2023

Industry Bulletin

Stormwater Management Facilities (SWMFs) and Miscellaneous Items

Preface:

This Industry Bulletin summarizes changes and clarifications to the 2011 Stormwater Management and Design Manual (SWMDM). The following changes will be effective for all new submissions as of January 1, 2024, and excludes Stormwater Management Facilities (SWMFs) covered by existing accepted SMDPs, Outline Plans, or Pond Reports. SWMFs covered by SMDPs, Outline Plans, or Pond Reports which have already been submitted and reviewed between January 1, 2021 and December 31, 2023 are excluded.

1 SWMFs – General Requirements

As per the December 2013 Industry Bulletin '[Amendments to the 2011 Stormwater Management & Design Manual]', item 2, Sediment Forebays were to be replaced with large Off-Line Custom Oil Grit Separators (OGSs) to address the excessive sedimentation of submerged inlet pipes. Due to continued maintenance challenges and resulting escalating costs of construction and operation, the replacement of the Custom OGS with a Sediment Forebay as per the requirements of the 2011 Stormwater Management & Design Manual (SWMDM), and additional requirements stated herein, is the preferred approach. The OGS may be eliminated in lieu of a forebay for all inlets to a Stormwater Management Facilities (SWMF) forebay that meet the criteria provided below.

Due to operational requirements to manage and mitigate algae growth, hydrogen-sulfide/methane, and invasive fish populations, partial or full drain down of wet facilities is anticipated to be required on a repeated basis. Where feasible, all new facilities will therefore require permanent infrastructure to allow for gravity drain down of all wet SWMFs. An optional bypass of the entire SWMF (i.e., from upstream of the forebay to the downstream side of the Outlet Control Structure) with a size of 450 mm diameter (or greater) is preferred.

A skimming manhole upstream of the SWMF per the 2011 SWMDM is not required. Additional guidance on measures for spill control, retention of floatables and floating hydrocarbons will be instituted with the forthcoming update to the SWMDM.

A sample pond schematic illustrating the preferred arrangement is provided in Figure 1. Additional improvements to the standard SWMF configuration to optimize the operation are anticipated with future updates to the SWMDM.

1.1 Pond Inlets

Where feasible, unsubmerged inlets to SWMFs are preferred. An OGS is not required upstream of an unsubmerged inlet that discharges to a forebay. An OGS is required upstream of some submerged inlets, see below. All inlets must be either unsubmerged or fully submerged, partial submergence at the inlet is not acceptable. A forebay will not be required if an OGS is provided.

1.1.1 Unsubmerged Inlets

An unsubmerged inlet pipe must be:

a) a minimum of 900 mm in diameter or height and have an invert above the (U)NWL and an obvert a minimum of 1.2 m above the (U)NWL,
b) equipped with a headwall or flared end, trash rack/grating, and anchoring (if required), and
c) provided with energy dissipation and erosion and scour protection (full calculations and associated backup shall be provided with the Pond Report). Additional guidance with respect to the required energy dissipation and protection measures will be part of the forthcoming update of the SWMDM.

1.1.2 Submerged Inlets

Submerged inlets of greater than 600 mm and less than 1800 mm nominal diameter (or height) require an OGS upstream.

An OGS is not required upstream of submerged inlets less than 600 mm or greater than or equal to 1800mm nominal diameter (or height), provided that:

a) the obvert of the pipe is fully submerged below the (L)NWL (of the forebay) by a minimum of 800 mm at the SWMF inlet.
b) the total combined length of submergence/partial submergence does not exceed 60 m.
c) for pipes 1800 mm diameter/height or greater, additional manhole(s) shall be provided, generally at a maximum spacing of 40 m along the length of the submerged pipes. It is intended that the first manhole shall be placed on the top of bank outside of the slope of the pond and the next manhole at the earliest opportunity in the roadway. Maximum Access frame and covers (Detail 1B of the Standard Specifications for Sewer Construction (SSSC)) shall be provided. The manholes shall be provided with Combination Unit access.

1.1.3 Trash Racks/Safety Grates

The trash rack/safety grating must be:

a) installed on the headwall or flared end; in pipe grating is not acceptable,
b) removable for maintenance, and
c) in conformance with all the requirements of the Stormwater Outfall Grating Standard Specifications (Industry Bulletin, June 2018).

1.1.4 Submerged/Partially Submerged Pipes upstream of Submerged Inlets – Hydraulic Grade Line (HGL) Analysis

Standing water in service connections shall not be permitted (i.e., with a service connection downstream invert below the (U)NWL).

The Hydraulic Grade Line (HGL) analysis of all pipes proposed to be submerged or partially submerged (regardless of whether an OGS is provided) must assume the pipe is filled to 1/3 of their diameter or height with sediment. Based on a flow rate corresponding to a Unit Area Release Rate (UARR) of 45 L/s/ha, fully submerged or partially submerged pipes must achieve a minimum velocity of 0.9 m/s without accounting for sediment infill.

(Design Flow Rate at 45 L/s/ha) / (Full Cross-Sectional Area) > 0.9 m/s

Equation 1 – Scour Velocity Check

1.2 Forebays

Forebays shall be designed in accordance with the 2011 SWMDM requirements, and the additional requirements as stated herein:

a) The forebay berm shall have an impermeable core, extending to the crest elevation.
b) A piped connection between the forebay and the main cell(s) shall not be included.

c) The forebay berm shall be geotechnically stable and properly ballasted under all reasonably foreseeable conditions including a full rapid drawdown of the forebay.
d) For SWMFs with an irrigation zone (subject to water withdrawal), the top of the forebay berm shall be 0.15 m below the Lower NWL.
e) The top and flanks of the forebay berm shall be protected from erosion by an Articulated Concrete Mat (ACM) with 25-50% open area.

For SWMFs not subject to water withdrawal, the ACM extents may be reduced where:

f) A notch in the forebay berm 0.15 m below the NWL of sufficient width to pass 45 L/s/ha at a maximum depth of 0.3m is provided.
g) The notch in the forebay berm is protected from erosion by an Articulated Concrete Mat with 25-50% open area.
h) The remainder of the berm is 0.3 m above the NWL and vegetated with appropriate inundation tolerant species.

1.3 Optional SWMF Bypass

Permanent infrastructure may be provided to allow for full isolation and bypass of the SWMF, see Figure 1. This shall include, but is not necessarily limited to, a gravity flow bypass, manholes and sluice/slide gates. The pipe size for the bypass shall be 450 mm diameter (or greater). The bypass shall be located in a manhole with a 600 mm sump upstream of the SWMF and any pipes with standing water.

The Pond Report and subsequent Operations and Maintenance Manual shall include instructions to limit the flow to the downstream system to the permissible pond discharge rate (e.g., appropriate direction on throttling the sluice/slide gate).

1.4 SWMF Drain Down

Where feasible, the drain gate in the weir wall in the Outlet Control Structure (OCS) and the invert elevation of the outlet pipe from the OCS shall allow for gravity drain down of the main cell to within 0.3 m of the bottom of the main cell(s) of the SWMF.

1.5 Outlet Control Structure

Outlet Control Structures (OCSs) shall be custom designed for each pond and shall meet the minimum requirements and be equipped with all appurtenances/requirements as identified in Drawing 62 (452.2005.001) of the City of Calgary (SSSC). The hydraulic configuration of the outlet may vary, refer to Section 1.4.

Access to the OCS must be provided via a Public Utility Lot (PUL), approval of alternate land use designation is at the sole discretion of the City. The proposed land use shall be delineated in both the Outline Plan (OP) and the Staged Master Drainage Plan (SMDP) submissions.

The access to, and rim elevation of, the OCS must exceed the freeboard elevation of the pond as defined in Section 6.1.3 of the 2011 SWMDM and herein.

1.6 The Pond Monitoring System Cabinet

The Pond Monitoring system cabinet shall meet the following requirements:

a) It shall be made of 12 gauge, 316L Stainless Steel with a #4 finish.
b) All penetrations shall conform to NEMA 4X enclosure requirements.
c) It shall be insulated with 12.7 mm foil backed insulation.
d) All hardware not fully contained within the cabinet shall be 316 or 316L Stainless Steel.
e) A UV resistant Lamacoid label as per Figure 2 shall be provided.

Permanent solar powered monitoring systems will generally not be accepted.

1.7 Retaining Walls

1.7.1 Public Retaining Walls

Land requirements for SWMFs must not rely on retaining walls to reduce the public footprint of any SWMF. Land requirements must be determined based on slopes as outlined in the 2011 SWMDM, which shall be demonstrated as part of the OP and SMDP submissions.

Minor retaining walls for landscaping purposes, per the below, may be included but sufficient land shall be dedicated to ensure they can be removed without requiring effective slopes in excess of the SWMDM requirements. The design must demonstrate the wall can be removed and returned to a slope without impacting other assets.

If proposed, minor retaining walls for landscaping purposes with a maximum 1.2 m total height may be proposed, at the latest, in the Pond Construction Drawings. The total height is defined as the overall stratified/tiered height of the wall for which the effective slope exceeds 3H:1V.

Refer to the Design Guidelines for Subdivision Servicing (DGSS) for additional submission requirements related to minor retaining walls. All design submissions listed in the DGSS shall be provided with the Pond Construction Drawings, irrespective of the proposed wall height (for greater clarity, walls < 1.2 m still require the submissions and processes identified in the DGSS).

1.7.2 Private Retaining Walls Adjacent to SWMFs

Where retaining walls are proposed within adjacent private lands, access to these retaining walls for inspection and maintenance activities shall not encroach on, or require access to the public footprint of, the SWMF. Any adjacent private retaining walls and provisions for their access shall be identified on the OP, SMDP, Pond Report, Pond Construction Drawing and Subdivision Construction Drawing submissions.

1.8 1:500-Year SWMF Storage Scenario

As per Section 6.1.3 of the SWMDM, SWMFs shall be designed with a continuous overland emergency escape route. As per Section 6.1.3 viii), only if all other options listed in the SWMDM have been demonstrated and documented to be exhausted, will the ‘de facto’ use of the downstream piped system, without provision for an additional downstream capacity of a minimum of 1.0 m^3/s, as the primary escape route be considered, resulting in a 1:500-year pond scenario.

The applicant shall clearly demonstrate and document why a 1:500-year pond is unavoidable as soon as possible. The City recommends the Applicant contact the Coordinator of Development Engineering - Utility Specialists a minimum of six months in advance, when possible, of SMDP or Outline Plan submission where a 1:500-year SWMF is anticipated to be required. The City will provide a response within four weeks.

In this case the following conditions shall be met:

a) The governing 1:500-year event water surface elevation is defined by the greater of the resultant volumes of the:
    - 1:500-year, 24-hour, single event, or
    - Long Term Continuous Simulation (LTCS) and Frequency Analysis (FA).
b) No emergency escape should be allowed as part of the LTCS (i.e., the weir/overland spill may need to be artificially raised in the model to ensure the required volumes are considered in the FA).
c) Typically, and at a minimum, the weir in the OCS will be set to the water surface elevation corresponding to the 1:500-year event.

For greater clarity, the High Water Level (HWL) is defined as the lowest elevation at which the SWMF spills, be it via the weir in the OCS or the overland spillway.

1.8.1 Hydraulic Grade Line (HGL) Analysis

An HGL analysis to determine the upstream Lowest Top of Footing (LTF) for any given lot shall be provided based on the greater of a) or b):

a) The elevation of the HWL (greater than or equal to the governing 1:500-year event) plus 0.5 m.
b) A steady state analysis of the upstream storms sewer system using the governing 1:100-year water surface elevation in the SWMF and a peak flow rate corresponding to a 1:100-year event plus the greater of:
    - 0.3 m freeboard, or
    - the difference between the 1:100-year water surface elevation in the SWMF and the HWL.

1.8.2 Pond Report and CD Requirements

All ponds have an overland spill location even if continuous conveyance to a safe outlet is not provided. In these case spill over the weir in the OCS is the primary emergency escape. Regardless, the potential for a secondary (‘de facto’) overland spill location must be evaluated.

a) The elevations around the perimeter of the pond (i.e., following the property line) shall be identified in the Pond Report and Construction Drawings by demarking the location and elevation of the lowest area(s) surrounding the pond, where the water would first spill overland. Where feasible this should be directed to adjacent public lands or an Overland Drainage Right of Way.
b) The elevation of all adjacent private property and the overland spill location shall be a minimum of 0.5 m above the HWL in the SWMF.

c) The Pond Report and Pond Construction Drawings shall provide figure(s) delineating the areal extents of the 1:500-year freeboard elevation (1:500-year Water Surface Elevation plus 0.5 m).

1.9 Emergency Spillway

The emergency spillway requirements for any SWMF classified as having a Regulated Dam have been revised, refer to Section 1.11.

1.10 SWMF Signage

SWMF signage as per the latest edition of the SSSC shall be provided at all public entrances to the pond parcel, and at a minimum spacing of 200 m around the entire pond.

1.11 Dam and Canal Safety Regulations

The Government of Alberta (the Province) regulates Dams and Canals in Alberta under the *Water Act*. Dam and Canal Safety is further covered under the *Water (Ministerial) Regulation (AR 205/1998 with amendments up to and including AR 253/2018) Office Consolidation* (current as of December 12, 2018) and references the *Alberta Dam and Canal Safety Directive* published on December 11, 2018 (ISBN: 978-1-4601-4157-1, referred to herein as the "Directive"). The changes are summarized as follows:

a) Effective as of December 2018, the Regulatory Framework for Dam Safety in Alberta includes:

- The Water Act
- The Water (Ministerial) Regulation
- The Water (Offences and Penalties) Regulations
- The Dam and Canal Safety Directive, 2018
- The various Guidelines seen within the Regulatory Framework including Emergency Management, OMS and Small Dam Inspection and Maintenance guidelines.

The following Canadian Dam Association's (CDA) publications are frequently used when additional information and technical guidelines are required:

- Dam Safety Guidelines 2007 (2013 Edition), herein after referred to as "CDA Guidelines"
- CDA Dam Safety Technical Bulletins 2007
- CDA Technical Bulletin Dam Safety Reviews 2016
- CDA Guidelines for Public Safety Around Dams with Technical Bulletins 2011.

The applicant is responsible for ensuring that the latest versions of the publications and guidelines are being referenced and followed.

b) The definition of a Dam has been broadened to include risk-based criteria. That is, all Dams with a Consequence Classification of Significant or greater are now Regulated Dams. This is in addition to specific volume or height requirements.

c) The Dam Owner must propose a Consequence Classification prior to obtaining an authorization to construct a dam. The Province has the authority to accept or request additional information justifying the proposed Consequence Classification.

d) A Consequence Classification must be proposed by a Qualified Professional, typically the 'designer-of-record' as defined in the Directive. The 'designer-of-record' will be acting on behalf of the Applicant in the case of facilities to be handed over to the City of Calgary.

Dams should be avoided wherever possible. If unavoidable, the proposed Dam as well as the surrounding subdivision development must be configured, designed and constructed to limit the potential consequences of a failure. The applicant is required to clearly demonstrate and document why the proposed Regulated Dam is unavoidable.

The applicant shall clearly demonstrate and document why the Regulated Dam is unavoidable as soon as possible. The City recommends the Applicant contact the Coordinator of Development Engineering – Utility Specialists a minimum of six months in advance of SMDP or Outline Plan submission where a Regulated Dam is anticipated to be required. The City will provide a response within four weeks.

1.11.1 City of Calgary Dam Safety Requirements

In accordance with the Directive the City requires the following for proposed Regulated Dams to be turned over to the City:

a) All correspondence related to Dams prior to FAC shall be directed to WA-ResourcesDevelopmentApprovals@calgary.ca with copy to Narayan.Pokhrel@calgary.ca.
b) Submissions to the Province will be made by the City on behalf of the Applicant.
c) A Qualified Professional acting on behalf of the Applicant must propose a Consequence Class for all structures meeting the definition of a Dam.
d) The proposed Consequence Classification requires City (through the City's 'engineer-of-record') review and acceptance prior to the City's submission for Provincial acceptance.
e) The City may, at its sole discretion, require a Consequence Classification be recommended by the Applicant in accordance with the requirements of the Directive.
f) The assessment(s) supporting the proposed Consequence Classification requires, and is/are not necessarily limited to, the content/submissions listed in Part 3 and Schedule 1 of the Directive.

1.11.2 Dam Safety and the Development Process

The requirements will be applied at the following junctures in the development process:

a) The Master Drainage Plan (MDP) must analyze all proposed or potential ponds, embankments etc. to identify potential Dams, Regulated Dams, High Consequence or greater Dams, and concept level dam breach routing.
b) Where an MDP is not required or an existing MDP does not include the above information the City recommends the Applicant contact the Coordinator of Development Engineering - Utility Specialists as soon as possible, preferably a minimum of six months in advance of submission of the OP and SMDP. The City will respond within four weeks.
c) All regulated Dams require City acceptance of the proposed Consequence Classification prior to City acceptance of the SMDP. The risk of land-use redesignation as a result of Provincial review(s) is solely borne by the applicant.

d) All supporting documentation and deliverables required as per Section 2.1 of the Directive must be submitted to the City for review, acceptance, and submission to the Province at the time of application for EPEA registration and no later than with the Pond Report.
e) It is the responsibility of the Applicant to meet all requirements of the Directive conditions of approval, and timelines imposed by the Province on the Dam Owner following Provincial authorization to construct, and required to be completed prior to FAC.
f) The Applicant shall bear all costs and is obligated to request City review and acceptance in advance of all submissions to the Province prior to issuance of FAC. This includes, but is not necessarily limited to: Construction Deviations, Signage, Construction Completion Report, Annual Performance Reviews, all Assessments and Evaluations, maintaining Deficiency and Non-Conformance Lists, and any updates to documents listed in Section 2.1 of the Directive.
g) The Applicant is responsible for coordination with the City as required where City input and acceptance is required.
h) The Applicant is responsible for meeting all timelines set out in the Directive. All submissions for City review prior to submission to the Province must be submitted a minimum of 30 days in advance of the Provincially mandated deadline. In the case of mandated periods of 30 days or less, half of the prescribed notice period shall be provided for City review.
i) If extenuating circumstances related to the protection of public safety or the environment require that the Applicant contact the Province directly the correspondence shall be copied to the City.

1.11.3 Emergency Spillway Requirements

Further to the CDA Guidelines, the emergency spillway capacity for Dams shall safely pass the routed Inflow Design Flood (IDF) based on the Dam Consequence Classification. The required capacity is as follows:

Consequence Classification	Design Event
Low	1:100-year flood
Significant	1/3rd to 2/3rd between 1:100-year and 1:1000-year flood, at the direction of the City.
High	1/3rd between 1:1000-yr flood and Probable Maximum Flood (PMF)
Very High	2/3rd between 1:1000-yr flood and PMF
Extreme	PMF

In no case shall any spillway and emergency overland escape be designed for a steady flow of less than 1 m^3/s.

For Consequence Classifications of Significant and above this requires determination of the corresponding total hydrograph volume. Alternatively, it is acceptable to consider the corresponding peak design flow rate upstream of the pond as this is conservative, though this approach will result in much larger spillways.

Further detailed guidance is provided in the CDA Dam Safety Technical Bulletin: Hydrotechnical Considerations for Dam Safety (2007).

1.12 Maintenance and Access

Combination Unit vehicle access shall be demonstrated in the OP and SMDP submissions (and carried forward through all subsequent submissions) and extend to:

a) the forebay at the elevation of the crest of the forebay berm for all wet facilities (no turnaround required), and
b) the bottom, including all structures and cleanouts, of all dry facilities.

2 Oil Grit Separators

The following requirements pertaining to Oil Grit Separators (OGSs) supplement the guidance provided in Section 8.4.3 of the 2011 SWMDM and Checklist 5.

2.1 Pre-Approved OGSs shall:

a) consist of a single manhole and sediment chamber not exceeding 3.6 m in nominal inside diameter or, width and length,
b) have been evaluated under the Environmental Technology Verification (ETV) Canada protocols,
c) have been approved by the City of Calgary in the latest edition of the SSSC (see 402.01.08), and,
d) all OGSs must be classified as Sedimentation Manufactured Treatment Devices as per CETV 2022-02-0001.

All submissions require demonstration of the following:

e) Based on the ETV evaluation results the OGS shall:
   - remove 85% TSS for particles ≥ 50 µm over the period of record,
   - remove 50% TSS for the full Particle Size Distribution (refer to Table 1) over the period of record,
   - cumulatively retain > 85% per the Light Liquid Re-entrainment Simulation Test. If the criterion is not met the OGS supplier may request an approval from the City and propose appropriate design parameters (e.g., maximum surface loading rate (SLR) and/or bypass provisions as applicable) to ensure the performance criterion is met.
   - The horizonal surface loading rate (SLR) to the unit in the 100-year return period event must be limited to the ETV tested flow rate for which the sediment scour and re-suspension test effluent concentration does not exceed 30 mg/L. To achieve this an external bypass or a larger sized unit may be required. Directing flows larger than the ETV tested flow rates to the unit requires prior approval by the City.
f) Any appurtenances that require removal to achieve access shall be identified on the drawings. It shall be possible to remove any such appurtenance via the access covers without entering the structure.
g) If not serviced by a separate access road, demonstrate that access to public Pre-Approved OGSs is within 4 m of a roadway and demonstrate that the designated access allows for parking of the Combination Unit without unduly impacting the flow of traffic, to the satisfaction of the City of Calgary Roads Operations.

2.2 Custom OGSs

Custom OGS units require a custom site-specific design and shall meet the following criteria:

a) All Custom OGSs shall be off-line.
b) A minimum storage chamber height of 2.4 m.
c) A maximum annual sediment accumulation depth of 0.8 m.
d) A maximum depth, from the rim to the invert of the storage chamber, of 6 m.
e) Person access to the bottom of the Custom OGS shall be provided at a maximum spacing of 6 m on center using the Maximum Access Frame and Cover (SSSC, Detail 1B, 452.2001.001).
f) Individual person access shall be provided to each sediment storage area (e.g., between weirs, benched sumps).
g) A staging area as per Figure 3 shall be provided. The road surface shall meet the requirements of Section 4.2.4 or approved equivalent.
h) Permanent isolation gates are required for Custom OGSs, such that it can be isolated from inflows during maintenance activities:
    - A gate shall be installed in the upstream diversion manhole adjacent to the mainline storm sewer, to isolate the inlet pipe to the Custom OGS.
    - A gate shall be installed on the downstream tie in from the Custom OGS to prevent backflow from the mainline storm sewer during maintenance. Alternatively, provide a hydraulic analysis demonstrating that the 1:2-year, 24-hour return period event (considering the peak flow and potential backwater conditions) can be bypassed with a maximum Hydraulic Grade Line elevation that is 0.3 m below the invert elevation of the outlet.

2.3 In Line vs. Off Line

The diversion structure and high flow diversion piping for off-line OGSs shall be provided a separate line assignment from the sediment storage vault and associated accesses.

2.4 Hydrologic, Hydraulic, and Water Quality Design

The invert elevation of the OGS inlet(s) and outlet shall be above the NWL and/or the UNWL of any downstream pond.

The OGS shall not create permanent standing water in the upstream pipe(s).

The hydraulic analysis and/or model setup shall account for all flow splits and energy losses imposed by the OGS system and associated infrastructure/appurtenances. It is the responsibility of the Engineer(s) authenticating the Pond Report, Stormwater Management Reports and Construction Drawings to include this.

The height of the weir in the upstream diversion manhole shall be determined as part of the hydraulic analysis such that the flow rate corresponding to (i) the peak runoff from the Water Quality Design Event at a 5-minute time step (SWMDM Section 3.2.4.4) and (ii) the rate at which a minimum of 90% of the total volume over the 1960-2014 continuous simulation period at a 1-hour time step (whichever is higher) is directed into the OGS sedimentation chamber, without bypassing the sedimentation chamber. This flow rate shall be defined as the Treatment Flow Rate.

Custom OGS chambers shall not exceed a horizontal SLR (sedimentation chamber surface area) of:

- 8.3 L/s/m^2 at the Treatment Flow Rate.
- 23.3 L/s/m^2 during the 1:100-year, 24 hour event.

The Particle Size Distribution (PSD) shown in Table 1 must be used in the analysis (The City of Calgary PSD is no longer acceptable for OGS design). Results shall be reported for both the full PSD and for the greater than 50 micron fraction.

Demonstrate a minimum of one year of sediment storage capacity is provided.

2.5 Maintenance and Access

Access to a public OGS must be designated Road Right of Way or PUL, approval of alternate land use designation is at the sole discretion of the City. The proposed land use shall be delineated in the OP, SMDP, Pond Report, SWMR and CD submissions.

To facilitate maintenance, any OGS joints must be watertight where located below:

a) the inlet obvert plus 0.3 m,
b) the groundwater table as defined in 3.3.6.8 of the 2011 SWMDM, and/or
c) an adjacent SWMF NWL or Upper NWL.

In addition to minimum gasket and parging requirements, joints must be sealed with one of the products below. If reliable groundwater elevations cannot be established, or seepage is observed post construction, all joints will require the additional sealing measures.

Acceptable sealing methods include:

- DryVault System by Mountain Waterproofing.
- Bituthene 3000.

Manhole steps shall be provided to within a maximum of 0.4 m of the base/benching of the sediment chamber for all Custom OGSs.

2.6 Submission Requirements

a) Shop drawings for all OGSs shall be provided with the Construction Drawing submission.
b) Approved equals require City review and acceptance through the Construction Drawing Minor Revision process.
c) Final shop drawings shall be submitted as part of the Construction Drawing CCC submission.
d) All Construction Drawings and CCC Drawings of OGS units shall include the following completed table:

OGS Information	
Manufacturer	
Model (type)	
Model no.	
Total no. of access openings.	
Oil storage capacity (L)	
Total sediment storage capacity (m^3)	
Sediment storage area dimensions (W x L x H, m) or diameter and depth (Ø x H, m)	
Rim elevation (m)	
Sediment storage chamber invert (m)	
Depth from Rim to Permanent Water Level (m)	
Total depth from Rim to Invert (m)	
Design details:	
Weir Elevation (m)	
Treatment (Water Quality) Flow (L/s)	
Treatment (Water Quality) Loading Rate ($L/s/m^2$)	
100-year Return Period Flow (L/s)	
100-year Return Period Loading Rate ($L/s/m^2$)	
Drainage area (ha)	
Drainage area imperviousness (%)	
Calculated TSS Removal (>50 µm)	
Calculated TSS Removal (Full PSD)	
Annual TSS Loading (m^3 @ 1230 kg/m^3, assumed density of captured sediment)	
Design Maintenance Frequency	

3 Sluice/Slide Gates

Sluice/slide gates shall meet the following criteria:

a) All gates shall be the sluice or slide type and shall only be installed in manholes (i.e., buried gate valves are not acceptable).
b) The gate, frame and all associated appurtenances are to be made of 316L Stainless Steel (SS).
c) The gate operating parts (stem, yoke, etc.) shall be designed to withstand a minimum of 150 ft-lb stall torque.
d) Greasing nipples shall allow lubrication of the gear box from the surface (i.e., without requiring manhole entry).
e) The frame and cover of the manholes in which the gates are installed shall be of sufficient size to remove the entire gate structure unless the gate is larger than the 'Maximum Access Frame and Cover' shown in the SSSC.

4 Access Roads

Maintenance vehicle access to SWMFs is required as per the 2011 SWMDM and as noted herein. The 1-tonne truck is herein referred to as the Light Truck. The 23-tonne vacuum truck is replaced with the 26-tonne Combination Unit (vacuum and power flusher) truck, herein referred to as the Combination Unit. Details of the requirements are provided below.

4.1 General Requirements

All OP and SMDP submissions must include the following information on authenticated engineering drawings:

a) A Swept Path analysis.
b) Longitudinal profiles.
c) Access location(s) and control(s).
d) Proposed road surfacing and structure.

The Pond Report and CDs must include the above and all applicable construction details. The geometric design requirements for the Combination Unit are shown in Figure 4.

The following structures require access by the Combination Unit:

- Outlet Control Structure (OCS).
- Oil Grit Separator (OGS).
- Flow Control, Flow Diversion or Weir Manholes.
- Pond Inlet Manholes.
- Skimming Manholes.
- Subdrain Cleanouts.
- Equalization Pipes (between SWMF cells).

Public access shall be restricted using an access gate or removable bollard(s). The placement of the access controls shall allow for the Combination Unit to be parked without obstructing traffic while the access controls are opened or removed while accessing the facility. Bollards shall not be placed in the wheel path.

The access to all structures within the overall pond footprint is to be within 4 m of the access road, above the Freeboard elevation and within the PUL boundaries and/or pond access Right of Way(s), approval of alternate land use designation is at the sole discretion of the City. Use of a Public Road for access to structures within the overall pond footprint may be permitted. Consideration will be given in situations where the Public Road is located within 5 m of the property line.

4.2 Emergency Vehicle and Light Truck Access

All access roads shall meet the requirements for Emergency Vehicles and Light Trucks.

4.2.1 Land use and layout

The access road shall be located:

a) within a PUL, Road Right of Way or Access Right of Way, (approval of alternate land use designation is at the sole discretion of the City) and
b) within 2 m to 10 m of the SWMF High Water Level (HWL).

4.2.2 Geometry

The access road geometry shall:

a) have a minimum width of 3 m.
b) provide (a) setback(s) of 0.5 m from the edge of the access road when the access road is adjacent to the top of slopes steeper than or equal to 4:1 (H:V) and from the edge of the access road to any vertical obstacles.
c) provide 4 m vertical clearance from all overhead obstacles.
d) provide a minimum 15 m tangent between each horizontal curve unless the swept path analysis demonstrates a shorter distance can be accommodated.
e) accommodate a swept path analysis for the TAC I-BUS or using the template on Figure 4.
f) have a maximum allowable grade of 8%.
g) join the public roadway at a 75-105 degree angle with adequate sight distance as per the requirements of the DGSS, if not clearly demonstrated and/or feasible then additional information, analysis and/or signage may be required.
h) have adequate slope to ensure positive drainage at all locations.
i) have a minimum 2% crossfall for asphalt and concrete surfacing.
j) have a minimum 3% crossfall for gravel surfacing.
k) The maximum allowable back up length (without providing a turnaround) is 40 m where the access connects to a local or a collector road. Where connected to higher class roads a turnaround or secondary access must be provided to ensure backup onto or from the public road is not required.

4.2.3 Road Subgrade

a) The subgrade shall be located above the SWMF HWL (except where providing direct access to the forebay or the base of a dry SWMF).
b) The subgrade soils shall have a minimum soaked California Bearing Ratio (CBR) value of 3%.
c) The subgrade shall be Proof Roll tested, per the City of Calgary Standard Specifications for Roads Construction, (SSRC) Section 302.06.02, and be approved by the Geotechnical Engineer prior to placement of the granular base(s).

d) If weaker subgrade conditions exist (i.e., soaked CBR less than 3%), a site-specific pavement design shall be provided.

4.2.4 Road Structure

All access roads shall be designed and constructed as per the requirements of the SSRC Sections 303, 307 and 310 and meet or exceed the following minimum road structures:

a) Gravel surfaced roads should consist of 100 mm thick Granular Base and 200 mm thick Granular Sub-Base.
b) Asphalt surfaced roads should consist of 50 mm thick Mix Type B Asphalt Concrete, 50 mm thick Granular Base and 200 mm thick Granular Sub-Base.
c) Concrete surfaced roads should consist of 140 mm thick Portland Cement Concrete pavement and 100 mm thick Granular Base.
d) Alternative surfaces, such as grassed pavers, require City approval.

4.3 Combination Unit Access

4.3.1 Land Use

Access roads designed to accommodate the Combination Unit shall:

a) be located within the PUL or Road Right of Way (approval of alternate land use designation is at the sole discretion of the City), and
b) accommodate the Combination Unit loading.

4.3.2 Geometry

To accommodate the Combination Unit, in addition to the requirements of Section 4.2.2, the access road geometry for shall:

a) have a minimum width of 4 m.
b) demonstrate and provide 6 m vertical clearance from all overhead obstacles at work platforms and staging areas.
c) have a maximum length of vertical grades between 5 to 8% of 60 m, after each area of greater than 5% grade of 60 m, have a minimum 20 m transition with a maximum vertical grade of 2% as a refuge area.
d) accommodate the swept path analysis as determined using the template on Figure 4.
e) have vertical curves, with a minimum vertical curve K value of 1.

5 Type G Catchbasin

A standard detail for the Type G catchbasin is attached in Figure 5 and may be used at the discretion of designers to intercept flows upstream of sidewalks.

6 Model Submissions

Full supporting electronic model files and electronic files of associated calculations shall be indexed and submitted with each report.

Table 1 – ETV Particle Size Distribution for Calculation Purposes

Particle Size (micron)	Mass Fraction
1000	0.05
500	0.05
250	0.15
150	0.15
100	0.1
75	0.05
50	0.1
20	0.15
8	0.1
5	0.05
2	0.05

Figure 1 – Preferred Pond Configuration

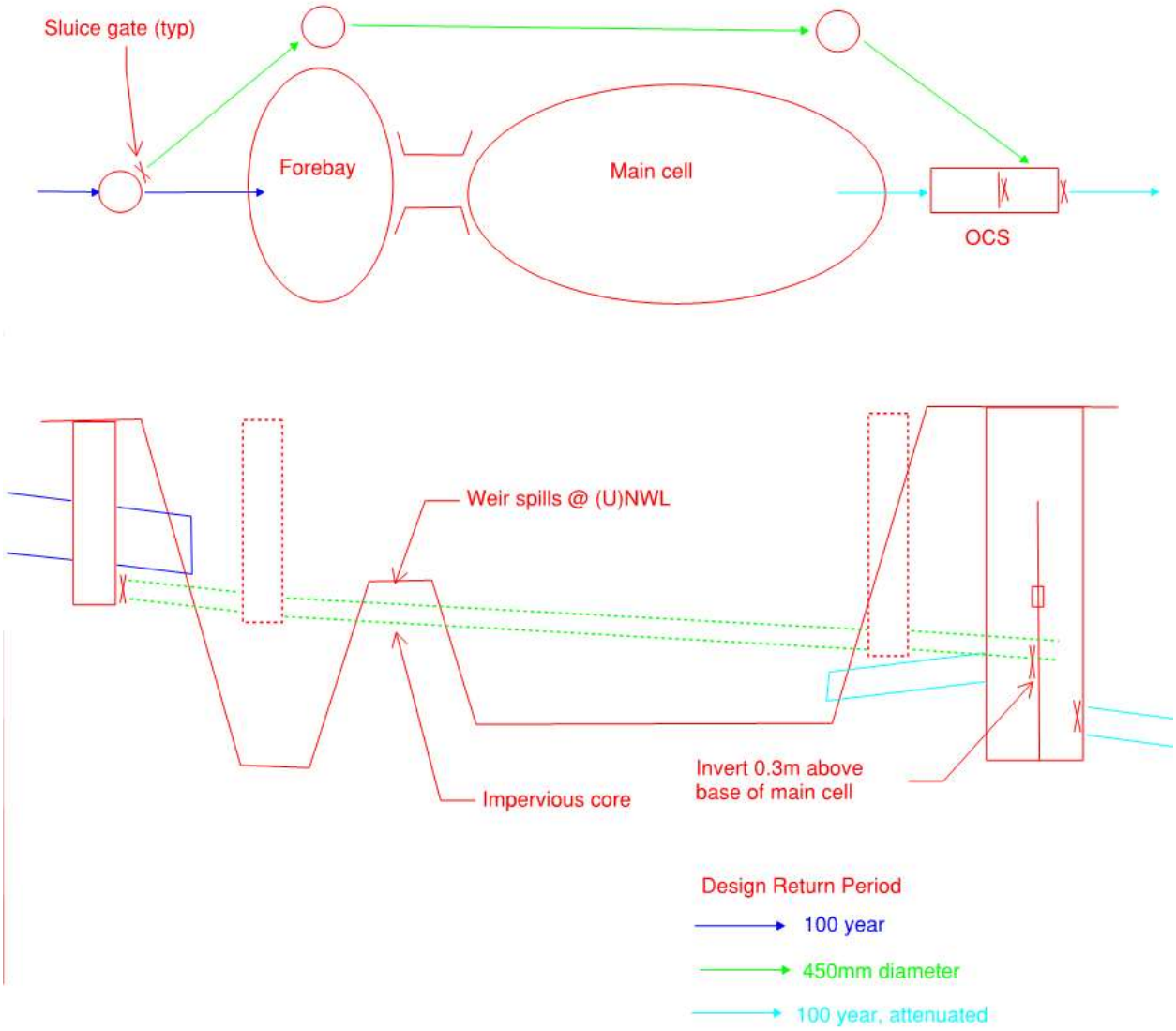
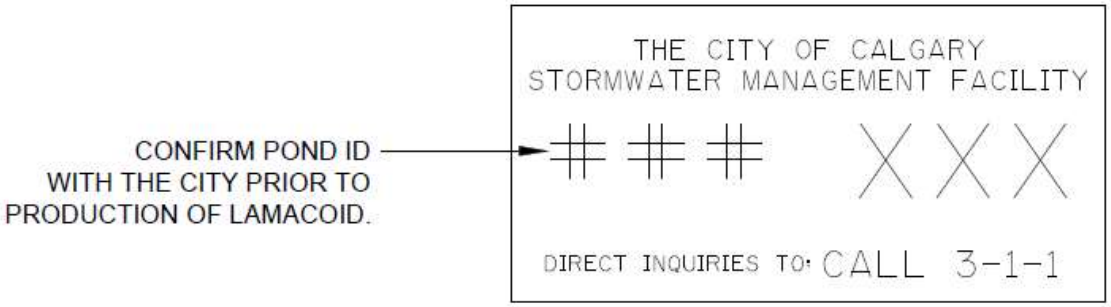


Figure 2 – Lamacoid Label



1. LAMACOID SIZE : 400 mm x 200 mm, COLOUR: WHITE, LETTERS: GREEN, EMBOSSED
2. LINE 1 TEXT HEIGHT: 12.5 mm
3. LINE 2 TEXT HEIGHT: 12.5 mm
4. LINE 3 TEXT HEIGHT: 50 mm
5. LINE 4 TEXT HEIGHT (DIRECT INQUIRIES TO:): 12.5 mm
6. LINE 4 TEXT HEIGHT (CALL 3-1-1): 20 mm

EXAMPLE POND ID's:
123-DPA: DRY POND ALARMED
124-WP: WET POND
125-WLA: WETLAND ALARMED

Figure 3 – Custom OGS Staging Area

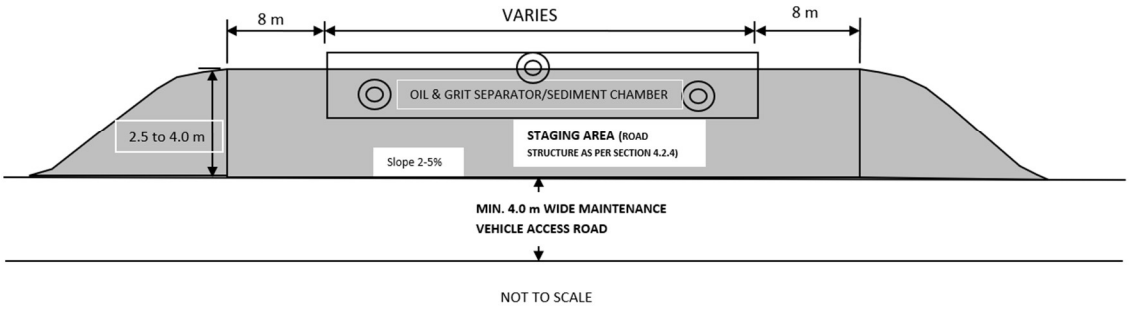


FIGURE: STAGING AREA FOR CUSTOM OGSs

Figure 4 - Combination Unit Swept Path

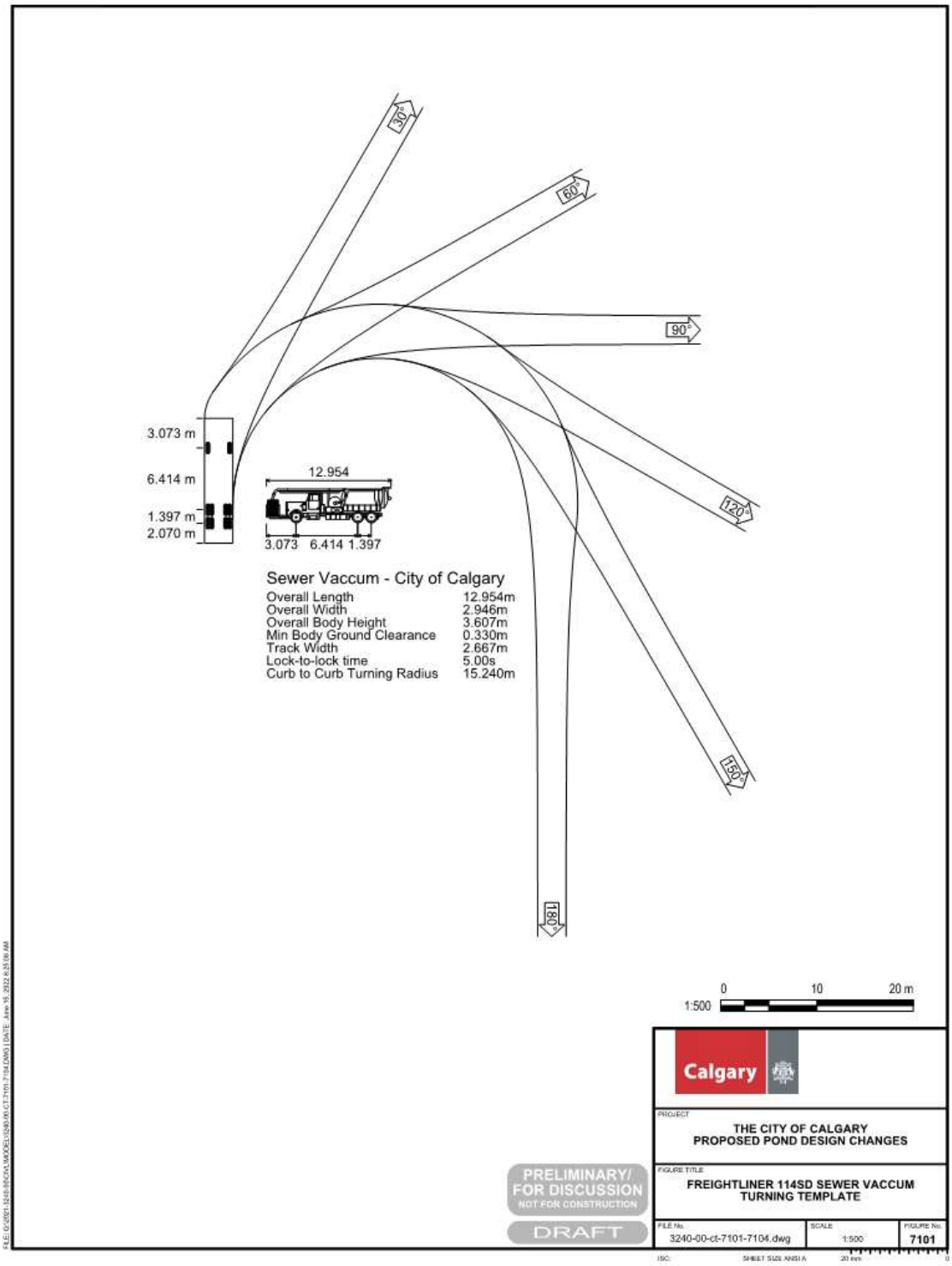
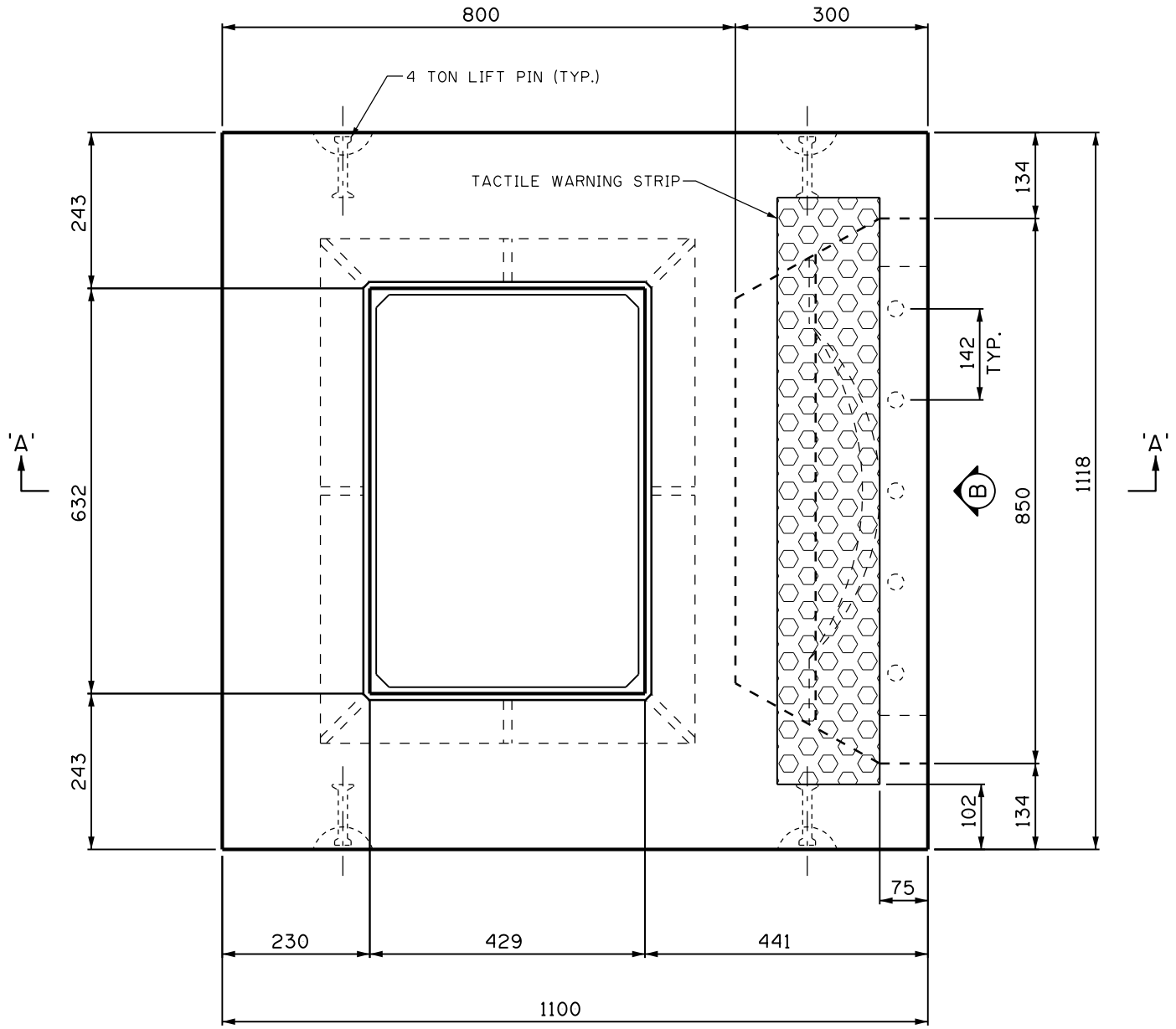


Figure 5 - Type G Catchbasin



PLAN VIEW

NOTES:

1. SEE CATCH BASIN FRAME TYPE 'C'. REFER TO S.S.S.C LATEST EDITION. SHEET 24
2. SEE PRECAST SLAB TOP FOR TYPE 'G' CATCH BASIN SECTION & ELEVATION. REFER TO S.S.S.C. LATEST EDITION. SHEET 32B

MATERIAL SPECIFICATIONS:

ALL SPECIFICATIONS & STANDARDS REFER TO LATEST EDITION.

1. CEMENT: SULFATE RESISTANT TYPE HS OR HSL TO CSA A3001 OR TYPE V/IL TO ASTM C150/C595.
2. CONCRETE COMPRESSIVE STRENGTH: 35 MPa AT 28 DAYS F1 EXPOSURE CLASS.
3. AIR CONTENT: 4% TO 7% EXCEPT WHERE NO SLUMP CONCRETE IS USED.
4. CONCRETE CLEAR COVER: 25mm MIN.
5. LOADING REQUIREMENT: SHALL MEET CL800 TRAFFIC LOADING.
6. REINFORCEMENT STEEL: TO CSA G30.18
   DEFORMED BARS fy=400MPa; WELDED WIRE MESH fy=485MPa.
7. CAST-IN-PLACE TACTILE WARNING STRIP SHALL BE 160mm WIDE AND 915mm LONG. SHALL BE IN FEDERAL YELLOW COLOR TYPE ARMOR-TILE FROM KINESIK OR APPROVED EQUAL.

DIMENSIONS ARE IN MILLIMETRES
UNLESS OTHERWISE NOTED

No.	Date	Revision	App'd

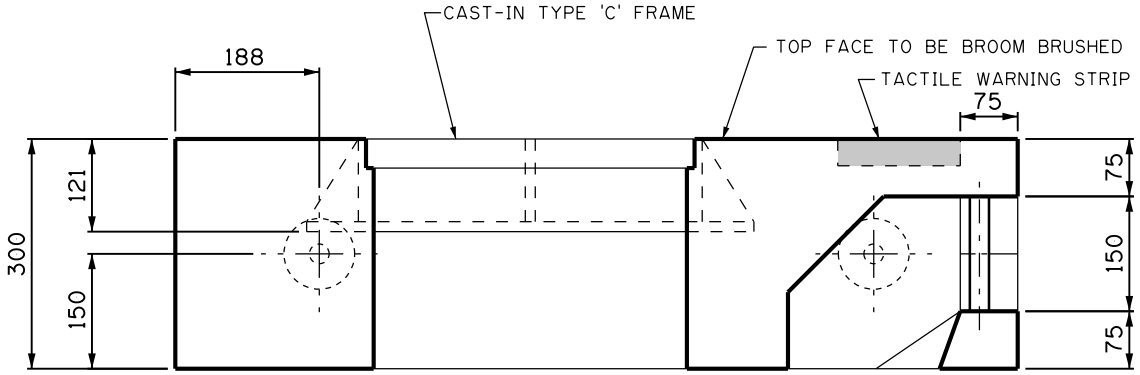
Date: 2023/11/08
Scale: N.T.S.
Approved by: for The City of Calgary

SEWER CONSTRUCTION

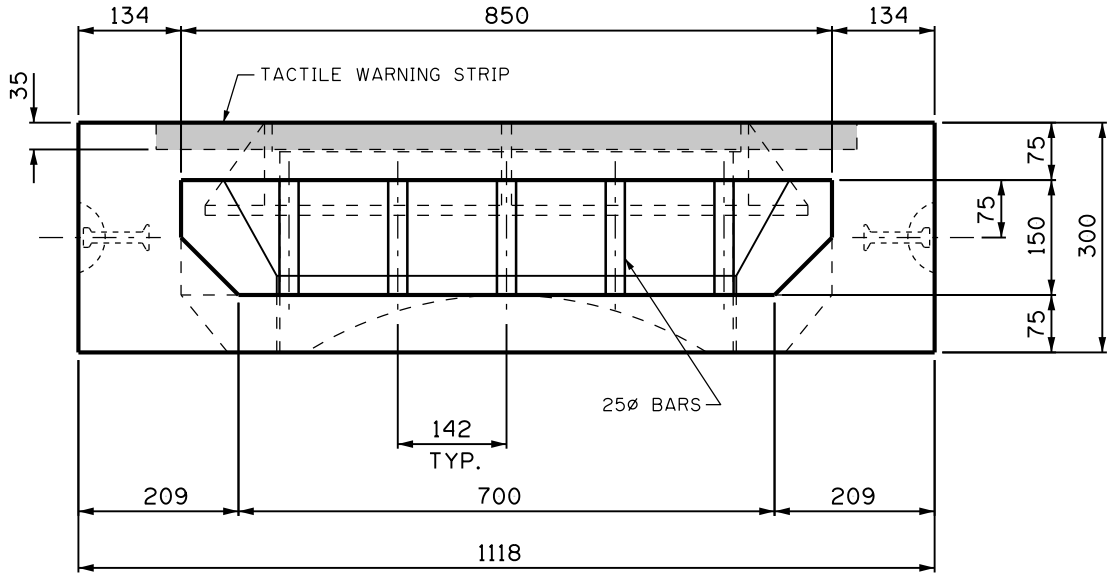
PRECAST SLAB TOP FOR TYPE 'G' CATCH BASIN PLAN VIEW

Sheet: 32A
File Number: 452.2008.001

ISC: Unrestricted



SECTION 'A-A'



ELEVATION 'B'

NOTES:

1. SEE CATCH BASIN FRAME TYPE 'C'. REFER TO S.S.S.C LATEST EDITION. SHEET 24
2. SEE PRECAST SLAB TOP FOR TYPE 'G' CATCH BASIN PLAN VIEW. REFER TO S.S.S.C. LATEST EDITION. SHEET 32A

MATERIAL SPECIFICATIONS:

ALL SPECIFICATIONS & STANDARDS REFER TO LATEST EDITION.

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4. CONCRETE CLEAR COVER: 25mm MIN.
5. LOADING REQUIREMENT: SHALL MEET CL800 TRAFFIC LOADING.
6. REINFORCEMENT STEEL: TO CAS G30.18
   DEFORMED BARS fy=400MPa; WELDED WIRE MESH fy=485MPa.
7. CAST-IN-PLACE TACTILE WARNING STRIP SHALL BE 160mm WIDE AND 915mm LONG. SHALL BE IN FEDERAL YELLOW COLOR TYPE ARMOR-TILE FROM KINESIK OR APPROVED EQUAL.

DIMENSIONS ARE IN MILLIMETRES
UNLESS OTHERWISE NOTED

No.	Date	Revision	App'd

Date: 2023/11/08
Scale: N.T.S.
Approved by: for The City of Calgary

SEWER CONSTRUCTION

PRECAST SLAB TOP FOR TYPE 'G' CATCH BASIN SECTION & ELEVATION

Sheet: 32B
File Number: 452.2008.002

ISC: Unrestricted