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MUNICIPAL ENGINEERING - RESIDENTIAL SUBDIVISION STANDARDS

Town of Grand Falls-Windsor

March 31, 2020

Final Report



Document history

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MUNICIPAL ENGINEERING

RESIDENTIAL

SUBDIVISION

STANDARDS

March 2020

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1 DIVISION 1- DEFINITIONS

1.1 DEFINITIONS

1.1.1 Stage I Work

Stage I work consists of all work relating to installation of water, sanitary, and storm sewer systems, construction of all street right-of-ways including base course asphalt, curb and gutter, street lighting and development of open space areas and accesses to these areas.

1.1.2 Stage II Work

Stage II work consists of all work relating to the construction of above groundwork, including but not limited to, surface course asphalt, landscaping of areas other than open space areas, tree planting, privacy fencing, sidewalks and walkways.

1.1.3 Developer

A person or company who has applied for and has been granted approval to subdivide or service an existing parcel of land.

1.1.4 Approval in Principle

A permit giving the Developer approval to proceed to the final design Stage of a project.

1.1.5 Consulting Engineer

A professional engineer, registered in the Province of Newfoundland and Labrador, retained by the Developer to be responsible for design and supervision of the works.

1.1.6 Construction Permit

Gives the Developer approval to proceed with construction work as per development agreement.

1.1.7 Master Specifications

Government of Newfoundland and Labrador Department of Municipal Affairs and Environment (MAE) Municipal Water Sewer and Roads Master Construction Specifications (latest revision).

1.1.8 Digital Format

Drawings to be submitted in digital format compatible with latest edition of Civil 3D or higher.

1.1.9 As-Built Drawings

Drawings in paper and digital format that shall be submitted by the Developer to the Director of Public Works and Development upon completion of the infrastructure installation. Drawings shall be the approved detailed engineered stamped drawings of the roads and services with all “As-Built” coordinates and elevations identifying locations of valves, curb stops, manholes, etc.

1.1.10 Contractor

General Contractor who performs the work that meets the approved specifications and plans of the Subdivision.

1.1.11 COR

Certificate of Recognition (COR) which is an Industry-Specific Occupational Health and Safety Program from the Newfoundland and Labrador Construction Safety Association.

1.1.12 Developer

The owner of the Subdivision. The Developer can also be the Contractor.

1.1.13 Director of Public Works and Development

The Director or any designate for the Town of Grand Falls-Windsor.

1.1.14 Government Department

Any Federal, Provincial, or Municipal Government and any agency, authority, body, board, commission, or entity thereof.

1.1.15 SSSP

The Site Specific Safety Plan (SSSP) for the construction of the subdivision. This plan must include all aspects of the work from original layout to final construction in all phases. The SSSP must be submitted and reviewed prior to any construction. The SSSP will be required to adhere

to the specifications as outlined in Section 190 of the Department of Transportation & Works Specifications Book latest edition.

1.1.16 Subcontractor

A contractor hired by the General Contractor to complete any portion of the work to meet the specifications and approved plans of the subdivision.

1.1.17 Subdivision

A subdivision of land in the Town of Grand Falls-Windsor consisting of lots, roadways, right-of-ways, open spaces and other lands.

1.1.18 Subdivision Agreement and the Development Agreement

The one and the same and means the “Residential Subdivision Agreement” document.

1.1.19 Subdivision Lots

Subdivision Lot means each of the residential lots in the Subdivision.

1.1.20 Subdivision Specifications

Those matters described in the latest edition of a document entitled "Master Construction Specifications Municipal Water, Sewer, and Roads" of the Province of Newfoundland and Labrador with a set of Construction Drawings attached as Schedule "D" of the Town's “Residential Subdivision Agreement” document.

1.1.21 Substantial Performance

Shall have been achieved when the work is so certified by the Director and is capable of completion or correction at a cost of not more than \$25,000 (Twenty-Five Thousand Dollars), excluding surface course asphalt and sidewalk.

1.1.22 Total Completion Date

The date upon which all of the work shall be totally completed.

1.1.23 Total Performance

Shall have been achieved when all deficiencies have been corrected to the satisfaction of the Director and the Town of Grand Falls-Windsor will acquire ownership of the completed phase of the subdivision.

1.1.24 Workplace NL

Workplace Health and Safety Compensation Commission.

1.2 DEVELOPMENTAL APPROVAL

1.2.1 Requirements

The applicant will be required to submit:

1. Three (3) copies of the proposed subdivision plan showing the street and lot layout, water courses, buffers and public open space. This plan shall be at a scale of 1:500 and have contours at one (1) meter intervals;
2. Three (3) copies of a location plan at a scale of 1:2500. Location plan shall indicate the proposed street layout and shall locate the position of the proposed development within the municipal boundaries of the Town Grand Falls-Windsor; and
3. Preliminary storm, sanitary sewer flows and water demands for the proposed subdivision.

1.2.2 Development Approval

The preliminary subdivision plan will be reviewed for the following:

1. Access

The plan will be evaluated for impact on traffic flows and ease of access to and from the subdivision.

2. Water Supply

The water supply to the subdivision will be evaluated to determine if adequate pressures and flows exist in the Town's system.

3. Sanitary Sewer Flows

The Town's system will be evaluated to determine if the current configuration has available capacity to accommodate the calculated flows to be generated.

4. Storm Sewer Flows

The Town's system will be evaluated to determine if the current configuration has available capacity to accommodate the calculated flows to be generated.

1.3 CONSTRUCTION APPROVAL

1.3.1 General

The subdivision is to be designed and constructed in accordance with the latest edition of the Town's Regulations and the MAE Master Specifications. In certain instances, the Town regulations are more stringent than, and supersede, the MAE Master Specifications – these instances are detailed in the Town's Supplement to the MAE Master Specifications contained in Division 9 of this document.

A professional engineer licensed by Professional Engineers and Geoscientists of Newfoundland and Labrador holding a valid PEGNL Permit to Practice shall design and supervise the works.

1.3.2 Requirements

The application for Construction Approval should be made within one (1) year of the granting of the Developmental Approval, and must be accompanied by the following:

1. Subdivision Plan

The Plan shall show the following items:

- a) Water, sanitary and storm sewer layout (invert information is not required);

- b) Street alignment information (coordinates for PI and street intersections are not required);
- c) Lot layouts and numbering;
- d) Right-of-ways, easements and carriageways;
- e) Canada Post locations;
- f) Driveway locations;
- g) Open space areas;
- h) Benchmark locations and elevations; and
- i) Direction of flow for sanitary and storm sewer systems.

2. Master Survey Plan

The Plan should be drafted as per the standard Master Survey Plan and shall show the following items:

- a) Street alignment information including coordinates for PI and street intersections;
- b) Lot metes and bounds, areas and numbers;
- c) Right-of-ways and easements;
- d) Canada Post locations;
- e) Driveway locations;
- f) Open space areas; and
- g) Benchmark locations and elevations.

3. Plan and Profile Drawings

Plan and profile drawings showing all streets, watermains and sewers to be constructed. Detailed drawings are required for any items not covered by the Standard Drawings in the MAE Master Specifications.

4. Lot Grading Plan

As per the Town's Standard. All grading for lots and open spaces to be included.

5. Sanitary Sewer Calculations

Calculations are to be submitted and accompanied by a detailed drainage plan.

6. Storm Sewer Calculations

Calculations are to be submitted and accompanied by a detailed drainage plan.

7. Federal Fisheries and Oceans

Copies of any approvals required for works under the jurisdiction of Fisheries and Oceans.

8. Municipal Affairs and Environment (MAE)

Copies of any approvals required for works under the jurisdiction of MAE.

9. Canada Post

Copies of approval for the proposed Canada Post locations.

10. Newfoundland Power

Legal plan and description for easements.

11. Other

Copies of any approvals required for works falling under jurisdiction from any other Government Department or Agency.

1.3.3 Approval

The detailed subdivision design will be reviewed for conformance with the Town's Regulations and the MAE Master Specification. If any problems are noted the Applicant will be required to make the necessary revisions and resubmit the drawings for approval.

If no problems are noted, then "Construction Approval" will be recommended and the Applicant will be asked to submit copies of the drawings in digital format.

Construction Approval is valid for a one (1) year period but may be renewed once for a further period not exceeding one (1) year.

The granting of Construction Approval shall not prevent the Town from thereafter requiring the correction of any errors not noted at the time of application.

Revisions to the drawings subsequent to approval for construction shall not be made without the prior approval of the Town. Upon approval of any revision, a digital copy of the revised drawing shall be submitted.

1.3.4 Financial requirements

1.3.4.1 Assessments

1. Capital Recovery Assessment

All outstanding assessments on the property to be developed as recorded by the Town must be paid prior to the Subdivision Development Agreement being executed. The assessments will be for items such as:

- a) Water, sanitary and storm sewer systems;
- b) Street improvements;
- c) Sidewalks;
- d) Over-sizing; and
- e) Recreational or as otherwise required by the Town.

1.3.5 Development Fee

The Developer shall contact the Town regarding the Development Fee.

1.3.6 Securities

The Town will determine the amount of any securities required. All securities must be in the form of cash, certified cheque, or irrevocable letter of credit from an approved surety company. No interest shall be paid on refunded Subdivision Securities. The Developer shall initiate the review of securities held.

1. Securities Prior to Start of Construction

The following securities must be in place prior to the start of any construction of an approved development phase.

- a) Stage I Completion Security – This security will be in the amount of 100% of the estimated cost of Stage I works for an approved phase(s). This security will be released upon acceptance of Stage I works for the approved phases(s).

2. Securities for Acceptance of Stage I Works

The following securities must be in place prior to the acceptance of Stage I works.

- a) Stage I Warranty Security - This security will be equal to 10% of the value of Stage I work for the approved phase(2) and shall remain in effect for twelve (12) months following the date of substantial completion for Stage I works for the approved phases(s).
- b) Stage II Completion Security – This security will be in the amount of 100% of the estimated cost of Stage II works for the approved phases(s). This security will be released upon acceptance of Stage II works of the approved phases(s).

3. Securities for Acceptance of Stage II Works

The following securities must be in place prior to the acceptance of Stage II works.

- a) Stage II Warranty Security - This security will be equal to 10% of the value of Stage II work for the approved phases(s) and shall remain in effect for

twelve (12) months following the date of substantial completion for Stage II works for the approved phases(s).

1.4 STAGE I WORKS

1.4.1 Schedule

Stage I works shall not commence until Construction Approval has been issued, all financial requirements have been met, and the Subdivision Agreement has been executed. All work shall receive continuous site supervision by the Consulting Engineer.

All work shall be in accordance with this document the MAE Master Specifications and the Municipality's supplementary documents (See Division 9). Where a conflict occurs the more stringent, as determined by the Director of Public Works and Development or designate, shall apply.

1.4.2 Acceptance of Stage I Works

Stage I works will be accepted by the Town when all work has been completed and the following submitted and approved:

1. Record Drawings as per Town standards;
2. Subdivision Plan as per Town standards;
3. House service information forms;
4. Lot grading plans;
5. Test results as required for the water, sanitary and storm sewer systems;
6. Inspection of the water, sanitary and storm sewer systems by the Town;
7. Stage I warranty period security;
8. Correction of all noted deficiencies;
9. Any hydrant flow test results as required by the Town;
10. Concrete test results for curb and gutter works;
11. Asphalt test results for base course asphalt;

12. Compaction test results for Class A and Class B granulars to the full limit of street;
13. Right of way; and
14. Video inspection of sanitary sewers and storm sewers.

1.4.3 Building Permits

Building permits will not be approved until Stage I Works have been accepted by the Town or security has been provided to cover the cost of the Stage I and Stage II works, then the building permits may be approved. The developer is cautioned that no occupancy permits will be issued until completion and acceptance of Stage I Works.

1.4.4 Warranty Period

The Developer shall at his own expense rectify and make good any defect or fault, however caused, appearing within a one (1) year period from the date of substantial performance of the Stage I works. The Stage I warranty security will be released at the end of the warranty period providing all noted deficiencies have been corrected.

1.5 STAGE II WORKS

1.5.1 Schedule

Stage II works shall not commence until Stage I works have been accepted. Base course asphalt and curb and gutter must be placed prior to the Town undertaking any snow clearing operations. The Town will not accept responsibility for damage by others to any Stage I works until all Stage II work has been completed and accepted by the Town. The surface course asphalt shall not be placed without the approval of the Director of Public Works and Development or designate. Approval to commence Stage II works will not normally be granted until eighty percent (80%) of the lots have been built upon and rough grading completed.

1.5.2 Benchmarks

Benchmarks shall be installed as per the requirements detailed in the Subdivision Design Criteria.

1.5.3 Acceptance of Stage II Works

The Town will accept stage II Works when all work has been completed and the following submitted and approved:

1. Concrete test results for sidewalk;
2. Asphalt test results for surface course asphalt;
3. As-built information for benchmark installations;
4. Legal plans and descriptions for all lands to be transferred to the Town; (i.e.: street right-of-ways, easements and open space);
5. Stage II warranty period security;
6. Inspection of Stage II works by the Town;
7. Correction of all noted deficiencies; and
8. Master survey of development, both plan and description, as per the Town's requirements.

1.5.4 Warranty Period

The Developer shall, at his own expense, rectify and make good any defect or fault, however caused, appearing within a one (1) year period from the date of Substantial Performance of the Stage II works.

The Stage II Warranty security will be released at the end of this warranty period providing all noted deficiencies have been corrected.

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2 DIVISION 2 – SURVEYING

2.1 DEFINITIONS

1. Survey:

Means the determination of any point or the direction or length of any line required in measuring, laying off or dividing land for the purpose of establishing boundaries or title to land.

2. Newfoundland and Labrador Provincial Co-ordinate Survey System:

Means a system established for referencing land surveys and is based on 3° (degree) Modified Transverse Mercator Projection (MTM-83-2) referenced to NAD 83.

3. Co-ordinate Monument:

Means any marker established for the Provincial Co-ordinate Survey System.

2.2 MASTER SURVEY PLAN

A Survey plan shall be drawn in accordance with the requirements Division 3 Drafting and shall include:

1. The name of the owner of all abutting lands;
2. The length and bearing of each line of any transverse which connects any point on the boundary of the subdivision with a Provincial Coordinate Monument;
3. The radius, central angle, the length of arc, the point of curve and the point of tangency shall be given for each curved line and clearly indicated on the survey plan;
4. Each street, walkway and easement;
5. Each lot and its number;
6. The length, bearing and internal angle of each line of the boundary of, and the area in square meters of:

- a) The land being subdivided;
 - b) Each street, walkway and easement;
 - c) Each lot; and
 - d) The land, if any, which is reserved for park, playground, buffers and public purposes.
7. The geometry of connections between existing streets and streets of the subdivision;
 8. The location of any existing structure which is to remain;
 9. Every water course and its direction of flow;
 10. All information necessary for the calculation and laying out of any curved line;
 11. The date of compilation;
 12. The date and description of revision, if any;
 13. The name of the subdivision;
 14. All existing streets, roads, lanes and intersections in the immediate area and their official names as designated by the Town;
 15. The location and extent of rock outcrops;
 16. The location and results of any test borings;
 17. At least two (2) center line points of known chainage related to the Provincial Co-ordinate Survey System;
 18. The location and elevation of the geodetic benchmark used; and
 19. Manhole numbers shall be assigned following the Town's current numbering sequence.

The master survey plan shall be of a size within the following limits:

1. MAXIMUM - Size designation, B1, which represents 707 mm wide x 1000 mm long;
 2. MINIMUM – Size designation A1, which represents 594 mm wide x 841 mm long;
- and

3. LEGAL SIZE - Size designation, P4 which represents 21.5 cm wide x 35.5 cm long.

NOTE: Refer to National Standards of Canada, CAN2-9.60 M and CAN 2-9.61M for paper size designation.

Master survey plan shall be drawn to a scale as indicated in Division 3 – Drafting.

Master survey plan shall have a Key Plan to locate the subdivision as it relates to adjacent streets of the Town. Scale shall be as indicated in Division 3 – Drafting.

Master survey plan shall be certified by a Newfoundland Land Surveyor registered with the Association of Newfoundland Land Surveyors.

2.3 SURVEY DETAILS AND ACCURACY

All traverses are to be plotted by either the actual calculated "Latitude (lats) and Departures (deps)" method or by the "Tangent Off-Set Method".

All boundary line dimensions to be shown to at least two (2) decimal places with all angles shown to the nearest thirty (30) seconds or better.

Greater or less distances shall only be accepted along a water boundary.

Contours or topographical survey elevations shall be shown to determine the elevations for all streets, roads, easements and walkways in relation to the proposed lot layout.

For proposed streets, the existing vertical alignment conditions shall be obtained from actual field surveys.

All Vertical Control shall be related to the Province of Newfoundland and Labrador Approved Datum.

Information shown on a survey plan shall be sufficiently detailed to permit any point on any surveyed line to be accurately located in the field.

The accuracy of closure shall be not less than one (1) meter in 10,000 meters.

2.4 STREET, WALKWAY AND LOT IDENTIFICATION

When the right of way and street have been constructed and the subdivision or area involved is ready for acceptance, each public lot, easement, walkway and street shall be identified by an iron or steel pin driven into the ground at each corner, beginning of curve, and end of curve, unless these points fall upon solid rock. In such cases, an "X" shall be cut into the rock.

2.5 SURVEY INFORMATION

Prior to Stage I work acceptance, a copy of all information, regarding permanent subdivision survey monuments, street lines, boundary lines, easements, and walkway locations will be presented to the Town, in both digital and paper formats.

Survey information shall be clear, concise, neat and accurate, properly labeled and signed by a registered Newfoundland Land Surveyor.

2.6 BENCHMARKS

The Developer shall supply brass plugs and wedges or other markers to be used as Benchmarks.

The Land Surveyor shall assign numbers to the Benchmarks, as per Provincial requirements.

The plugs with wedges shall be placed in the concrete curb flush with the concrete. Prior to setting, the plug hole will be filled with quick-set cement. Then, with the use of a mallet and a wooden block, the plug and wedge will be driven into the hole.

All benchmarks shall be inter-visible and coordinated using the 3 (degree) Modified Transverse Mercator Projection. The traverse closure shall be a minimum of 1:10,000. Crown land reference monuments and their coordinates shall be listed when running the traverse.

The maximum distance between benchmarks shall be 300 meters.

Benchmarks must be established from provincial monuments to return to the same monument with acceptable elevation values and coordinates. All lines beginning and ending in existing Benchmarks with known elevations and all lines forming self-closing loops will be levelled one (1) way. All Benchmarks must be turning points and form part of the levelling loop.

Benchmarks must be established by spirit levels done to third order standards with a minimum accuracy of 24 mm/k where k = the distance in kilometers between benchmarks measured along the leveling route. If the misclosure or discrepancy exceeds the allowable, the line shall be re-leveled.

The method used will be three (3) wire method (mean of the reading for the three wires).

The Contractor/Surveyor will perform all necessary adjustments of the level loops.

The description sheet shall be digital in a fashion that can be reproduced in a clear and legible form. A minimum of three (3) ties shall be shown to reference the Benchmark. The reference plan need not be to scale; however, all information shall be digital in a form compatible with Town software. Lettering size shall be a minimum of 2.5 mm high and line weight shall be 0.35 mm.

All Benchmarks and Benchmark information shall be shown on the subdivision plan according to the Town standards.

If the work does not meet the above criteria, the contractor/surveyor's work shall be returned for corrections.

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3 DIVISION 3 – DRAFTING

3.1 PREPARATION OF DRAWINGS

3.1.1 CAD Drawings Required

Computer-aided design and drafting (CAD) shall be used in the preparation of construction and as-built or record drawings for all developments. **Manually drafted drawings will not be accepted.**

3.1.2 Submission of Drawings in Digital Format

Wherever this specification requires the submission of digital drawings, they shall be in format compatible with the latest edition of Civil 3D.

Prior to submission of digital drawings, the Consulting Engineer shall inquire as to the version of Civil3D presently being used by the Town and shall submit his drawings in a compatible format.

Electronic File Transfer – The preferred method of file transfer during the design process, is via e-mail.

Storage Media – Throughout the Design process individual drawings may be submitted on USB flash drive. As-built or record drawings shall be submitted in complete sets on USB flash drive. One (1) complete set of prints to be submitted with digital submission.

3.1.3 Physical Size of Drawings

All drawings in any one development shall be of the same physical size. The prime consultant shall coordinate the drawing size with any/all sub-consultants, i.e.: surveyors, etc.

Maximum size: the maximum size designation shall be "B1" which represents a 707 mm wide by 1000 mm long sheet.

Minimum size: the minimum size designation shall be "A1" which represents a 594 mm wide by 841 mm long sheet.

3.1.4 Scales

All CAD drawings shall be drawn full size and plotted at a reduced scale.

The Plotting Scales shall be:

1. Engineering Plan or Site Services:
 - a) Plan - 1:500
 - b) Profile - 1:500 Horizontal and 1:50 Vertical
2. Survey Plan/Subdivision Plan shall be:
 - a) 1:500 or
 - b) As approved by the Town
3. Site drainage plan shall be:
 - a) 1:500 or
 - b) 1:1000 or
 - c) 1:2500 or
 - d) As approved by the Town
4. Location plan or key plan shall be 1:2500;
5. Site grading plan shall be 1:500; and
6. Detail plan and cross-sections shall be at a scale that will fully illustrate the subject matter.

3.1.5 Grid Reference

Drawings shall be prepared using NAD 83 (North American Datum 1983). Grid lines at 200 meters shall be shown and Northings and Eastings indicated.

3.1.6 North Arrow

A north arrow shall be placed in the upper right corner of each drawing.

3.1.7 Plan Orientation

Survey plans shall be drawn using the development's actual coordinates based upon NAD 83. Title blocks, borders and plots shall be rotated such that the top of the sheet is approximately north, and text can be read left to right and/or bottom to top.

3.1.8 Symbols and Line Types

Standard Town drafting symbols and line types shall be used on all drawings. Where symbols other than the standard ones are used, they shall be shown in the legend.

3.1.9 Lettering

Except as noted below for existing grades, all drawing notes and dimensions shall be Arial and the minimum size lettering shall be 2.5 mm. For the purpose of annotating existing grades, text at a forty-five (45) degree angle to the bottom of the drawing sheet should be used. With the exception of text for existing grades, it is recommended that no more than three (3) lettering heights be used on any one drawing.

3.1.10 Layering

Data on each drawing shall be fully layered according to standard engineering practice.

3.1.11 Reserved Area

An area at least 21.5 cm high shall be reserved above the title block for the key plan, notes, legend, engineer's stamp, revision data, etc.

3.1.12 Cover Sheet

A cover sheet shall be provided for each drawing set and shall contain the following information:

1. Project Name;
2. Key Plan;
3. Name of Consulting Engineer and Sub-consultants;
4. Name of Developer;

5. List of Drawing Names and Numbers;
6. Date of Issue; and
7. "As-Built" or "Record Drawing" note when applicable.

3.1.13 Submission of Drawings

1. Design drawings (IFR) shall be submitted as follows:
 - a) Three (3) each - White Prints; and
 - b) One (1) only – Digital submission: PDF format and all CAD files including CTB file.
2. Construction drawings shall be submitted as follows:
 - a) Three (3) each - White Prints; and
 - b) One (1) only – Digital submission: PDF format and all CAD files including CTB file.
3. Record drawings shall be submitted as follows:
 - a) One (1) only - White Print; and
 - b) One (1) only – Digital submission: PDF format and all CAD files including CTB file.

3.2 PREPARATION OF DRAWINGS – GENERAL CONDITIONS

3.2.1 Street Names

All streets shall be identified, and names printed within street lines. Council will determine the names for each street and the developer will be advised of approved street names.

3.2.2 Intersection Identification

At intersection streets or where the continuation of the streets is on other plans, the following note shall be shown on the Plan: "For Continuation see plan no. "

3.2.3 Traverse Plotting

All traverses shall be plotted by either:

4. The "Tangent Off-Set Method; or
5. The calculated "Latitude (Lats) and Departure (Deps)" Method

3.2.4 Percent (%) Grade

Percent (%) grades (slopes) shall be shown for all appropriate services to two (2) decimal places.

3.2.5 Accuracy of Measurements

All distances shall be measured to the nearest centimeter.

3.2.6 Geodetic Datum

Elevations shown on any plan shall be referred to the Provincial Geodetic Datum and the reference Benchmark (B.M.) along with its location and description shall be shown in the area above the Title Block.

3.2.7 Irregular Boundary Line Measurements

Greater or less distances shall not be accepted except along a water boundary or other irregular boundaries in which case a "tie line" between the adjoining boundary end points shall show the bearing and the distance.

3.2.8 Revisions to Plan

If plans are revised, amended or altered, the revision number, date and a brief description of the revision shall be noted in the revision area of the Title Block;

3.2.9 Signing of Plan

All plans shall be stamped and signed by a professional engineer licensed in the Province of Newfoundland and Labrador.

3.2.10 Procedure Revision

This procedure is subject to change without notice, and the onus lies with the user to ensure that they are in possession of the latest revision.

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4 DIVISION 4 - EASEMENTS

4.1 GENERAL

Easement means an incorporeal right, distinct from ownership of the soil, vested in the Town and consisting of a use of another's land for any Public service or utility.

When sewers, surface drainage or water system pipes are to be installed other than in a street or walkway, an easement shall be provided over such installations.

The owner of the easement land shall not construct any type of structure over such easement area.

4.2 DESIGN

The width of any easement shall be based upon the type, depth and number of services proposed to be installed.

The minimum width of an easement shall be six (6) meters or as determined by the Town.

The alignments for any easement shall be dependent upon the type of service to be installed. All necessary easements must be identified in the design drawings.

4.3 ACCEPTANCE

Acceptance of services within an easement shall be carried out as outlined under the requirements for Stage I acceptance.

All easements shall be covered by legal agreement as approved by the Town's Solicitor.

4.4 RESTORATION

When the Town carries out work within an easement, it shall be responsible for restoring the area as close as practical to its original condition or as otherwise stipulated in the Easement Agreement.

This procedure is subject to change without notice, and the onus lies with the user to ensure that they are in possession of the latest revision.

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5 DIVISION 5 - STREETS

5.1 STREET CLASSIFICATION

Streets are classified based on service function, geometric design and in accordance with Transportation Association of Canada's (TAC's) *Geometric Design Guide for Canadian Roads* (latest edition). Table 5-1 presents the street classification for the Town of Grand-Falls Windsor.

Table 5-1 - Street Classification

	Arterial	Collector	Local
Traffic Service	Traffic movement is of primary concern	Traffic movement and land access of equal importance	Traffic movement is of secondary consideration
Land Service Function	Land access is of secondary importance	Traffic movement and land access are equal consideration	Land access first consideration
Parking	On-street parking permitted under certain circumstances	On-street parking is usually permitted	On-street parking is usually permitted
Typical ADT Range	5,000 – 30,000	1,000 – 12,000	< 3,000
Flow Characteristics	Uninterrupted except at signals and crosswalks	Interrupted flow	Interrupted flow
Vehicle Type	All vehicles	All types with trucks limitations	Passengers and service vehicles; large vehicles restricted
Connections	Arterials, collectors, freeways, some locals	Arterials, collectors, locals	Collectors, locals

5.2 DESIGN CRITERIA

5.2.1 General

1. Streets should be designed to provide the safest and smoothest traffic flow possible. The criteria shown in Table 5-2 are the minimum requirements for flat terrain. Specific combinations of horizontal and vertical alignments may dictate a variance in the noted criteria;

2. For specific situations not covered by this section, the latest edition of the Geometric Design Guides for Canadian Roads should be used as a guide;
3. All local streets shall have a minimum of 150 mm Class "B", 100 mm Class "A" granulars and 75 mm asphalt (2 lifts of 37.5 mm). Collector and arterial shall have 200 mm Class B and 100 mm Class A and 75 mm asphalt (2 lifts of 37.5 mm). Additional granulars and asphalt may be specified as determined by the Director of Public Works and Development or designate; and
4. In all areas there shall be a minimum of 300 mm of imported fill for subgrade construction unless material deemed suitable by the Director of Public Works and Development or designate.
 - a) Local roads to have a minimum of 300 mm fill;
 - b) Collector roads to have a minimum of 500 mm fill; and
 - c) Arterial roads to have a minimum of 750 mm of fill.

Table 5-2 -Street Design Criteria

	Arterial	Collector	Local
Street grade Maximum	8%	8%	8%
Street grade Minimum	0.5%	0.5%	0.5%
Street right of way width	30 m	24 m	18 m
Minimum C/I Radius	90 m	90 m	30 m
Maximum Super Elevation	0.06 m/m	0.06 m/m	Normal Crown
Minimum Stopping Sight Distance and Turning Sight Distance	As per TAC Geometric Guide for Canadian Roads latest edition		
Pavement Widths	15 m	12 m	9 m
Lane Widths	As per TAC Geometric Guide for Canadian Roads latest edition		

	Arterial	Collector	Local
Minimum "K" value Vertical curve Crest Sag Maximum "K" value for drainage Crest Sag	As per TAC Geometric Guide for Canadian Roads latest edition		
Minimum Length of vertical curve	L = length in meters should not be less than design speed in kilometers per hour. With exception of local intersections approved the Town.		
Vertical curve Maximum (Length for drainage)	Crest: K =60 Sag: K=30		
Minimum Distance between intersections	400 m	60 m	60 m
Minimum face of curb radius at intersections*	15 m	9 m	8 m
Sidewalks (sides)	Both	Both	See section 5.9
Street Lighting: Average maintained illumination level Uniformity ratio	As per Newfoundland Power Requirements		

* For pedestrian crossing locations follow TAC Pedestrian Crossing Control Guide latest edition

5.2.2 Vertical Alignment

1. Vertical curves shall meet the requirements in Table 5-2;
2. The minimum length of a vertical curve in meters shall be no less than the design speed in kilometers per hour;
3. For inverted vertical curves, a minimum grade of 0.5% shall be maintained along the gutter line; and
4. The Town may stipulate additional requirements where collector or arterial roads require super elevation.

5.2.3 Horizontal Alignment

1. Roadway alignment shall be centered within the right-of-way;

2. Straight or near straight residential roadways shall have a maximum unimpeded length of 300 m, unless traffic calming measures are provided; and
3. Horizontal curves shall meet the requirements in Table 5-2.

5.3 CUL-DE-SACS

Due to the inefficiency of cul-de-sacs to provide smooth delivery of services, cul-de-sacs should be restricted and used only where land access is not possible by through streets. In any case, the use of a cul-de-sac should be approved by the Town's Development Department.

Cul-de-sacs shall have the following additional minimum requirements:

1. The turning circle radius in the cul-de-sac shall be 15.25 m, at the curb face;
2. Bulb road surfaces may be crowned, or cross fall sloped for drainage, at a minimum grade of 1% and maximum grade of 5%, outward from the center of the bulb;
3. The maximum exit gradient for cul-de-sacs shall be 5% from intersecting street curb line. This applies to the street gradient beyond the 10 m criteria stated in Section 1.3.5 (b);
4. Low back curb, gutter and sidewalk shall be installed along the entire perimeter of the street;
5. The maximum length of a cul-de-sac shall not exceed 200m without prior approval from the Town, measured from the connecting street right of way to end of bulb; and
6. Transitional radius of street line into the turning circle street line shall be 15.25 m.

5.4 INTERSECTIONS

Intersections shall adhere to the following criteria:

1. Be of a "T" type configuration;
2. Have a maximum vertical alignment of 2% for a minimum distance of 10 m from the curb line of the roadway intersection;

3. The ideal angle of intersection shall be 90°. The maximum and minimum permissible angle of intersection shall be 100° and 80° respectively;
4. The minimum offset distances between minor streets center-lines for intersections on the same or opposing side of the major street shall be 60 m;
5. The minimum intersection sight distance from the minor street for the critical turning movement, measured within the street right-of-way shall be determined as per TAC Geometric Guide for Canadian Roads latest edition;
6. When two (2) streets (or more) intersect, only one (1) street may have a curved horizontal alignment. All other streets at this intersection shall have minimum tangent section of 30 m as measured from the point of street line intersection to the first point of horizontal curvature on each approached street line; and
7. Directional islands should be provided where an arterial or collector street intersects with an arterial street.

5.5 DRIVEWAYS

All residential lots shall have a low back curb of 6.2 m in width, starting at a point 0.5 m from the property line. Widths greater than this may be approved at Council's discretion.

Corner lots may be permitted to have a driveway access from the flanking street as per the approved subdivision plan.

No driveway (ramp) shall be permitted to enter onto a proposed designated limited access freeway, arterial or major street.

5.6 TRAFFIC LIGHTS

All traffic lights shall be designed as per the Transportation Association of Canada: Manual of Uniform Traffic Control Devices for Canada (latest edition), unless otherwise noted herein.

Vehicle Detection methods:

1. Semi actuated modes and/or fully actuated mode:

- a) Semi actuated typically used for light intersections with lightly travelled side roads; and
 - b) Fully actuated control requires detection on all approaches:
 - i. In pavement loops:
 - Long loop - Normally for roads with higher speeds
 - Double loop
 - Single loop
2. Signal heads may be pole, mast-arm or gantry mounted:
- a) All equipment shall be designed to withstand loading of aluminum four-section traffic signal head with backboard as well as loading from wind and snow/ice as per CSA Standards;
 - b) All mounting poles, arms or gantry are to be structural steel and conform to CSA Standards; and
 - c) All steel hardware, cast alloy or aluminum materials are to conform to the appropriate CSA Standards.
3. Signal heads:
- a) Primary signal head - Primary signal heads shall be mounted on the far right side of each intersection approach and where practicable should be located in such a position that it will be within the driver's cone of vision; and
 - b) Secondary Signal Head - Secondary signal heads shall be mounted on the far-left side of each intersection approach. When the signal is mounted clear of the traveled roadway the bottom of the signal head shall be not less than 2.75 meters above the sidewalk however the standard mounting height is 5m clear of the sidewalk.
4. Pedestrian Signal Heads
- a) Pedestrian heads are required to cross the main roadway and are to be pedestrian activated;

- b) The number and placement of signal heads is dependent on the volume of pedestrian traffic, pedestrian type and intersection type and size and should be determined on an intersection basis;
- c) Where deemed dangerous or redundant, opposite sides of the intersection can be restricted and appropriate warning signs installed; and
- d) Pedestrian signal heads are to be mounted on steel poles conforming to CSA Standards, or may be mounted on utility poles if permission is granted.

5.7 STREETLIGHTS

Roadway lighting is required and shall be designed in accordance with Newfoundland Power requirements and/or standards.

5.8 CURB AND GUTTER

Curb and gutter shall be installed on all streets.

5.9 SIDEWALKS

Requirements for sidewalk installation on Town streets as part of subdivision development are as follows:

1. Sidewalk will be required on both sides of local streets, unless the installation of sidewalk is deemed not warranted by Town;
2. Sidewalk will be required on both sides of collector and arterial streets in all instances unless deemed not warranted by the Town;
3. A strip of publicly owned land behind the curb, 1.60 m wide, must be provided to the Town by the subdivision developer. This strip of land must be graded in such a manner that the back strip of land will be no higher than 100 mm above the top of curb;
4. No fence, trees, landscaping or retaining walls will be permitted inside the 1.60m wide strip of public land located behind the curb; and
5. Paraplegic ramps shall be provided at all intersections with walkway access

5.10 CANADA POST

Design of Canada Post Super Mailboxes shall adhere to the latest edition of Canada Post's *Delivery Planning Standards Manual for Builders and Developers*, available from Canada Post's website.

In addition to Canada Post's Standard, Community mailboxes (CMBs) shall meet the following criteria:

1. CMBs sites shall be located on the flanking side of corner lots;
2. CMBs sites can be located adjacent to open spaces or Tot Lots, but shall not impede access by Town maintenance vehicles;
3. CMBs sites shall be located on the predominantly homecoming side of the street to ensure that the majority of users can retrieve their mail without crossing the street;
4. CMBs sites shall not be located along street frontage where parking restrictions apply;
5. CMBs sites shall not be located closer than 10 m from a fire hydrant or transit stop;
6. CMBs sites shall not be located in close proximity to utility poles or street lighting standards;
7. CMBs sites shall not be located in such a way that they do not constitute distance restrictions to either pedestrians or motorists; and
8. CMBs sites shall have pull off areas and locations that are near entrances of subdivisions serviced by the CMBs shall be preferred.

A copy of the subdivision plan indicating the location of Canada Post CMBs sites must be submitted to both the Town of Grand Falls-Windsor and Canada Post for approval. A copy of approval from Canada post shall be submitted to the Town.

5.11 TRAFFIC CALMING

Design of traffic calming measures for roadways shall be in accordance with TAC's *Canadian Guide to Neighbourhood Traffic Calming*, latest edition. Traffic calming measures include vertical changes in the road (speed humps, speed bumps, speed tables, raised intersections), lateral changes in the road (chicanes, offset intersections, lateral shifts), constrictions (narrowings, pinch points, islands, parking), entrance features (gates, signs, surface treatments), and other measures intended alter driver behaviour, improve conditions for non-motorized road users, and improve the quality of life for residents on traffic calmed streets. Any traffic calming measures must be approved by the Town.

5.12 SNOW STORAGE / DISPOSAL

If snow storage is required by the Town, snow storage and/or disposal of snow shall adhere to the following:

1. Ensure that site plans provide for sufficient snow storage to eliminate the need to transport snow off-site;
2. Locating snow storage sites such that melt water is not directed towards salt vulnerable areas (including sources of drinking water);
3. Directing melt water to sediment ponds or sanitary sewers where permitted by the local municipal sewer use by-law;
4. Storing snow on-site in paved areas where the melt water will not drain into the parking area or form puddles that cause slippery conditions that require extra salting operations to maintain safety;
5. Ensuring that snow does not block drains;
6. Never using salt to promote rapid melting of stockpiled snow;
7. Storing snow in areas where the sun will promote rapid melting;
8. Snow that is removed from a facility and transported for disposal should be taken to a properly designed snow disposal site. Property owners and contractors should determine the disposal locations prior to the winter; and

9. Designing snow disposal sites in accordance with the Transportation Association of Canada document Syntheses of Best Practices Road Salt Management – Snow Storage and Disposal Sites (latest edition).

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6 DIVISION 6 – STORM SEWER SYSTEMS

6.1 GENERAL

The Consulting Engineer must consider climate change when designing the storm sewer system.

6.1.1 Record Drawings

Upon completion of the storm system installation, and prior to acceptance by the Town, record drawings must be submitted to the Town for record purposes. The record drawings must be stamped by a Professional Engineer registered to practice in the Province of Newfoundland and Labrador.

The record drawing information must show the location of all manholes, including inlets and outlets, headwalls, outfalls, and other fittings.

6.2 DETERMINATION OF STORM RUNOFF

Depending on the overall area of the watershed, the runoff shall be calculated by either the Rational Method or by Hydrologic Modeling. The Rational Method shall only be used for areas less than 65 ha. The methodology used for integrating climate change into the storm run-off determination including any Intensity-Duration-Frequency (IDF) information must be provided to the Town.

6.2.1 Design Drainage Area

The drainage area shall be determined from topographical mapping contour lines having an interval not exceeding one (1) meter. The design drainage area shall encompass surrounding areas currently draining into the study area which have not been previously accounted for, as well as other areas which may become tributary through regrading.

6.2.2 Drainage Plan

A plan of the drainage area must be submitted for review and approval. The scale of the drainage plan shall be 1:500 or as approved. The following information should be identified on the drainage plan:

1. Streets;
2. Building Lots;
3. Watercourses, showing direction of flow;
4. The size and grade of proposed storm sewers with manholes numbered in accordance with the Town's manhole numbering system for design reference;
5. Tributary areas to each storm manhole, the size of the tributary area in hectares and the runoff coefficient for each tributary area; and
6. Direction of flow for proposed surface drainage.

6.2.3 Hydrologic Modeling

For watershed areas greater than 65 ha the runoff shall be calculated using Hydrologic Modeling Software as per the methodology described in sections 6.5.1, 6.5.2 and 6.5.3.

Software input, runoff methodology, methodology for integrating climate change including any IDF information and working model shall be submitted to the Town for review.

6.2.3.1 Design Parameters

The return period shall be as follows:

1. For the design of local storm sewers:
 - a) Return period of 25 years; and
 - b) Minimum duration of 10 minutes.
2. For the design of trunk storm sewers:
 - a) Return period of 50 years; and
 - b) Minimum duration of time of concentration of the drainage basin.
3. For the design of minor culverts (roadside ditches and driveways):
 - a) Return period of 25 years; and
 - b) Minimum duration of time of concentration of the drainage basin

6.2.4 Rational Method

Storm runoff shall be calculated using the Rational Method for areas less than 65 ha.

$$Q = 2.778CiA$$

Where Q= maximum rate of stormwater runoff, in liters per second

C = the appropriate runoff coefficient, dimensionless

i = the rainfall intensity, in millimeters per hour

A = the drainage area, in hectares

The calculation for runoff shall be submitted to the Town for review.

6.2.4.1 Runoff Coefficient

The values in the following table shall be minimum values for runoff coefficient for use in the Rational Method based on the required return period.

Table 6-1 Runoff Coefficients for Rational Method

Land Use	Return Period (Years)	
	25	50
Parks and Undeveloped Areas	0.2	0.3
Single Family Residential	0.4	0.5
Semi-detached Residential	0.5	0.6
Row Housing/Apartment Residential	0.7	0.75
Parking Lots	0.95	1.00
Industrial	0.8	0.9
Institutional	0.75	0.8
Light Commercial	0.6	0.7
Commercial Core	0.85	0.95

6.2.4.2 Rainfall Intensity

Rainfall intensity shall be based on the return period and the time of concentration, with the assumption that the storm length is equal to the time of concentration. The Consulting Engineer shall identify what IDF curves were used for determining rainfall intensity.

6.2.4.3 Time of Concentration

The time of concentration shall be calculated using the following equation

$$t_c = \frac{2.593L^{0.8} \left[\frac{1000}{CN} - 9 \right]^{0.7}}{1900\sqrt{S}}$$

Where t_c = time of concentration, hours

L = maximum length of travel from the most remote part of the basin to outlet, meters

S = mean slope of the main drainage basin, %

CN = Curve Number, see Section 6.2.4.4.

6.2.4.4 Curve Number

A curve number shall be derived based on the runoff characteristics. If a particular basin has more than one (1) land use as listed in Table 6-2 below, then the basin shall be subdivided by land use and a composite curve number shall be calculated based on the following equation:

$$CN = \frac{\sum A_n CN_n}{\sum A_n}$$

Where n = number of sub-basins

A = area of sub-basin

CN = Curve number of sub-basin.

Table 6-2: Curve Number

Land Use	Curve Number
Residential:	
500m ² lot size (65% impervious)	85
1000m ² lot size (38% impervious)	75
2000m ² lot size (25% impervious)	70
4000m ² lot size (20% impervious)	68
Streets and Roads:	
Paved w/ curbs and storm sewers	98
Gravel	85
Commercial and Business Area (85% impervious)	92
Industrial Districts (72% impervious)	88
Open Spaces, lawns, parks, golf courses, cemeteries, etc.:	
75% pervious	61
50% - 75% pervious	69
Pasture or Range:	
Poor condition	79
Good Condition	69
Woods or Forest Land:	
Sparse	66
Dense	55

Note: All other land use, contact Town.

6.3 STORM SEWER PIPE DESIGN

6.3.1 Hydraulic Capacity

Manning's formula shall be used to determine the capacity of storm sewer pipes:

$$Q = \frac{A}{n} R^{2/3} S^{1/2}$$

Where	Q =	discharge, m ³ /s
	A =	cross sectional area of flow, m ²
	R =	hydraulic radius, m
	S =	slope, m/m
	n =	coefficient of roughness, dimensionless

6.3.2 Coefficient of Roughness

The coefficient of roughness to be used in Manning's formula shall be selected based on pipe material using the American Society of Engineers Manual on Engineering Practice No. 37, Design and Construction of Sanitary and Storm Sewers.

In no case shall the roughness coefficient selected for design purposes be less than 0.013.

6.3.3 Minimum Pipe Size:

The minimum diameter of storm sewer pipes shall be as follows:

1. Storm Sewers 300 mm;
2. Catch Basin Leads 300 mm; and
3. Storm Sewer Service Pipe 100 mm.

6.3.4 Velocity

The minimum acceptable velocity at design peak flow shall be 0.75 m/s.

The maximum acceptable velocity at design peak flow shall be as follows:

1. 4.5 m/s for pipes equal to or less than 600 mm in diameter;
2. 6.0 m/s for pipes greater than 600 mm and less than 1200 mm in diameter; and
3. 7.5 m/s for pipes with diameters greater than 1200 mm in diameter.

6.3.5 Minimum Gradient

The minimum allowable pipe gradient shall be the gradient required to produce the minimum acceptable velocity of 0.75 m/s at design peak flow. In no case shall the minimum gradient be less than 0.5%.

6.3.6 Change of Pipe Size

No decrease of pipe size from a larger size upstream to a small size downstream shall be allowed under any circumstances.

6.3.7 Pipe Location and Clearance

The location of pipes shall be as per DMAE Master Specification and conform to the following:

1. Storm sewers shall be located such that manholes are placed within the street ROW between the sidewalk/curb and gutter and property boundaries wherever possible; and
2. Where storm sewer is to be laid in a trench, other than in the ROW, the developer shall grant to the Town by deed and plan, at his cost, title to the Easement. Such Easement shall be not less than six (6) meters in width and the Town shall approve its location and width.

6.3.8 Service Pipe

Storm sewer service pipe material shall conform to the requirements of the Division 10 Approved Products section. Separate storm sewer service pipes shall be provided for each separately owned dwelling unit.

Storm sewer service pipes must not be located within 3.0 m of the side boundary of a building lot. Storm sewer service pipes must connect to the storm sewer main and not to a storm sewer manhole.

6.3.9 Storm Water

Storm water drains, roof drains, foundation drains shall not be connected to any part of the sanitary sewer system.

6.3.10 Earth Load

Shall be calculated by using the Marston Formula.

6.3.11 Superimposed Load

The effect of concentrated and distributed superimposed loads shall be evaluated by generally accepted formula.

6.4 MANHOLES AND STRUCTURES

6.4.1 Manhole Location

1. Manholes shall be located at every change of horizontal and vertical alignment, at every change of pipe size and/or material, at dead ends; and
2. No manholes are to be located within 6.0 m of an overhead electrical line.

6.4.2 Manhole Spacing

The maximum allowable spacing for storm manholes shall be 100 m.

6.4.3 Drop Manholes

Vertical drop pipe shall be provided at manholes where the vertical distance between the invert of the inlet pipe and the invert of the outlet pipe is greater than 1.0 m. The drop manhole should be used only when more acceptable alternatives cannot be incorporated into the design.

6.4.4 Invert Drop

1. All manhole inverts shall be smoothly benched to the crown of the pipe;

2. The minimum invert drop across a manhole shall be the greater of:
 - a) The difference in the diameters of the upstream and downstream pipes, or
 - b) 50 mm for straight run and 150 mm for bends and tees.
3. The obvert elevation of the lowest upstream pipe shall be equal to or higher than the obvert of the downstream pipe.

6.4.5 Manhole Design

Manholes shall be designed, constructed and tested in accordance with the MAE Master Specifications.

6.4.6 Special Manholes

Special manholes shall be permitted when no standard manholes are appropriate. These special manholes must be fully detailed and approved by the Town.

6.4.7 Special Structures

Special drainage structures shall conform to the following:

1. Special inlet and outfall structures such as headwalls, tailwalls, stilling chambers, and energy dissipaters shall be fully designed and detailed. Designs shall be submitted for review and approval;
2. Details of protective and erosion control works must be submitted for review when discharge velocities exceed 80% of the limiting velocity of the material that lines the receiving water body;
3. Grates shall be provided on all inlet structures to a piped storm sewer system and shall be fully designed, detailed and approved by the Town. Culverts do not require grates; and
4. Copies of approval from the appropriate authorities must be forwarded to the Town for all storm sewer outfalls.

6.4.8 Special Catch Basins

Special catch basins shall be permitted when no standard catch basins are appropriate. These special catch basins must be fully detailed and approved by the Town.

6.4.9 Catch Basin Location

Catch basins shall be located and spaced in accordance with conditions of design and shall provide for the expected maximum flow. Catch basin locations shall be adequate to prevent on-street ponding of storm water during the design storm.

No catch basins are to be located within 6.0 m of an overhead electrical line.

Catch basins at street intersections shall be located immediately upstream of sidewalk or pedestrian crosswalks.

All catch basins located in low points shall be double catch basins.

6.4.10 Catch Basin Spacing

The maximum permissible spacing for catch basins draining streets shall be 95 m.

6.4.11 Catch Basin Leads

1. Catch basin leads shall have a minimum diameter of 300 mm;
2. Catch basin leads shall have a minimum grade of 2%;
3. The maximum length of catch basin leads shall be 30 m; and
4. Catch basin leads shall connect directly to a storm manhole.

6.5 STORMWATER DETENTION

The necessity for Stormwater Detention will be determined by the Town on a case by case basis. In the event the Stormwater Detention is determined to be necessary, hydraulic modeling as described below must be carried out.

The Town recognizes two (2) major storm water detention systems; above ground and underground detention.

The required storage for the stormwater quantity control will be designed to maintain the peak post-development runoff rates to pre-development run-off rates. The design shall be carried out as follows:

1. Determine the required volumes of storage using the design storms (section 6.5.2.1);
2. Select outlet control device(s) that control the post-development flows to their respective pre-development flow rates. The emergency overflow device should not be engaged; and
3. Route the post-development runoff from remaining rainfall design events for each return period through the detention facility and adjust the volume / outlet control accordingly until zero increase (i.e.: limiting of post-development peak discharge to the existing pre-development peak discharge) is achieved.

6.5.1 Analysis Software

Software to be used is PCSWMM software by CHI (latest release).

During the review stage, a working PCSWMM model, a design report describing the methodology and results of the analysis as well any relevant AutoCAD design files will be handed over to the Town.

Final PCSWMM and AutoCAD files are to be submitted to the Town after the Record Drawings have been issued.

6.5.2 Hydrology

Pre-development and post-development hydrographs needed to determine the stormwater storage volume are to be generated using synthetic design storms (section 6.5.2.1). The simulation times must be long enough to produce the complete hydrograph

The following subcatchment characteristics shall be defined:

1. Area – to be delineated based on contour mapping;

2. Percent impervious - % of subcatchment area that is asphalt / concrete surface / rooftops;
3. Width: Estimated by dividing the subcatchment area by the overland flow path, where the overland flow path is the longest path from the furthest point to the outlet of a subcatchment;
4. Depression Storage:
 - a) Impervious depression storage 1 mm;
 - b) Pervious depression storage 2.5 mm; and
 - c) % of subcatchment impervious area with zero depression storage 25%:
5. Mannings Roughness:
 - a) Impervious – 0.020; and
 - b) Pervious – 0.50.
6. Infiltration: Use Green-Ampt Method where recommended default values are:
 - a) capillary suction at wetting front to be taken as 200 mm
 - b) soil hydraulic conductivity is to be taken as 0.001 mm/hr
 - c) initial moisture deficit is to be taken as 0.30
7. Evaporation 3 mm/day.

6.5.2.1 Design Storms

Synthetic Storm hyetographs shall be generated from the latest IDF curve information selected by the Consulting Engineer using the Modified Chicago Storm distribution.

6.5.3 Hydraulics

All manholes, catchbasins, catchbasin leads, open channels, ditch inlets, culverts, outfalls, sewer pipe, storage, outlet control devices and other applicable hydraulic structure must be modelled. Emergency overflows must be included. All elements must be georeferenced to NAD83 coordinates and geotetic datum.

Hydraulic routing is to be done using the dynamic wave method.

If the hydraulic grade of the of the storm sewer system cannot be maintained below the crown of the pipe, it must be demonstrated that that there will be no impact on any residences/buildings. Under no circumstances can the hydraulic grade line be higher than the ground elevations.

6.6 APPROVED PRODUCTS

Refer to Division 10 for approved products.

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7 DIVISION 7 – SANITARY SEWER SYSTEMS

7.1 GENERAL

7.1.1 Record Drawings

Upon completion of the installation of the sanitary sewer system, and prior to the acceptance of the system by the Town, record drawing must be submitted to the Town for record purposes. The record drawings must be stamped by a Professional Engineer registered to practice in the Province of Newfoundland and Labrador.

The record drawing information must show the location of all manholes, including inlets and outlets, any outfalls, and other fittings., etc. referenced by accurate distance measurements to the front survey pins of the nearest building lot.

The record drawing information must show the accurate as-built depth of the sewer main.

7.2 SANITARY SEWER SYSTEM DESIGN

The design shall be based on accommodating peak sewage generation and infiltration flows.

7.2.1 Sanitary Sewage Demand

The sanitary sewer system shall be designed for the sanitary sewer flow generated from all lands within the design drainage area in which the system is situated.

7.2.1.1 Design Drainage Area

The design drainage area may be determined from topographical mapping showing contour plans. The design drainage area shall include all other areas which may become tributary by reason of regarding and/or pumping.

7.2.1.2 Drainage Plan

The drainage plan shall be based on design elevations and shall be to a scale as indicated in Division 3 – Drafting and shall show:

1. Streets;

2. Lots;
3. The size and grade of the sanitary sewers with manholes numbered using the Town’s naming system; and
4. Tributary areas to each manhole, size of the area in hectares and ultimate average population per hectare clearly shown therein.

7.2.1.3 Population Densities

The design population considered shall be the ultimate population in the area under consideration as per the Town’s land use zoning requirements of the current land use maps for the area.

Design flows for residential land uses other than single family residential developments shall be based on expected densities, but in no case the design flows from developments of single, family residence shall be less than 40 persons/ha

7.2.1.4 Sanitary Sewage Generation Rates

Sewer flow rates shall be based on Table 7-1.

Table 7-1 - Sanitary Sewage Flow Rates

Land Use	Average Sewage Flow
Residential (l/c/d)	340
Commercial core (l/ha/d)	90,000
Light commercial (l/c/d)	28,000
University (l/ha/d)	34,000
Hospitals (l/bed/d)	950
Heavy industrial (l/ha/d)	168,500
Light industrial (l/ha/d)	39,000
Schools (l/room/day)	1,700
Hotels and motels (l/room/d)	340

7.2.1.5 Infiltration Rates

The minimum rate of infiltration for which capacity shall be provided is 22,500 L/ha/d.

7.2.1.6 Peaking Factors

Average sewage flows shall be factored to provide peak sewage flows as follows

1. Residential Peak Hour peaking factor is the larger of 2.5 or Harmon's Peaking Factor where:

Harmon formula:

$$PF = \frac{1 + 14}{(4 + p^2)^{\frac{1}{2}}}, \text{ where}$$

PF = the ratio of the peak rate of flow to the average rate of flow,

p = the tributary design population, in thousands, for residential areas.

2. Commercial/Institutional/Industrial peaking factor shall be 0.8 of the Residential Peaking Factor. The design population "p" can be termed as an equivalent population and is computed by dividing the unit non-residential sewage flow by the average unit residential sewage flow of 340 l/c/d.

7.2.2 Hydraulic Design

The sanitary sewer system shall be designed with sufficient capacity to convey peak flows and infiltration. The design must include a hydraulic analysis for the Development and be updated for each subdivision stage.

7.2.2.1 Hydraulic Modelling

In general, a hydraulic analysis is required for any new development for which a hydraulic analysis has not been previously approved. A hydraulic analysis will also be required for any new development that significantly alters the current system such that a previously approved hydraulic analysis is no longer applicable.

The Town shall provide the necessary boundary conditions for the hydraulic analyses.

7.2.2.2 Analysis Software

Software to be used is SewerCAD by Bentley Systems (latest release).

During the review stage, a working SewerCAD model, a design report describing the methodology and results of the analysis as well any relevant AutoCAD design files will be handed over to the Town.

Final SewerCAD and AutoCAD files are to be submitted to the Town after the Record Drawings have been issued.

7.2.2.3 Hydraulic Capacity

Manning's formula shall be used to determine the capacity of sanitary sewer pipes:

$$Q = \frac{A R^{2/3} S^{1/2}}{n}$$

Q = discharge, m³/s

A = cross-sectional area of flow, m²

R = hydraulic radius, m

s = slope, m/m

n = coefficient of roughness]

A minimum roughness coefficient *n*, of no lower than 0.013, is to be used for all smooth-walled pipe material.

7.2.3 Sanitary Sewer Pipe

7.2.3.1 Pipe Size

The minimum diameter of sanitary sewer pipes shall be 200 mm.

The minimum diameter of the sanitary sewer service pipe shall be 100 mm.

No decrease in pipe size from a larger size upstream to a smaller size downstream shall be allowed regardless of the increase in grade.

7.2.3.2 Pipe Slope

The minimum allowable slope shall be according to Table 7-2.

Table 7-2 Minimum Pipe Slopes

Pipe Diameter (mm)	Minimum Slope (%)
200 – 300	0.50
301 – 525	0.25

7.2.3.3 Pipe Velocity

The minimum acceptable velocity at design peak flow shall be 0.60 m/s.

The maximum acceptable velocity at design peak flow shall be 3.0 m/s.

7.2.3.4 Pipe Location and Clearance

Pipe location and clearance shall be as per DMAE Master Specification and conform to the following:

1. Sanitary sewers shall be located such that manholes are placed within the street ROW between the sidewalk/curb and gutter and property boundaries wherever possible; and
2. Where sanitary sewer is to be laid in a trench, other than in the ROW, the developer shall grant to the Town by deed and plan, at his cost, title to the Easement. Such Easement shall be not less than six (6) meters in width and the Town shall approve its location and width.

7.2.3.5 Storm Water Connections

Storm water drains, roof drains, foundation drains shall NOT be connected to any part of the sanitary sewer system.

7.3 CONNECTION TO EXISTING SEWER SYSTEM

A connection of the Developer's sanitary sewer system to any part of the existing sanitary sewer system must be carried out in such a way as to cause the least interruption to existing service and the Town must approve each such connection. The Town will assist in the scheduling of any such connection

7.4 MANHOLES

7.4.1 Manhole Location

1. Manholes shall be located at every change of horizontal and vertical alignment, at every change of pipe size and/or material, and at dead ends; and
2. No manholes are to be located within 6.0 m of an overhead electrical line.

7.4.2 Manhole Spacing

The maximum allowable spacing for sanitary manholes shall be 100 m.

7.4.3 Drop Manholes

Vertical drop pipes shall be required at manholes with a vertical separation of 1000 mm or greater between the inlet and outlet mains. The drop manhole should only be used when a more acceptable alternative cannot be incorporated into the design.

7.4.4 Invert Drop

1. All manhole inverts shall be smoothly benched to the crown of the pipe;
2. The minimum invert drop across a manhole shall be the greater of:
 - a) The difference in the diameters of the upstream and downstream pipes; or
 - b) 50 mm.
3. All pipes turning at a greater than 45° in a manhole require a 150 mm drop.

7.4.5 Manhole Design

Standard types of manholes and their details are shown in MAE master specification standard drawings.

Manhole frames and covers to be 600 mm round design.

7.4.6 Special Manholes

Special manholes shall be fully designed and detail.

7.5 LIFT STATIONS

7.5.1 General Requirements

Wherever possible, every reasonable effort should be made in the design to provide a drainage system for the Development that relies solely on gravity for conveyance in order to minimize the overall operation and maintenance requirements and life cycle costs of the system.

7.5.2 Pumping Station Configuration Considerations

All lift stations shall be suction lift above ground lift stations

The following will be considered when selecting the pumping station:

1. The size and weight of pumps when compared to the Town's available lifting equipment;
2. The wet well shall be offset from the pumps/pump enclosure;
3. Where various technically viable options exist in the choice of the type of pumps or in the station arrangement, a present-worth analysis should be undertaken to determine the most cost-effective equipment and arrangement, taking into account:
 - a) The design is to address the required functional lifetime of the facility structure. This is deemed to be fifty (50) years unless the Town specifically approves a different lifetime;
 - b) The pumping equipment should be assumed to receive a major overhaul involving renewal of the wearing components at seven (7) to ten (10) year intervals, dependent on service conditions; and
 - c) The analysis should bear in mind that the pumping units may have to be replaced every fifteen (15) years, as many manufacturers do not hold spare parts for pumps that have been out of production for longer than this period.

7.5.3 Building Requirements

A building will be required at all pumping stations to house all electrical and control equipment.

1. Pumping stations shall be adequately sized to house all equipment and provide adequate clearance around all equipment;

2. The minimum outside dimensions of the building shall be 5.5 m (L) by 3 m (W) by 2.5 m (H);
3. All equipment shall be accessible for inspection and maintenance from inside the building;
4. All buildings shall have removable roof panels to allow access with a crane to hoist any equipment;
5. All hardware used (i.e.: bolts, hinges, etc.) are to be stainless steel so as to prevent corrosion;
6. Locking systems for pumping facilities shall be electronic and programmable;
7. Backup power generation capability is required at all new lift stations, fuel source to be diesel. Generator capacity shall be sufficient to allow all pumps in lift station to operate simultaneously;
8. The backup generator and station controls shall be located in a suitable building located adjacent to the lift station; and
9. The station shall be architecturally compatible with the Development and located such that it is readily accessible by Town Public Works staff allowing easy access to all equipment.

7.5.4 Pumping Capacity Requirements

7.5.4.1 Design Capacity

Pumping capacity shall be designed for peak flows with 100% redundancy.

7.5.4.2 Mechanical Redundancy

A minimum of two (2) pumps are required for each pumping station and three (3) is preferred.

1. Where only two (2) pumping units are provided, they shall each be of the same pumping capacity and each unit, operating independently, shall be capable of pumping at the design capacity flow rate for the station under the service conditions; and

2. Where three (3) or more pumping units are provided, they shall have pumping capacity such that with the largest unit out of service, the remaining units operating in parallel are capable of pumping at the design capacity flow rate for the station under the service conditions.

7.5.5 Wet Well Size and Detail

Wet wells are to be of adequate size to suit equipment space, operator access requirements and active volume considerations.

1. To minimize dead storage volume, the depth from the "pump off" level to the floor of the wet well should be kept to an acceptable minimum. The required depth will be dictated by suction pipe inlet conditions, pump manufacturer's requirements for submergence or cooling, net positive suction head, priming requirements and vortex control;
2. Wet wells must be sized small enough to minimize total retention time, the time sewage is held in the wet well and any rising forcemain, and yet be large enough maximize pump life by decreasing the frequency of pump starts;
3. The maximum retention time in the wet well should not exceed 30 minutes for the design minimum flow rate anticipated when the contributing area is fully developed;
4. Total retention time in the wet well and forcemain should be kept to a minimum (generally less than 4 h) to avoid anaerobic fermentation and the resultant production of odorous, hazardous and corrosive gases. Otherwise, provisions must be made to control anaerobic conditions;
5. It is desirable to have a wet well with sufficient active volume so that all sewage within the discharge forcemain will be replaced during one (1) pumping cycle, especially if sags exist in the forcemain profile; and
6. Wet well chamber to meet requirements outlined under MAE Master Specification.

7.5.6 Pumps

The following are pump selection considerations.

1. Where dry wells could become flooded, design of the cables, seals, and connectors and electronic controls (etc.) should allow dry mounted pumps to operate under water;
2. Pumps are to be removable and replaceable without dewatering the wet well or requiring personnel to enter the wet well;
3. Generally, all pumps in a pumping station should be identical and interchangeable;
4. Pumps are to be selected which provide optimum efficiencies at actual operating points;
5. The power rating of a motor should not be exceeded by the pump at any operating condition on the characteristic curve of the pump;
6. Flush valves or recirculation pipes from the pump discharge to the wet well are to be provided for occasional aeration and suspension of grit and solids in wet well;
7. Pressure transducers shall be installed on any suction/discharge for all pumps; and
8. Pump to meet requirements outlined under MAE Master Specification.

7.5.7 SCADA and Controls System

1. All pumping stations to have pump controllers that are Programmable Logic Controller (PLC) based and to have a supervisory control and data acquisition (SCADA) system which can be accessed via Human Machine Interface (HMI) software and shall at a minimum display and trend the following parameters:
 - a) Status of all devices;
 - b) Wet well level;
 - c) Total station flow;
 - d) Pump run status;
 - e) Pump discharge pressure when pumps are running;
 - f) Pump flows for each pump;
 - g) Pump alarms;
 - h) Suction pressure when pumps are running
 - i) Discharge pressure when pumps are running; and
 - j) All stations to include communications equipment.

2. All SCADA and Controls System hardware and software components to comply with the Town of Grand Falls – Windsor SCADA requirements.

7.6 APPROVED PRODUCTS

Refer to Division 10 – Approved Products for approved products.

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8 DIVISION 8 – WATER SYSTEMS

8.1 GENERAL

8.1.1 Record Drawings

Upon completion of the installation of the water system, and prior to the acceptance of the system by the Town, record drawings of the water system, stamped by a Professional Engineer registered in the Province of Newfoundland and Labrador must be forwarded to the Town for record purposes.

The record drawing information must show the location of all valves, hydrants, fittings, etc. referenced by NAD83 GPS coordinates.

The record drawing information must show the accurate as-built depth of the water main.

The record drawing information must show the extent of trench rock.

8.2 WATER DISTRIBUTION SYSTEM DESIGN

8.2.1 Water Demand

The water system shall be designed with sufficient capacity to accommodate the greater of Maximum Day Demand plus Fire Flow or Peak Hour demand.

The following *minimum* criteria shall apply to the Design, as applicable to the Development:

1. The design population shall be the ultimate population in the area under consideration as per the land use zoning requirements of the current land use map for the area;
2. Population Density for Residential Areas: 40 persons/ha;
3. 25,000 L/ha/day for Commercial/Institutional;
4. Average Day Demand: Design Population x 340 L/capita/day;
5. Peaking Factors as per section 8.2.1.1; and

6. Where the Development may have commercial users with appreciable water demands, such shall be duly considered in the hydraulic analysis.

8.2.1.1 Peaking Factors

For a municipal system with a variety of uses (residential, public, commercial, industrial) the values in Table 8-1 shall be used. For small water systems where the water usage is strictly residential then the Harmon formula in conjunction with the theoretical average day demand may be used.

Table 8-1 Peaking Factor for Municipal Water Supply Systems

Equivalent Population	Minimum Hour Factor	Maximum Day Factor	Peak Hour Factor
500 to 1000	0.40	2.75	4.13
1001 to 2000	0.45	2.50	3.75
2001 to 3000	0.45	2.25	3.38
3001 to 10 000	0.50	2.00	3.00
10 001 to 25 000	0.60	1.90	2.85
25 001 to 50 000	0.65	1.80	2.70
50 001 to 75 000	0.65	1.75	2.62
75 001 to 150 000	0.70	1.65	2.48
Greater than 150 000	0.80	1.50	2.25

Harmon formula:

$$PF = \frac{1 + 14}{(4 + p^2)^{\frac{1}{2}}}, \text{ where}$$

PF = the ratio of the peak rate of flow to the average rate of flow,

p = the tributary design population, in thousands, for residential areas.

8.2.1.2 Fire Protection

Fire flow requirements shall be in accordance with the recommendations of Water Supply for Public Fire Protection by the Fire Underwriters Survey for the type of development under considerations.

In no case shall fire flows shall not be less than 51 L/s.

8.2.2 Hydraulic Modeling

In general, a hydraulic network analysis is required for any new development for which a hydraulic analysis has not been previously approved to determine the required system configuration and sizing. A hydraulic network analysis will also be required for any development that significantly alters the current system such that a previously approved hydraulic network analysis is no longer applicable.

The Design must include hydraulic network analyses for the Development, updated for each subdivision stage. The limits of the analysis begin at a location of known hydraulic grade determined in consultation with the Town. The Consulting Engineer shall conduct a hydrant flow test to confirm the static hydraulic grade line and determine the available residual pressure at the boundaries of the analysis.

All water system hydraulic models shall be completed using computer modeling software and are to be modeled in accordance with AWWA manual M32.

8.2.2.1 Analysis Software

Software to be used is WaterCAD by Bentley Systems (latest release).

During the review stage, a working WaterCAD model, a design report describing the methodology and results of the analysis as well as any relevant AutoCAD design files will be handed over to the Town.

Final WaterCAD and AutoCAD files are to be submitted to the Town after the Record Drawings have been issued.

8.2.2.2 Friction Coefficients

The Hazen-Williams formula is to be used to calculate friction losses. Coefficients for ductile iron water mains shall be according to Table 8-2.

Table 8-2 Hazen Williams Coefficients

Pipe Diameter (mm)	Hazen-Williams, C
150 - 250	80
251 - 350	90
> 351	100

8.2.2.3 Pressure Requirements

Minimum desirable residual pressure under maximum day plus fire flow conditions shall be 150 kPa at ground level of any point in the system.

Minimum desirable residual pressure under peak hour flow conditions shall be 300 kPa at ground level of any point in the system.

8.2.3 Water Main

8.2.3.1 Water Main Size

Water mains shall generally be sized in accordance with the requirements of the water distribution and transmission plans of the Town of Grand Falls-Windsor.

The minimum diameter of water main pipes shall be:

1. 200 mm diameter for distribution mains;
2. 150 mm diameter for hydrant leads; and
3. 19 mm diameter for water service pipe. The Designer shall verify the minimum pipe diameter requirements for lots with extraordinary long service connections, multi-floor buildings and/or any special requirements. Trace wire shall be included on all services and all curb stops to accommodate the trace wire.

8.2.3.2 Water Main Cover

All water pipe shall have a minimum cover of 1800 mm in relation to the final finished street grade.

For streets not paved prior to November 15 of any year, a sufficient depth of fill shall be placed to give a minimum cover of 1800 mm.

8.2.3.3 Water Main Location

Water main location and clearance shall be as per DMAE Master Specification and conform to the following:

1. Water mains shall be placed within the street ROW between the sidewalk/curb and gutter and property boundaries wherever possible; and
2. Where a water main is to be laid in a trench, other than in the ROW, the developer shall grant to the Town by deed and plan, at his cost, title to the Easement. Such Easement shall be not less than six (6) meters in width and the Town shall approve its location and width.

8.2.3.4 Water Main Dead Ends

The water system shall be so designed to exclude any dead-ended pipe, so far as is reasonably possible. Water mains in Cul-de-Sacs must be connected to other streets wherever possible to eliminate dead ends. If it is not possible to connect to adjacent street a hydrant at end of line must be provided for flushing

8.2.4 Hydrants

1. Hydrants shall be placed behind the sidewalk within the limits of the street right-of-way;
2. Hydrants shall normally be placed in center of building lot;
3. The minimum distance from the edge of a driveway to the center of a hydrant shall be 3 m;
4. The minimum distance from the center of a utility pole to the center of a hydrant shall be 6.0 m;
5. The maximum permissible spacing between hydrants shall be 140 m. No dwelling unit shall be located more than 70 m from a hydrant;
6. Hydrants shall be installed so that the top of the standpipe flange will be 100 mm 150 mm above the finished curb grade;

7. A valve shall be installed on all 150 mm diameter hydrant leads. The hydrant lead valve shall be located at least 1.0 m from the hydrant;
8. All joints on hydrant leads, from the mainline Tee, shall be equipped with joint restraining fittings; and
9. All hydrants shall be GF standard type.

8.2.5 Valves

1. Location of Valves:
 - a) Valves at street intersections shall be located in the roadway at the points of intersection of the street lines with the water main;
 - b) Where water mains intersect, the appropriate number of valves required to allow complete isolation of the system shall be installed. At a typical four-way intersection, four (4) valves will be required. At a typical tee-intersection, three (3) valves will be required;
 - c) Maximum allowable distance between valves on straight sections of water main in residential areas shall be 180 m; and
 - d) On dead end streets zoned for future development a valve shall be installed at the end of the water main
2. Valve Chambers:
 - a) All valves on water mains less than 400 mm in diameter shall be enclosed in a standard screw type adjustable box;
 - b) All valves of 400 mm and larger shall be installed in a chamber constructed of reinforced concrete or made from a 1500 mm diameter prefabricated concrete manhole;
 - c) All valves larger than 300 mm diameter shall be geared; and
 - d) Access frames and covers for these chambers shall be cast iron, providing a clear opening of 750 mm in diameter with two (2) countersunk lifting rings in the cover. The term "WATER" shall be imprinted on the cover. There shall be two (2) access covers in each chamber larger than 1800 mm in diameter and access ladders shall be provided in the chamber.

8.3 CONNECTIONS TO EXISTING WATER SYSTEMS

8.3.1 Service Interruption

A connection of the developer's water system to any part of the existing water system must be carried out in such a way as to cause the least interruption to existing service and the Town must approve each such connection. A connection of 100 mm diameter pipe or greater shall be by a tapping sleeve and valve. All connections shall be pressure connections.

8.3.2 Scheduling of Connection

The Town will assist in the scheduling of any such connection and will install the tapping sleeve and valve at the Developer's expense. If the Developer is permitted to make the actual connection the work must be done under the supervision of the Town at the Developer's expense.

8.3.3 Other Connections

Whenever the existing water system is within reasonable distance from a proposed subdivision, and an interconnection is practical, the developer shall be required, at his cost, to install the necessary pipe and interconnect the water system in his subdivision to the existing water system. Closed loop systems are encouraged.

8.3.4 Prohibited Cross-Connections:

No pipe or water service pipe, cross-connection will be made from the existing water system to a water system in a subdivision, which is connected to some other source of supply including any artesian wells.

8.4 WATER STORAGE RESERVOIRS

8.4.1 General

For specific information not covered in this document, see Section 3.6 of *Guidelines for the Design, Construction and Operation of Water and Sewerage Systems* for water storage requirements and design of water storage tanks.

8.4.2 Design Criteria

The top water level and location of the storage structures will be determined by the hydraulic analysis undertaken for the design of the distribution system to result in acceptable service pressures throughout the existing and future service areas.

The materials and design used for treated water storage structures should provide stability and durability as well as protect the quality of the stored water. The following subsections outline criteria that should be considered when designing treated water storage facilities.

8.4.3 Sizing of Water Storage Tank

Sizing requirements of water storage tanks shall be done according to Section 3.6.5 of *Guidelines for the Design, Construction and Operation of Water and Sewerage Systems*.

8.5 PUMPING SYSTEMS

Designers should refer to Section 3.5 of *Guidelines for the Design, Construction and Operation of Water and Sewerage Systems* for information pertaining to the design and construction of pumping facilities.

8.6 SCADA AND CONTROLS SYSTEM

Wherever Scada and Control Systems are installed they shall meet the following requirements:

1. All pumping stations to have pump controllers that are Programmable Logic Controller (PLC) based and to have a supervisory control and data acquisition (SCADA) system which can be accessed via Human Machine Interface (HMI) software and shall at a minimum display and trend the following parameters:
 - a) Status of all devices;
 - b) Wet well level;
 - c) Total station flow;
 - d) Pump run status;
 - e) Pump flows for each pump; and
 - f) Pump alarms.

2. Pressure Reducing Valves (PRVs) to have controllers that are Programmable Logic Controller (PLC) based and to have a supervisory control and data acquisition (SCADA) system which can be accessed via Human Machine Interface (HMI) software unless otherwise specified. At a minimum the following parameters shall be displayed and trended:
 - a) Status of all devices;
 - b) Pressures; and
 - c) Alarms.
3. All stations to include communications equipment; and
4. All SCADA and Controls System hardware and software components to comply with the Town of Grand Falls – Windsor SCADA requirements.

8.7 APPROVED PRODUCTS

Refer to Division 10 – Approved Products for approved products.

DIVISION 9 – SUPPLEMENT TO MAE MASTER SPECIFICATION

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9 DIVISION 9 – SUPPLEMENT TO MAE MASTER SPECIFICATION

9.1 SECTION 01001: DEFINITIONS

ENGINEER - Shall mean Consulting Engineer registered in the Province of Newfoundland and Labrador, retained by the Developer to be responsible for design and supervision of the work.

OWNER - Owner, where used in the Master Specifications, refers to the Developer, a person or company who has applied for and has been granted approval to subdivide or service an existing parcel of land.

9.2 SECTION 01005: GENERAL INSTRUCTIONS

Where a Contractor is required to install storm or sanitary sewer mains beginning at an existing manhole or section of existing main, the Contractor shall install a temporary 6 mm mesh screen over the outlet pipe of the first downstream existing manhole to prevent silt and gravel from entering the existing system from the new work. If this location is not appropriate, the Engineer may choose a more suitable location, to be approved by the Director of Public Works and Development or designate.

9.3 SECTION 01570: TRAFFIC REGULATIONS

Refer to latest version of Town of Grand Falls-Windsor Traffic Control Manual

Traffic detours shall not be implemented unless the owner receives the prior written approval of the Town. The owner shall request approval at least seven (7) days in advance of the proposed implementation of the detour.

Traffic detours shall be applicable to through traffic movements only. The owner shall provide adequate means whereby access is maintained to properties fronting on closed sections of streets.

9.4 SECTION 02552: HOT MIX ASPHALT CONCRETE

Refer to latest version of Town of Grand Falls-Windsor Asphalt Specification.

9.5 SECTION 02702: PIPE SEWER CONSTRUCTION

Add the following to the items listed under section 3.8 CCTV Inspection of Pipelines in the MAE Master Specification

1. A Video inspection will be required:
 - a) For all new sewers (sanitary and storm). Sewers are to be inspected prior to acceptance of Stage I works and ten months from the date of acceptance or before placing of surface course asphalt, whichever occurs first; and
 - b) When any proposed construction project may conceivably damage, disrupt or otherwise disturb any portion (or an appurtenance) of the municipality's sewerage system, a pre- construction and post-construction inspection of the system will be required. Inspection requirements shall be determined based on the following criteria:
 - i Any sewer running parallel to the proposed construction area and within 5 m of same shall be inspected if blasting is required or anticipated; and
 - ii When blasting is not required, any sewer running parallel to the proposed construction and is within 3m of same shall be inspected.
2. The Contractor will arrange all pre-construction and post-construction video inspections;
3. In the area of the proposed construction, all building services connected to the sewer main shall be assumed to be in reasonable structural condition if they have been functioning properly in the past. If a malfunction of a building service is caused, the contractor will be held responsible for any repairs. As an alternate to the previously outlined pre-construction inspection requirements, the Contractor may accept the sewer line conditions noted in a previous video inspection report for the affected area, which may be presently on file, however, to permit utilization of a past report, the following criteria must be met:
 - a) The video inspection report shall be less than three (3) years old; and
 - b) No major construction works shall have been undertaken in the immediate area since this inspection.

4. The post-construction inspection must be completed within thirty days of completion of the works, and in any case before the work is accepted;
5. The results of the video inspection will be evaluated by the Engineer for determination of any damage as a result of the construction project. The sewer system and its appurtenances will be assumed to be damaged by a construction project under the following conditions:
 - a) The excavation is of sufficient proximity and depth; and
 - b) In bedrock, to cause damage to sewers by blasting tremors or rock movement.
6. All damage incurred by the sewer system due to the construction project shall be repaired by the contractor in accordance with the Town standards. Upon completion of these repairs, a subsequent verification inspection shall be undertaken to assess the quality of the repairs;
7. Definitions:
 - a) "Clean" shall mean the removal of all sand, grease and all other solid or semi-solid material from the length of pipe connecting two (2) manholes.
 - b) "Building service" shall mean the sewer line (lateral) extending from the building to the sewer main.
8. The camera shall be small enough to ensure passage through a 150 mm sewer;
9. The Contractor shall record all the video inspection digitally and shall submitted the recordings to the Engineer within ten (10) working days following completion of a video inspection on a section of sewer. The Engineer shall prepare and submit a written final video inspection report to the Town;
10. The video inspection shall be performed on one (1) sewer line section at a time. Each sewer line section being inspected shall be isolated where necessary from the remainder of the line by the use of a line plug to ensure total viewing of the periphery of the pipe. The inspection shall be performed in the direction of the flow, where possible;
11. An Inspection Record, in log form, shall be maintained during the video inspection by the Engineer. This log shall show the exact location of each point of infiltration,

fault and building service observed by the camera. The location shall include the distance away from the referenced manhole and also the position as referenced to the axis of the pipe. Further, a detailed technical description shall be accompanied with photographs as supporting data for each leak or fault noted in the Inspection Report. The term leak or fault is hereinafter defined as:

- a) Any sewer pipe joint which displays a gap or spread, offset, or signs of infiltration.
 - b) Any building service which has water entering around the junction of the lateral to the sewer line section or a steady flow entering the line section through the sewer lateral.
 - c) Any building service exhibiting a pronounced protrusion into the sewer line section.
 - d) Any section of the sewer which is crushed, broken or displays cracks which are either parallel or perpendicular to the axis of the pipe (longitudinal cracks or shears).
 - e) Any variance in the grade of the sewer line section.
12. The Engineer reserves the right to take pictures of the video monitor, as long as such photographing does not interfere with the Contractor's operations and work;
13. Sections found to have deficiencies are to be re-taped after deficiencies have been rectified, therefore, taping of new work will show no deficiencies;
14. The Contractor shall provide the accommodation for no less than two (2) people, for the purpose of viewing the monitor, while the inspection is in progress;
15. All photos and video pictures shall be of excellent quality and resolution. They should present a clear picture of the condition of the pipe with a precise and distinct definition of all observations, (i.e.: leaks, faults, cracks, obstructions, etc.);
16. Site Safety:
- a) A SSSP shall be submitted prior to any work commencing;
 - b) Manhole barricades are required around all open manholes in addition to Traffic Control;

- c) Prior to entering manholes and sewer lines, the contractor shall ensure that dangerous gases are not present. The Contractor shall keep a C.S.A. certified gas meter and air blower at the site to ensure the safety of the workmen when they are working inside the manholes and sewer lines; and
 - d) Personnel shall be trained in confined space entry.
17. When sewer line flows are above the minimum requirements (1/4 of the pipe diameter) to effectively conduct the inspection, one (1) or more of the following methods of flow control shall be used:
- a) Plugging or Blocking - A sewer line plug shall be inserted into the line at a manhole upstream from the section to be inspected. The plug shall be designed so that all or any portion of the sewage flows can be released. During the inspection portion of the operation, flows shall be shut off or substantially reduced in order to properly inspect the pipe at the invert. After the inspection is complete, flows shall be restored to normal; and
 - b) Pumping or By-passing - When adequate flow control cannot be obtained by the plugging method, pumps or siphons shall be used to divert all or a portion of the flows as may be necessary to perform the inspection, as approved by the Engineer. Excess sewage flows shall be transported through a pipe or by tank trucks to the nearest or most economical disposal area.

9.6 SECTION 02713: WATER MAINS

9.6.1 Location of Curb Stops

Delete item 1.1.1 as shown in the in the MAE Master Specification and substitute the following:

Curb stops shall be located at the property boundary.

DIVISION 10 – APPROVED PRODUCTS

10 DIVISION 10 – APPROVED PRODUCTS 10-2

10 DIVISION 10 – APPROVED PRODUCTS

See MAE Master Construction Specification for a list of approved products for all items not explicitly covered in Division 10

Item	Description	Product
Division 6 – Storm Sewer Systems		
10.6.1	Pipe Culvert	Pipe and any applicable fittings
		Aluminized Steel
		Concrete
		Corrugated Polyethylene
10.6.2	Storm Sewer Main	Pipe and any applicable fittings
		HDPE corrugated double wall 320 kPa
10.6.3	Service Laterals	Pipe and any applicable fittings
		J.M Ring-Tite PVC SDR 28
Division 7 – Sanitary Sewer Systems		
10.7.1	Sanitary Sewer Main	Pipe and any applicable fittings
		J.M Ring-Tite PVC SDR 35
10.7.2	Service Laterals	Pipe and any applicable fittings
		J.M Ring-Tite PVC SDR 28
10.7.3	Sewage Forcemain	Pipe and any applicable fittings
		Ductile Iron
		PVC pressure pipe
		Polyethylene pressure pipe
Division 8 – Water Systems		
10.8.1	Water Main	Pipe and any applicable fittings
		Polyethylene Encased Ductile Iron with Rubber Gasket Joint (AWWA C151 and AWWA C111)
10.8.2	Service Connections	Pipe and any applicable fittings
		Cross linked polyethylene (PEX) B137.9 and A.S.T.M F1282 with #14 RW90 trace wire. All connections/fitting to be compression type
10.8.3	Valves	Gate Valves
		Metal Seated double disk– non rising stem (AWWA C500)
10.8.4	Valve Boxes	Valve Boxes
		Cast Iron
		PVC

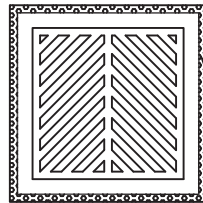
APPENDIX A – REFERENCE INFORMATION AND DRAWINGS

Catch Basin Detail

N.T.S.

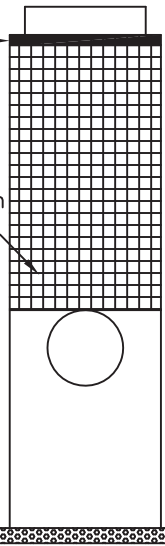
Minimum 50mm Adjustment
Ring For All Catch Basins

Top View



Armtex 825 Woven
GeoSynthetic
or Equivalent

50mm High Density
Rigid Insulation



Side View