

Design Criteria Memorandum - Final



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From: Steven Greeley, P. Eng.
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Design Criteria Memorandum-Final
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1.0 Introduction

1.1 Intent of this Document

The intent of this design criteria memorandum is to establish the specific design criteria which will guide and inform the detailed design of the infrastructure, both above and below ground.

It should be noted that this document was produced using the City of Iqaluit Municipal Design Guidelines, January 2005 Edition. It is understood that the City of Iqaluit is currently in the process of updating these guidelines.

Once the project moves to the detailed design stage, the latest edition of the Municipal Design Guidelines must be used and all design assumptions must be checked against the new standard.

1.2 General Design Guidelines and Documents

The following is a list of design guidelines and background reports that must be considered and followed during the detailed design phase.

1. City Iqaluit Municipal Design Guidelines, City of Iqaluit, Latest Edition.
2. Good Building Practices Guideline, Government of Nunavut, Latest Edition.
3. Good Engineering Practice for Northern Water and Sewer Systems, Department of Municipal and Community Affairs, Government of the Northwest Territories, Latest Edition.
4. Capital Programs: Standards and Criteria (July 1993), Government of the Northwest Territories
5. National Master Specifications, Latest Edition.
6. Desktop Geotechnical Evaluation – Creekside Village 900 Block (Tetra Tech-2015).
7. Astro Hill Master Plan – Nunastar Properties Inc.
8. Ulvvaq Loop – Design and Construction Considerations Memorandum, EXP 2020

2.0

Water Mains, Sewer Mains & Access Vaults

2.1

Water Distribution System

2.1.1

General

Water distribution systems shall be designed to meet the City of Iqaluit Municipal Design Guidelines, Section A.

The following sections highlight some of the design considerations described in Section A. The detailed design must meet all requirements laid out in Section A.

The City of Iqaluit's water distribution system is complex and highly interconnected. The Lower Base, Lower Iqaluit, and Airport Loops are all interconnected. Changes to one loop will affect the other loops. The exact water main size required can only be determined after consultation with the City water model.

At this time, it is understood that the water model is being calibrated and will not be available until September 2022 at the earliest. At the detailed design stage, the size of the water main must be confirmed by the city water model.

2.1.2

Flow Requirements and Pipe Sizing

Flow requirements shall be as laid on in Section A.3.1 of the City of Iqaluit Municipal Design Guidelines.

Water main sizes must be verified by the City of Iqaluit water model. Under no circumstances should the water main size be less than the minimum sizes for water mains, laid out in Section A.3.2. (200mm distribution lines and 50mm recirculation lines).

The analysis must confirm that there is a minimum residual pressure of 350kPa (50psi) under Peak Hour Demand Conditions. Separate analysis shall be made to ensure that there is a minimum residual pressure of 140kPa (20psi) under Maximum Day Demand plus Fire Flow Conditions.

2.1.3

Water Main Alignments, Locations and Depths

Water mains shall be located within the Road R-O-W and outside of the Carriageway.

Public Utility Lot (PUL) widths shall be at least 6.0m for a single utility and 8.0m for two utilities.

Water mains shall have a minimum depth of burry of 2.5m measured from finished grade to the top of the pipe.

All water and sewer crossings shall meet the requirements of Section A.3.4 of the City of Iqaluit Municipal Design Guidelines.

2.1.4 Water Main Materials, Valves & Hydrants

Water mains shall be HDPE DR11 (Series 160, 110kPa), complete with a 50mm thick shop cast polyurethane insulation and black jacket.

All fittings shall meet the requirements of Section A.3.5 of the City of Iqaluit Municipal Design Guidelines. Further to this, it is recommended that all fittings be stainless steel.

All valves shall be located in Access Vaults and should not be spaced greater than 250m apart. Valves should be located such that when the system is in operation:

1. No more than two hydrants will be put out of service by a water main shutdown.
2. No more than 4 valves will be required to effect a shutdown
3. No more than 20 lots are out of service due to a water main shutdown.

Hydrants shall meet the requirements of Section A.5 and Standard Drawing A-9 of the City of Iqaluit Municipal Design Guidelines.

Maximum spacing of hydrants in a residential area shall be 120m.

2.1.5 Trenching and Backfilling

Trenching and backfilling shall meet the requirements of Section A-7 and the required standard details of the City of Iqaluit Municipal Design Guidelines.

2.2 Sanitary Sewer System

2.2.1 General

Sanitary sewer systems shall be designed to meet the City of Iqaluit Municipal Design Guidelines, Section B.

The following sections highlight some of the design considerations described in Section B. The detailed design must meet all requirements laid out in Section B.

No pumping stations or pressure pipe is expected in this design.

2.2.2 Flow Generation Rates and Pipe Sizing

Flow generation rates shall be determined as per Section B.3.1 of the City of Iqaluit Municipal Design Guidelines.

The pipe size shall be calculated using the minimum slope requirements and the parameters laid out in section B.3.2. Under no circumstances shall the pipe size for a sanitary sewer main be less than 200mm diameter.

2.2.3 Sewer Main Alignments, Locations and Depths

Sanitary sewer mains shall be located within the Road R-O-W and outside of the Carriageway.

Public Utility Lot (PUL) widths shall be at least 6.0m for a single utility and 8.0m for two utilities.

Sewer gravity mains shall have a minimum depth of cover to ensure that the mains are in permafrost. Minimum depth of bury shall be 3.0m. Gravity mains shall have a sufficient depth to allow all buildings to drain by gravity to the main.

All water and sewer crossings shall meet the requirements of Section B.3.4 of the City of Iqaluit Municipal Design Guidelines.

2.2.4 Sewer Main Materials and Cleanouts

Sewer mains shall be HDPE DR11 (Series 160, 110kPa).

Clean outs shall be located at the end of each line and at all changes in pipe size, grade and alignment.

Clean outs shall be located in all Access Vaults and the maximum distance between cleanouts shall not exceed 120m.

2.2.5 Trenching and Backfilling

Trenching and backfilling shall meet the requirements of Section B-5 and the required standard details of the City of Iqaluit Municipal Design Guidelines.

2.3 Access Vaults

2.3.1 General

Access Vaults shall be designed to meet the City of Iqaluit Municipal Design Guidelines, Section C.

The following sections highlight some of the design considerations described in Section C. The detailed design must meet all requirements laid out in Section C.

2.3.2 Access Vault Materials and Locations

Access Vaults to be constructed of steel plate and designed to meet the requirements of Standard Drawings A-1 and A-2 of the City of Iqaluit Municipal Design Guidelines.

Access Vaults shall be located at all alignment and grade changes. Maximum spacing for Access Vaults shall be 120m. Separate access vaults shall be provided for water service connections greater than 50mm in diameter.

It is recommended that all fittings inside the Access Vaults be Stainless Steel.

Experience has shown that there is a tendency for differential settlement between HDPE pipes and access vaults. This often results in cracked HDPE flanges. It is recommended that a flex connector, (GF Multi/Joint restrain system or similar) be installed at all metallic to HDPE transitions.

3.0 Service Connections

3.1.1 General

Service Connections shall be designed to meet the City of Iqaluit Municipal Design Guidelines, Section D. The following sections highlight some of the design considerations described in Section D. The detailed design must meet all requirements laid out in Section D.

3.1.2 Water Services

Water services shall meet the requirements of the City of Iqaluit Municipal Design Guidelines Section D-2.

Separate water services connections shall be provided for each separately titled lot. The minimum size of a residential water service shall be a 25mm supply and a 25mm return placed in a 100mm insulated carrier pipe. Non-residential service connections shall be sized according to anticipated demand.

The minimum allowable distance between water services shall be 1000mm. Water services greater than 50mm shall be connected and valved inside an access vault. Services shall be located such that they do not conflict with driveway locations.

Water service pipes shall be Series 160 SDR9. Connections and fittings shall be as per Section D.2.2 of the City of Iqaluit Municipal Design Guidelines.

Residential water services shall be installed in a common trench with the sanitary service.

3.1.3 Sanitary Service

Sanitary sewer services shall meet the requirements of the City of Iqaluit Municipal Design Guidelines Section D-3.

Separate sewer services connections shall be provided for each separately titled lot. The minimum size of a residential gravity sewer service shall be taken as 150mm. Non-residential service connections shall be sized according to anticipated user requirements, but will not be less than 200mm.

The minimum grade for gravity sanitary sewer service lines shall be 2.0% for 150mm diameter lines and 1% for 200mm diameter lines and larger. Services shall be located such that they do not conflict with driveway locations.

Sewer service pipes shall be Series 160 SDR9. Connections and fittings shall be as per Section D.2.2 of the City of Iqaluit Municipal Design Guidelines.

Residential sanitary services shall be installed in a common trench with the water service.

4.0 Road Construction

4.1 General

Road construction shall be designed to meet the City of Iqaluit Municipal Design Guidelines, Section E.

The following sections highlight some of the design considerations described in Section E. The detailed design must meet all requirements laid out in Section E.

Roads within this assignment shall be considered local roads.

4.2 Road Structure

Road structures shall be designed based on the results of a geotechnical investigation. Before detailed design, a Geotechnical investigation shall be carried out and shall include an appropriate number of Boreholes.

4.3 Intersections

Intersections shall be designed at 90 degrees, wherever possible. Should 90 degrees not be possible, the minimum angle of intersection shall be 75 degrees.

Minimum intersection spacing shall be 60m measured from Centreline to Centreline.

4.4 Driveways

Driveways shall have a minimum clearance of 1.5m from any surface feature and shall not be located within 100m of an intersection. For corner lots, driveways should access the road with the lesser volume.

Residential driveways shall be between 7.5m and 9.0m in width. All driveways shall have the same structure as the adjoin roadway and be constructed up to the property line.

4.5 Drainage and Culverts

Drainage and culverts shall be designed to meet the requirements of section E-9 of the City of Iqaluit Municipal Design Guidelines.

Minimum culvert sizes shall be:

- 400mm for residential Driveway Culverts
- 450mm for industrial Driveway Culverts
- 450mm for Roadway Centerline culverts.

All culverts shall have appropriate end treatments depending on application. Minimum cover shall be 300mm or one-half the diameter of the culvert, whichever is greater.

Culverts and ditches shall be designed to meet the requirements of the 1:25 yr rainfall event, adjusted for climate change.

4.6 Road Geometry

Road Geometry for new roads will follow the Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads. Existing roads will be modified, to the extent possible, to bring them in line with current standards.

Minimum stopping site distances and intersection separation distances will be provided.

Horizontal and vertical curves will follow the TAC Guidelines.

Maximum road grades will be kept at or below 8.0%.

5.0 Population Projections

5.1 Future Development in the Area

The High Annual Population Growth Rate of 3.38% (from the consolidated general plan of 2015) shall be used for all population projections.

Year	Population
2016 (Statics Canada)	7082
2022	8937
2042	17376

Population growth estimates for the Astro Hill RE-Development are included in the Astro Hill Master Plan, and should be consulted.