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**City of Mount Pearl
INDUSTRIAL AND COMMERCIAL SUB-DIVISION DEVELOPMENT
STANDARDS
Revision 2009**

INDUSTRIAL DEVELOPMENT STANDARDS

The Council of the City of Mount Pearl hereby adopts the following Municipal Engineering Standards.

Made and adopted by the Council of the City of Mount Pearl on this _____ day of _____ 2002.

Clerk

Mayor

All persons are hereby requested to take notice that anyone who wishes to view these Standards may do so at the Office of the Manager of Engineering Services, of the City of Mount Pearl. Should there be any questions or need for clarification, please contact the City's Engineering Department at 3 Centennial Street or telephone 709-748-1018.

Approved by:

Eliol Blackmore, P. Eng.
Manager of Engineering Services

AMENDMENTS TO Industrial Development Standards

<u>AMENDMENT #</u>	<u>DESCRIPTION OF REVISION</u>	<u>DATE OF REVISIONS</u>
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1.0 - STREETS

In order to properly develop street layouts a number of possible considerations must first be considered. A street cannot simply be put anywhere it seems to fit. There are many variables that will determine its placement and layout along with other vital aspects including its geometric properties. The following will consider the various aspects that need to be examined in order to develop a roadway.

1.1 Street Classification:

Streets first need to be classified based upon their traffic demands in order to help determine possible demands that will be placed on the future roadway. Streets shall be classified according to the following table (see Table 1.1). Below are some common street classification definitions.

Arterial: An arterial is a roadway that carries large volumes of all types of traffic which are moving at medium to high speeds. These roadways serve as major traffic flows between the principle areas that traffic generates to connect to collectors and highways.

Collector: A collector roadway provides both traffic and land service. Its function is to carry traffic between local and arterial roadways.

Local: A local roadway provides land access and connections to collector roadways. They carry traffic within an origin and is not intended to carry thorough traffic. Direct access is usually allowed to abutting properties.

TABLE 1.1: Street Classification

	ARTERIAL	COLLECTOR	LOCAL
Traffic service	Traffic movement first consideration	Traffic movement and land access of equal importance	Traffic movement second consideration
Land service	Land access second consideration	Traffic movement and land access of equal importance	Land access first consideration
On Street Parking	None	None	OK
Design Volume (A.D.T.)	30000	Less than 3000	Less than 1,000
Characteristics of traffic flow	Uninterrupted except at signals and crosswalks	Interrupted flow	Interrupted flow
Vehicle type	All types	All types including passenger, service vehicles, large vehicles (transport trucks, buses,	All types including passenger, service vehicles, large vehicles (transport trucks, buses,
Connects to	Arterials, collectors, & some locals	Arterials, collectors, locals	Collectors, locals

1.2 **Geometric Design**

The proper geometric design of a roadway will allow a roadway to serve its intended purpose. All aspects must be considered in order to properly design to facilitate the intended traffic flows/type. The following are some guidelines that are used for the development of an industrial street.

1.2.1 Design Speed

The applicable design speed shall be 50 km/hr unless otherwise specified by the Municipality. See Figure 1.1 as adapted from the Urban Supplement for Geometric Design of Canadian Roads.

Classification	Design Speed (Km/h)	Maximum Gradient (%)	Decision Sight Distance (m)	Minimum Stopping Sight Distance (m)
ULU Industrial/Commercial	30	6-12	90-120	30
	40	6-12	110-180	45
	50	6-12	140-190	65
UCU Industrial/Commercial	50	6-12	140-190	65
	60	6-11	170-230	85
	70	6-9	200-270	110
UAU	50	6-10	140-190	65
	60	6-9	170-230	85
	70	5-8	200-270	110

Figure 1.1: Design Speed and Alignment guidelines

ULU – Urban Local Undivided

UCU – Urban Collector Undivided

UAU – Urban Arterial Undivided

1.2.2 Vertical Alignment

1.2.2.1 The minimum grade shall be in accordance with Table 1.2.

- 1.2.2.2 The minimum centre line grade shall not be less than 1.0 %. The minimum centre line grade on a cul-de-sac shall be such to provide a minimum curb grade of 1.0 %.
- 1.2.2.3 The maximum grade on any local road shall not exceed 8 % unless otherwise specified or approved by the Municipality.
- 1.2.2.4 The maximum centerline grade of cul-de-sac shall not exceed 5 %.
- 1.2.2.5 Minimum K values for vertical curves shall be in accordance with Table 1.2.

1.2.3 Horizontal Alignment

- 1.2.3.1 The minimum curve radius to be used for collectors and arterials will be related directly to the design speed and shall be in accordance with the Urban Supplement to the TAC Geometric Design Guide. See Table 1.2
- 1.2.3.2 The minimum face of curb radius shall be in accordance with Table 1.2.
- 1.2.3.3 Tangent distances between horizontal reverse curves shall not be less than 50 m.
- 1.2.3.4 Tangent distances between horizontal curves turning the same way shall not be less than 100 m.

	MAJOR COLLECTOR	MINOR COLLECTOR	LOCAL
Street grade Maximum	10.0%	8.0%	8.0%
Street grade Minimum	1.0%	1.0%	1.0%
Street right of way width	30 m	20 m	15 m
Minimum C/I Radius	90 m	100 m	50 m
Minimum Stopping Sight Distance	65 m	65 m	65m
Pavement Widths	15.0 m	12.0 m	10.5 m
Minimum "K" value Vertical curve Crest Sag	7 11	7 6	7 6
Minimum Distance between intersections	400 m	60 m	60 m
Minimum face of curb radius at intersections	15 m	10 m	10 m
Sidewalks	2 or as required by city	1 or as required by city	1 or as required by city
Street lighting (Minimum requirements)	1.5 cd/m or 22 lx	1.0 cd/m or 15 lx	1.0 cd/m or 15 lx

TABLE 1.2: Characteristics of Street Classes Street Classification

NOTE: At an intersection of a minor collector and a major collector there should be sufficient room for a left hand turning lane and also a refuge islands with a large enough radii to support a TST designed vehicle.

1.3 Design Criteria

Once the physical properties of the roadway have been determined the design criteria must be evaluated in order to verify that the roadway will accommodate its intended function.

- 1.3.1 Street layout and design shall include streets to accommodate through traffic and shall reflect the streets overall function.
- 1.3.2 Land uses along streets used for thorough traffic shall be chosen and designed to minimize their sensitivity to the adverse affects of traffic with land use being the first consideration for local roads and thorough traffic and land consideration being of equal importance for collectors.
- 1.3.3 Reference can be made to Table 1.2 regarding the minimum requirements for vertical alignments. Specific vertical and horizontal alignments may dictate a variance in these requirements.
- 1.3.4 For situations not covered by this section, the Geometric Design Guidelines for Canadian Roads and/or the Urban Supplement should be used as a reference or guide.

1.4 Right-of-Way

- 1.4.1 Minimum street rights-of-way for various roadway classifications can be found in Table 1.2. The Municipality may require an extended right-of-way to facilitate any traffic, maintenance or construction requirements.

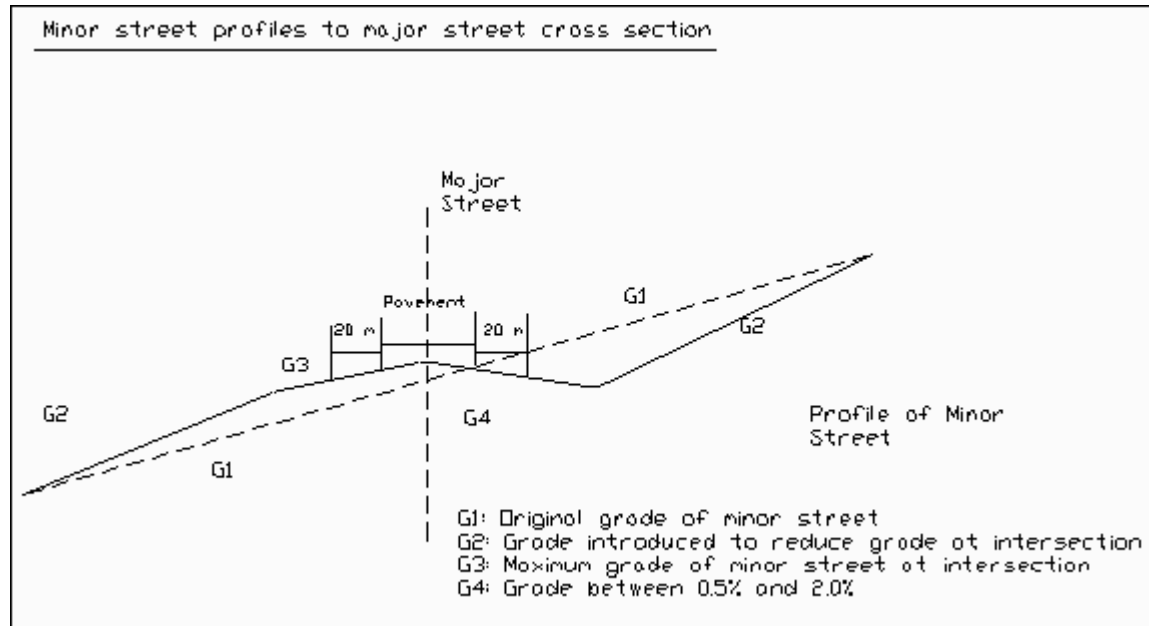
1.5 Intersections

- 1.5.1 The maximum number of streets that may approach an intersection shall be four.
- 1.5.2 The intersection shall have an intersecting angle of 90 ° where possible. The minimum angle shall be 80°.
- 1.5.3 The intersection shall have a minimum centre line distance between adjacent and/or opposite intersections:
- a) on Local streets to Collector streets of 60 m,
 - b) on Collector streets to Collector streets of 60 m.
- 1.5.4 The intersection shall have a vertical alignment within the intersection approach of not more than 3 % grade for a minimum distance of 20 m from the roadway intersection curb line. See figure 1.2 unless otherwise approved by the city's engineering department

Figure 1.2: Minor Street Profiles to Major Street Cross Section

- 1.5.5 When two streets (or more) intersect, only one street may have a curved horizontal alignment; all other streets at this intersection shall have a minimum tangent section of 30.0 m as measured from the street line intersection to the first point of horizontal curvature on each approved street line.

1.6 Cul-De-Sacs



- 1.6.1 Cul-De-Sacs are a special variation of roadway or dead end. They should only be used where approved by the City's Planning and Engineering Departments. They shall have the following additional minimum requirements:
- Face of curb line, turning circle, radius of 15.25 m.
 - Right away Radius – 17.25 m.
 - Maximum negative slope of – 5.0 %
 - High back curb and gutter to extend around the bulb.
 - Transitional street line radius of 15.25 m into street line turning circle.

- (f) Maximum length of cul-de-sac is 200 m – measured from the edge of the right of way to which the new cul-de-sac road is to connect to the start of the turning radius of the cul-de-sac bulb.
- (g) Cul-de-sacs shall be graded so that the road is crowned to allow for drainage to the curb.

1.7 Ice Control on Newly Paved Streets Prior to Acceptance by the City

1.7.1 Sand and salt mixture may be used as a method of ice control but the developer must take the proper precautions in order to reduce build-up of sand particles in catch basins and man holes.

The Following precautions can be taken to prevent build-up of sand in the cities storm water systems;

- 1) Use clean sand that is free of any fine materials and chemicals. Fine particles mixed with sand can increase stream turbidity and carry pollutants such as phosphorous and metals.
- 2) Street sweeping during the spring months can reduce amount of pollutants in storm water
- 3) Operators should be trained to apply only the necessary amount for given conditions
- 4) Catch basin sumps to be cleaned annually

1.7.2 Road Deicers:

These are chemicals that have been designed to melt snow and ice on pavement. The most commonly used is road salt (NaCl), but many other types of deicers exist.

1.8 Other General Requirements

- 1.8.1 Horizontal alignment of streets shall be such that the centre line and curb lines shall be symmetrical with the street line unless otherwise specified by the Municipality.
- 1.8.2 Vertical alignments of streets shall be considered as symmetrical about the centre line unless otherwise instructed by the Municipality.
- 1.8.3 All streets must have a minimum 210mm crowned roadway cross-section and in no case should the crowned roadway cross section be less than 2%.
- 1.8.4 Curb and gutter is required.
- 1.8.5 All streets shall have a minimum of 200 mm Class “ B” and 100mm Class “A” granulars, 37.5 mm base course and 37.5 mm surface course asphalt. Additional granulars and asphalt may be specified as determined by the City Engineer.

1.9 Revisions of Procedure:

This procedure is subject to change without notice and the responsibility lies with the consulting engineer to ensure that he /she is in possession of the latest revision.

2.0 SURVEYING

The main purpose of this section is to ensure that all materials and quantities are to specifications and set standards.

2.1 Definitions

TST: Maximum tractor-semi trailer combination prescribed by the MOU.

MOU: Memorandum of Understanding on Interprovincial Weights and dimensions.

Curb line: The area where the face of curb meets the pavement of the carriageway (roadway).

Street line: The area where the street meets perpendicular to the edge of the adjoining street or cul-de-sac.

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.

Newfoundland and Labrador Provincial Co-ordinate Survey System:

Means a system established for referencing land surveys and are based on 3° (degree) transverse Mercator projection.

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

2.2 Master Survey Plan

2.2.1 A Survey plan shall be drawn in accordance with the requirements of the "Drafting" section of Schedule 2 and shall include:

- (a) The name of the owner of all abutting lands;
- (b) The length and bearing of each line of any transverse which connects any point on the boundary of the subdivision with a Provincial Co-ordinate Monument;

- (c) 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.
- (d) Each street, walkway and easement;
- (e) Each lot and its number;
- (f) The length, bearing and internal angle of each line of the boundary of, and the area in square metres of:
 - (i) The land being subdivided;
 - (ii) Each street, walkway and easement;
 - (iii) Each lot;
 - (iv) The land, if any, which is reserved for park, playground, buffers and public purposes;
- (g) The geometry of connections between existing streets and streets of the subdivision;
- (h) The location of any existing structure, which is to remain;
- (i) Every water course and its direction of flow;
- (j) all information necessary for the calculation and laying out of any curved line;
- (k) The date of compilation;
- (l) The date and description of revision, if any;
- (m) The name of the subdivision;
- (n) All existing streets, roads, lanes and intersections in the immediate area and their official names as designated by the City;
- (o) The location and extent of rock outcrops;
- (p) The location and results of any test borings;
- (q) At least two (2) centre line points of known chainage related to the Provincial Co-ordinate Survey System;
- (r) The location and elevation of the City benchmark used.

- (s) Manhole numbers shall be assigned by using the last four whole numbers of the easting and the suffix, "S" for sanitary sewer manholes and "R" for storm sewer manholes.

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

- (a) MAXIMUM - Size designation, B1, which represents 707 mm wide x 1000 mm long;
- (b) MINIMUM – SI Size designation A1, which represents 594 mm wide x 841 mm long;
- (c) LEGAL SIZE - Size designation, P4 that 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.

2.2.3 Master survey plan shall be drawn to a scale as indicated in the “Drafting” section of Schedule 2;

2.2.4 Master survey plan shall have a Key Plan to locate the subdivision as it relates to adjacent streets of the City. Scale shall be as indicated in the “Drafting” section of Schedule 2.

2.2.5 Master survey plan shall be certified by a Newfoundland Land Surveyor.

2.3 SURVEY DETAILS AND ACCURACY:

- 2.3.1 All traverses are to be plotted by either the actual calculated "Latitude (lats) and Departures (deps)" method or by the "Tangent Off-Set Method".
- 2.3.2 All boundary line dimensions to be shown to at least two decimal places with all angles shown to the nearest 30 seconds or better.
- 2.3.3 More or less distances shall only be accepted along a water boundary.
- 2.3.4 Contours shall be shown to determine the elevations for all streets, roads, easements and walkways in relation to the proposed lot layout.
- 2.3.5 For proposed streets, the existing vertical alignment conditions (contours) shall be obtained from actual field surveys.
- 2.3.6 All Vertical Control shall be related to the Province of Newfoundland Approved Datum.
- 2.3.7 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.
- 2.3.8 The accuracy of closure shall be not less than 1 metre in 10,000 metres.

2.4 STREET, WALKWAY AND LOT IDENTIFICATION

- 2.4.1 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

- 2.5.1 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 City;
- 2.5.2 Survey information shall be clear, concise, neat and accurate, properly labelled and signed by a registered Newfoundland Land Surveyor.

2.6 BENCHMARKS

- 2.6.1 The Developer shall supply brass plugs and wedges or other markers to be used as Benchmarks.
- 2.6.2 The City shall assign numbers to the Benchmarks.
- 2.6.3 The plugs with wedges shall be placed in the concrete curb flush with the concrete. Prior to setting, the plughole will be filled with quickset cement. Then, with the use of a mallet and a wooden block, the plug and wedge will be driven into the hole.
- 2.6.4 All benchmarks shall be inter-visible and coordinated using the 3⁰ (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.

- 2.6.5 The maximum distance between benchmarks shall be 300 metres.
- 2.6.6 Benchmarks must be established from other City Benchmarks or Geodetic Benchmarks and end at the same or different City Benchmarks that have acceptable elevation values. All lines beginning and ending in existing Benchmarks with known elevations and all lines forming self-closing loops will be levelled one way. All Benchmarks must be turning points and form part of the levelling loop.
- 2.6.7 Benchmarks must be established by spirit levels done to third order standards with a minimum accuracy of 24mm/k where k= the distance in kilometres between benchmarks measured along the levelling route. If the misclosure or discrepancy exceeds the allowable, the line shall be re-levelled.
- 2.6.8 The method used will be three-wire method (mean of the reading for the three wires). The difference of elevation is the mean of the two running where:
- $$Mean = \frac{(F) - (B)}{2}$$
- The Contractor/Surveyor will perform all necessary adjustments of the level loops.
- 2.6.9 The original field notes for the horizontal, vertical control and completed description sheets shall be submitted to the City.
- 2.6.10 All notes shall be on loose-leaf paper (100 mm x 165 mm) with the cover sheet showing the name of the firm, date, name or observer, and recorder.

- 2.6.11 The City shall supply description sheets for the drafting of a reference plan for each Benchmark.
- 2.6.12 The description sheet shall be prepared in a fashion that will produce clear and legible copies. A minimum of three ties shall be shown to reference the Benchmark. The reference plan need not be to scale, however, all lettering and numbering must be in ink and produced by a mechanical or computer generated means. Lettering size shall be a minimum of 2.5 mm high and line weight shall be 0.35 mm.
- 2.6.13 All Benchmarks and Benchmark information shall be shown on the subdivision plan according to the City standards.
- 2.6.14 If the work does not meet the above criteria, the contractor/surveyor's work shall be returned for corrections.

3.0 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 record drawings for all developments.
Manually drafted drawings will not be accepted.

3.1.2 Submission of Drawings in Digital Format

The City of Mount Pearl presently uses AutoCAD map 3D 2010 or equivalent for drafting and archival storage of its own digital drawings. Wherever this specification requires the submission of digital drawings,

they shall be in AutoCAD *dwg* format, or *dxf* format, where the consultant uses a CAD platform other than AutoCAD.

Prior to submission of digital drawings the consultant shall enquire as to the version of AutoCAD presently being used by the City and shall submit his drawings in a compatible format.

Storage Media – Throughout the Design process individual drawings may be submitted on compact disk (CD/DVD). Record drawings shall be submitted in complete sets on compact disk (CD/DVD).

Electronic File Transfer – During the design process, electronic file transfer through e-mail or internet will be considered on a case by case basis.

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 Scale of the:

- (a) Engineering Plan or Site Services Plan shall be:
 - (i) Plan - 1:500
 - (ii) Profile - 1:500 Horizontal
1:50 Vertical or as otherwise approved in writing.

- (b) Survey Plan/Subdivision Plan shall be:
 - (i) 1:500 or
 - (ii) As approved by the City

- (c) Site drainage plan shall be:
 - (i) 1:500 or
 - (ii) 1:1000 or
 - (iii) 1:2500 or
 - (iv) As approved by the City

- (d) Location plan or key plan shall be 1:2500
- (e) Site grading plan shall be 1:500
- (f) Detail plan and cross-sections shall be at a scale that will fully illustrate the subject matter.

* Note: For some smaller projects to use a 1:500 scale would not be permitted in order for sufficient detail to be legible.

3.1.5 **Grid Reference**

Drawings shall be prepared using NAD 83 (North American Datum 1983). Grid lines at 200 metres 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 City drafting symbols and line types, as shown on the sample drawing provided, can then be placed on web site(view only) , 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 roman simplex font and the minimum size lettering shall be Leroy 100, which represents a plotted height of 2.54 mm. For the purpose of annotating existing grades, text at a forty five degree angle to the bottom of the drawing sheet should be used. This text shall be Leroy 60 size, which represents a plotted height of 1.524 mm. 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. Contact the City's draft person for requirements.

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:

- (a) Project Name
- (b) Key Plan
- (c) Name of Consulting Engineer and Sub-consultants
- (d) Name of Developer
- (e) List of Drawing Names and Numbers
- (f) Date of Issue
- (g) "Record Drawing" note when applicable.

3.1.13 **Submission Of Drawings**

- (a) Design drawings shall be submitted as follows:
 - (i) 3 each - White Prints

- (b) Construction drawings shall be submitted as follows:
 - (i) 3 each - White Prints
 - (ii) 1 only – Digital Copy

- (c) Record drawings shall be submitted as follows:
 - (i) 1 only - White Print
 - (ii) 1 only – Digital Copy
 - (iii) 1 only - Listing of screen colour/pen weight designations.

3.2 **Preparation Of Drawings – General Conditions**

3.2.1 **Street Names**

All streets shall be identified and names printed within street lines.

Proposed street names to be submitted to the City prior to incorporating in drawings. The City will forward names to the Fire Commissioner's office for review. Upon approval by the Fire Commissioner and Council, the developer will be advised of approved street names.

3.2.2 **Intersection Identification**

At intersection streets or where the continuations of the streets are 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:

- (a) The "Tangent Off-Set Method; or
- (b) The calculated "Latitude (Lats) and Departure (Dep)s" 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 centimetre.

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**

More 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**

(a) 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 he is in possession of the latest revision.

4.0 SANITARY SEWAGE SYSTEM

The following guidelines deal with issues concerning the development of an adequate sanitary sewage system. The system must be designed so that it will accommodate the worst probable case for present conditions and future development conditions.

4.1 **Design Drainage Area:**

The drainage area may be determined from contour plans and shall include all other areas, which may become tributary by reason of regrading or pumping.

4.2 **Drainage Plan:**

The drainage plan shall be based on design elevations and shall be to a scale as indicated in the Drafting section of this specification and shall show generally:

- (a) Streets
- (b) Lots
- (c) The size and grade of the sanitary sewers with manholes numbered using the last four digits of the Easting and the suffix "S".
- (d) Tributary areas to each manhole, size of the area in hectares and ultimate average population per hectare clearly shown therein.

4.3 **Evaluation of Design Flows:**

- (a) Standard design forms shall be used for all calculations. A sample may be obtained from the City of Mount Pearl Web site under the Engineering Department-Municipal Standards.
- (b) The design of all sanitary sewers shall be based on a peak flow and the 22,500 L/ha/day constant of infiltration. A typical computation of Design Flow (for distribution pipes only) is shown on attached Table 2 and some of its aspects explained in the following items.
- (c) The minimum rate of infiltration for which capacity shall be provided is 22,500 L/ha/d.
- (d) The design flows from developments of an individual Industrial lot shall be based on an average population density of 80 people per hectare.
- (e) Flow computations (for distribution pipes only) shall be based on Table I as follows:

TABLE #1

LAND USE	AVERAGE DAILY SEWER FLOW	PEAKING FACTOR	PEAK SANITARY FLOW
Industrial	(Area) X (80 people per hectare) X (275 L/c/d)	Calculate Using Peaking Factor Formula	

Where:

Average Sewer Flow is a predicted flow based on ninety (90%) percent of water consumption.

Peaking Factor is the ratio of the peak rate of flow or the average rate of flow. It is based on the Harmon Formula,

$$M = 1 + \frac{14}{4 + \sqrt{p}}$$

where "p" is the tributary design population in thousands for residential areas. For other than residential, 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 275 L/c/d.

4.4 Capacity of Pipe:

Manning's Formula:
$$V = \frac{R^{\frac{2}{3}} \times S^{\frac{1}{2}}}{n}$$

shall be used to compute the capacity of sanitary sewers. The following roughness coefficient "n" shall be used:

- | | | |
|-----|---------------|-------|
| (a) | Concrete Pipe | 0.013 |
| (b) | P.V.C. | 0.010 |

4.5 Minimum Size:

- | | |
|-------------------|--------|
| Of street sewer | 250 mm |
| Of building sewer | 150 mm |

4.6 Velocity: (for design flow)

- | | |
|-----------|---|
| Minimum - | 1 m/s |
| Maximum - | 5 m/s for diameter up to and including 825 mm and
6 m/s for diameters larger than 835 mm |

4.7 Change of Size

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

4.8 Pipe Crossing Clearance:

- (a) Sewer crossing sewer: A minimum of 150 mm vertical clearance is required between outside barrels where sewer pipes cross.
- (b) Sewer crossing waterline :(vertical clearance): A minimum of 450 mm vertical clearance between a sewer pipe crossing a waterline. (horizontal clearance) A minimum of 3.0m horizontal separation between sewer and

the waterline and the waterline must be located in a separate trench than the storm and sanitary sewer.

4.9 **Location:**

- (a) Sanitary sewers shall be located such that manholes are placed in the centre of driving lanes wherever possible.
- (b) Manholes shall be located at every change of grade, alignment, size or material of the sewers.
- (c) Manholes shall be spaced a maximum of 90 m apart for sewers smaller than 700 mm diameter and 120 m apart for sewers over 700 mm diameter.

4.10 **Earth Load:**

Earth loads on sewers shall be calculated by using the Marston Formula.

4.11 **Superimposed Load:**

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

4.12 **Manholes:**

- (a) Standard types of manholes and their details are shown in Standard Drawings found in Newfoundland and Labrador Municipal Water , Sewer and Road Specifications.
- (b) All manhole chamber openings must be located on the upstream side of the manhole.
- (c) All pipes turning at a greater angle than 45° in a manhole require a 150 mm drop.
- (d) Special manholes shall be fully designed and detailed.

4.13 Storm Water:

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

4.14 Vertical deflection:

Testing of every section with a “Go-No Go” device is required. The deflection shall be checked by manually pulling a go, no-go deflection testing mandrell through the pipe. If the percent of deflection exceeds the maximum specified, the contractor shall, at his own expense, undertake such remedial action as required to reduce the deflection to the limits specified. Vertical deflection tests shall be performed on all lines. The contractor shall conduct the tests under the observation of the Department of Engineering Services

4.15 Revisions of Procedure:

This procedure is subject to change without notice and the onus lies with the Consulting Engineer to ensure that he is in possession of the latest revision.

TABLE #2

LAND USE	PEAK SANITARY FLOW (FROM TABLE 1)	MINIMUM RATE OF INFLITRATION	DESIGN FLOW
Industrial		22,500 L/ha/d	Peak Sanitary Flow + Minimum Rate Of Infiltration

--	--	--	--

Remarks and Computations:

5.0 **STORM SEWERS**

5.1 **Design Drainage Area:**

The design drainage area may be determined from contour plans, and shall include any fringe areas not provided for, in adjacent storm drainage areas, as well as other areas, which may become tributary by reason of regrading.

5.2 **Drainage Plan:**

The drainage plan shall be based on design elevations and to a scale as indicated in the drafting section of this specification and shall show generally:

- (a) Streets;
- (b) Lots;
- (c) Water courses and direction of flow;
- (d) Proposed storm sewers with manholes numbered using the last four digits of the Easting and the suffix "R",

- (e) Tributary areas to each manhole, size of the area in hectares and the runoff coefficient clearly shown therein;

- (f) Contour lines having an interval not exceeding one metre;
- (g) Proposed surface drainage.

5.3 **Runoff:**

Computations shall be based on the Rational Method formula or other method as approved by the City of Mount Pearl Engineering Services:

$Q = R.A.I.N.$ where:

Q = maximum rate of runoff, in litres per second

R = runoff coefficient

A = area tributary to the point of design, in hectares

I = average rainfall intensity, having duration equal to the time of concentration of drainage area, in millimetres per hour

N = Constant = 2.778

Standard design forms shall be used for all calculations. (See Appendix A).

5.4 **Recommended Coefficients Of Runoff Values For Various Land Uses:**

The value of the coefficient shall be obtained by correlating the ratio of impervious to pervious surfaces. The minimum coefficients for fully developed areas shall be as follows:

- | | | |
|-----|---------------------------|-------------|
| (a) | Parks & Undeveloped Areas | 0.10 - 0.30 |
| (b) | Single Family Residence | 0.30 - 0.50 |
| (c) | Semi-Detached | 0.40 - 0.60 |
| (d) | Row Housing | 0.60 - 0.75 |
| (e) | Apartments | 0.50 - 0.70 |
| (f) | Parking Lot Areas (paved) | 0.90 - 1.00 |
| (g) | Light Industrial | 0.50 - 0.80 |
| (h) | Heavy Industrial | 0.60 - 0.90 |
| (i) | Hospitals | 0.70 |
| (j) | Light Commercial | 0.50 - 0.70 |

- (k) Commercial Core 0.70 - 0.95
- (l) Heavily developed areas 0.80 - 0.95

Often it is desired to have a runoff coefficient that is based upon the different types of drainage that can be found within the area of drainage. The following are some coefficients currently in use with respect to surface areas:

<u>Surface Character</u>	<u>Runoff Coefficient</u>
Pavement	
Asphalt and Concrete	0.70 – 0.95
Brick	0.70 – 0.85
Roofs	0.75 – 0.95
Lawns, sandy soil	
Flat, 2 %	0.05 – 0.10
Average, 2 to 7 %	0.10 – 0.15
Steep, 7%	0.15 – 0.20
Lawns, heavy soil	
Flat, 2%	0.13 – 0.17
Average, 2 to 7 %	0.18 – 0.22
Steep, 7 %	0.23 – 0.35

These coefficients are applicable to storms of 5 and 10 year frequencies. Storms that are less frequent and higher in intensity would require higher coefficients due to the smaller effect of infiltration and other losses on runoff.

5.5 **Rainfall Intensity:**

The rainfall intensity for pipe design shall be based on a 1 in 10 year return period and duration of ten (10) minutes for light industrial areas. Trunk

Sewers, bridges and other critical structures as determined by the City shall be on a 1 in 100 year return period with a duration equal to the time of concentration. The design intensity must be obtained from the most up-to-date data available from Environment Canada for the St. John's area.

5.6 **Capacity of Pipe:**

Manning's Formula:
$$V = \frac{R^{\frac{2}{3}} \times S^{\frac{1}{2}}}{n}$$

shall be used to compute the capacity of storm sewers. The following roughness coefficient shall be used:

- | | | |
|-----|---|-------|
| (a) | Concrete box culverts | 0.013 |
| (b) | P.V.C. ribbed pipe | 0.011 |
| (c) | C.S.P. - Refer to C.S.P. manual for roughness coefficient based on particular pipe size and corrugation type. | |

5.7 **Minimum Size**

Street Sewers	300 mm
Catch Basin Leads	Single 200 mm
	Double 300 mm
Building Sewer	100 mm

5.8 **Velocity: (for design flow)**

Minimum 1 m/s

Maximum 5 m/s for diameter up to and including 825 mm and 6 m/s for diameters larger than 825 mm.

5.9 **Change of Size:**

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

5.10 Pipe Crossing Clearance:

- (a) Sewer crossing sewer: A minimum of 150 mm vertical clearance is required between outside barrels where sewer pipes cross.
- (b) Sewer crossing waterline :(vertical clearance): A minimum of 450 mm vertical clearance between a sewer pipe crossing a waterline.
(horizontal clearance) A minimum of 3.0m horizontal separation between sewer and the waterline and the waterline must be located in a separate trench than the storm and sanitary sewer.

5.11 Location:

- (a) Storm sewers shall be located such that manholes are placed in the centre of driving lanes, wherever possible.
- (b) Manholes shall be located at every change of horizontal and vertical alignment, size and material of the sewer.

5.12 Earth Load:

Shall be calculated by using the Marston Formula.

5.13 Superimposed Load:

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

5.14 Manholes:

- (a) Standard types of manholes and their details are shown on Standard Drawings.

- (b) All manhole chamber openings must be located on the upstream side of the manhole.
- (c) Special manholes shall be fully designed and detailed.
- (d) Maximum distances between manholes unless otherwise specified shall be 90 m for 700 mm pipe or smaller, and 120 m for pipe greater than 700 mm.

5.15 **Special Structures:**

Inlet and outfall structures including headwalls, stilling chambers, etc. shall be fully designed and submitted in detail. In each case, topography shall be shown as well as the protective works necessary to counteract erosion of the site at the structure. Grates shall be provided on all inlet structures and outlet structures greater than 600 mm in diameter and shall be fully designed, detailed and approved by the City.

5.16 **Outfalls:**

All storm outfalls, which empty into a ditch or water course, must receive approval from Fisheries and Oceans Canada and the Provincial Department of Environment.

5.17 **Catch Basins:**

- (a) The lead shall have a minimum 2% grade and shall discharge directly to an existing or proposed manhole located within 30 m of the catch basin. Unless otherwise approved.
- (b) Recess catch basin shall not be used.
- (c) Catch basins shall be located and spaced in accordance with conditions of design and shall provide for expected maximum flow.

- (d) Spacing shall not exceed 95 m for road grades up to 3%. On steeper roads, this spacing shall be reduced.
- (e) Catch basins are to be depressed 30 mm with respect to the gutter grade.
- (f) Double catch basins maybe required at the uphill radius point of curb returns on intersections in order to prevent the bypass of storm water flows.

5.18 **Headwalls:**

Headwalls shall be designed for inlet control with:

$$\frac{HW}{D} \leq 1.0$$

5.19 **Storm Water Detention**

Storm water detention is the delay of storm water runoff prior to discharge into downstream, receiving waters or drainage facilities. A detention basin is a temporary storage area that modifies or restricts the flow of storm water to a maximum rate by detaining excess water and allowing for subsequent release.

The City of Mount Pearl recognizes two major storm water detention systems; above and underground detention. For storm water detention the 1: 100 year return rainfall event shall be used. The duration shall be the time of construction or the event which requires the greatest storage up to the 12 hour event.

5.19.1 **Above Ground Detention**

There are various considerations when designing an above ground storm water system, they include:

- i. Design to allow the maximum amount of sediment and pollution build up to be removed
- ii. A low flow channel should be included to be graded towards the outlet structure
- iii. The detention system should be made easily accessible for service and maintenance. A minimum width of 4 meters should be provided to access the system
- iv. Debris racks should be placed over the outlet to prevent clogging
- v. The slope of the basin should be a maximum of 1:2 to prevent excessive erosion during heavy rain, along with easy maintenance.

If detention basins are placed close to residential or high traffic areas, fencing and other safety precautions are required.

5.19.2 **Underground Detention**

There are various considerations when designing an underground storm water detention system. Some guidelines that should be considered are:

5. The storm water system shall not be connected to any part of the sanitary sewer or water system.
6. A minimum of 450mm clearance is required between sewer and water lines both horizontally and vertically.
7. A minimum of 150mm clearance is required between outside barrels at all sewer pip crossings.
8. Pipes for the detention system are to have a minimum cover of 2.0 meters.

5.20 **Vertical deflection:**

Testing of every section with a “Go-No Go” device is required. The deflection shall be checked by manually pulling a go, no-go deflection testing mandrell through the pipe. If the percent of deflection exceeds the maximum specified, the contractor shall, at his own expense, undertake such remedial action as required to reduce the deflection to the limits specified. Vertical deflection tests shall be performed on all lines. The contractor shall conduct the tests under the observation of the Department of Engineering Services

5.21 **Revisions of Procedure:**

This procedure is subject to change without notice and the onus lies with the Consulting Engineer to ensure that he is in possession of the latest revision.

6.0 **WATER SYSTEMS**

6.1 **General:**

Of most importance to any development is the water system. One of the basic human needs is the requirement for clean water. It developed and installed correctly the water system will not be of any concern for the development. However, if not correctly planned and installed then the water system will cause health issues. The following provides guidelines to ensure that the system provides an adequate supply of clean water.

6.1.1 **(a) Definitions:**

- (i) **Water system** means an assembly of pipes, fittings, control valves and appurtenances, which convey water-to-water service pipes and hydrants.

- (ii) **Water service pipe** means a pipe that conveys water from a water system to the inner side of the wall through which the pipe enters the building.

6.2 Design Criteria and Location:

6.2.1 **Dead Ends:**

The water system shall be so designed to exclude any dead-ended pipe, so far as is reasonably possible.

6.2.2 **Size of Water Pipe:**

- (i) 150 mm diameter mains may be used on cul-de-sacs and crescents less than 200 m in length. 200 mm and up in diameter pipe shall be used for all local mains.
- (ii) The size of a main feeder pipe shall be a minimum of 300 mm.

6.2.3 **Depth of Cover:**

- (i) All water pipe shall have a minimum cover of 1800 mm in relation to the final finished street grade.
- (ii) For streets not paved prior to December 1 of any year, a sufficient depth of fill shall be placed to give a minimum cover of 1500 mm.

6.2.4 Location of Water Pipes:

- (i) All water pipes shall normally be laid on the quarter point of the street right of way and in a separate trench from the sanitary and storm sewers. Horizontal separation between water main any sewer main shall be a minimum of 3000mm unless otherwise approved.
- (ii) Where a water pipe is to be laid in a trench, other than in a street, the developer shall grant to the City by deed and plan, at his cost, title to the Easement. Such Easement shall be not less than six (6) metres in width and the City shall approve its location.

6.2.5 Location of Valves:

- (i) Valves at street intersections shall be located within the street carriageway.
- (ii) Four (4) valves shall be required at each four-way street intersection. There shall be no less than four (4) streets meeting at any intersection, the appropriate number of valves shall be installed to allow complete isolation of the system.
- (iii) On straight runs in a industrial area, the maximum distance between valves shall be 180 m.

6.2.6 Valve Chambers

- (i) All valves larger than 300 mm diameter shall be geared.

- (ii) All valves of 400 mm and larger shall be installed in a chamber constructed of reinforced concrete or made from a 1500 mm diameter pre-fabricated concrete manhole.
- (iii) 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. Access ladders shall be provided in the chamber.

6.2.7 Hydrants

- (i) Hydrants shall be placed at the centre of lots, 1700mm behind the curb line or 400mm behind the sidewalk; whichever is greater, and spaced not more than 140 m apart.
- (ii) Hydrants shall be installed so that the top of the standpipe flange will be from 100 mm - 150 mm above the finished curb grade.
- (iii) The branch pipe to the hydrant shall be 150 mm in diameter and shall include a 150 mm branch valve located 1 (one) metre from the centre line of the water pipe in the street. Where the hydrant valve is less than 3.0m from hydrant, the valve shall be restrained to the main using joint restraining fittings. Hydrant valves shall be located within the street carriageway. And with the dead ends located a minimum 6(six) metres from the end.
- (iv) Although dead-ended pipes are not desirable, if unusual conditions exist and warrant the installation of a dead-ended pipe, a hydrant shall be installed in its proper location at the dead end.

- (v) Hydrants shall be installed at all high points in profile.

6.3 Connections to Existing Water Systems:

6.3.1 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 City must approve each such connection. A connection of 100mm diameter pipe or greater shall be by a tapping sleeve and valve. All connections shall be pressure connections.

6.3.2 Scheduling of Connection:

The City 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 City at the Developer's expense.

6.3.3 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.

6.4 Tapping Sleeves and Valves:

Tapping sleeves and valves shall be used for all ductile iron connections to existing water mains.

7.0 Lots - Refer to the city's industrial/ commercial lot development standards

7.1 Landscaping - For detailed requirements refer to the city's landscaping policy and regulations.

7.2 **Service Laterals:**

All individual lots must be adequately serviced and have required fire-fighting capability designed to meet the need of the particular Industrial/commercial uses permitted.

7.2.1 In areas where service laterals have previously been installed, the laterals shall be extended into the lot at the same diameter of those, which have already been found in the ground.

7.2.2 There shall be no decrease in the size of the lateral from the building to the main line.

7.2.3 Service laterals shall be installed using the following provisions:

- a) Each lot or future lot shall be provided a service lateral. The laterals , including that of the water lateral, shall extend from the main to a minimum of 3.0 m outside of the right of way of the road.
- b) The sewer laterals shall be capped and end in a bell end.
- c) Laterals that are a length of 50 m and less shall have a minimum grade of 2% when laid. Laterals that are over 50 m maybe be laid at a minimum 1% grade.
- d) Manholes shall be used for laterals that have a diameter of 200 mm and larger.
- e) Sanitary and Storm lateral connections less than 200 mm diameter at the main maybe installed using vertical long radius bends to a maximum of 45 °.

7.2.4 Storm and Sanitary sewer Lateral depth shall not be less than 1.2 m.

Water Lateral shall have 1.8m cover and be separated from the sanitary and storm by 3 meter horizontal or 0.45 meter vertical.

7.2.5 Pipe installation shall follow regulations as stated in the Government of Newfoundland and Labrador, Municipal Water, Sewer and Road Specifications- Section 02702.

7.3 **Driveways**

7.3.1 Driveways have a minimum Gradient of 0.5% and a desired maximum of 6%.

7.3.2 Driveways and all parking areas are required to be paved areas unless otherwise approved by the Municipality. It is required that a continuous concrete curb be installed and maintained on all driveways, entrances and parking areas up to the rear wall of the building unless otherwise determined by the municipality.

7.3.3 Driveway access to properties shall be 7.5m wide with a 9m radius. Unless otherwise approved by the Manager of Engineering Services.

7.3.4 Parking areas are to have a minimum gradient of 2% and a maximum of 5%.

8.0 Materials

The below section illustrates all materials that the City of Mount Pearl recognizes as approved products. This will help to ensure that the standard of quality that the City expects and requires for all workmanship is maintained.

8.1 **Approved products and Manufacturers**

8.1.1 **Sewer Systems**

	ITEM	PRODUCT	MANUFACTURER
8.1.1	<u>Sewer mains</u>	PVC SDR 35	Ipex Rahau Royal
	Concrete (reinforced)		L.E. Shaw
	PVC Ribbed		Ipex Rahau Royal
8.1.2	Service laterals within R.O.W	Up to 150mm use PVC SDR 28 over this use PVC SDR 35	Sceptor Ipex Rehau
8.1.3(a)	<u>Services</u> Private	<i>PVC SDR 35</i>	Rehau Sceptor
8.1.3(b)	<u>PVC Fittings</u>		Ipex Rahau Royal

8.1.4	Repair Couplings	appropriate series	Preper Fernco Mission Rubber Pipe Connects
8.1.5	<u>Manholes</u>	Pre-cast	L.E. Shaw Atlantic Concrete Terra Nova Precast
8.1.6	Manhole Frames and Covers	BM 34 BM 2	Labco Foundry
8.1.7	Catch Basin Frames & Covers	BM 12A BM1614	Labco Foundry
8.1.8(a)	<u>Storm Mains</u>	PVC Ribbed HDPE	Ipex Rahau Royal Solenio
8.1.8(b)	<u>Structures</u>	<i>Structural multi-plate with cement foundations</i>	
	<u>Culverts</u>	<i>HDPE</i>	Solenio

8.1.2 Water Systems

	ITEM	PRODUCT	MANUFACTURER
8.2.1	Water main	<i>Ductile iron (class 52) Cement Lined. Seal coat to be applied to cement- mortar lining</i>	Canada Pipe U.S. Pipe
8.2.2	Fittings	Ductile iron Ductile iron	Star Pipe Stigma U.S. Pipe
8.2.3	Sleeves	Ductile iron Ductile iron	Star Pipe Stigma U.S. Pipe
8.2.4	Tapping sleeves & valves	Cast iron M.J. Stainless Steel	Muller
8.2.5	Hydrants	M67 <u>B50B18</u>	McAvity Darling
8.2.6	Valves	Single Resilient Seated	McAvity Muller
	Valve boxes	<u>MVB Composite</u>	Muller

8.2.7	(screw/slide)	Buffalo Bibby	Bibby
8.2.8	Copper	Copper Type K	Wolverine Cerro
8.2.9	Corporation Stops	102CF F600	Muller Cambridge Brass Ford
8.2.10	Curb Stops (Flared/ Compressed)	Inverted key stop & drain A617 129CF Z22	Muller Cambridge Brass Ford
8.2.11	Couplings	Compressed A319 118CF C22 138	Muller Mueller Ford Dresser
8.2.12	Curb stop boxes	A726 D1-T5	Muller Clow Star
8.2.13	Curb box extension	A:12	Muller Clow

			Star
8.2.14	Curb box cap	800 or 808	Muller Clow Star
8.2.15	Repair clamp	300 mm C clamp/split/stainless steel	Muller Robar
8.2.16	Repair clamp	Solid split sleeve	Canada Pipe U.S. Pipe
8.2.17	Mechanical Join Restrainers	Mega Holder	EBBA Iron Star Sigma Clow

9.0 Street Lighting

Although considered a side issue, street lighting is of a major concern. If not properly placed and directed then the effect is greatly reduced as well as hazards created due to poorly lit areas of low visibility and the miss direction of light into drivers eyes.

9.1 Design Criteria

Factors that shall be considered in the design of street lighting:

- a) type of land use

- b) night time vehicular volumes
- c) night time potential traffic accidents
- d) security issues
- e) speed and turning movements of vehicles at night
- f) parking
- g) Roadway features including : width of pavement, pavement surface character, off street access, medians, intersections, special structures, signs, evening maintenance, snow clearing operations.

Any deviations from this will be approved first by the municipality in conjunction with Newfoundland Light and Power.

9.2 **Level of Light**

The minimum level of street lighting shall be as found in Figure 9.1.

Figure 9.1: **Minimum Average Maintained Horizontal Distance Between Base of Pole**

<i>Street Classification</i>	<i>Urban</i>
<i>Local</i>	<i>15 (1.0)</i>
<i>Minor Collector</i>	<i>15 (1.0)</i>
<i>Arterial</i>	<i>22 (1.5)</i>

9.3 **Quality of Light**

The quality of life will be controlled to avoid the following conditions:

- light glare
- light beam intensities
- over sizing of lamps

In order to address these potential problems, the design shall include the position of the light, colour, reflective characteristics, and uniformity.

9.4 **Glare Control**

Discomfort brightness and glare that is blinding shall be controlled at all times. There shall be control features in place such as:

- Cut-off
- Source size
- Adaptation level
- Surround brightness
- Displacement angle
- Mounting heights

9.5 **Luminaries Arrangement**

The light design shall have an even distribution of lighting on the street surface so as to prevent dark areas on the road surface. Lighting distribution shall be based on block length, driveways, property lines, and terrain features.

9.6 **Poles**

Luminaries shall typically be installed on wooden poles used to support overhead utility lines. Where the utility poles are not used the luminaries shall be mounted on aluminium poles with breakaway bases and set on a concrete base.

9.7 **Light Sources**

Light sources shall be as follows:

- | | |
|---------------------------|--|
| - Street lighting | High Pressure Sodium
Induction Lamps |
| - Signs and Symbol Lights | Florescent
Low Pressure Sodium
LED |

10.0 **SCHEDULE 1**

SUPPLEMENT TO: GOVERNMENT OF NEWFOUNDLAND AND LABRADOR MUNICIPAL WATER, SEWER AND ROADS MASTER CONSTRUCTION SPECIFICATION

Note: This section details areas where the City of Mount Pearl's Municipal Engineering Standards differ from the Provincial Government's Master Specification.

1.1 SECTION 01001 **DEFINITIONS (Added)**

1.1.1 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.

1.1.2 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.

1.2 SECTION 01005 GENERAL INSTRUCTIONS (Reference to City Engineer added)

1.2.1 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 City Engineer.

1.3 SECTION 01570 TRAFFIC REGULATIONS (Added)

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

1.3.2 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.

2.1 SECTION 02702 PIPE SEWER CONSTRUCTION

1) Delete item 2.4.1 as shown in Government Master Specification and substitute the following:

2.4.1 All house/building sewer service pipe to be SDR 28. All storm mains to be PVC or HDPE with a stiffness factor of 320 or greater

2) Delete item 3.4.1 as shown in the Government Master Specification and substitute the following:

3.4.1 Place Type 1 granular bedding materials on all storm and sanitary services.

3) **3.7.13** Delete the items as shown in the Government Master Specification and substitute as follows:

1. Scope of work:

The work covered by this specification consists of furnishing all materials, labour, supervision, equipment and plant; to perform all work necessary for the video inspection of the gravity sewer lines as specified.

2. When Video Inspection Required:

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.

(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 5m of same, shall be inspected if blasting is required or anticipated.
- (ii) When blasting is not required, any sewer running parallel to the proposed construction and is within 3m of same shall be inspected.

3. Arrangement for inspections:

The Contractor will arrange all pre-construction and post-construction video inspections.

4. Pre-Construction Inspection of Sewers:

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 3 years old;

(b) No major construction works shall have been undertaken in the immediate area since this inspection.

5. Post-construction inspection of sewers:

The post-construction inspection must be completed within thirty days of completion of the works, and in any case before the work is accepted. The video inspection contractors shall record both the pre-construction and post-construction inspections on video tape, as outlined. Upon completion of the post-construction inspection, the tapes will be submitted to the Engineer.

6. Evaluation of inspection results:

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;
- (b) In bedrock, to cause damage to sewers by blasting tremors or rock movement.

7. Repair of damaged sewers:

All damage incurred by the sewer system due to the construction project shall be repaired by the contractor in accordance with the City standards. Upon completion of these repairs, a subsequent verification inspection shall be undertaken to assess the quality of the repairs.

8. Definitions:

- (i) "Clean" shall mean the removal of all sand, grease and all other solid or semi-solid material from the length of pipe connecting two manholes.
- (ii) "Building service" shall mean the sewer line (lateral) extending from the building to the sewer main.

9. Video Equipment:

Video equipment shall consist of a self-contained camera and a monitoring unit connected by a 3 wire coaxial cable. The camera shall be small enough to ensure passage through a 150 mm sewer, shall be water proof, and shall have a

self-contained remotely controlled lighting system capable of varying the illumination of the interior of the sewer line for inspection and photographic purposes.

Picture quality shall be such as to produce a continuous 600 line resolution picture showing the entire periphery of the pipe. All video discs submitted must be DVD or Blue Ray Colour format, SP mode. An audio description of the inspection must also be provided, as well as a written report.

10. Video inspection:

The video inspection shall be performed on one 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.

An inspection record prepared by the Engineer shall be kept, showing the exact location of each point of infiltration, fault and building service observed by the camera. 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. Sewer lines 1050 mm in diameter or greater may be inspected by walking through the pipe. Video pictures shall be recorded with a hand held video inspection camera. In addition, still pictures may be taken with a 35 mm camera. Sections found to have deficiencies are to be retaped after deficiencies have been rectified, therefore, taping of new work will show no deficiencies.

11. Accommodation for Viewing:

The Contractor shall provide the accommodation for no less than two people, for the purpose of viewing the monitor, while the inspection is in progress.

12. Records:

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 leak, fault and building service. 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.

The final video inspection report for each section will be submitted by the Engineer in the format as noted in item 201.16 - Standards for Video Inspection Records. In addition to the normal inspection report format, the Contractor shall record all the video inspection on video tape. These tapes shall be submitted to the Municipality. The written inspection report will prepared by the Engineer.

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.

13. Threading of Sewers:

A 6mm nylon rope or equivalent may be installed in the sewer not more than one day in advance of the inspection, in order that the camera traction cable may be drawn through the sewer. The rope shall be tightly secured to the manhole ladders, making sure the line is taut, leaving no slack in the sewer line.

14. Site Safety:

Manhole barricades are required around all open manholes, in addition to Traffic Control, as per Division 7. Manhole barricades shall be as per Form 741. 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 personnel shall be trained in confined space entry.

15. Flow Control:

When sewer line flows are above the minimum requirements (1/4 of the pipe diameter) to effectively conduct the inspection, one or more of the following methods of flow control shall be used:

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.

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.

16. Standards for Video Inspection Reports:

Within ten working days following completion of a video inspection on a section of sewer, a final video inspection video on this section shall be submitted by the Contractor to the Engineer. The Engineer shall prepare and submit a final video inspection report to the Municipality.

The 10" x 11 1/2" enclosure for the final report will meet the following specifications:

- The report shall be suitably bound;
- Only letter-sized paper (8 1/2 x 11) will be used;
- The title page of the final report will be as follows, with the appropriate substitution where required:
(see following page)

Video Inspection
of
Sanitary/Storm Sewer
Engineering Services

Location:

Video Recorded by:

Report Prepared by:

Date:

- An Index Page is to be included with each report and will state:
 - "Street names from manhole #__ to manhole #__.
- Whether inspected at the same time or not, the complete sewer inspection report will be presented together, from upstream to downstream manhole.
- All pages will be numbered in the upper right hand corner of the right hand page. Thus, only every second page will be numbered with the same number referring to both the left and right hand page.
- A standard form for documenting the video and manhole inspection findings is provided in Item 202. The form must show:
 - (a) For video inspection results the heading will state:
 - (i) the street name
 - (ii) the manhole numbers applicable to this section

- (iii) the reference drawing number
- (iv) the date of the inspection

(b) The key plan will consist of a small drawing (not to scale) showing the appropriate locations of the two manholes in relation to any nearby reference points such as houses (with corresponding civic numbers), telephone poles (with corresponding pole numbers) etc. This drawing will denote:

- (i) The manhole numbers
- (ii) the horizontal distance between the two manholes
- (iii) the direction of sewer flow

VIDEO INSPECTION REPORT

SUBDIVISION: _____ STREET NAME: _____ MANHOLE NO. _____
TO MANHOLE NO. _____
DISTANCE: _____ GRADIENT: _____
PIPE LENGTH: _____ PIPE SIZE: _____ PIPE MATERIAL: _____ DATE: _____
REF. DWG. NO. _____ SHEET NO. _____

DVD NUMBER	LINE FOOTAGE	PHOTO NO.	COUNTER REF. NO.	OBSERVATIONS

All photographs will appear on the left page only, opposite the corresponding description for the photo which appears on the right hand page. When there are more pictures in any run than can be placed on the first left page, these will be placed on subsequent pages with corresponding descriptions appearing opposite. All photographs will be numbered in order. This number will appear beside them and will be the same number referred to in the description. The last page of the report will consist of an area sewer plan to scale, showing the street inspected for the report and applicable manhole numbers.

4) Delete the item 3.7.15 as shown in the Government Master Specification and substitute as follows:

3.7.15

Deflection Test for PVC Sanitary Sewers

- .1 A deflection test shall be carried out on all sections of the sewer. The maximum allowable deflection under fully backfilled and compacted trench conditions shall not exceed 5% before 30 days and 7.5% after 30 days.
- .2 Locations with excessive deflection shall be repaired and/or pipe shall be replaced at the Owner's expense. The equipment used for the deflection test shall be that as recommended by the manufacturer, and may include an Electronic Deflectometer or a Rigid "Go-No-Go" Device. For the purpose of deflection measurement, the base inside diameters and the deflection mandrel dimensions are provided in Table 2. To ensure accurate testing, the lines shall be thoroughly cleared.

TABLE 2
Base Inside Diameters
and Deflection Mandrel
Dimensions, PVC SDR-35 (ASTM D3034)

Nominal Size	Base Inside Diameter (mm)	5% Deflection Mandrel (mm)	7.5% Deflection Mandrel (mm)
200	194.69	185.0	180.0
250	242.90	230.8	224.6
300	288.57	274.0	266.9
375	353.01	335.4	326.6

2.2 SECTION 02713 - WATER MAINS

- (1) Delete item 1.1.1 as shown in the Government Master Specification and substitute the following:

1.1.1 Curb stops shall be located behind the sidewalk within the street right of way.

- (2) Delete items 2.1.2, 2.1.3, and 2.1.4 as shown in the Government Master Specification and substitute the following for item 2.1.1:

- All water mains shall be ductile iron, class 52, cement lined. Seal coat to be applied to the cement-mortar lining.

- (3) **Item 2.4 (general)**

- All water service pipe to be copper tubing, Type K. Delete references to all other pipe materials.

- (4) Delete item 2.6.1 as shown in the Government Master Specification and substitute the following:

Item 2.6.1 - Granular bedding materials to be Type 3.

2.3 SECTION 02724 - SEWAGE FORCEMAINS

- (1) Delete item 2.2.1 as shown in the Government Master Specification and substitute the following:

Item 2.2.1 - Granular bedding materials to be Type 3 for ductile iron pipe and Type 1 for all other materials.

5.1 SECTION 05500 – METAL FABRICATIONS (Section Added)

5.1.1 HAND RAIL

1. Scope of Work:

Fabricate and erect pedestrian hand railing constructed of steel pipe posts. Locations shall be as shown on the drawings.

2. Form and Dimensions:

The form and dimensions of the handrail shall conform to those given in the drawings, and the length shall be as required to suit the particular site conditions where necessary. The Contractor shall vary the spacing of the posts such that the spacing is uniform throughout the length of the rail.

3. Materials and Fabrication:

Steel posts and rails shall consist of 50 mm inside diameter galvanized schedule 40 pipe conforming to ASTM Standard A53. The railing shall be pre-fabricated before erection, and joints between rails and posts shall be made by proper cutting and fitting to insure complete contact. The joints shall then be welded, and the welds and surrounding heat-damaged areas shall be galvanized after fabrication or otherwise suitably protected from corrosion by the use of a zinc based coating. The railing shall be delivered to the site complete and ready for erection.

4. Installation and Finish:

Posts shall be bedded in non-shrink grout in accordance with the bedding detail in the drawings. Holes shall be either drilled or formed in the concrete walls, walks, steps or sidewalks as required.

After installation, the posts and rails shall be prepared and painted as follows:

- i) Clean galvanized with a Matchless brand #802 metal conditioner or approved equal.

- ii) Prime (one coat) with Matchless brand #590 Zinc Dust Zinc Oxide primer or approved equal.

- iii) Paint (two coats) with Matchless brand #119 enamel in colour selected by the Engineer.