ALEO ASSOCIATES INC.
CONSULTING ENGINEERS

# PRELIMINARY STORMWATER MANAGEMENT REPORT PROPOSED MULTI-UNIT DWELLING 1919-1925-1949 DEVONSHIRE COURT WINDSOR, ON

**FOR:**

**ARCHITECTURAL DESIGN ASSOCIATES INC.**
**1670 Mercer Street**
**Windsor, Ontario**
**N8X 3P7**

**BY:**

**ALEO ASSOCIATES INC.**
**325 Devonshire Road, Suite 500**
**Windsor, Ontario**
**N8Y 2L3**


**DATE: AUGUST 16, 2021** **PROJECT No.: 7837**

ALEO ASSOCIATES INC.
CONSULTING ENGINEERS

August 16, 2021

Corporation of the City of Windsor
Engineering – Development & Geomatics Division
350 City Hall Square, Room 302
Windsor, Ontario, N9A 6S1

**ATT: MR. ADAM PILLON, RIGHT-OF-WAY SUPERVISOR**
**RE: STORMWATER MANAGEMENT REPORT FOR THE PROPOSED MULTI-UNIT DWELLING AT 1919-1925-1949 DEVONSHIRE COURT, WINDSOR, ON**

Dear Mr. Pillon,

We are pleased to submit our preliminary stormwater management report for the proposed multi-unit dwelling located at 1919, 1925, 1949 Devonshire Court in the City of Windsor.

The property was previously developed and consisted of two existing buildings, hard pavement surfaces and grass area. The site had an existing runoff coefficient of C=0.64. There was no stormwater management measures in place and runoff flowed into the existing municipal combined sewer or into the right-of-way unrestricted. The existing buildings have since been demolished to make way for new development.

The proposed development will consist of a new multi-unit residential building with parking lot. The stormwater management boundary has an area of 1,885 m² (0.19 ha.) and will discharge to the existing 375 mm x 500 mm brick combined sewer within the alley located south of the site through an existing 150 mm diameter connection.

We have carried out storm detention design using the 1:5 year and 1:100 year frequency storm events. The pre-development runoff coefficient was taken to be 0.20. The development flow of both design storms is restricted by a Tempest “LMF” (Low to Medium Rate) Flow Inlet Control Device by Ipex (80 mm ICD orifice).
The inlet control device will be installed on the 150 mm dia. outlet pipe inside storm manhole #1. See product submittal package attached.

Storage has been provided on the asphalt surface above catch basins, and within storm sewer pipe and structures. However, storage for the 1:5 year storm event will occur exclusively underground in storm pipe and structures only in accordance with the WERSMSM. Storm sewer pipe has been oversized to ensure no surface ponding occurs in the parking lot for the minor storm event. Please see the attached calculations for both the 1:5 year and 1:100 year frequency storm events. The 1:5 year and 1:100 year storage elevations are 183.40 m and 183.65 m, respectively. The 1:100 year storage elevation is 0.35 m below the proposed floor elevation of 184.00 m.

Stormwater quality control is being accomplished by utilizing catch basins with built-in goss gully traps in all catch basins to capture debris, sediments and oils floating at the surface and prevent them from entering the pipe and storm system. Trapped oil and sediments will be removed during routine catch basin cleaning.

If you have any questions or concerns please contact me.

Yours Very Truly,

John-Paul Aleo, P.Eng.
**ALEO ASSOCIATES INC.**

EXIST. COMMERCIAL ZONED AREAS/USES

EXIST. RESTAURANT

375x500mm COMBINED SEWER

375mm COMBINED SEWER

KILDARE ROAD

GRASS AREA NOT SHOWN WITHIN
DRAINAGE AREA DRAINS TO R.O.W.

EX. HP

DEVONSHIRE COURT

SWM DRAINAGE AREA
1,885 SQ.M. (0.19 HA.)
RELEASE TO COMBINED SEWER IN ALLEY (SOUTH OF SITE)

DRAINAGE AREA PLAN
SCALE: NTS

# ALEO ASSOCIATES INC., CONSULTING ENGINEERS

325 DEVONSHIRE ROAD SUITE 500, WINDSOR, ONTARIO, CANADA, N8Y 2L3

| | |
|---|---|
| **PROJECT NAME:** | Proposed Multi-Unit Dwelling |
| **PROJECT No.:** | 7837 |
| **PREPARED BY:** | J.P.A. |
| **DATE:** | August 8, 2021 |
| **FILE NAME:** | 7837_1-5yr_2021.08.08.xlsx |

## PROPOSED MULTI-UNIT DWELLING
## 1919, 1925, 1949 DEVONSHIRE COURT, WINDSOR, ON
## STORM WATER MANAGEMENT CALCULATIONS
## FOR 1:5 YEAR FREQUENCY STORM

### A. PRE-DEVELOPED SITE CONDITIONS:

| | | | | | |
|---|---|---|---|---|---|
| Total Proposed Drainage Area = | 1,885 | sq.m. | 0.19 | ha. | Cund = 0.20 |

### B. PROPOSED SITE CONDITIONS:

| | | | | | |
|---|---|---|---|---|---|
| Total Proposed Drainage Area = | 1,885 | sq.m. | 0.19 | ha. | Cdev |
| Total Proposed Building Roof Area = | 717 | sq.m. | 0.07 | ha. | C = 0.95 |
| Total Proposed Asphalt & Concrete Area = | 960 | sq.m. | 0.10 | ha. | C = 0.95 |
| Total Proposed Grassed Area = | 208 | sq.m. | 0.02 | ha. | C = 0.20 |

### C. RUNOFF COEFFICIENTS:

EXISTING(allowable): Cund = 0.20

PROPOSED:

$$C_{pro.} = \frac{(717\ m^2 \times 0.95) + (960\ m^2 \times 0.95) + (208\ m^2 \times 0.20)}{1{,}885\ m^2}$$

$C_{pro.} = 0.87$

### D. PRE-DEVELOPED (ALLOWABLE) DISCHARGE FOR 1:5 YEAR FREQUENCY STORM:

Average Runoff Coefficient, Cund = 0.20

$T_C$ = 20 minutes

Intensity, i = 75.3 mm/hr

Design storm intensity is calculated from the equation $i = a/(T_c+b)^c$

Where a,b,c are IDF curve parameters based on historical data for a 5 year return period at Windsor Airport.

For a 1:5 year frequency storm, i = 1259/(Tc+8.8)^(0.838),

Qund = 2.78 * Cund * i * A

= 2.78 * 0.20 * i * 0.19

= 0.106 * i

= 8.0 L/s

### E. POST-DEVELOPMENT DISCHARGE FOR 1:5 YEAR FREQUENCY STORM:

Average Runoff Coefficient, Cdev = 0.87

$T_C$ = 20 minutes

Intensity, i = 75.3 mm/hr

Design storm intensity is calculated from the equation $i = a/(T_c+b)^c$

Where a,b,c are IDF curve parameters based on historical data for a 5 year return period at Windsor Airport.

For a 1:5 year frequency storm, i = 1259/(Tc+8.8)^(0.838),

Qdev = 2.78 * Cdev * i * A

= 2.78 * 0.87 * i * 0.19

= 0.46 * i

= 34.7 L/s

## F. STORM VOLUME CALCULATIONS:

| Duration (min.) t | Intensity* (mm/hr) i | Qd=CiA Qd=0.46*i (L/s) | Storm Volume (cu.m.) V1=Qdev t 60 | Relief Volume** (cu.m.) V2 = Qund t 60 | Storage (cu.m.) V1 - V2 | Max *** |
|---|---|---|---|---|---|---|
| 5 | 139.6 | 64.2 | 19 | 2 | 17 | |
| 10 | 107.7 | 49.5 | 30 | 5 | 25 | |
| 15 | 88.4 | 40.7 | 37 | 7 | 29 | |
| 20 | 75.3 | 34.7 | 42 | 10 | 32 | |
| 25 | 65.9 | 30.3 | 45 | 12 | 33 | |
| 30 | 58.7 | 27.0 | 49 | 14 | 34 | |
| 35 | 53.0 | 24.4 | 51 | 17 | 34 | *** |
| 40 | 48.4 | 22.3 | 53 | 19 | 34 | |
| 45 | 44.6 | 20.5 | 55 | 22 | 34 | |
| 50 | 41.4 | 19.1 | 57 | 24 | 33 | |
| 55 | 38.7 | 17.8 | 59 | 26 | 32 | |
| 60 | 36.3 | 16.7 | 60 | 29 | 31 | |

* Where Intensity, I = 1259/(Tc+8.8)^(0.838), from IDF curves for 1:5 year frequency storm in Windsor, ON

** Qund = 8.0 L/s (Based on flow through a 80 mm dia. ICD orifice with 2.1 m of head.)

***** Maximum volume to be stored = 34 cu.m.**

****** 50% of Maximum volume to be stored = 17 cu.m.**

This property was previously developed and had a runoff coefficient of C=0.65. Stormwater drained to combined sewer unrestricted. Due to the limited capacity of the receiving combined sewer, the City of Windsor requires 50% of the max. volume to be stored based on the flow rate associated with a pre-development coefficient of C=0.20.

## G. STORAGE CALCULATIONS:

Maximum 1:5 year (storage) water surface elev. = 183.40 m

Storage is accomodated exclusively underground within storm sewer pipe and structures.

Storage in storm sewer pipe:

| Pipe dia. (mm) | Length (m) | Volume (cu.m.) |
|---|---|---|
| 150 | 12 | 0.2 |
| 200 | 16 | 0.5 |
| 600 | 45 | 12.7 |

Total storage provided in storm sewer pipe is 13.4 cu.m.

Storage in storm structures:

2 - catch basins with an average depth of 0.80 m

Volume = 2 x 0.6 m x 0.6 m x 0.80 m = 0.60 cu.m.

3 - 1.2 m dia. storm manholes with an average depth of 1.0 m

Volume of storage in manholes = 3 x 1.13 m x 1.0 m = 3.40 cu.m.

Total storage provided in storm structures is 4 cu.m.

The minimum volume of storage provided is 17.4 cu.m. > max. volume to be stored is 17 cu.m.

## H. FLOW RESTRICTOR:

Allowable discharge (Qund) = 8 L/s

1:5 year (storage) water surface elev. = 183.40 m

Assumed 1:5 yr tailwater in municipal combined sewer = 181.30 m

Head (H) = 2.1 m

A Tempest "LMF" inlet control device by Ipex (80 mm ICD orifice) will be installed on the outlet pipe in new storm manhole #1 and is used to restrict the flow for a 1:5 year frequency strom event. See submittal package attached.

The flow through the "LMF" 80 mm dia. ICD orifice with 2.1 m of head is 8 L/s.

# ALEO ASSOCIATES INC., CONSULTING ENGINEERS

325 DEVONSHIRE ROAD SUITE 500, WINDSOR, ONTARIO, CANADA, N8Y 2L3

| | |
|---|---|
| **PROJECT NAME:** | Proposed Multi-Unit Dwelling |
| **PROJECT No.:** | 7837 |
| **PREPARED BY:** | J.P.A. |
| **DATE:** | August 8, 2021 |
| **FILE NAME:** | 7837_1-100yr_2021.08.08.xlsx |

## PROPOSED MULTI-UNIT DWELLING
## 1919, 1925, 1949 DEVONSHIRE COURT, WINDSOR, ON
## STORM WATER MANAGEMENT CALCULATIONS
## FOR 1:100 YEAR FREQUENCY STORM

### A. PRE-DEVELOPED SITE CONDITIONS:

| | | | | |
|---|---|---|---|---|
| Total Proposed Drainage Area = | 1,885 | sq.m. | 0.19 ha. | Cund = 0.20 |

### B. PROPOSED SITE CONDITIONS:

| | | | | |
|---|---|---|---|---|
| Total Proposed Drainage Area = | 1,885 | sq.m. | 0.19 ha. | Cdev |
| Total Proposed Building Roof Area = | 717 | sq.m. | 0.07 ha. | C = 0.95 |
| Total Proposed Asphalt & Concrete Area = | 960 | sq.m. | 0.10 ha. | C = 0.95 |
| Total Proposed Landscape Area = | 208 | sq.m. | 0.02 ha. | C = 0.20 |

### C. RUNOFF COEFFICIENTS:

EXISTING(allowable): Cund = 0.20

PROPOSED:

$$C_{pro.} = \frac{(717\ m^2 \times 0.95) + (960\ m^2 \times 0.95) + (208\ m^2 \times 0.20)}{1{,}885\ m^2}$$

Cpro. = 0.87

### D. PRE-DEVELOPED (ALLOWABLE) DISCHARGE FOR 1:5 YEAR FREQUENCY STORM:

Average Runoff Coefficient, Cund = 0.20

$T_C$ = 20 minutes

Intensity, i = 75.3 mm/hr

Design storm intensity is calculated from the equation $i = a/(T_c+b)^c$

Where a,b,c are IDF curve parameters based on historical data for a 5 year return period at Windsor Airport.

For a 1:5 year frequency storm, i = 1259/(Tc+8.8)^(0.838),

Qund = 2.78 * Cund * i * A

= 2.78 * 0.20 * i * 0.19

= 0.106 * i

= 8.0 L/s

### E. POST-DEVELOPMENT DISCHARGE FOR 1:100 YEAR FREQUENCY STORM:

Average Runoff Coefficient, Cdev = 0.87

$T_C$ = 20 minutes

Intensity, i = 123.5 mm/hr

Design storm intensity is calculated from the equation $i = a/(T_c+b)^c$

Where a,b,c are IDF curve parameters based on historical data for a 100 year return period at Windsor Airport.

For a 1:100 year frequency storm, i = 2375/(Tc+11.0)^(0.861),

Qdev = 2.78 * Cdev * i * A

= 2.78 * 0.87 * i * 0.19

= 0.46 * i

= 56.8 L/s

## F. STORM VOLUME CALCULATIONS:

| Duration (min.) t | Intensity* (mm/hr) i | Qd=CiA Qd=0.46*i (L/s) | Storm Volume (cu.m.) V1=Qdev t 60 | Relief Volume** (cu.m.) V2 = Qund t 60 | Storage (cu.m.) V1 - V2 | Max *** |
|---|---|---|---|---|---|---|
| 5 | 218.2 | 100.4 | 30 | 2 | 28 | |
| 10 | 172.7 | 79.4 | 48 | 5 | 43 | |
| 15 | 143.7 | 66.1 | 59 | 7 | 52 | |
| 20 | 123.5 | 56.8 | 68 | 10 | 59 | |
| 25 | 108.6 | 49.9 | 75 | 12 | 63 | |
| 30 | 97.1 | 44.6 | 80 | 14 | 66 | |
| 35 | 87.9 | 40.4 | 85 | 17 | 68 | |
| 40 | 80.4 | 37.0 | 89 | 19 | 70 | |
| 45 | 74.2 | 34.1 | 92 | 22 | 71 | |
| 50 | 68.9 | 31.7 | 95 | 24 | 71 | |
| 55 | 64.4 | 29.6 | 98 | 26 | 71 | *** |
| 60 | 60.5 | 27.8 | 100 | 29 | 71 | |
| 65 | 57.1 | 26.2 | 102 | 31 | 71 | |
| 70 | 54.0 | 24.8 | 104 | 34 | 71 | |

* Where Intensity, I = 2375/(Tc+7.0)^(0.861), from IDF curves for 1:100 year frequency storm in Windsor, ON

** Qall = 8.0 cfs

***** Maximum volume to be stored = 71 cu.m.**

## G. STORAGE CALCULATIONS:

Maximum 1:100 year (storage) water surface elev. = 183.65 m

Storage is accomodated on the parking lot surface above catch basins, and within storm sewer pipe and structures.

Storage above cb's:

Total storage above cb's to elevation 183.65 m is 66 cu.m. (See Drawing C1.0)

CB#1:

V = (((23.4m x 17.1m x 0.25m)/3))

V = 33 cu.m.

CB#2:

V = (((23.4m x 17.1m x 0.25m)/3))

V = 33 cu.m.

Storage in storm sewer pipe:

| Pipe dia. (mm) | Length (m) | Volume (cu.m.) |
|---|---|---|
| 150 | 12 | 0.2 |
| 200 | 16 | 0.5 |
| 600 | 45 | 12.7 |

Total storage provided in storm sewer pipe is 13.4 cu.m.

Storage in storm structures:

2 - catch basins with an average depth of 0.80 m

Volume = 2 x 0.6 m x 0.6 m x 0.80 m = 0.60 cu.m.

3 - 1.2 m dia. storm manholes with an average depth of 1.0 m

Volume of storage in manholes = 3 x 1.13 m x 1.0 m = 3.40 cu.m.

Total storage provided in storm structures is 4 cu.m.

The minimum volume of storage provided is 83 cu.m. > max. volume to be stored is 71 cu.m.

## H. FLOW RESTRICTOR:

Allowable discharge (Qund) = 8 L/s

1:100 year (storage) water surface elev. = 183.65 m

Assumed 1:100 yr tailwater in municipal combined sewer = 181.55 m

Head (H) = 2.1 m

A Tempest "LMF" inlet control device by Ipex (80 mm ICD orifice) will be installed on the outlet pipe in new storm manhole #1 and is used to restrict the flow for a 1:100 year frequency strom event. See submittal package attached.

The flow through the "LMF" 80 mm dia. ICD orifice with 2.1 m of head is 8 L/s.

# TEMPEST Product Submittal Package


**Date: August 16, 2021**

**Customer: Aleo Associates Inc.**

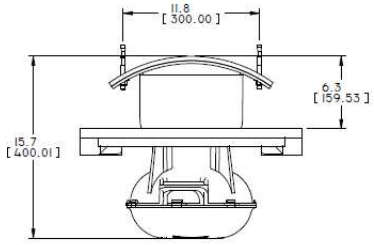
**Contact: John-Paul Aleo**

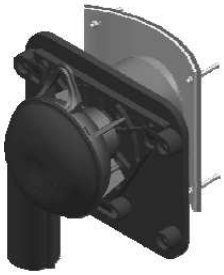
**Location: Windsor**

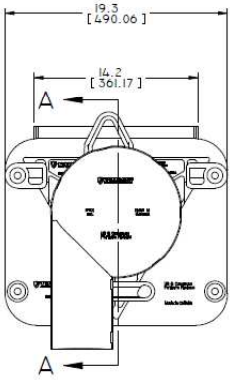
**Project Name: Devonshire Court**

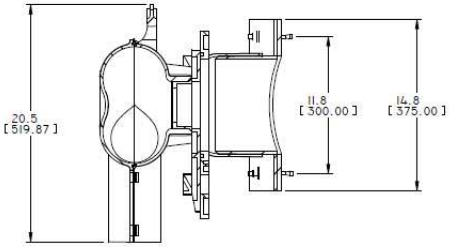
IPEX

# Tempest LMF ICD Rd Shop Drawing





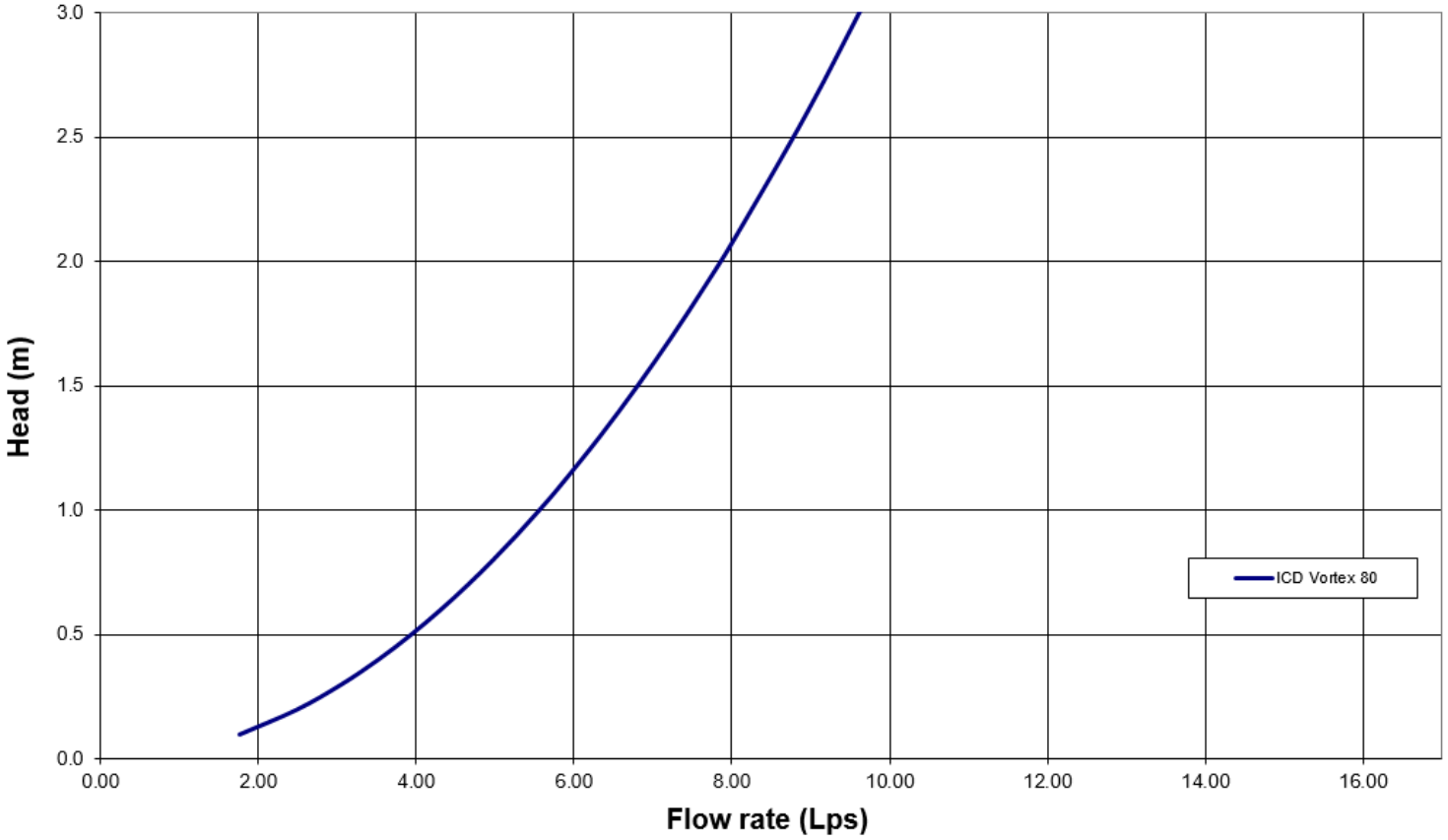

SECTION A-A

| | | | | | |
|---|---|---|---|---|---|
| TOLERANCES: | IPEX TECHNOLOGIES INC. | | | | |
| | PROJECTION | UNITS: in (mm) | TITLE: LMF ROUND CB ASSEMBLY | | |
| | DRAWN BY: H. M-MARTIN | DATE: 2011-07-26 | SIZE: B | SCALE: 1/8 | SHEET: 1 OF 1 |
| | VERIFIED BY: | DATE: 2011-07-26 | DRAWING NUMBER: SGM74_FA002R03 | | REV: 3 |

IPEX

# Tempest LMF ICD Flow Curve

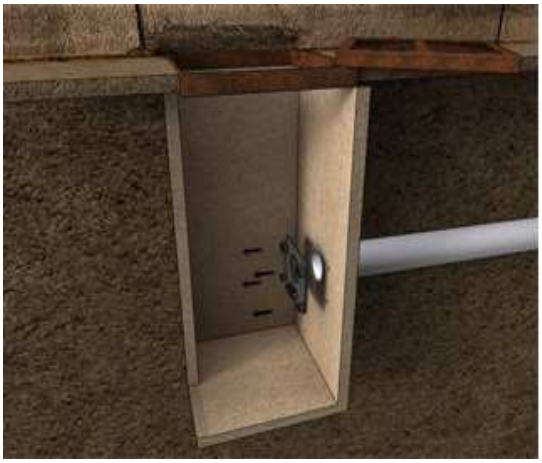
**Flow:** **8 L/s**
**Head:** **3 m**
**100yr storm**

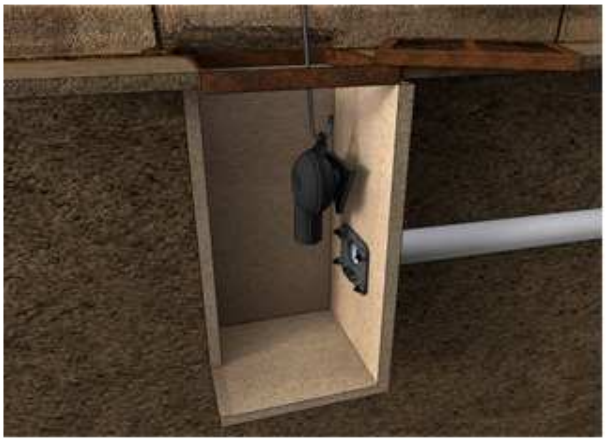



IPEX

## Square CB Installation Notes:

1. Materials and tooling verification:
   - Tooling: impact drill, 3/8'' concrete bit, torque wrench for 9/16''nut, hand hammer, level, and marker.
   - Material: (4) concrete anchor 3/8x3-1/2, (4) washers, (4) nuts
2. Use the mounting wall plate to locate and mark the hole (4) pattern on the catch basin wall. You should use a level to ensure that the plate is at the horizontal.
3. Use an impact drill with a 3/8'' concrete bit to make the four holes at a minimum of 1-1/2'' depth up to 2-1/2''. Clean the concrete dust from the holes.
4. Install the anchors (4) in the holes by using a hammer. Put the nuts on the top of the anchors to protect the threads when you will hit the anchors with the hammer. Remove the nuts on the ends of the anchors
5. Install the wall mounting plate on the anchors and screw the nut in place with a maximum torque of 40 N.m (30 lbf-ft). There should be no gap between the wall mounting plate and the catch basin wall.
6. From ground above using a reach bar, lower the device by hooking the end of the reach bar to the handle of the LMF device. Align the triangular plate portion into the mounting wall plate. Push down the device to be sure it has centered in to the wall mounting plate and has created a seal.



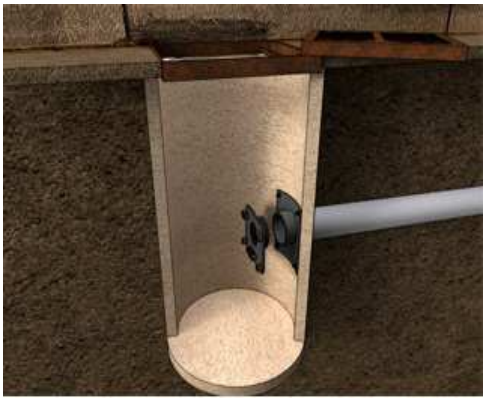


IPEX

## Round CB Installation Notes: (Refer to square install notes above for steps 1 , 3, & 4)

2. Use spigot catch basin wall plate to locate and mark the hole (4) pattern on the catch basin wall. You should use a level to ensure that the plate is at the horizontal.
5. Install the CB spigot wall plate on the anchors and screw the 4 nuts in place with a maximum torque of 40 N.m (30 lb-ft). There should be no gap between the CB spigot wall plate and the catch basin wall.
6. Apply solvent cement on the hub of the universal mounting plate and the spigot of the spigot CB wall plate. Slide the hub over the spigot. Make sure the universal mounting plate is at the horizontal and its hub is completely inserted onto the spigot. Normally, the corners of the universal mounting plate hub adapter should touch the catch basin wall.
7. From ground above using a reach bar, lower the ICD device by hooking the end of the reach bar to the handle of the ICD device. Align the triangular plate portion into the mounting wall plate. Push down the device to be sure it has centered into the mounting plate and has created a seal.






**CAUTION/WARNING/DISCLAIM:**

- Verify that the inlet(s) pipe(s) is not protruding into the catch basin. If it is, cut it back so that the inlet pipe is flush with the catch basin wall.
- Any required cement in the installation must be approved for PVC.
- The solvent cement should not be used below 0°C (32°F) or in a high humidity environment. Please refer to the IPEX solvent cement guide to confirm required curing times or attend the IPEX **Online Solvent Cement Training Course**.
- Call your IPEX representative for more information or if you have any questions about our products.

IPEX

# IPEX TEMPEST Inlet Control Devices Technical Specification

## General

Inlet control devices (ICD's) are designed to provide flow control at a specified rate for a given water head level and also provide odour and floatable control where specified. All ICD's will be IPEX Tempest or approved equal.

All devices shall be removable from a universal mounting plate. An operator from street level using only a T-bar with a hook will be able to retrieve the device while leaving the universal mounting plate secured to the catch basin wall face. The removal of the TEMPEST devices listed above must not require any unbolting or special manipulation or any special tools.

High Flow (HF) Sump devices will consist of a removable threaded cap which can be accessible from street level with out entry into the catchbasin (CB). The removal of the threaded cap shall not require any special tools other than the operator's hand.

ICD's must have no moving parts.

## Materials

ICD's are to be manufactured from Polyvinyl Chloride (PVC) or Polyurethane material, designed to be durable enough to withstand multiple freeze-thaw cycles and exposure to harsh elements.

The inner ring seal will be manufactured using a Buna or Nitrile material with hardness between Duro 50 and Duro 70.

The wall seal is to be comprised of a 3/8" thick Neoprene Closed Cell Sponge gasket which is attached to the back of the wall plate.

All hardware will be made from 304 stainless steel.

## Dimensioning

The Low Medium Flow (LMF), High Flow (HF) and the High Flow (HF) Sump shall allow for a minimum outlet pipe diameter of 200mm with a 600mm deep Catch Basin sump.

## Installation

Contractor shall be responsible for securing, supporting and connecting the ICD's to the existing influent pipe and catchbasin/manhole structure as specified and designed by the Engineer.