development. The existing and proposed conditions presented indicate the post development conditions will be improved, this will meet the City of Ottawa requirements and the proposed development can safely be carried out. This report is issued for site plan approval and building permit.

In my opinion, the storm flow from the new proposed building and parking area will be adequate and will not impact the performance flow capacity or cause an increase on Streets main sewers. Site inspection during construction is required to ensure compliance with the design drawings, by a professional engineer.

It is recommended that:

i) The site grading is undertaken according to the proposed elevations, details and erosion control measures shown on the enclosed engineering drawing.
ii) The storm water management facilities are installed as detailed on the enclosed engineering drawings.

iii) The storm water management faculties to be inspected by local authorized civil engineer and certified to facilities, City of Ottawa.

All of which is respectfully submitted,

Kamco Technique Ltee

Mohamad Salame, M.A.Sc., P. Eng.,
Project Manager

17 February 2015

Appendices

178 Carruthers Avenue, Ontario
Residential Building

Storm water calculations

RAINFALL	5- Years Storm Event	
T.C. (min):	10	
C" Pre. C, constant < 1.0	0.5	
C" Post. No landscape inside property line	0.9	

AREAS:

ROOF(ha):	0.0275	
PAVED (ha)	0.02391	
GRASS(ha):	0.00526	
TOTAL(ha):	0.05667	
Allowable runoff factor "= (Total area x 0.0028 x C Pre x I)"	0.0083	
CONT. FLOW ROOF FLOW	0	cms
UNCONTROLLED	0	cms
RELEASE RATE. "= (Allowable - (control+uncontroled flow))"	0.0083	cms
RUN-OFF FACTOR: "= (Roof x C" Post) / Total area + (Paved x C Post) / Total area +(Grass x C Post) / Total area"	0.86	

TIME	I (mm/hr)	Q (cms)	STORAGE(cm)
10	104.19	0.014	3.6
11	99.18	0.014	3.8
12	94.69	0.013	3.6
13	90.62	0.012	3.5
14	86.93	0.012	3.3
15	83.55	0.011	3.1
16	80.45	0.011	2.9
17	77.60	0.011	2.7
18	74.97	0.010	2.4
19	72.52	0.010	2.1
20	70.25	0.010	1.9
21	68.13	0.009	1.6
22	66.14	0.009	1.3
23	64.28	0.009	1.0
24	62.54	0.009	0.7
25	60.89	0.008	0.4
26	59.34	0.008	0.0
27	57.88	0.008	-0.3
28	56.49	0.008	-0.6
29	55.17	0.008	-1.0
30	53.92	0.007	-1.3

Storage Required (m^3):	3.8	
Roof Storage Provided (m^3):	11.0	(see drawing C1)
Top of Water Elevation (m):	62.90	(Grade)
Orifice plate Inv. Elevation (m):	59.43	(see drawing C2)
Head relative to the orifice invert (m)	3.470	
Q (cms)	0.008	
'g' Gravitianal acceleration (m/s^2)	9.810	
`C' Coefficient of contraction (Factor)	0.820	
'D' Orifice diameter (mm)	39	

Use minimum orifice plate 75mm diameter installed upstream of pipe
to match 100yrs. storm event.

178 Carruthers Avenue, Ontario

Residential Building

Storm water calculations

RAINFALL	100- Years Storm Event	
T.C. (min):	10	
C" Pre. C, constant < 1.0	0.5	
C" Post. No landscape inside property line	0.9	

AREAS:

ROOF(ha):	0.0275	
PAVED (ha)	0.02391	
GRASS(ha):	0.00526	
TOTAL(ha):	0.05667	
Allowable runoff factor "= (Total area x 0.0028 x C Pre x I)"	0.0142	
CONT. FLOW ROOF FLOW	0.00189	cms
UNCONTROLLED	0	cms
RELEASE RATE. Use 2-years release reate	0.0083	cms
RUN-OFF FACTOR: "= (Roof x C" Post) / Total area + (Paved x C Post) / Total area +(Grass x C Post) / Total area"	0.86	

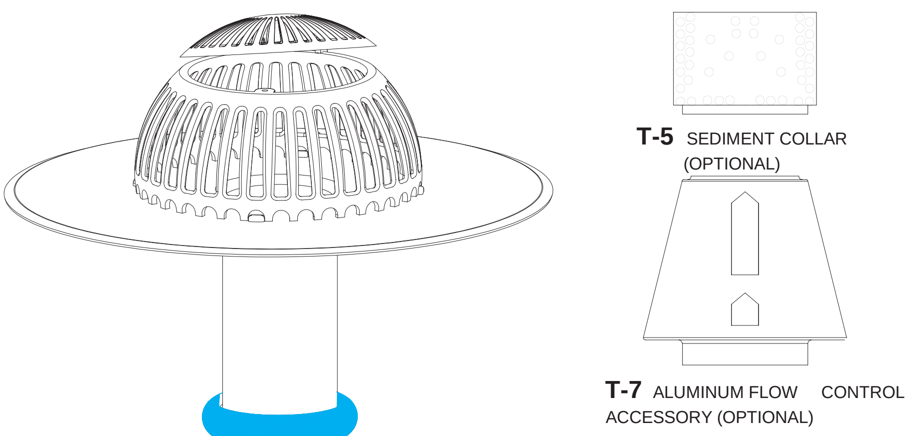
TIME	I (mm/hr)	Q (cms)	STORAGE(cm)
10	178.49	0.024	9.7
11	169.84	0.023	10.1
12	162.07	0.022	10.2
13	155.05	0.021	10.3
14	148.66	0.020	10.4
15	142.84	0.020	10.4
16	137.49	0.019	10.4
17	132.58	0.018	10.3
18	128.03	0.018	10.2
19	123.82	0.017	10.1
20	119.90	0.016	10.0
21	116.25	0.016	9.8
22	112.84	0.015	9.7
23	109.64	0.015	9.5
24	106.63	0.015	9.3
25	103.81	0.014	9.1
26	101.14	0.014	8.9
27	98.62	0.014	8.7
28	96.24	0.013	8.4
29	93.98	0.013	8.2
30	91.83	0.013	7.9

Storage Required (m^3):	10.4	
Roof Storage Provided (m^3):	11.0	(see drawing C1)
Top of Water Elevation (m):	62.90	(Grade)
Orifice plate Inv. Elevation (m):	59.43	(see drawing C2)
Head relative to the orifice invert (m)	3.470	
Q (cms)	0.008	
'g' Gravitianal acceleration (m/s^2)	9.810	
`C' Coefficient of contraction (Factor)	0.820	
'D' Orifice diameter (mm)	39	

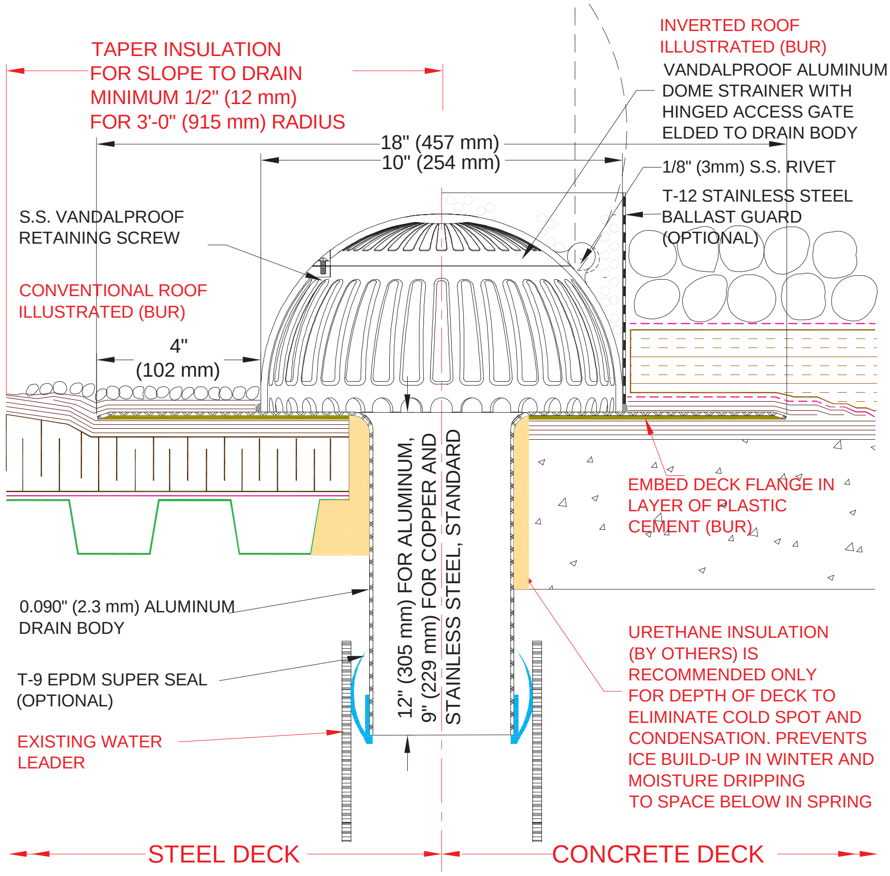
Use minimum orifice plate 75mm diameter installed upstream of pipe
to match 100yrs. storm event.

ROOF SPECIALTIES

RD-14A-RR VANDALPROOF ALUMINUM ROOF DRAIN (All Purpose, Low Spot Retrofit)



Note: Specify accessories required by adding appropriate suffix to model number e.g. RD-14C RR-T-5 for sediment collar, T-7 for flow control and T-12 for ballast guard.



RD-14A-RR VANDALPROOF ALUMINUM ROOF DRAIN (All Purpose, Low Spot Retrofit) Note: RD-14C-RR (Copper) and RD-14SS-RR (Stainless Steel) Roof Drain similar. See reverse side of page for material change.

INSTALLATION

"Installation Instructions" are provided with every Thaler product. Essentially, the RD-14A-RR roof drain is installed by coring or cutting the roof assembly, fitting the drain outlet into the rainwater leader, slowly rotatening and pushing down into position, installing the dome strainer (including any optional accessories), and as follows:

BUR: Set drain flange over membrane in layer of plastic cement and flash in with 3 overlapping layers of felt flashing.

ModBit: Torch membrane until bitumen is fluid and set drain flange into fluid. Flash in flange with two overlapping layers of ModBit and seal with asphalt sealer.

Single Ply: Set drain flange in layer of membrane adhesive before applying membrane over flange. Note: for PVC membrane, specify PVC coated drain flange by adding suffix P to end of model number, e.g. RD-14A-RR-P; weld roofing to drain flange using PVC torch.

Precautions: If coating drain flange with a bituminous paint on site, allow 24 hours for drying before applying roof membrane.

Ordering: Available throughout North America. Contact Thaler for list of distributors and current cost information. Most products are readily available from stock.

DESCRIPTION

The Thaler RD-14A-RR Roof Drain consists of a vandalproof cast aluminum dome with hinged access gate, flat aluminum body, deck flange and straight outlet fitted with EPDM sealing ring (Thaler Super-Seal). The Super-Seal provides a superior seal in the event drains or pipes become clogged.

Prominent Features: Easy installation for retrofit applications requiring new hook-up (see Recommended Use). Non-removable dome strainer eliminates improper strainer installation or lost strainers that can result in plugged drains. Vandalproof hinged access gate (allen-key opening) allows drain to be cleaned if necessary.

Leader Diameters: *With Super-Seal EPDM Sealing Ring*: 1-3/4" to 5-3/4" (44 mm to 146 mm). See detail at left for specific sizes.

Options: Without Super-Seal on outlet (see Thaler Super-Seal Retrofit Drain Seal literature). T-5 aluminum sediment collar. T-10 Stainless steel under-deck clamp (provides snug installation in otherwise insecure applications). T-7 aluminum Flow Control accessory (weir) for utilizing roof as temporary reservoir during excessive rainfall. T-12 stainless steel ballast guard. See Thaler Roof Drain Options literature. PVC coated deck flange for PVC roof membrane. Bituminous painted deck flange for BUR and ModBit roof membrane.

RECOMMENDED USE

For flat roofs in existing construction employing conventional roof (membrane above insulation) or inverted roof and new hook-up e.g. new installation in low spots subject to ponding water. Suitable for PVC, cast iron, steel, copper, or other type leaders in both Schedule 40 or 80 leader thicknesses.

APPROVALS

Conforms to ANSI A112.21.2 Roof Drains standard.

WARRANTY

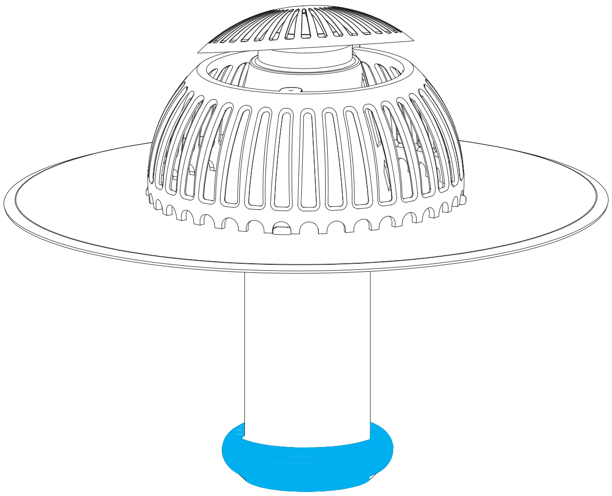
20 year warranty against defects in materials and/or manufacture when installed in accordance with Thaler "Installation Instructions". Copy of Warranty Certificate available upon request.

MAINTENANCE

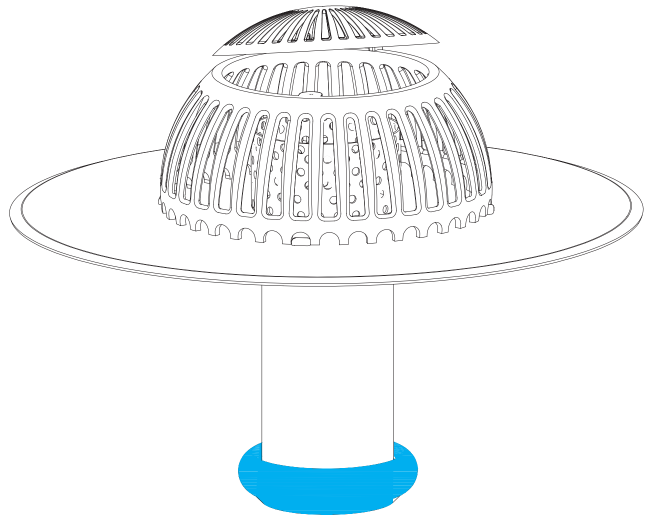
No maintenance required (maintenance free), however, as per CRCA/NRCA recommendations, drains should be inspected twice a year (spring and fall) and any debris removed from both around and inside the strainer.

SPECIFICATION (Short Form)

Roof drains: Thaler RD-14A-RR aluminum drain for [1-3/4" (44 mm) to 5-3/4" (146 mm)] leader size with: vandalproof cast aluminum dome with hinged access gate welded to drain body; .090" (2.3 mm) spun aluminum flat drain body, deck flange and straight seamless aluminum outlet with [T-5 aluminum sediment collar;] [T-9 Super-Seal EPDM sealing ring;] [T-10 stainless steel under-deck clamp;] [T-7 aluminum flow control accessory;] [T-12 stainless steel ballast guard;] [PVC coated deck flange] [bituminous painted deck flange]; as manufactured by Thaler Metal Industries, 1-800-387-7217 (Mississauga, Ontario, Canada) or 1-800-576-1200 (New Braunfels, TX), installed as per manufacturer's written instructions. Provide standard 20 year warranty against defects in materials and/or manufacture.

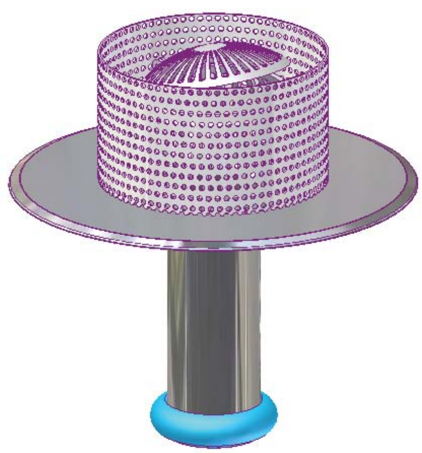


Optional T-7 Flow Control Accessory
(Shown Friction Fitted To Drain Body)



Optional T-5 Sediment Collar
(Shown Friction Fitted To Drain Body)

RD-14C-RR (Copper)
Roof Drain



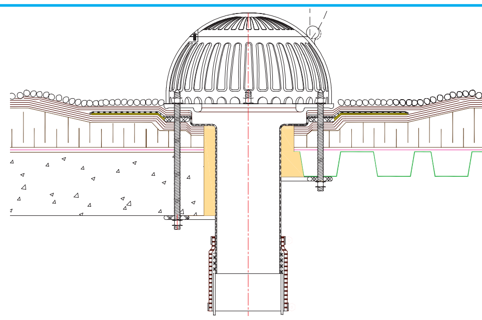
Optional T-12 Stainless Steel Ballast Guard
on RD-14SS-RR Roof Drain
(Shown Friction Fitted To Drain Body)

RD-14SS-RR (Stainless Steel)
Roof Drain

Material Specification for RD-14C-RR (Copper) and RD-14SS-RR (Stainless Steel) Roof Drains (RD-14A-RR Aluminum Illustrated on page M-9) Note: In Short Form specification on front of sheet, edit clause to reflect choice of copper (RD-14C-RR) or stainless steel (RD-14SS-RR) roof drain in lieu of aluminum if desired.

Drain Type	Dome Strainer	Underdeck Clamp	Drain Body and Base	T-5 Sediment Collar	T-7 Flow Control	T-12 Ballast Guard
RD-14A-RR	Cast Aluminum	Stainless Steel	Aluminum 0.090" (2.3 mm)	Aluminum	Aluminum	Stainless Steel
RD-14C-RR	Cast Aluminum	Stainless Steel	Copper base: 24 oz. 0.032" (0.813) pipe:DWV 0.058"(1.47mm)	Copper	Copper or Painted Aluminum	Stainless Steel
RD-14SS-RR	Cast Aluminum	Stainless Steel	Stainless Steel base:26Ga. (0.476mm) pipe:304L 0.058"(1.47mm)	Stainless Steel	Painted Aluminum or Stainless Steel	Stainless Steel

CALCULATING DRAIN SIZE & QUANTITY



INTRODUCTION

Roofing experts today all agree roofs should be drained to avoid ponding; no accidental ponds should be left after a rain. Freezing of ponded water that has penetrated into the plies can delaminate the membrane. Standing water can promote the growth of vegetation and fungi, create breeding places for insects, and produce objectionable odors. Plant roots can puncture the membrane and spread into the insulation thereby influencing leaks, blisters, wrinkles, and destruction of the insulation. Wide temperature variations in a randomly ponded roof can promote a warping pattern of surface elongation and construction, possibly wrinkling the membrane. Further it is impossible to apply a new built-up membrane or to repair a roof with ponds of standing water. Evidence of ponded water on a roof surface after a rain-fall can nullify some manufacturers roofing warranties.

RAINFALL RECORDS

In any case, when calculating drain size and quantity, an examination of rainfall records must be carried out. For rain-fall data for various cities, refer to the appropriate guide information provided by the Sheet Metal & Airconditioning Contractors National Association (SMACNA), Architectural Sheet Metal Manual, or search weather bureau records.

CALCULATION DATA

Following are some general guidelines provided by Thaler, keeping in mind that a slope of 1:50 (2%) is about the mini-mum practible slope to achieve reasonable drainage on low slope/flat roofs. This minimum is accepted by roofing authorities around the world.

FLOW IN U.S. GALLONS PER MINUTE (GPM)

VERTICAL LEADER	
Leader Size	U.S. Gallon Per Minute
2"	30 gpm
3"	90 gpm
4"	192 gpm
5"	348 gpm
6"	566 gpm

ROOF AREA TO BE DRAINED

Inches per hour vs Square Ft. of Roof					
Leader Size	1"/ h	2"/ h	3"/ h	4"/ h	5"/ h
2"	2880 sf	1440 sf	960 sf	720 sf	575 sf
3"	8880 sf	4400 sf	2930 sf	2200 sf	1760 sf
4"	18,400 sf	9200 sf	6130 sf	4600 sf	3680 sf
5"	34,600 sf	17,300 sf	11,530 sf	8680 sf	6920 sf
6"	54,000 sf	27,000 sf	18,000 sf	13,500 sf	10,800 sf

CALCULATING DRAINAGE IN U.S. GPM

GPM = U.S. Gallons Per Minute
A = Roof Area in square feet
R = Rainfall in inches per hour
0.0104 = Conversion Factor
Roof Area= Assume a roof area 320'-0" x 350'-0" or 112,000 sq.ft.

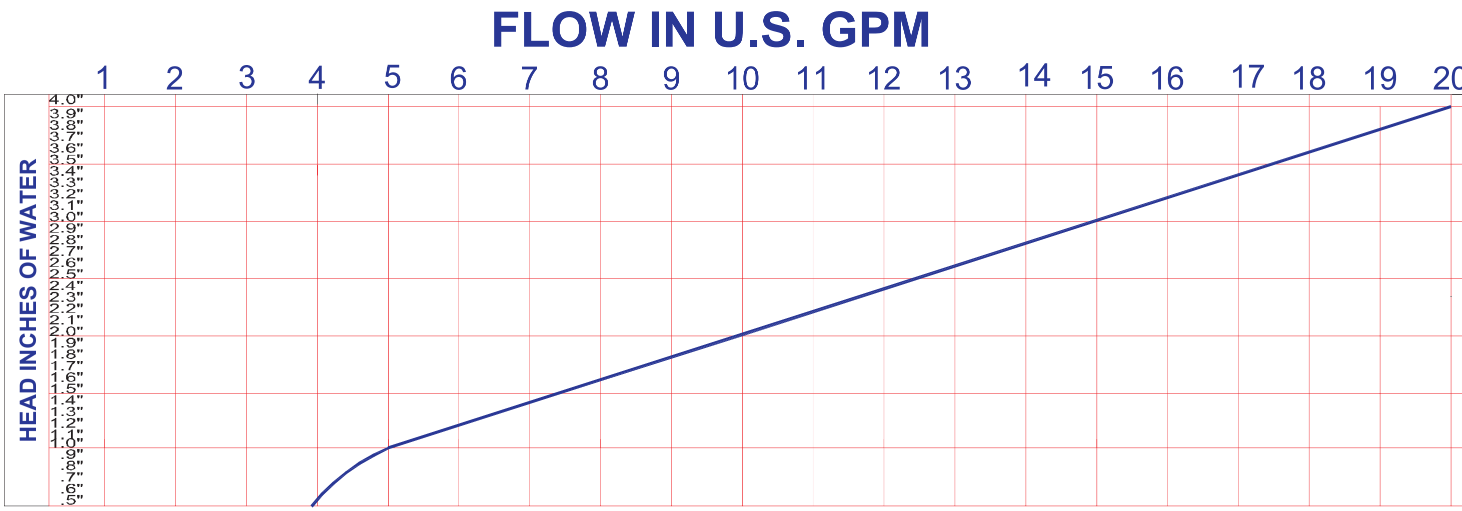
Example

GPM = Factor x Rain Fall in inches per hour x Roof Area in square feet
GPM = 0.0104 x 2" x 112,000 sq.ft.= 2329 GPM

Assume a 3" Leader for a flow rate of 90 U.S. GPM, 2" rainfall per hour for every 4400 square feet of roof area

2329 GPM÷90 = 25.88 rounded to 26 vertical leaders required of 3" diameter.

NOTES:
1. The number and size of roof drains should be determined by the building designer. The method used will vary geographically, and be influenced by local building regulations and other factors relating to building design e.g. slope of roof, angle of horizontal leader under the roof, and similar con-siderations.
2. On school roofs, specify drains with vandalproof and shatterproof strainers.

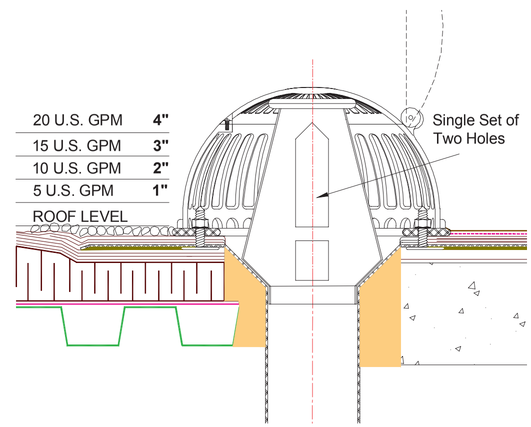


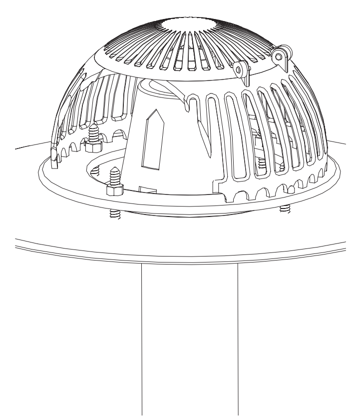
DRAIN DOWN TIME IN HOURS FOR FLAT ROOFS FOR VARIOUS HEADS OF WATER AND ROOF ARE

	2500	5000	7500	10.000 s
4.0"	11.0	21.9	32.8	43.9
3.9"	10.9	21.6	32.4	43.4
3.8"	10.8	21.4	32.0	42.7
3.7"	10.6	21.1	31.5	42.1
3.6"	10.5	20.8	31.0	41.7
3.5"	10.3	20.5	30.6	41.0
3.4"	10.2	20.2	30.2	40.3
3.3"	10.0	19.8	29.7	39.7
3.2"	9.9	19.5	29.2	39.7
3.1"	9.7	19.2	28.6	37.7
3.0"	9.5	18.7	28.2	37.7
2.9"	9.3	18.5	27.6	37.0
2.8"	9.1	18.2	27.0	36.2
2.7"	9.0	17.8	26.4	35.4
2.6"	8.8	17.4	26.0	34.6
2.5"	8.6	17.0	25.3	33.0
2.4"	8.3	16.5	24.6	33.0
2.3"	8.1	16.0	24.0	32.1
2.2"	7.9	16.6	23.2	31.1
2.1"	7.5	15.0	22.5	30.0
2.0"	7.4	14.6	21.8	29.0
1.9"	7.1	14.0	20.9	27.8
1.8"	6.8	13.4	20.0	26.7
1.7"	6.5	12.8	19.2	25.5
1.6"	6.2	12.2	18.2	24.3
1.5"	5.8	11.5	17.2	23.0
1.4"	5.5	10.7	16.1	21.4
1.3"	5.1	10.0	14.9	20.0
1.2"	4.7	9.2	13.7	18.2
1.1"	4.2	8.2	12.3	16.4
1.0"	3.7	7.2	10.8	14.4
.9"	3.1	6.1	9.1	12.2
.8"	2.5	4.3	7.3	9.9
.7"	1.8	3.4	5.2	7.0
.6"	1.0	1.8	2.8	3.8
.5"	0.5	0.9	1.2	2.0

FLOW CONTROL APPLICATION

The need to control or restrict the flow of rainwater was a result of rapid growth within city centres. Existing drainage systems were unable to cope with the increased flow created by new commercial developments.
To meet this increased demand the Thaler T-7 Flow Control (weir) accessory was developed.
With the use of this specialty designed T-7 Flow Control accessory the roof is utilized as a temporary rainwater reservoir, thus eliminating the need to upgrade existing municipal drainage systems. Rather than draining rainwater as fast as it falls, the T-7 Flow Control, which is pre-calibrated at the factory, holds water back on the roof temporarily and sufficiently for the drainage system to function normally, even under adverse rainfall conditions.





DRAIN SELECTION RAINFALL PROCEDURE FOR THALER FLOW CONTROLS

A Determine maximum rain fall per hour in locality of building.
B Determine total roof area to be drained.
C Calculate the total number of roof drains required for roof size
(See local by-laws for maximum drain spacing).
D Calculate GPM per drain
E Specify GPM requirement on drawing.

Example: A 1" (25 mm) head of water on a 2500 square foot (232 square metre) roof will take approximately 3.7 hours to drain, based on the use of a single roof drain flowing at a rate of 5 U.S. GPM. The same head of water on a 10,000 square foot (929 square metre) roof, based on the use of one drain, flowing at a rate of 5 U.S. GPM, would take 14.4 hours to drain; alternatively, if using four drains on the larger roof, the drain down time would be 3.7 hours.

CAUTION: ENSURE STRUCTURE IS CAPABLE OF WITHSTANDING THE INCREASED LOADS (Head of Water).
Note: All calculations based on single set of two holes supplied with T-7 Flow Control accessory. A four hole accessory is available which provides twice the efficiency.

Canada 1 800 387-7217 **U.S.** 1 800 576-1200 **Internet:** www.thalermetal.com **e-mail:** info@thalermetal.com

STORM SEWER DESIGN SHEET - STREET CONNECTION SEWER

BY: MS
DATE: 17/02/2015

RAINFALL PARAMETERS:	A =	998.00	mm/hr	C = 0.814 minutes	**SEWER DESIGN:**	PIPE ROUGHNESS: 0.013 FOR MANNING'S EQUATION
5 YEAR DESIGN STORM EVENT	B =	6.05	mm/hr	n = 0.013		PIPE SIZES: 1.016 IMPERIAL EQUIVALENT FACTOR
Municipality of Ottawa	t =	10.000	minutes			PERCENT FULL: TOTAL PEAK FLOW / CAPACITY

MUNICIPAL ADDRESS: 178 Carruthers Avenue, Ottawa
PROJECT NAME: Proposed residential building
PROJECT NO.: 14031

S T O R M S E W E R D E S I G N S H E E T

LOCATION			STORMWATER ANALYSIS								STORM SEWER DESIGN						
DESCRIPTION	From Building	To Ex. Street	A Area (hectares)	R Runoff Coeff.	A*R	Accumulated A*R	Time of Concentration (min)	Flow Time (min.)	Rainfall Intensity (mm/hr)	Peak Flow (L/s)	Length (m)	Diameter (mm.)	Slope (%)	Full Flow Capacity (L/s)	Full Flow Velocity (m/s)	Percent Full	
						0.000											
Area drain above parking	AD	MH	0.06	0.86	0.049	0.049	10.00	0.47	104.5	14.1	21.1	200	0.50	24.2	0.75	58.4%	10
																	11
																	12
																	13
																	14
																	15
																	16
																	17