

TOWN OF PORTUGAL COVE – ST. PHILIP’S

**SUBDIVISION DESIGN &
CONSTRUCTION STANDARDS**

SUBDIVISION DESIGN AND CONSTRUCTION STANDARDS

The Council of the Town of Portugal Cove - St. Philip's hereby adopts the following Sub-Design and Construction Standards.

Made and adopted by the Council of the Town of Portugal Cove - St. Philip's on

_____ day of _____, 20_____.

Clerk

Mayor

All persons are hereby requested to take notice that anyone who wishes to view these Standards may do so at the Town Council Office of the Town of Portugal Cove - St. Philip's. Should there be any questions or need for clarification, please contact the Town Manager at telephone 895-8000.

Approved by: _____
Town Manager

AMENDMENTS TO SUBDIVISION DESIGN AND CONSTRUCTION STANDARDS

<u>AMENDMENT #</u>	<u>DESCRIPTION OF REVISION</u>	<u>REVISION DATE</u>
NO. 1	Appendix "A" Section 1.4 Financial Requirements: Section 1.4.3 Phase I and Phase II Security Deposits	June 2005
NO. 2	Section 4.3 Street Design Criteria: Table 1 Minimum "K" Value and Sidewalk Requirement	October 2011
NO. 3	Section 4.3 (b) Street Design Criteria Street Length	January 2018
NO. 4	Section 4.3 (b) and (c) Street Design Criteria Street Length	February 2019

SUBDIVISION DESIGN AND CONSTRUCTION STANDARDS

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APPENDIX “A”

Subdivision Development Policy

APPENDIX “B”

Standard Forms and Drawings

1.0 SURVEYING

- 1.1 DEFINITIONS
- 1.2 SURVEY PLAN
- 1.3 SURVEY DETAILS AND ACCURACY
- 1.4 STREET WALKWAY AND LOT IDENTIFICATION
- 1.5 SURVEY INFORMATION

1.1 DEFINITIONS

- 1.1.1 Survey means the determination of any point or the direction or length of any line required in measuring, laying out or dividing land for the purpose of establishing boundaries or title to land.
- 1.1.2 Newfoundland and Labrador Provincial Co-ordinate Survey System means a system established for referencing land surveys and is based on 3 (degree) transverse Mercator projection.
- 1.1.3 Co-ordinate Monument means any marker established for the Provincial Co-ordinate Survey System.

1.2 SURVEY PLAN

- 1.2.1 A Survey plan shall be drawn in accordance with Section 2 - “Drafting” 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) each street, walkway and easement;
 - (d) each lot and its number;
 - (e) 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 and public purposes;
 - (f) the geometry of connections between existing streets and streets of the subdivision;
 - (g) the location of any existing structure which is to remain;
 - (h) every water course and its direction of flow;
 - (i) all information necessary for the calculation and laying out of any curved line;

- (j) the date of compilation;
- (k) the date of revision, if any;
- (l) the name of the subdivision;
- (m) all existing streets, roads, lanes and intersections in the immediate area and their official names as designated by the Town.
- (n) the location and extent of rock outcrops;
- (o) the location and results of any test borings;
- (p) at least two (2) centre line points of known chainage related to the Provincial Co-ordinate Survey System;
- (q) the location and elevation of the Town or Provincial Bench Mark used.

1.2.2 The 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 - Size designation, A1, which represents 594 mm wide x 841 mm long;
- (c) LEGAL SIZE - Size designation, P4, which represents 215 mm wide x 355 mm long;

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

1.2.3 A survey plan shall be to a scale as indicated in Section 2.0 - “Drafting”.

1.2.4 A survey plan shall show a Key Plan to locate the subdivision as it relates to adjacent streets of the Town with the scale being as indicated in section 2.0 “Drafting”.

1.2.5 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.

1.2.6 A survey plan shall be certified by a Newfoundland Land Surveyor.

1.3 SURVEY DETAILS AND ACCURACY:

- 1.3.1 All traverses are to be plotted by either the actual calculated “Latitude (lats) and Departures (deps)” method or by the “Tangent Off-Set Method”.
- 1.3.2 All boundary line dimensions to be shown to at least two decimal places with all angles shown to the nearest 30 seconds or better.
- 1.3.3 More or less distances shall only be accepted along a water boundary.
- 1.3.4 Contours shall be shown to determine the proper elevations for all streets, roads, easements and walkways in relation to the proposed lot layout.
- 1.3.5 For proposed streets, the existing vertical alignment conditions (contours) shall be obtained from actual field surveys.
- 1.3.6 All Vertical Control shall be related to the Province of Newfoundland Approved Datum.
- 1.3.7 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.
- 1.3.8 The accuracy of closure shall be not less than 1 metre in 10,000 metres.

1.4 STREET, WALKWAY AND LOT IDENTIFICATION

- 1.4.1 When the roadway and street (street line to street line) have been construction 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.

1.5 SURVEY INFORMATION

- 1.5.1 Prior to Phase 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.

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

2.0 DRAFTING

2.1 PLAN PREPARATION

2.2 GENERAL CONDITIONS

2.1 PREPARATION OF DRAWINGS

2.1.1 CADD Drawings

Except as provided in Section 2.2.2, computer -aided design and drafting (CADD) shall be used in the preparation of construction and as-built drawings for all developments.

2.2.2 Manually Drafted Drawings

Where CADD drawings are unavailable, or are cost prohibitive due to the nature of the development, the Town may at its sole discretion accept manually drafted drawings.

2.2.3 Size of Drawings

All drawings in any one development shall be the same 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 707 mm wide x 1000 mm long sheet;

Minimum Size: the minimum size designation shall be “A1”, which represents 594 mm wide x 841 mm long sheet;

2.2.4 Scales

All CADD 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

- (b) Survey Plan/Subdivision Plan shall be:
 - (i) 1:500 or
 - (ii) As approved by the Town
- (c) Site drainage plan shall be:
 - (i) 1:500 or
 - (ii) 1:1000 or
 - (iii) As approved by the Town
- (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.

2.1.5 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.

2.1.6 North Arrow

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

2.1.7 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.

2.1.8 Symbols and Line Types

Standard Provincial, Municipal Affairs 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.

2.1.9 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) “As-Built” or “Record Drawing” if/when applicable.

2.1.10 Submission of Drawings

- (a) Design and construction drawings shall be submitted as follows;
 - (i) 3 each - white or blue prints
- (b) As-built drawings shall be submitted as follows:
 - (i) 1 only - Mylar Reproducible
 - (ii) 1 only - White or Blue Print
 - (iii) 1 only - 3 ½" floppy disk of Autocad Release 2002 compatible files or DXF files suitable for same.
 - (iv) 1 only - Listing of screen color/pen designations.

2.2 **GENERAL CONDITIONS**

2.2.1 Street Names

All streets shall be identified and printed within street lines.

2.2.2 Accuracy of Measurements

All distances shall be measured to the nearest centimeter.

2.2.3 Geodetic Datum

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

2.2.4 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.

2.2.5 Revisions to Plan

- (a) If plans are revised, amended or altered, the date and Draftsman’s initial shall be noted in the revision area of the Title Block;
- (b) All corrections and changes shall be shown in permanent fashion, i.e. with ink.

2.2.6 Signing of Plan

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

2.2.7 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.

3.0 EASEMENTS

- 3.1 GENERAL
- 3.2 DESIGN
- 3.3 ACCEPTANCE
- 3.4 RESTORATION

3.1 GENERAL

- 3.1.1 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.
- 3.1.2 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.
- 3.1.3 The owner of the easement land shall not construct any type of structure over such easement area.

3.2 DESIGN

- 3.2.1 The width of any easement shall be based upon the type and number of services proposed to be installed.
- 3.2.2 The minimum width of an easement shall be six metres.
- 3.2.3 The alignments for any easement shall be dependent upon the type of service to be installed.

3.3 ACCEPTANCE

- 3.3.1 Acceptance of services within an easement shall be carried out as outlined under the requirements for Phase I acceptance.
- 3.2.2 All easements shall be covered by legal agreement as approved by the Town’s Solicitor.

3.4 RESTORATION

- 3.4.1 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.

- 3.4.2 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 STREETS

- 4.1 STREET CLASSIFICATION
- 4.2 OTHER STREET CLASSIFICATION
- 4.3 STREET DESIGN CRITERIA
- 4.4 INTERSECTIONS
- 4.5 OTHER GENERAL REQUIREMENTS

4.1 **STREET CLASSIFICATION**

Streets shall be classified as shown in the following table:

CHARACTERISTICS OF STREET CLASSES			
	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
PARKING	Some Parking	Parking	Parking
RANGE OF TRAFFIC DESIGN VOLUME (A.D.T.)	5000 - 30,000	1000 - 12,000	Less than 1000
CHARACTERISTICS OF TRAFFIC FLOW	Uninterrupted flow except at signals and crosswalks	Interrupted Flow	Interrupted Flow
AVERAGE RUNNING SPEED (Off-peak conditions) in km/h.	50 km/h - 80 km/h	30 km/h - 50 km/h	30 km/h - 50 km/h
VEHICLE TYPE	All types but trucks may be limited	All types with truck limitations	Passengers and service vehicles, large vehicles restricted.
CONNECTS TO	Arterials, collectors, free-ways, some locals	Arterials, collectors, locals	Collectors, locals

4.2 OTHER STREET CLASSIFICATIONS:

Local Streets could be further classified as:

- (a) Residential Street
- (b) Cul-de-sac

4.3 STREET DESIGN CRITERIA:

- (a) Streets shall be designed in accordance with the minimum requirements as outlined in Table 1.

TABLE 1

STREET CLASSIFICATION				
	ARTERIAL	COLLECTOR	LOCAL	
			Residential	Cul-de-sac
1. Design Speed in km/h	50 km/h - 80 km/h	50 km/h - 80 km/h	20 km/h - 50 km/h	20 km/h - 50 km/h
2. Street grade max. = (1)min. =	50 km/h - 10 % 0.5 %	12.0% 0.5 %	12.0% 0.5 %	12.0% 0.5 %
3. Street Width	25m	17.5m	15m	15m
4. Street Spacing	1 Kilometre	1 Kilometre	-	-
5. Radius	90m	90m	50m	15m
6. Maximum super-elevation	0.06 m/m	0.06 m/m	0.02 m/m	0.02 m/m
7. Minimum stopping sight distance	65m	65m	45m	45m
8. Pavement Widths ⁽²⁾	21.5 m (4 lane parking each side)	13.5 m (2 lane parking each side)	11.5 m (2 lane parking each side)	11.5 m (2 lane parking each side)
9. “K” value - Vertical curve. Crest - Sag -	7 11	7 11	L=length in metres should not be less than design speed in kilometres per hour. ⁽³⁾	
10. Minimum length of Vertical Curve	L=length in metres should not be less than design speed in kilometres per hour.			
11. Vertical Curve (Length for Drainage)	Crest: K = 80 Sag: K = 40			
12. Minimum Passing Sight Distance	350m	350m	-	-
13. Minimum Distance between Intersection	400 m	60 m	60m	60m
14. Range of Traffic Design Volume (A.D.T.)	5000 - 30,000	1000 - 12,000	Less than 1000	Less than 1000
15. Minimum curb radius at intersections ⁽²⁾	15m	9m	8m	8m
16. Sidewalks (sides) ⁽²⁾	Both	Both	One ⁽⁴⁾	One at Council’s Discretion ⁽⁴⁾
17. Street lighting (Minimum requirements)	1.5 cd/m ² or 22 1x	1.0 cd/m ² or 15 1x	1.0 cd/m ² or 15 1x	1.0 cd/m ² or 15 1x

- *Note:** ⁽¹⁾ Minimum grade permitted with combined curb and sidewalk is 2.0%
⁽²⁾ Refer to RLU-60 standard for unserved areas.
⁽³⁾ The Town may accept any design that does not meet the minimum “K” Value – Vertical Curve for Local Streets as per Motion # 2011-284.
⁽⁴⁾ As per Motion # 2011-284.

Note: Lumens/sq metre is commonly called “lux” or lx. The “Candela” is also another means of measurement.

- (b) The maximum length of any cul de sac shall be:
- i) 450.0m (1,476.38 feet) in areas served by or planned to be served by municipal piped water and sewer services, as shown in the map and letter of agreement signed by the Municipality and the Minister in connection with municipal five-year capital works program eligibility;
 - ii) 450.0m (1,476.38 feet) in areas not served by or planned to be served by municipal piped water and sewer services;
 - iii) greater in length as described in Section 4.3(b)(ii) where it can be determined that the cul de sac will round out an existing subdivision only and where no alternative means of access can be acquired; and
 - iv) determined at the discretion of Council to a maximum of 450.0m (1,476.38 feet) in areas served by or planned to be served by only one municipal service (semi-served development).

As per Motion # 2019-023

4.3.1 Design Criteria

- (a) Streets shall be designed to provide the safest and smoothest traffic flow possible. The criteria in Table 1 consists of the minimum requirements for flat vertical alignments. Specific vertical and horizontal alignments may dictate a variance in these requirements.
- (b) For specific situations not covered by this section, the latest standards edition of Transportation Association Canada (TAC) should be used as a guide.
- (c) Cul-de-sacs have the following additional minimum requirements;
 - (i) Face of curb line, turning circle, radius of 15 m.
 - (ii) Low back curb and gutter to extend around the bulb
 - (iii) Transitional street line radius of 15 m into street line turning circle.

4.4 INTERSECTIONS

4.4.1 Intersection shall:

- i) Be of "T" type design;
- ii) Have a vertical alignment within the intersection approach of not more than 2% grade for a minimum distance of 15 m from the roadway intersection curb line.
- iii) Have an intersection angle of 90° where possible. The minimum angle is 75°.
- iv) Have a minimum centre line distance between adjacent and/or opposite intersections:
 - (a) on Local streets to Collector street of 60m
 - (b) on Collector streets to Collector streets 60m

4.4.2 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 a minimum tangent section of 30.5 m as measured from the point of street line intersection to the first point of horizontal curvature on each approach street line.

4.5 OTHER GENERAL REQUIREMENTS

4.5.1 Tangent distances between horizontal reverse curves shall not be less than 50 m.

4.5.2 Horizontal alignment of streets shall be such that the centre line and curb lines shall be symmetrical with their street lines.

4.5.3 Vertical alignments of streets shall be considered as symmetrical about the centre line unless otherwise instructed by the Municipality.

4.5.4 All streets shall have a minimum 150 mm crowned roadway cross-section and in no case should the crowned roadway cross-section be less than 2%.

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

4.5.6 Curb and gutter with sidewalk or combined curb and sidewalk is required.

- 4.5.7 All streets shall have a minimum of 150 mm Class “B” and 75 mm Class “A” granulars, 38 mm base course and 38 mm surface course asphalt. Additional granulars and asphalt may be specified as determined by the Developer’s or the Town’s Engineer.
- 4.5.8 Streets in unserved areas that are approved for development without the installation of water and sewer mains, are to be constructed to the Provincial RLU-60 standard as a minimum. Additional granulars and asphalt may be specified as determined by the Developer’s or the Town’s Engineer.

5.0 STORM SEWER

- 5.1 DESIGN DRAINAGE AREA
- 5.2 DRAINAGE PLAN
- 5.3 RUNOFF
- 5.4 RUNOFF COEFFICIENT
- 5.5 RAINFALL INTENSITY
- 5.6 CAPACITY OF PIPE
- 5.7 MINIMUM SIZE
- 5.8 VELOCITY
- 5.9 CHANGE OF SIZE
- 5.10 CLEARANCE
- 5.11 LOCATION
- 5.12 EARTH LOAD
- 5.13 SUPERIMPOSED LOAD
- 5.14 MANHOLES
- 5.15 SPECIAL STRUCTURES
- 5.16 OUTFALLS
- 5.17 CATCH BASINS
- 5.18 HEADWALLS
- 5.19 REVISIONS OF PROCEDURES

5.1 **DESIGN DRAINAGE AREA:**

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

5.2 **DRAINAGE PLAN:**

Plan of the drainage area shall be to a scale of 1:500, 1:1250, or 1:2500, depending on the size of the area and shall show generally:

- a) Streets;
- b) Lots;
- c) Water courses and direction of flow;
- d) Proposed storm sewers with manholes numbered consecutively for design reference.
- 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 two metres;
- g) Proposed surface drainage.

5.3 **RUNOFF**

Computations shall be based on the Rational Method formula: $Q = R.A.I.N.$ 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.

5.4 RUNOFF COEFFICIENT:

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

5.5 RAINFALL INTENSITY:

The rainfall intensity shall be based on a 1 in 10 year return period and a duration of ten (10) minutes for suburban residential areas. Trunk sewers, bridges and other critical structures as determined by the Town 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 $V = \frac{Rb}{n} S^{1/2}$ shall be used to compute the capacity of storm sewers.

The following roughness coefficient shall be used:

- a) concrete pipe - 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 200mm/double 300mm
Building Sewer	100 mm
Driveway Culverts	450 mm
Road Crossing Culverts	600 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 CLEARANCE

- a) A minimum of 80 mm clearance is required between outside barrels at all sewer pipe crossings.
- b) A minimum of 450 mm in vertical and horizontal direction is required between the sewer pipe and water pipe.

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 EARTHLOAD

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 as per the Department of Municipal and Provincial Affairs Master Specifications.
- 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 Town.

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 CATCHBASINS

- 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.
- 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) Standard location for catch basins at street intersections shall be immediately upstream of sidewalk or pedestrian crosswalks and between intersections at all low points.
- e) Spacing shall not exceed 95m for road grades up to 3%. On steeper roads, this spacing shall be reduced.
- f) Catch basins are to be depressed 30 mm with respect to the gutter grade.

5.18 HEADWALLS

Headwalls shall be designed for inlet control with $HW/D \leq 1.0$.

5.19 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 SANITARY SEWER

- 6.1 DESIGN DRAINAGE AREA
- 6.2 DRAINAGE PLAN
- 6.3 EVALUATION OF DESIGN FLOWS
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6.1 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.

6.2 DRAINAGE PLAN:

Plan of the drainage area shall be to a scale of 1:1250 or 1:2500, depending on the size of the area and shall show generally:

- a) Streets;
- b) Lots;
- c) The size and grade of the sanitary sewer with manholes numbered consecutively and ending with the suffix "s";
- d) Tributary areas to each manhole, size of the area in hectares and ultimate average population per hectare clearly shown therein.

6.3 EVALUATION OF DESIGN FLOWS

- a) Standard design forms shall be used for all calculations.
- b) The design of all sanitary sewers shall be based on the Peak Wet Weather Flow.
- 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 single family residence shall be based on an average population density of 80 people per hectare.
- e) Flow computations shall be based on Table I as follows;

TABLE 1

LAND USE	AVERAGE SEWER FLOWS	PEAKING FACTOR	PEAK FLOW

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 on the average rate of flow. It is based on the Harmon

Formula, $M = 1 + \frac{14}{(4+p)^{1/2}}$ 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.

6.4 CAPACITY OF PIPE

Manning’s Formula $V = \frac{R^{2/3} S^{1/2}}{n}$ 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

6.5 MINIMUM SIZE

- Of Street Sewers 200 mm
- Of Building Sewer 100mm

6.6 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 825 mm.

6.7 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.

6.8 CLEARANCE

- a) A minimum of 80 mm clearance is required between outside barrels at all sewer pipe crossings.
- b) A minimum of 450 mm in vertical and horizontal direction is required between the sewer pipe and water pipe.

6.9 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.

6.10 EARTH LOAD

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

6.11 SUPERIMPOSED LOAD

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

6.12 MANHOLES

- a) Standard types of manholes and their details are shown in The Department of Municipal Affairs Master 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.
- c) Special manholes shall be fully designed and detailed.

6.13 BUILDING SEWER

- a) Separate and independent building sewers shall be provided for every single family house, each unit in a semi-detached, and each apartment building, office building, factory or similar building.

6.14 STORM WATER

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

6.15 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.

7.0 WATER SYSTEMS

- 7.1 GENERAL
- 7.2 DESIGN CRITERIA AND LOCATION
- 7.3 CONNECTIONS TO EXISTING WATER SYSTEM
- 7.4 WATER MAINS AND SERVICE PIPE
- 7.5 REVISIONS

7.1 GENERAL

7.1.1 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.

7.2 DESIGN CRITERIA AND LOCATION

7.2.1 Dead Ends

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

7.2.2 Size of Water Pipe

- i) 150 mm diameter mains may be used on cul-de-sacs and crescents less than 300 m in length. 200 mm diameter mains shall be used for all local mains unless otherwise approved by Town's Engineer.
- ii) The size of a main feeder pipe shall be a minimum of 300 mm.

7.2.3 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.

7.2.4 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. Town's Engineer may approve combined trench construction under special circumstances.
- ii) Where a water pipe is to be laid in a trench, other than in a street, the sub-divider 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) metres in width and its location shall be approved by the Town.

7.2.5 Location of Valves

- i) Valves at street intersections shall be located in the roadway at street line intersection.
- ii) Four (4) valves shall be required at each four-way street intersection, If there are more or 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 residential area, the maximum distance between valves shall be 180 m.

7.2.6 Hydrants

- i) Hydrants shall be placed at the centre of lots, at the rear of the sidewalk, 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 one metre from the centre line of the water pipe in the street. Where the hydrant valve is less than 3.0 m from the hydrant the valve shall be restrained to the main.
- 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.

7.3 CONNECTION TO EXISTING WATER SYSTEMS

7.3.1 Service Interruption

A connection of the sub-divider’s water system to any part of the existing water system must be carried out to cause the least interruption to existing service and each such connection must be approved by the Town.

7.3.2 Other Connections

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

7.3.3 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.

7.3.4 Tapping Sleeves and Valves

Whenever it is practical, tapping sleeves and valves shall be used for all ductile iron connections to existing water mains.

7.4 WATER MAINS AND SERVICE PIPE

7.4.1 Water Service Pipe

a) Size and Materials

Water service pipes shall be of type K copper material and a minimum size of 20 mm diameter, and shall be connected to the water system at a point approximately 45 degrees above horizontal with an approved corporation cock and with the formation of a goose-neck in the water service pipe immediately following the connection to the

water pipe. Non-flexible water service pipe larger than 25 mm in diameter shall be connected to the water pipe at the horizontal with an approved corporation cock. An approved stop and drain fitting shall be installed in the water service pipe at precisely the street line and to this fitting will be connected a standard service box, the top of which shall be set at finished sidewalk grade.

b) Depth of Cover

All water service pipes from the pipe in the street to and including the standard service box at the street line location shall be supplied and installed by the subdivider so that there will be a minimum cover of 1500 mm and a maximum cover of 2000 mm in relation to the finished street surface and such installation must be approved by the Town prior to backfilling.

c) Oversized Water Service Pipes

Water service pipes larger than 20 mm shall be of a size and material as approved by the Town's Superintendent of Works.

d) All copper pipe joints are to be compression type suitable for 1MPa (145 psi) working pressure.

7.4.2 Water Mains

a) Materials

Ductile Iron Pipe shall be A.N.S. Specification A-21.51, latest amendment, and of appropriate class (min. Class 350), supplied with two millimetres thick cement lining to A.N.S. Specification A.N.S. 21.4, latest amendment. The exterior of all pipe shall be coated with coal tar or asphalt base. The Ductile Iron Pipe shall be supplied with Tyton joints unless otherwise approved by Town's Superintendent of Works.

b) Special Fittings

Cast iron special fittings shall conform to A.W.W.A. Specifications No. C-110-64, latest amendment. All fittings shall be cement lined (A.W.W.A. , C-104-64) and shall be supplied with mechanical joint ends. The exterior of all fittings shall be coated with coal tar or asphalt base.

7.5 REVISIONS

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