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STORMWATER OUTFALL GRATING STANDARD SPECIFICATIONS

The City of Calgary has created standard specifications for stormwater outfall gratings. This is to provide consistency of requirements during submission, increase operational efficiency, and to ensure that gratings stay in place while being able to open during heavy flows to release collected debris. These specifications apply to all stormwater outfalls including those discharging into any type of drainage course (e.g., rivers, creeks and streams).

The new standards replace Section 3.3.7.4 (i) of the 2011 Stormwater Management & Design Guidelines, while moving Section 3.3.7.4 (ii) and (iii) into a new Section 3.3.7.5 containing all remaining Safety and Aesthetics components.

Section 3.3.7.4 Gratings

Outfalls with openings of 450mm in diameter and larger (or with equivalent area for box conduits) must be provided with safety grates designed and constructed based on the following criteria:

i. As a minimum, the grating design shall consider such factors as public safety, structural integrity, hydraulic capacity, erosion control and overall appearance. Refer to Stormwater Management and Design Manual Section 3.3.7 Outfall for more details.

ii. The grating must consist of vertical bars or steel rods with an absolute clear spacing of 140mm (5.5 inches) between bars as this
    a. provides a level of safety against children and large animals entering the pipe; and
    b. allows for smaller debris to freely exit the outfall.

    Any spacing deviation requires approval from Water Resources.

iii. For non-symmetrical bars, the thinner portion shall be pointed against the direction of the flow.

iv. To avoid blockage, only one horizontal bar added for structural support is allowed per gate.

v. The grating must be secured with tamper-proof bolts or a locking device, or other suitable means to keep unauthorized persons from entering. Maintenance access must be provided.

vi. The outlet grating shall be installed with break-away pin(s), designed to fail under extreme hydraulic loading in case of blockage. It shall be designed and installed such that the grates will not be lost when the break-away features engage.

vii. The shear pin must be designed to break based on the force exerted during the simultaneous occurrence of the following:
    a. 50% reduction of the pipe's cross-sectional area due to accumulated debris/garbage, and
    b. flow corresponding to a 1:5 year storm event passing through the outfall.

viii. Outfalls with horizontal openings up to 1.5 m must be designed with one grate only, with one side to be anchored by a hinge-type connector and the other end with a breakaway pin.

ix. Outfalls with horizontal openings larger than 1.5 m must be designed with two grates, having both ends anchored with hinge connectors and a break-away pin connector between the two grates.

x. Outfalls with a height over 1.5 m require a fixed upper grate section while the lower section (1.5 m max.) be installed with break-away pin(s).

xi. Circular and flared end grates must be anchored on two sides by hinge-type connectors and the top with a break-away pin.

xii. Fully submerged outlets do not require gratings unless specified by the Engineer or Water Resources.

xiii. When riprap is placed, it needs to be clear from the grate allowing the grate to swing open freely when the shear pin breaks.

xiv. Flared outfall grating must be designed by the Engineer following the same criteria described herein where applicable.

Material Specifications:

i. Structural steel sections, plates and bars must be according to CSA-G40.21, Grade 300W.

ii. Hollow structural steel sections must be according to CSA-G40.21, Grade 350W.

iii. All metals must be hot-dipped galvanized except for stainless steel items.

iv. Hinges, bolts, nuts and washers shall be 304 stainless steel material unless site conditions warrant different material subject to approval by Water Resources.

v. Welding materials and electrodes must be according to CSA-W59 and CSA-W48, respectively.

vi. All joints must be fully-welded. Spot welds are not allowed.

Section 3.3.7.5 Safety & Aesthetics

Fall protection, including corrosion-resistant guardrails or approved equivalent, must be incorporated for any outfall structures where the grading is steeper than 3H:1V or where the drop is greater than 0.60 m.

i. Outfalls, which are often located in parks, ravines, or along the river banks, should be made as safe and attractive as possible. Aesthetic treatment or concealment is to be part of the overall design. Bush hammered, exposed aggregate concrete, or finishes that blend into the natural surroundings are recommended.

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