Municipality of Perth-Andover
New Brunswick

STANDARD SPECIFICATIONS FOR DEVELOPERS

submitted by

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STANDARD SPECIFICATIONS FOR DEVELOPERS

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DIVISION ONE

GENERAL INFORMATION

Contents

GENERAL INFORMATION

1. Introduction

These standards are adopted as minimum standards for the construction of a subdivision within the Municipality. The subdivision will not be accepted by the Municipality until construction is completed in accordance with these standards and the Subdivision By-law.

2. Responsibility of Developer

The Developer shall be responsible for the construction of the street, sanitary sewer, storm runoff control and water systems required to complete the subdivision which shall include:

i. Obtaining all required approvals and fees from regulatory agencies.
ii. Design of all systems required for the subdivision.
iii. Construction.
iv. All testing and certification.
v. "Record" Drawings.

Additionally the Developer will be responsible for the extension of electrical utility services. The work will be completed by the Perth-Andover Electric Light Commission and the Developer shall pay the Commission for the work on a "per metre" basis.

The Municipality will participate in cost sharing of the subdivision only by prior agreement.

3. Standards and Codes

The following standard specifications shall apply as if written out in full:

- The Province of New Brunswick Department of Transportation General Specifications for Highway Construction -
- CANADIAN STANDARDS ASSOCIATION C.S.A.
- AMERICAN WATER WORKS ASSOCIATION A.W.W.A.
- AMERICAN SOCIETY FOR TESTING MATERIALS A.S.T.M.

Reference to standards, codes, specifications and recommendations shall mean the latest edition of such publications adopted and published at the date of signing of the Developer's Agreement.

4. Conflicts

In the event of conflicts in the specifications the one requiring the better grade of work or material shall govern.

5. Engineer

For purposes of this Specification; Engineer shall be the person authorized by council to represent the Municipality in dealings with the Developer as specified herein.

In order to avoid cumbersome and confusing repetition of expressions in these specifications it is hereby provided that any and all of the following words or any form of such words, unless clearly indicated otherwise shall be understood to be followed by the words "By the Engineer" or "To the Engineer". - Accepted, approved, authorized, condemned, considered or deemed necessary, designated, determined, directed, disapproved, given, indicated, insufficient, ordered, permitted, rejected, required, satisfactory, specified, sufficient, suitable, suspended, unacceptable, unsatisfactory.

6. Inspection of the Work

The Municipality and the Engineer and their authorized representatives shall have access to the Work for inspection wherever it is in preparation or progress. If the Developer covers or permits to be covered any of the Work that is subject to inspection or special tests before receiving approval, the Developer shall uncover the Work, have the inspections satisfactorily completed and make good the Work at his own expense.

Examination of any questioned work may be ordered. If such work is found in accordance with the Agreement, the Municipality shall pay the cost of examination and replacement. If such work be found not in accordance with the Agreement, the Developer shall pay the cost of examination, repair and replacement.

The duties of the Engineer's Representative are to watch over and to inspect the Work and to supervise the testing and examine all materials to be used or workmanship employed in connection with the Work. He shall have no authority to relieve the Developer of any of his duties or obligations under the Agreement nor, except as expressly provided in the Agreement to order any work involving delay or to make any variations of or in the Works.

Failure of the Engineer's Representative to disapprove any work or materials shall not prejudice the power of the Engineer thereafter to disapprove such work or materials and to order the pulling down, removal or breaking up thereof.

If the Developer shall be dissatisfied by reason of any decision of the Engineer's Representative he shall be entitled to refer the matter to the Engineer who shall thereupon confirm, reverse or vary such decision.

7. Approval Procedure

To initiate the approval process for a development proposal, the applicant must submit a letter of application, together with a tentative plan, the requirements for which are set out in the municipal subdivision bylaw. For the Developer's convenience a check list for tentative plan requirements is included with this specification.

The letter of application shall be addressed to the Municipality, Attention: Development Officer. The Development Officer will assess the application and route to municipal departments and council as required.

The applicant is encouraged to discuss the basic concept of his development proposal with the Development Officer prior to preparation of his tentative plan for small developments. Should approval be considered doubtful or uncertain by the Development Officer, he may suggest that the applicant apply for approval in principle based on general concept prior to submission of tentative plans.

Upon notification of an approved tentative plan, the applicant shall proceed with the preparation of a final subdivision plan. A subdivision plan may be all or a portion of the tentative plan.

An application of approval of a subdivision plan must be submitted to the Municipality, Attention: Development Officer, together with a properly prepared subdivision plan and engineering drawings of streets and services as required.

A subdivision plan must be submitted within six (6) months of the date of tentative approval, otherwise tentative approval is considered null and void.

Upon approval of a tentative subdivision plan the Municipality shall draft a Developer's Agreement for execution by the Municipality and the Developer after which the subdivision plan will be approved.

Following the Developer's compliance with all subdivision approval procedures, including any additional conditions stipulated during the approval process, and the execution of the developer's agreement complete with the required performance guarantees the Development Officer will affix his seal to the plan for registration in the registry office. If new streets are involved the council shall pass a resolution approving the streets prior to the Development Officer affixing his seal. Once such resolution is passed both the Development Officer and Clerk shall sign the plan for registration in the registry office.

Upon the filing of a subdivision plan in the local registry office, the Developer may sell building lots. However, building permits will not be issued for individual lots until the services have been properly installed and the street on which the lots front is constructed to sub-base (gravel sub-base in place) for the lot in question.

The Developer may proceed to lay out the subdivision upon approval of a tentative plan. However, should the Developer proceed with actual construction prior to final subdivision plan approval, he does so at his own risk.

8. Easements

All easements for underground services or drainage shall be a minimum width as established under the Subdivision Bylaw. The Developer shall show all easements within the subdivision on the registered subdivision plan. Easements which are required outside of the subdivision boundaries shall be obtained and registered by the Developer. When installing underground utilities or ditching on easements they shall be installed such that a minimum of 3 metres exists between the edge of the easement and the centerline of the pipe or ditch.

9. Protection of Property and the Public

The Developer shall protect property adjacent to the Work Site, the public and public utilities from damage as a result of his operations.

Before the Developer starts work he shall be responsible for locating all underground structures and contacting the Municipality, Perth-Andover Electric Light Commission and NBTel. Should any damage occur to property or utilities he shall make good such damage at his own expense or pay all costs incurred by others in making good such damage.

The Developer shall maintain safe and passable traffic accommodations for public travel, preventing dust nuisance, furnishing, erecting and maintaining construction signs, barricades, lights, flashers and other warning devices required to protect the site and the public.

The Developer shall carry on the Work in such a manner as to not prevent the passage of traffic on the public streets. However, should it be necessary in the performance of the Work to close streets to traffic, the Developer shall obtain the necessary permission from the responsible authority and make all necessary arrangements.

If the Developer fails to protect, repair, rebuild or otherwise restore such property as may be deemed necessary, the Engineer, after giving notice, may proceed to protect or to have repairs made by others and the cost thereof will be deducted from the development performance guarantee.

10. Guarantee

The Developer will be required to guarantee all work and materials on the Street System, Sanitary Sewer System and the Water System for a period of three years after acceptance of the development by the municipality.

A bond or other form of security acceptable to the Municipality shall be deposited with the Municipality by the Developer prior to acceptance of the development and remain in effect for the three year guarantee period. The bond or security will be equal to ten per cent of the combined value of the Street System, Sanitary Sewer System and Water System.

Until the end of the guarantee period, the Developer shall correct at his own expense any defects in the discovered in the development by the Municipality due to faulty products and/or workmanship. The Developer shall also correct and/or pay for any damage to other work resulting from any corrections. All such work, repair, alterations, reconstruction or replacement shall be executed as the need becomes apparent or upon the written request of the Municipality. Should the Developer neglect or fail to commence the execution of such works within two (2) weeks of receipt of the written request, the Municipality will be entitled to complete the corrections themselves or by others and recover the cost of the corrections from the bond or other form of security deposited by the Developer with the Municipality.

DIVISION TWO

STREET SYSTEM

Contents

ITEM 1 SYSTEM INFORMATION

1. General

All subdivision streets shall be constructed by the Developer. The Municipality may require the Developer to upgrade existing streets which are providing access to the proposed subdivision.

2. Reference Specifications

Construction of subdivision streets and upgrading of existing streets if required, shall be in accordance with these specifications.

3. Approvals

The Developer shall be responsible for obtaining all necessary approvals required to construct the subdivision streets including but not be limited to:

i. New Brunswick Department of Environment - If a Watercourse Alteration Permit is required.
ii. N.B.D.O.T. - If the subdivision has access from a provincial designated highway.
iii. Canadian Transport Commission - If construction of the street system requires crossing a railroad right-of-way.

4. Scope of Work

The street system shall be completed by the Developer and shall include the following work:

i. Construction of the street to lines and grades approved by the Municipality including granular borrow sub-base, crushed gravel base and chipseal including base and seal courses the initial year followed by a second seal course the next year.
ii. Shoulders and ditches.
iii. Roadway culverts complete with headwalls.
iv. Driveway culverts at each lot to be installed by the Municipality, if deemed necessary, at the Developer's or lot Owner's expense.

5. Cul-de-Sacs

A dead end street shall be constructed as a cul-de-sac to dimensions specified under the Subdivision Bylaw. Where provision is made for future street extension in the subdivision, a temporary turn-around shall be constructed to the cul-de-sac dimensions. In general a crescent street layout is preferable over cul-de-sacs.

6. Standards

The Municipality will require the Developer to construct the street system to meet or exceed the following minimum standard:

i. All street right-of-ways shall have a minimum width of 20 metres.
ii. Streets shall be constructed to a minimum width of 9.7 metres shoulder to shoulder.
iii. Street grades shall not exceed 8% except as permitted under the Subdivision Bylaw.
iv. All intersections between streets shall be at right angles.

7. Record Drawings

Upon completion of the street system, the Developer shall provide the Municipality with one transparent set and two copies of "RECORD" drawings. The "RECORD" drawings shall show the actual geodetic elevations, dimensions, grades and location of each street; right-of-way locations; and all other features such as roadway culverts, etc.

ITEM 2 TECHNICAL SPECIFICATIONS

1. Description

The Developer is required to construct all streets in accordance with these specifications, and, where applicable, Department of Transportation - General Specifications. The Developer must also comply with any additional or unique requirements as contained in the Developer's Agreement.

Generally, the work covered by this section includes clearing and grubbing, initial cuts and fills and shaping of road bed to subgrade, gravel sub-base, crushed gravel base, chipseal, ditching, culverts and driveways.

2. Materials

Unless otherwise specified approved materials shall meet the following specifications:

2.1 Borrow Fill

This item refers to fill material required to bring the road bed elevation up to the required subgrade.

Excess material from road cuts may be used for this purpose provided that it can be moved and re-compacted in embankments and does not contain more than 50 percent passing the 75μm sieve.

Borrow material not originating from roadway cuts must be approved as to source and suitability.

2.2 Culvert Pipe Bedding Material

a) Bedding Material For Concrete Pipe
This shall be a granular material conforming to the gradation limits of Gravel Sub-base and shall be uniformly compacted using approved compaction methods as outlined in Division Three, Section 3.2 Pipe Installation.

b) Bedding Material For Corrugated Steel Pipe
This shall be a granular material conforming to the gradation limits of Crushed Gravel Base and shall be uniformly compacted using approved compaction methods as outlined in Division Three, Section 3.2 Pipe Installation.

2.3 Crushed Gravel Base

Shall be bank gravel which has been crushed and screened to meet the following grading limits:

Particle Diameter (mm)	Percentage by Weight Smaller
37.5	100
31.5	95 - 100
25	84 - 94
19	70 - 88
12.5	55 - 78
9.5	45 - 72
4.75	30 - 57
2.36	20 - 46
1.18	14 - 35
600μm	10 - 27
300μm	7 - 21
150μm	5 - 16
75μm	3 - 12

2.4 Gravel Sub-base

Shall be pit run gravel in its natural, screened and/or crushed condition with the following gradation limits. Material shall be composed of clean, hard, durable particles, free from lumps of clay or other deleterious material. Abrasion loss shall not exceed 50%.

Particle Diameter (mm)	Percentage by Weight Smaller
125	100
100	95 - 100
75	82 - 100
50	62 - 100
25	39 - 100
19	30 - 94
9.5	22 - 80
4.75	16 - 66
2.36	12 - 55
1.18	9 - 44
300μm	4 - 25
75μm	0 - 7

2.5 Shoulder Material

Shall be crushed gravel or rock conforming to the gradation limits as per the item Crushed Gravel. The material shall be free from deleterious substances and have a maximum abrasion loss of 50%.

2.6 Crushed Stone For Chip Seal

Shall be quarried stone which has been crushed and screened to meet the following grading limits:

a) Base Course

Particle Diameter (mm)	Percentage By Weight Smaller
16.0 mm	100
12.5 mm	0 - 90
9.5 mm	0 - 60
4.75 mm	0 - 20
75 μm	0 - 3

b) Seal Course

Particle Diameter (mm)	Percentage By Weight Smaller
9.5 mm	100
4.75 mm	0 - 5
75 μm	0 - 2

2.7 Asphalt Emulsion For Chip Seal

HP-200 Emulsion as supplied by Atlantic Colas Limited, or approved equal.

2.8 Random Rip-Rap

Shall be quarry stone, field stone or broken ledge and consist of sound, durable rock and shall be of a type approved. Average rock size shall be 0.03 cubic metres with a maximum rock size of 0.06 cubic metres and with a portion of about 20 percent of smaller stones and spalls intermixed.

2.9 Culvert Pipe

The minimum diameter for roadway and driveway culverts shall be 450 mm unless the Municipality designated a smaller size. Culvert pipe shall be either reinforced concrete or corrugated steel pipe conforming to the following specifications:

a) Reinforced Concrete Pipe

Shall be reinforced concrete pipe meeting ASTM Standard C-76 minimum Class III or as specified on drawings.

b) Corrugated Steel Pipe and Fittings

Shall be full round galvanized steel pipe and fittings with 68 mm x 13 mm corrugations and a thickness of 1.6 mm as manufactured by Armtec Construction Products (Hel-Cor Lock Seam Galvanized Steel Pipe) or approved equal.

2.10 Concrete Pipe Joint Wrap

Shall be Terrafix 200R, or approved equal.

2.11 Grassed Areas

a) Sod

Shall be taken from a good loamy soil and shall be well permeated with roots; be uniform in texture; free from weeds and in healthy condition. Sod shall contain sufficient moisture to maintain its vitality during transportation and placement, and if left overnight shall be stacked to prevent drying. When sod is installed in ditches, the ditch beneath the sod shall be excavated so that the elevation of the finished sodded ditch is lower than the culverts.

b) Hydroseed Mixture

The mixture to be used for hydroseeding shall contain the following elements:

i. Grass seed mixture containing 60% Kentucky Blue Grass, 20% Creeping Red Fescue and 20% Perennial Rye Grass.
ii. Approved mulch.
iii. Fertilizer sufficient to promote a densely matted growth.
iv. Organic base adhesive.

c) Topsoil

Shall be fertile, friable soil, reasonably free from subsoil, clay lumps, stones, roots, weeds, and other objectionable materials.

3. Construction Methods

3.1 Clearing and Grubbing

All trees, stumps, brush and other perishable material shall be close cut within three hundred (300) millimetres of the ground surface and shall be burned or disposed of in a satisfactory manner.

The Developer must obtain a permit before starting to burn any materials and shall have on site the equipment necessary to control the burning operation.

All roots, stumps and other objectionable material shall be excavated and removed to a depth of not less than two hundred (200) millimetres below the original ground surface.

Grubbing shall be completed in advance of the excavation and grading operations unless otherwise approved.

The Developer shall dispose of all objectionable material in a satisfactory manner. Disposal areas must be approved and shall be left with a neat and

finished appearance. It will be the responsibility of the Developer to obtain permission for the use of land from the property owner for these disposal areas.

3.2 Roadway Excavation

All approved material shall be used in the formation of embankments or as directed. All material considered surplus or unsatisfactory shall be disposed of in an approved manner. When practical, surplus and unsatisfactory material shall be utilized for grading slopes or other grading, as directed, within the project.

If, during the excavation, material is encountered that is suitable for use as described under any item of this contract, the Developer will reserve this material and use it as directed.

All breakage and slides shall be removed by the Developer and disposed of in an approved manner. Ditches shall be excavated to the depth and width as shown on the drawings or as directed. During construction the ditches shall be maintained in such condition that the roadway will be well drained at all times.

Excavated material shall be placed and compacted to a minimum of ninety-five (95) percent of ASTM D-698 or D-2049 maximum density; as determined by one of the following ASTM Tests: D-1556, D-2167 or D-2922 when ordered.

In un-grubbed areas, swamps and rough terrain, the initial layer shall be as directed.

Excavated material may be common excavation or solid rock excavation.

It is the responsibility of the Developer to conduct sufficient soil investigations prior to submission of final plans so as to determine the extent of solid rock excavation.

Major changes in roadway design will not be permitted after final approval solely on the basis of solid rock encountered during construction.

Width and depth of roadway excavation will be sufficient to provide a final street cross section as per plans and specifications.

Embankment fills shall be shaped during construction so as to provide adequate drainage at all times.

Excavated material or imported borrow shall be placed in layers not more than 300 mm and compacted to 95%.

Special placing procedures may be permitted or required where initial ground is un-grubbed, swampy or rough terrain.

Embankments constructed of blasted rock shall be placed in layers not exceeding 1 metre and tramped with a tractor having a weight of not less than 20 tonnes.

3.3 Road Sub-Base

Upon completion of roadway excavation and embankments and the initial shaping of the road bed and ditches, a layer of gravel sub-base having a minimum depth of 450 mm shall be placed over the road bed.

This material shall be shaped to required grades as it is placed and compacted to a density of 95%. Gravel sub-base shall not be placed on wet or muddy surfaces.

3.4 Crushed Gravel Road Base

Road Base shall consist of 150 mm minimum layer of crushed gravel.

The gravel sub-base shall be well graded and compacted prior to application of crushed gravel base material. Crushed gravel base shall be placed with a motor grader and compacted to 95%.

The road surface shall be periodically graded to prevent excessive accumulation of ruts and pot holes.

3.5 Roadway Culverts

Culverts shall be as indicated on drawings. Pipe laying methods shall be as per those for storm sewer pipe where applicable. All joints on concrete pipe shall be wrapped with concrete pipe joint wrap.

Culvert invert elevations shall match bottom of ditch elevations. Roadway culverts shall have a minimum cover of 1 metre.

If culverts are installed after construction of roadway, backfill material shall correspond to roadway materials as per Detail 2L.

Approved culvert headwalls shall be constructed at all inlets and outlets. Culvert ends shall be kept clear of debris after installation.

3.6 Driveway Culverts

A driveway culvert must be installed prior to the issuance of a building permit for any lot within the development. Driveway culverts will be installed by the Municipality at the Developer's or lot Owner's expense.

At least one driveway culvert shall be installed for each lot within the development except at the crest of a hill where elimination of the driveway culvert maybe approved. Culverts shall be minimum 450 mm in diameter and

7.3 metre minimum in length unless the Municipality determines a smaller diameter culvert is acceptable. Driveway culverts may not be extended beyond a total length of 15 metres without prior approval from the Municipality. The Municipality, upon acceptance of the works, only maintains one culvert per lot.

Culvert invert elevations and alignment shall match that of finished ditch line. Culvert pipe shall be installed in accordance with methods described under the Storm Runoff Control System. All joints on concrete pipe shall be wrapped with concrete pipe joint wrap.

Culverts shall have a minimum cover of 300 mm.

3.7 Driveway Construction

Access to each lot shall be by a driveway having a minimum finished width of 6 metres. The top surface shall be graded with a layer of crushed gravel having a minimum depth of 150 mm.

Driveway side slopes in the ditch area shall not exceed a 2:1 slope unless the culvert length is extended beyond the minimum length required or culvert headwalls are constructed.

Final vertical driveways alignment shall match the abutting street grades at the edge of shoulder line.

3.8 Shoulders and Ditches

Shoulders shall be minimum 1.25 metres wide as per Detail 2L. Following the chipsealing operation, shoulders shall be graded and compacted so that the finished surface is flush with the edge of chipseal and has a cross slope matching that of the adjacent driving lane. Fore slopes and ditch inverts shall be clear of excess material following final shoulder grading.

Open ditches shall be constructed generally as shown on Detail 2L. Ditch depth shall match adjacent driveway and roadway culvert invert elevations.

Ditch sides shall have a maximum slope of 2:1.

In areas where in situ soils are unstable or subject of erosion, additional work may be required in the construction of ditch back slopes. Generally this situation will have to be assessed based on:

i. Nature of soil condition
ii. Depth of ditch or total vertical height of back slope at property line
iii. Water runoff volume and slope of ditch

Where sodding or hydroseeding is to be completed adjacent to ditches; the area to be sodded or hydroseeded shall be fine graded to a uniform surface, be loosened to a minimum depth of 50 millimetres, have topsoil spread to a

minimum depth of 100 millimetres and be levelled to a uniform surface prior to placing the sod or hydroseed.

Sod shall be laid lengthwise across the length of a slope with ends close together. Joints in adjacent rows shall be staggered. Sod shall be pounded to form a smooth surface. On slopes steeper than 3 to 1, every sod in the bottom three rows, and in every third row above shall be pegged with pegs driven flush with the ground. The Developer shall be responsible for watering and maintaining the sod until acceptance of the subdivision by the Municipality. Any break which may occur through slipping of sod shall be removed and replaced. No sod shall be laid when in a frozen condition or on frozen ground.

In areas of relatively low runoff, a swale may be acceptable in lieu of an open ditch. However, each area proposed will be evaluated on its own merits and must be approved by the Municipality.

3.9 Chip Seal

The Developer will be required to provide double course chip seal (base and seal) the first year to be followed by single seal chip seal the subsequent year.

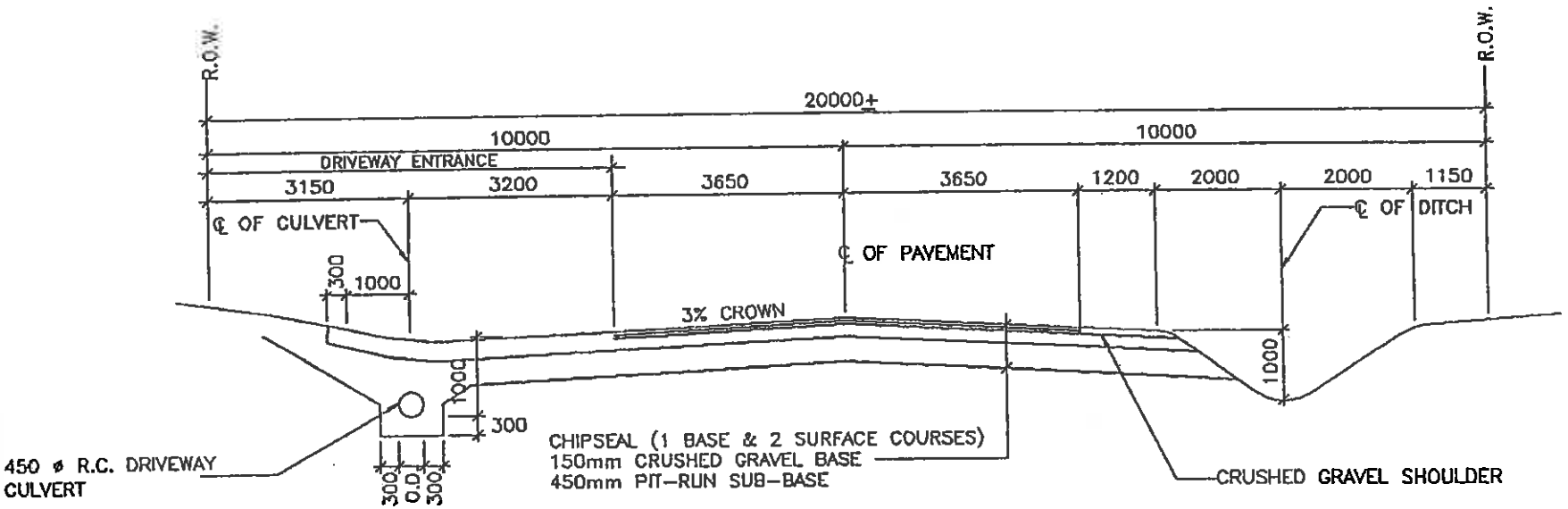
Once the street has been properly shaped, graded and compacted, the Developer shall apply a layer of emulsion at a rate of 2.2 litres per square metre. This layer of emulsion shall be covered with a layer of crushed stone of the type specified for Crushed Stone For Chip Seal - Base Course. This layer of crushed stone shall be placed at a rate of 24.4 kg per square metre.

Once the base course has been completed and approved, the Developer shall place a surface course. Emulsion for the surface course shall be placed at a rate of 1.90 litres per square metre and shall be followed by a layer of crushed stone of the type specified for crushed stone for chip seal - surface course at a rate of 13.6 kg per square metre.

In the following spring, the road surface shall be checked and any settlement, potholes or other surface irregularities shall be repaired prior to placement of the final surface course.

Once necessary repairs have been made and approved, the Developer shall place the final surface course.. Emulsion for the final surface course shall be placed at a rate of 1.90 litres per square metre and shall be followed by a layer of crushed stone of the type specified for crushed stone for chip seal - surface course at the rate of 13.6 kg per square metre.

Note: The above rates are a guide only and may be modified to suit local conditions.



NOTES

1. DITCH SLOPES MAX. 2:1
2. ALL DIMENSIONS SHOWN IN MILLIMETRES.

REGISTERED PROFESSIONAL ENGINEER
#2307
K. W. Hannah
Feb 12/96
PROVINCE OF NEW BRUNSWICK

GO' 'REY ASSOCIATES LTD.
CON: .TING PROFESSIONAL ENGINEERS

MUNICIPALITY OF PERTH-ANDOVER
NEW BRUNSWICK

TYPICAL RESIDEN' L STREET

REVISIONS			
SCALE N.T.S.	PROJ. NO. 007-035	DRAWN	
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DIVISION THREE

SANITARY SEWER SYSTEM

Contents

ITEM 1 SYSTEM INFORMATION

1. General

Where the proposed subdivision is required to be serviced by a sanitary sewer system, the Developer shall be responsible for the installation of a complete sanitary sewer system including sewer mains and sanitary service lines to the property line of each lot. If the existing municipal sanitary sewer system is required to be extended outside of the subdivision boundaries to service the proposed subdivision, the extension shall be completed by the Developer.

2. Reference Specifications

All work on the sanitary sewer system shall be in accordance with these specifications, additional requirements stipulated by the New Brunswick Department of the Environment and any additional requirements stipulated by the Municipality at the time of approval of the subdivision.

3. Approvals

The Developer shall be responsible for obtaining all necessary approvals required for construction of the sanitary sewer system. This shall include but not be limited to:

i. New Brunswick Department of Environment - Sanitary Sewer Design and if required a Watercourse Alteration Permit.
ii. Perth-Andover Electric Light Commission - If required for extension of power lines for sewage lift stations or trenching across underground utilities.
iii. N.B. Tel - If required for trenching across underground utilities.
iv. N.B.D.O.T. - If sewers are installed across or along a provincial designated highway.
v. Railway Authority - If sewers are installed on a railroad right-of-way.

4. Scope of Work

The construction of the sanitary sewer system shall include the following items:

i. All sewer mains complete with precast concrete structures.
ii. A service line from the sewer main to the property line at each lot.
iii. High pressure cleaning and video inspection of 100% of all sewer mains.

iv. Air testing of a minimum of 100% of all sewer mains and visual inspection of all manholes.
v. All sewage lift stations if required including force mains and testing, flap gate chambers and electric utility extensions.
vi. Site restoration of existing lawns, asphaltic pavement, chipseal, easements, etc.

5. Sewage Lift Stations

If the sanitary sewer system requires the construction of a sewage lift station, the type of station, manufacturer, size and features shall be subject to review and approval by the Municipality.

6. Record Drawings

Upon completion of the sanitary sewer system, the Developer shall provide the Municipality with one transparent set and two copies of "RECORD" drawings which shall include the following:

i. Location, grade and geodetic elevation of all sewer mains and manholes.
ii. The location of each service pipe at the sewer main.
iii. The location and depth of each service pipe at the property line with three separate measurements between the end of the service line and a permanent structure or lot pin.

ITEM 2 TECHNICAL SPECIFICATIONS

1. Description

All work on the sanitary sewer system shall be in accordance with the following technical specifications and shall meet all requirements of the New Brunswick Department of the Environment.

2. Materials

Unless otherwise specified approved materials shall meet the following specifications:

2.1 Gravity Sewer - Polyvinyl Chloride 1120 Pipe

Shall be PVC 1120 pipe, CSA Standard B182.2-M with a DR of 35. The bell will be an integral and homogeneous part of the pipe barrel. The pipe shall be marked to show the manufacturer, class and CSA certification.

Joints for sanitary sewer pipe will be bell and spigot type with a rubber gasket made as recommended by the manufacturer. All sanitary sewer pipe joints must be water tight within the limits by the New Brunswick Department of the Environment.

2.2 Tees

Shall be as manufactured by Vassallo or approved equal.

2.3 Flexible Couplings

Shall be as manufactured by Fernco Joint Sealer Co., or approved equal.

2.4 Saddles

a) All saddles on concrete pipe shall be Crowle, Daigle or approved equal complete with gasket and stainless steel bands.

b) All saddles on PVC pipe shall be of an approved type complete with gasket and stainless steel bands.

2.5 Precast Concrete Sections

ASTM Standard C-478 for concrete manhole sections.

2.6 Cast Iron Frames and Covers

NBDOT General Specifications Standard Drawing No. 25 - Frames, Grates and Covers.

2.7 Screened Stone

Shall conform to the following grain size distribution:

Particle Diameter (mm)	Percentage by Weight Smaller
40	100
30	40 - 70
10	20 - 50
5	0

2.8 Crushed Gravel

Shall be as specified in Division Two for Crushed Gravel Base.

2.9 Pit Run Gravel

Shall be as specified in Division Two For Gravel Sub-base.

2.10 Forcemain - Polyvinyl Chloride Pipe

Shall be AWWA Standard C-900 for Polyvinyl Chloride (PVC) Pressure Pipe with a DR of 25 and shall be Class 100.

3. Construction Methods

3.1 Excavation

Construction methods used by the Developer in making the excavation must safeguard public and private property and must be carried out in strict compliance with the Occupational Health and Safety Act of the Province of New Brunswick.

The Developer shall be responsible for the condition of all excavations. He shall be held solely responsible for damages that may be caused through lack of proper sheeting, bracing, water control, etc., and for any damage to person or property resulting from the same.

The excavation shall be dewatered and kept continuously dewatered.

Any part of the trench excavated below the specified grade shall be corrected with approved granular fill material thoroughly compacted. Where the subgrade is considered too soft to support the pipe or structure then deeper

excavation will be required to permit the installation of additional granular base material.

Excavated material when approved shall be used to backfill excavations. Rock-blasting shall be carried out under the supervision of experienced persons employed by the Developer. No blasting shall be done outside the Developer's normal working hours.

In excavations requiring blasting, the mouth of the pipe and any portion not backfilled shall be adequately protected. No blasting will be allowed within five (5) metres of any installed pipe.

Immediately prior to a blast, the Developer shall clear the blasting area of all residents, vehicular and pedestrian traffic and shall post flagpersons on each road entering the blasting area who shall stop all traffic and shall prevent such traffic from entering the area until the blast has taken place.

The Developer shall be responsible for any repair that is necessary to restore the municipal or private property to their original condition due to damage caused by blasting.

3.2 Pipe Installation

In soft subgrade conditions, the Engineer may order the Contractor to excavate to a depth of 300 millimetres below the bottom of the pipe and to place a layer of "Screened Stone" below the pipe zone material. This material will provide a 150 millimetre layer of sub-bedding as shown on the detail drawing "Typical Trench".

Pipe zone material, (including bedding, haunching and initial backfill), shall be as shown on the Detail Drawing "Typical Trench" and shall be from the bottom of the trench excavation to 300 millimetres above the top of the pipe. Pipe zone material for a single pipe or the lowest pipe in the case of a multiple pipe trench shall be "screened stone" unless otherwise ordered. Pipe zone material for second and successive pipes in a trench shall be "crushed gravel" unless otherwise ordered.

Pipe zone material may be machine placed and shall be uniformly compacted before the pipe is installed. Bell holes shall be provided at each bell joint to permit proper assembly while maintaining uniform pipe support. Bedding for structures shall be a minimum of three hundred (300) millimetres deep.

In trenches with more than one pipe installed, all material between the pipe zones shall be pit run gravel.

The pipe shall be installed so that the pipe cross section deflection is less than 7.5 %.

All pipe shall be laid and jointed in strict accordance with the manufacturer's instructions. Joints between dissimilar pipes shall be made in accordance with the recommendation of the manufacturer of one or the other of the pipes.

The pipe, laid with bell-end upgrade, shall be installed so as not to unduly disturb the bedding during jointing. The bell and spigot shall be free of any foreign matter before jointing.

All pipes shall be laid and maintained to the required lines and grades as shown on the drawings or as directed. All pipe laid at 2% grade or less shall be laid with the use of a laser beam or other approved optical method for maintaining grade and alignment. Any pipe which is not in true alignment, or which shows any settlement after laying, shall be taken up and relaid by the Developer at his own expense.

Foundation backfill shall consist of backfilling trenches and foundations as shown on the detail drawings. Backfilling shall be placed in such a manner as will not unduly stress or damage the structures. If the material is to be placed otherwise than by hand the method must be approved. In general, the height of dump shall not exceed the depth of fill then over the structure. Excavated material when approved may be used as foundation backfill.

Foundation backfill placed under roadway, driveways, railroads, and when directed, shall be placed and uniformly compacted to ninety (90) percent Standard Proctor Density. Approved pneumatic tampers, vibrating compactors or other approved methods will be used to consolidate the material. Backfilling of all other areas must be made in an approved manner but will not require mechanical compaction. The Developer is reminded that he is responsible for all settlement which occurs until acceptance of the subdivision by the Municipality.

3.3 Sanitary Manholes

All manholes shall be constructed as shown on the detail drawings.

All manholes shall be located on the shoulder of the roadway off the pavement.

All joints between sanitary manhole sections will be installed with both a rubber gasket and an approved bituminous compound and must be water tight.

All manholes will be constructed to between one hundred and fifty (150) millimetres and three hundred (300) millimetres of the proposed finished grade by means of one thousand fifty (1050) millimetre diameter or one thousand two hundred (1200) millimetre sections. The cast iron frame and cover or grates will be set as shown on the drawings as ordered or flush with the finished grade using a grade ring and six hundred (600) millimetre diameter sections. All non-tongue and groove joints shall have a cement mortar joint. One course

only of concrete brick in a full mortar bed shall be permitted for height adjustments.

Connections between concrete structures and sewer pipe shall be the method recommended by the manufacturer. All sanitary manhole bases shall be prebenched by the supplier and be complete with water tight inserts or stubs for connections to main sewer pipe unless otherwise approved.

Upon completion, each structure shall be cleaned of silt, debris or other matter of any kind and shall be kept clean until final acceptance of the Work.

3.4 Leak Testing - Sewer Mains

a) General

One hundred (100%) percent of all sanitary sewers installed shall be tested for leakage using air testing.

The Municipality shall be notified in advance of the schedule for testing.

All manholes shall be visually inspected for infiltration.

The Developer shall supply all approved materials necessary to complete the test, including approved specially fabricated air tight plugs and caps and air in sufficient quantities.

All tests, unless otherwise ordered, shall be:

i. For exfiltration;
ii. Carried out after backfilling;
iii. Conducted on sections of pipe lines between adjacent manholes;
iv. Carried out in the presence of the Engineer or his representative; and
v. Carried out on all sanitary mains.

b) Testing Method

As soon as the Developer has notified the Engineer that he wishes to test a section of the pipeline, the Developer shall check that all relevant open ends are blocked off with air tight plugs and caps; and that all elbows, bends, etc., are adequately blocked to safely withstand the pressure developed under the test.

An approved air tight plug shall be placed in the inlet and outlet of the downstream and upstream manholes respectively. In both cases, the plug shall be securely blocked to prevent movement.

The test section is pressurized to 38 kPa (4 psig) using an approved air blower or similar pressure regulated apparatus. The fill valve is then closed and the injected air is permitted to stabilize for a period of not less than two minutes.

Following this waiting period, the pressure is increased or decreased to 24 kPa (3.5 psig) and the time is measured for the pressure drop to 17 kPa (2.5 psig). The time required for this pressure drop shall not be less than indicated by Table I.

CAUTION: Compressed air can be potentially dangerous if plugs are not properly secured. **DO NOT EXCEED 28 kPa (4 PSIG.)**

Time required for pressure drop from 24 kPa (3.5 psig) to 17 kPa (2.5 psig) not to exceed values provided in Table I following:

TABLE I
TIME REQUIREMENTS FOR AIR TESTING

Pipe Diameter (mm)	Minimum Time (min:sec)	Length for Minimum Time (metres)	Time for Longer Length (sec)
100	1:53	182	.623 L
150	2:50	121	1.40 L
200	3:47	91	2.49 L
250	4:43	73	3.89 L
300	5:40	61	5.61 L
375	7:05	48	8.76 L
450	8:30	41	12.6 L
525	9:55	35	17.2 L
600	11:20	30	22.4 L

L = length of test section in metres

Test gauges shall be in 5 kPa (0.5 psig) maximum increments and have been recently calibrated.

Should the test disclose that the leakage is greater than the amount permissible, the Developer shall, at his own expense, locate and repair the defective pipe or joints. Tests shall be carried out, at the Developer's expense, to determine the success or otherwise of remedial measures applied to the pipe work. These tests shall be repeated, at the Developer's expense, until the results shown that the remedial measures have been successful.

3.5 Leak Testing - Manholes

Each manhole installed shall be visually inspected for infiltration.

The testing schedule shall be at the Engineer's discretion.

Any manholes showing signs of infiltration before the end of the guarantee period shall be repaired by the Developer at his expense.

Manholes shall be repaired by pressure grouting or shall be excavated and repaired on the outside using an approved caulking compound.

Manholes which have been repaired shall be reinspected at the Developer's expense to determine the success of the remedial measures. These inspections shall be repeated, at the Developer's expense, until the results show that the remedial measures have been successful.

3.6 Cleaning and Video Inspection

The interior of all sanitary sewers shall be cleaned with approved high pressure flushing equipment and shall be 100% video inspected.

The sewers shall be inspected using a closed circuit television camera. The maximum speed of the television camera through the pipe shall be 0.30 metres per second with a 5 second minimum stop at each defective location and a 15 second stop at each lateral showing a flow discharging into the pipe.

The inspection shall be recorded on a VHS. The audio part shall include the recording of distances at a maximum interval of three metres and a brief description of every defective location and of each service connection. A photograph shall be taken at each defective location and at each lateral location. The photograph and the distance the photograph was taken at shall be placed in a report to the Municipality.

In addition to the original video tapes, the Developer shall supply the Municipality with one edited copy showing all defects appearing on the original video tapes. The edited copy shall be on VHS tape equal to "Fuji VHS T90".

The complete record of the inspection, original tape and edited tape shall be the property of the Municipality.

The Municipality shall be notified in advance of the schedule for cleaning and video inspection.

3.7 Sanitary Service Pipes and Appurtenances

Excavation for service pipe shall be as outlined under Section 3.1 Excavation.

Service pipe installation shall be as outlined under Section 3.2 Pipe Installation.

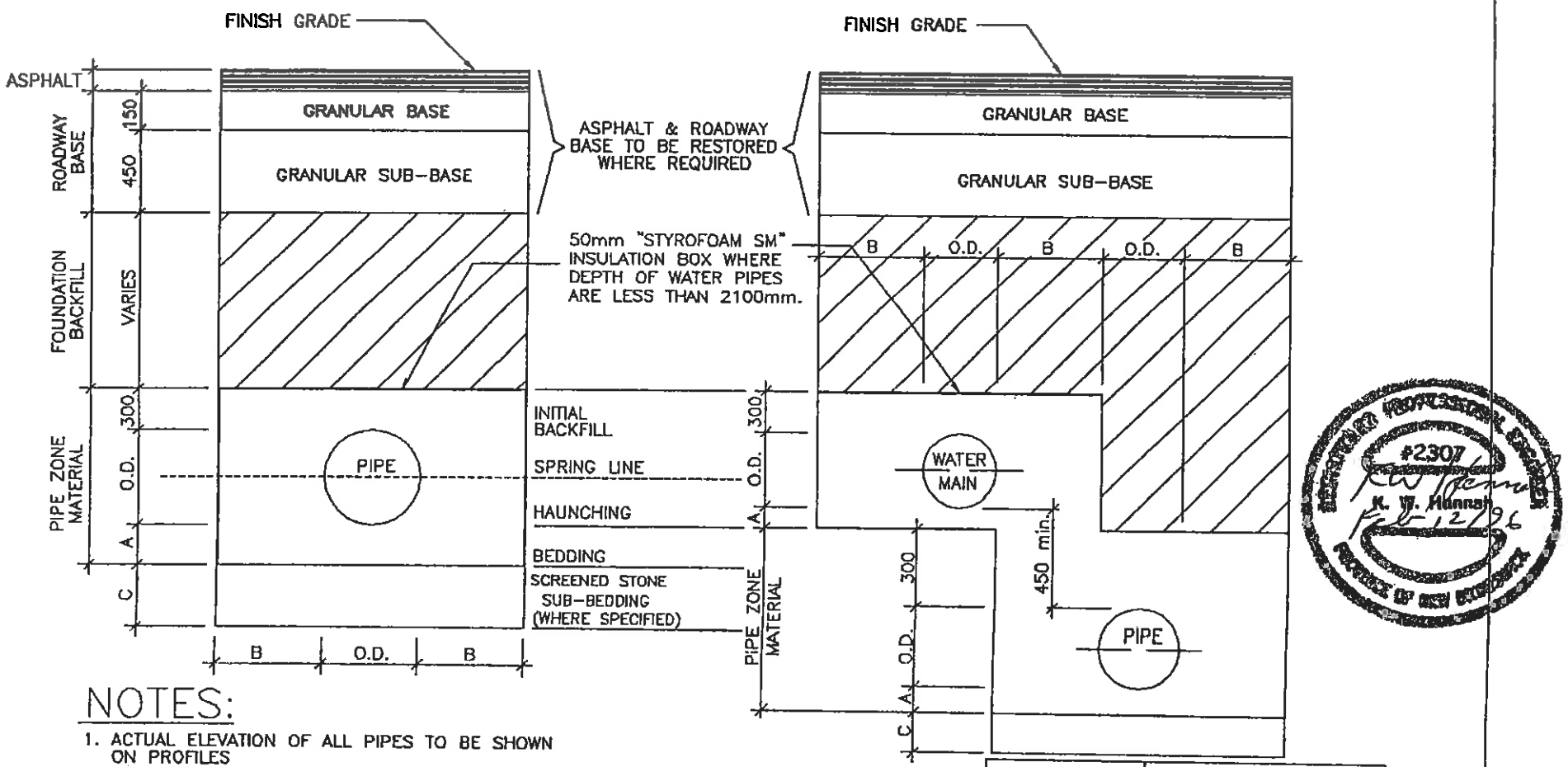
Provision for service connections shall be made at the time the main line pipe is installed using Tees. Saddles will only be permitted to be used if the Developer is directed to install a service after the main line has been installed.

Wherever provision is made for future connections either to mains or building services, the ends of the installed lengths of the pipe or the opening in the

fittings shall be plugged with a water tight plug adequately blocked to safely withstand the pressure developed during leakage tests. All laterals shall end with a bell end.

Each plugged end shall be marked by a 50 mm x 100 mm timber extending from the plugged end of the pipe to a minimum of six hundred (600) millimetres above the ground surface so that the property owner can easily locate the end of the installed service.

A completed "Service Connection Report", a sample of which is included in the Appendix, shall be filed with the Municipality for each service pipe installed. The completed report shall include the depth of all service pipes at the property line and three separate measurements between the end of the service pipe and permanent structures such as a lot pin or utility pole.



NOTES:

1. ACTUAL ELEVATION OF ALL PIPES TO BE SHOWN ON PROFILES
2. ACTUAL CONSTRUCTION WIDTHS SHALL BE IN ACCORDANCE WITH N.B. INDUSTRIAL SAFETY ACT.
3. ALL DIMENSIONS SHOWN IN MILLIMETRES.

PIPE SIZE O.D.	DIMENSIONS		
	A	B	C
UP TO 800	150	300	150
801 TO 1200	200	400	150
OVER 1200	300	600	150

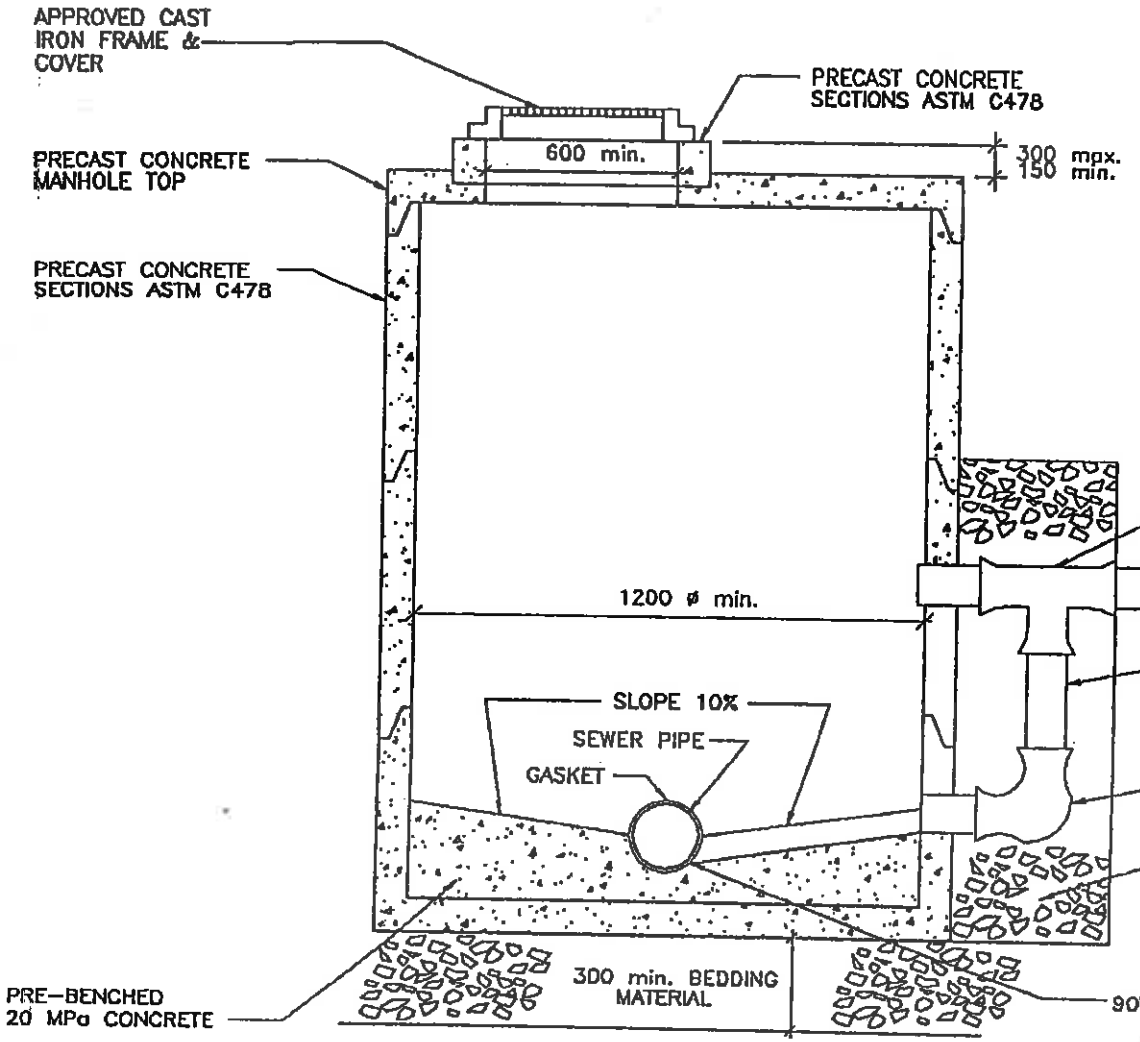
GOD[illegible]Y ASSOCIATES LTD.
CONSU[illegible]NG PROFESSIONAL ENGINEERS

MUNICIPALITY OF PERTH-ANDOVER
NEW BRUNSWICK

TYPICAL TR[illegible]H
SINGLE & DOU[illegible] PIPE

REVISIONS

SCALE	N.T.S.	PROJ. NO.	007-035	DRAWN	K.D.
DATE	JAN. 1998	DRAWING	1 [illegible]		



NOTES:

1. JOINTS SHALL BE WATER TIGHT & MADE WITH APPROVED JOINTING COMPOUND SUCH AS RAMNECK AND WITH "O" RING GASKET.
2. LIFT HOLES SHALL BE PLUGGED TIGHT.
3. ALL DIMENSIONS SHOWN IN MILLIMETRES.

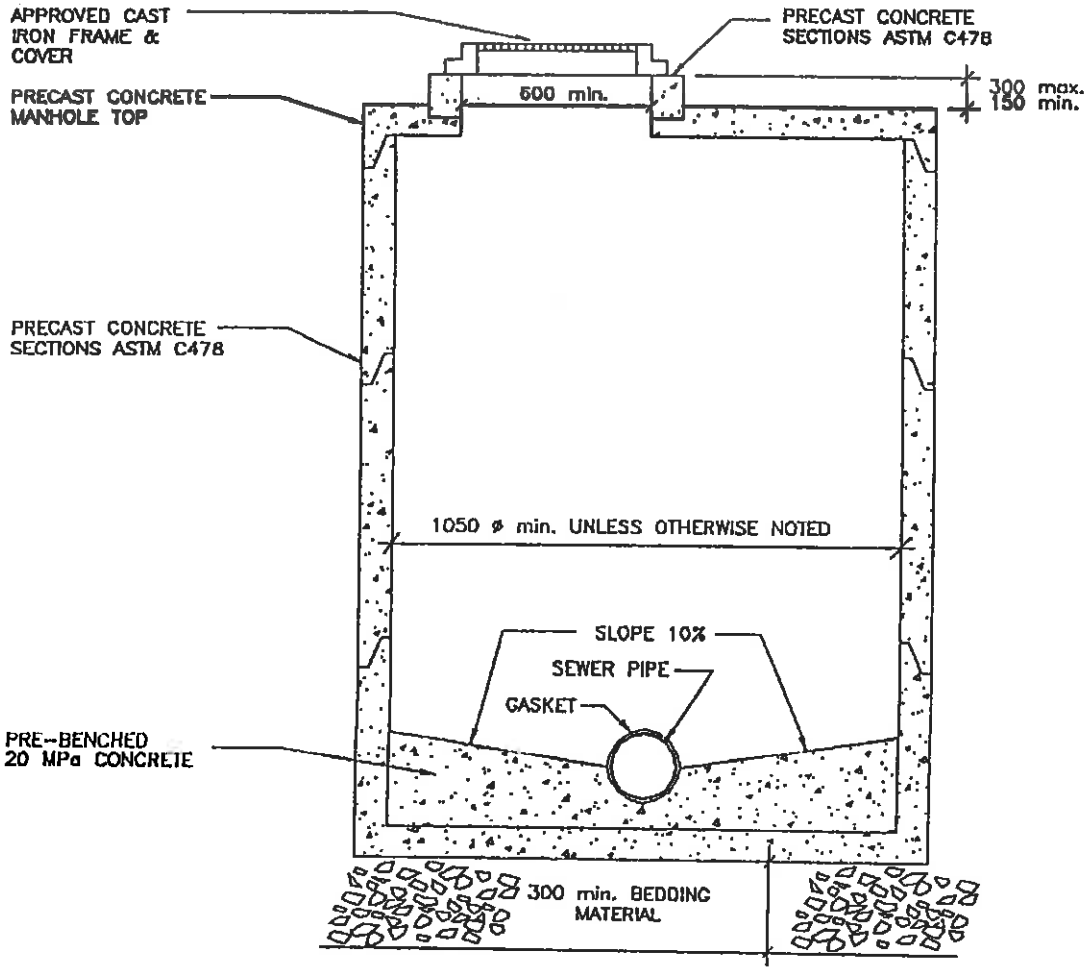
REGISTERED PROFESSIONAL ENGINEER #2307 K. W. Mannah PROVINCE OF NEW BRUNSWICK

GODFREY ASSOCIATES LTD.
CONSULTING PROFESSIONAL ENGINEERS

MUNICIPALITY OF PERTH-ANDOVER
NEW BRUNSWICK

SANITARY DROP MANHOLE (PRECAST)

REVISIONS			
SCALE N.T.S.	PROJ. NO. 007-035	DRAWN K.D.T.	
DATE JAN. 1998	DRAWING 3 L		



NOTES:

1. JOINTS SHALL BE WATER TIGHT & MADE WITH APPROVED JOINTING COMPOUND SUCH AS RAMNECK AND WITH "O" RING GASKET.
2. LIFT HOLES SHALL BE PLUGGED TIGHT.
3. ALL DIMENSIONS SHOWN IN MILLIMETRES.

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CONSULTING PROFESSIONAL ENGINEERS

MUNICIPALITY OF PERTH-ANDOVER
NEW BRUNSWICK

SANITARY MANHOLE
(PRECAST)

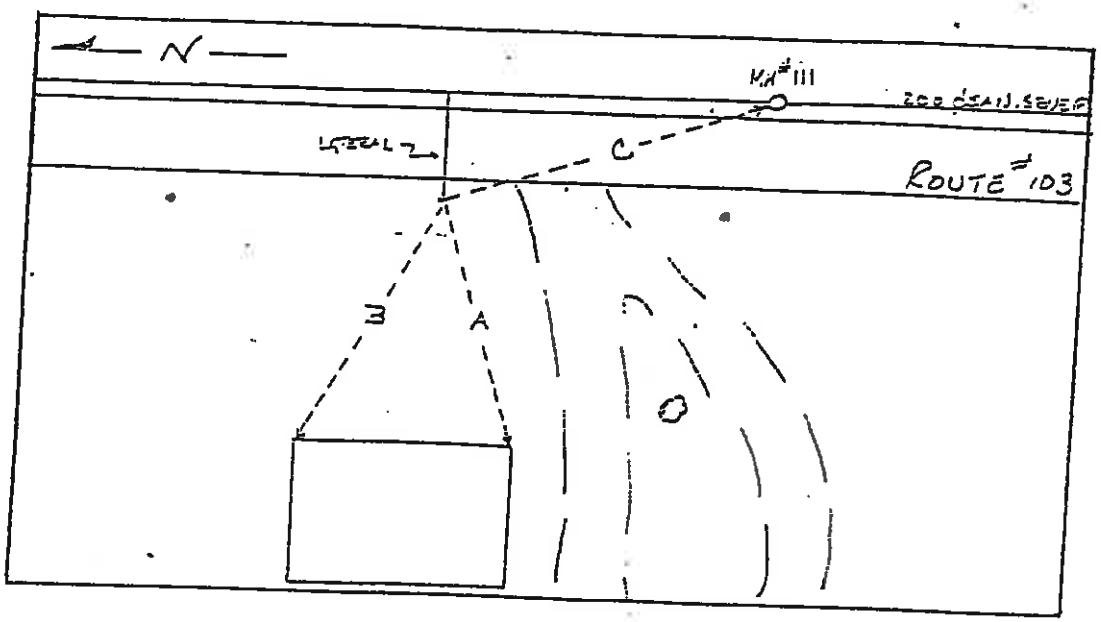
REVISIONS

SCALE	N.T.S.	PROJ. NO.	007-035	DRAWN	K.D
DATE	JAN. 1996			DRAWING	4 L

OWNER'S NAME: _____

STREET: _____

NO: ____



MATERIALS USE

1 - 200 x 100 TEE

14.4 m @ 100 ϕ PIPE (PV

a = 48.2 metres

b = 49.8 metres

c = 32.2 metres

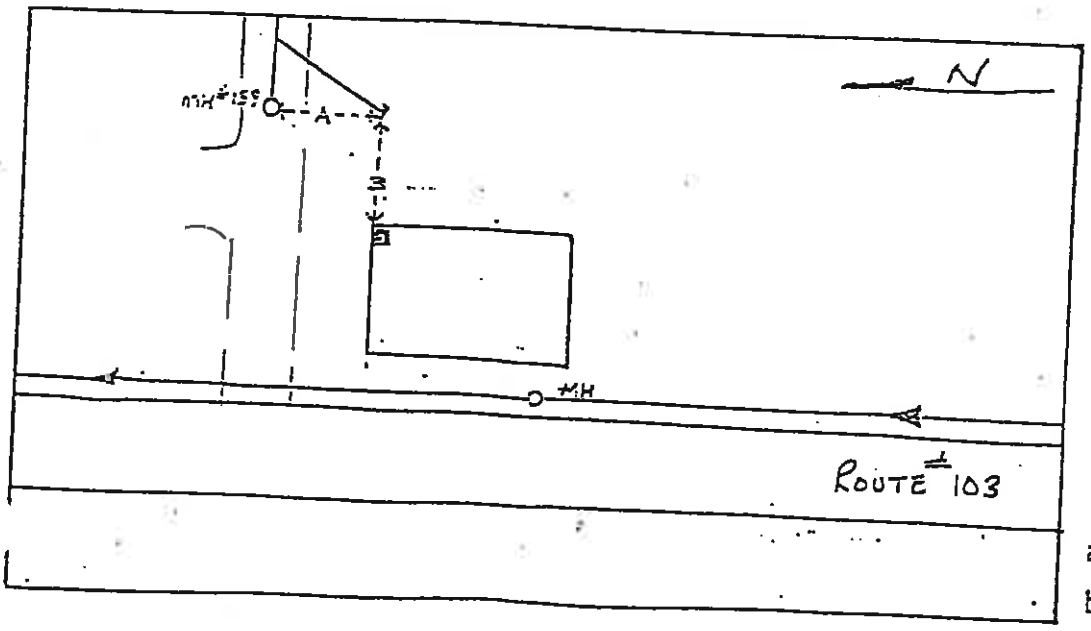
AT SEWER MAIN: Depth 2.9 Metres; Dis. From Downstream MH # 110 to ℄ Tee 49.6 Met

At P/L: Depth 1.6 Metres; Dis. From Sewer Main 14.4 Metres

OWNER'S NAME: _____

STREET: _____

NO: ____



MATERIALS

200 x 100 TEE

1 BEND

5.2 m @ 100 ϕ PVC PIP

a = 5.9 metres

b = 8.9 metres

c = ____ metres

AT SEWER MAIN: Depth 2.4 Metres; Dis. From Downstream MH # 138 to ℄ Tee 83.0 Metres

At P/L: Depth ____ Metres; Dis. From Sewer Main ____ Metres

DIVISION FOUR

WATER SYSTEM

Contents

ITEM 1 SYSTEM INFORMATION

1. General

Subdivisions may be required to be provided with a water distribution system. The water distribution system will be a complete and operating system with an approved source, water mains, service lines to the property line of each lot, and if required, a booster pumping station.

2. Reference Specifications

All work on the water system shall be in accordance with these specifications, additional requirements stipulated by the New Brunswick Department of the Environment and any additional requirements stipulated by the Municipality at the time of approval of the subdivision.

3. Approvals

The Developer shall be responsible for obtaining all necessary approvals required for construction of the water system. This shall include but not be limited to:

i. New Brunswick Department of Environment - Water System Design
ii. Perth-Andover Electric Light Commission - If required for extension of power lines to a booster pumping station or trenching across underground utilities.
iii. N.B. Tel - If required for trenching across underground utilities.
iv. N.B.D.O.T. - If water lines are installed across or along a provincial designated highway.
v. Railway Authority - If water lines are installed on a railroad right-of-way.

4. Scope of Work

The construction of the water system shall include the following items:

i. All water mains complete with fittings, thrust blocks, valves and connections for fire hydrant installation. Fire hydrants are to be supplied and installed by the Municipality after the water system is pressure tested and disinfected. The Developer shall provide a thrust blocked main line tee and a gate valve at each fire hydrant connection location. The hydrant gate valve shall be restrained to the main line tee and located on the roadway. The Developer shall install 150 mm diameter water main to the location of the future fire hydrant and cap the

end of the water main. The location of the cap shall be marked with a 38 x 89 wood stud installed from the cap to 300 mm above ground level.

ii. A service line from the water main to the property line at each lot.
iii. Disinfection of all water mains.
iv. Pressure testing of 100% of all water mains.
v. The complete construction of booster pumping stations and well houses complete with pumps and controls, if required, including all buildings, mechanical, electrical and site work.
vi. Site restoration of existing lawns, asphaltic pavement, easements, etc.
vii. Source approval if required.

5. Standards

The Municipality will require the Developer to construct the water system to meet or exceed the following minimum standards:

i. A gate valve complete with box to be installed on each branch of the water system at each intersection.
ii. Fire hydrants to be installed at the end of all dead end lines and at all high points on the system.
iii. Maximum spacing distance between fire hydrant shall be 150 metres.
iv. All fire hydrants are to be complete with a gate valve and box.
v. Thrust blocks are to be installed at all fittings including fire hydrants.
vi. Each service line shall be complete with a corporation stop and a curb stop complete with box 900 mm on the street side of the property line.

6. Booster Pumping Stations and Well Houses

If the water system requires the construction of booster pumping stations, well house and pumps, the design of the station, well house and pumps, manufacturer, size and features, shall be subject to review and approval by the Municipality.

7. Record Drawings

Upon completion of the water system, the Developer shall provide the Municipality with one transparent set and two copies of "RECORD" drawings which shall include the following:

i. Location, grade and geodetic elevation of all water mains.
ii. The location of each service pipe at the water main.
iii. The location and depth of each service pipe at the property line with three separate measurements between the curb stop box and a permanent structure or lot pin.

ITEM 2 TECHNICAL SPECIFICATIONS

1. Description

All work on the water system shall be in accordance with the following technical specifications and shall meet all requirements of the New Brunswick Department of the Environment and the Municipality.

2. Materials

Unless otherwise specified, approved materials shall meet the following specifications:

2.1 Polyvinyl Chloride Water Pipe

AWWA Standard C-900 for Polyvinyl Chloride (PVC) Pressure Pipe with a DR of 18 and certified to CSA B137.3-M90.

2.2 Fittings For Polyvinyl Chloride Water Mains

a) Gate Valves

Shall be iron body, bronze mounted with non-rising spindle with mechanical joint and shall meet AWWA C-500 and/or AWWA C-504, closing clockwise.

b) Valve Boxes

Shall be cast iron, adjustable slide type for two (2) metre bury.

c) Guide Rings

All gate valves with valve boxes shall be complete with guide rings.

d) Iron Fittings

Shall be Class 250 grey cast iron or Class 350 ductile iron.

For cast or ductile iron fittings, the radius of curvatures shall conform with AWWA C-110 or AWWA C-153; cement lining shall be in accordance with AWWA C-104; and mechanical joints shall be in accordance with AWWA C-111.

e) PVC Fittings

Polyvinyl chloride fittings shall conform to AWWA Standard C-907 and be certified to CSA Standard B 137.2M. Depth of bell for PVC fittings shall be as required for pipe.

All fittings shall be restrained as shown on the detail drawing.

f) Joints
Shall be as recommended by the manufacturer and/or AWWA.

2.3 Cathodic Protection (Bolted Metal Fittings)

Each bolted metal fitting and mechanical restraint used with mono-metallic water main pipe shall be equipped with one (1) packaged Z-12-24 zinc anode as supplied by Corrosion Service Company Limited, or approved equal.

2.4 Caution Zone Tape

Shall be Lineguard Super Tuff III "Caution Striped" Caution Zone Tape, or approved equal.

2.5 Water Service Pipes and Appurtenances

a) Copper Service Pipe
Shall conform to ASTM B88-Type K suitable for underground bury.

b) Main Stop
For services up to and including 25 mm in diameter, the main stop shall be full size of the pipe Mueller H-15008 or approved equal.

c) Curb Stop
Shall be full size of the pipe Mueller H-15219 complete with drain or approved equal.

d) Curb Box
Shall be Mueller A-726 for services up to and including 25 mm in diameter complete with rod for two metre bury or approved equal.

2.6 Cathodic Protection (Copper Service Pipe)

Each copper service pipe used with non-metallic water main pipe shall be equipped with one (1) packaged Z-24-48 zinc anode as supplied by Corrosion Service Company Limited, or approved equal.

2.7 Fire Hydrants

Shall be "McAvity M-67" unless approved otherwise.

3. Construction Methods

3.1 Excavation

Excavation shall be as specified in Division Three for Excavation of the Sanitary Sewer System.

3.2 Pipe Zone Material, Foundation Backfill and Compaction

Pipe Zone Material, Foundation Backfill and Compaction for water mains and service pipes shall be as specified in Division Three for the Sanitary Sewer System.

3.3 Pipe Installation

Ductile Iron Fittings and Cast Iron Fittings shall be installed in accordance with AWWA C-600. P.V.C. pipe, P.E. pipe, fittings and specials shall be installed in accordance with the manufacturer's recommendations. Gate valves shall be installed in accordance with AWWA C-500.

All water main shall be installed at a minimum depth from top of ground to top of pipe of 2100 mm.

P.V.C. pipe shall be installed in accordance with the manufacturer's recommendations and such that the pipe cross section deflection is less than 7.5%.

The bell and spigot shall be free of any foreign matter before jointing. Water main shall not be used to carry ground water from the excavation and all ends of pipes shall be capped or plugged when work is not in progress to prevent the entrance of water or foreign matter.

Joints between dissimilar pipe shall be made in accordance with the recommendation of the manufacturer of one or the other of the pipes.

Continuous Lineguard III Tape shall be buried along the entire centre line length of the main line water main which is 100 mm or greater in diameter. This continuous tape shall be buried from 100 mm to 150 mm below finished grade in accordance with the manufacturer's instructions.

Concrete thrust blocks shall be placed in accordance with AWWA C-600 at all bends, tees, plugs and caps as shown on the detail drawings.

Sacrificial anodes shall be placed on each metal fitting, mechanical restraint and hydrant assembly in accordance with manufacturer's recommendations.

In addition to thrust blocks, all bends, tees, plugs and caps shall be equipped with mechanical restraint collars as shown on the detail drawings. All gate valves to be restrained as shown on the detail drawings.

3.4 Cleaning and Disinfection

The cleaning and disinfection of the water mains shall comply with the AWWA Standard C-651, latest revision, for Disinfecting Water Mains which includes chlorination of all mains so that a chlorine residual of not less than ten (10) mg/l remains in the water after twenty-four (24) hours.

3.5 Pressure and Leakage Test

The Contractor shall in the presence of the Engineer conduct a pressure and leakage test in accordance with AWWA C-600. The pressure for the test will be 1.5 times the working pressure at the point of testing but not less than 1.25 times the working pressure at the lowest elevation along the line. The allowable leakage shall be determined by the following formula:

$$L = \frac{S\,D\,(P)^{0.5}}{704{,}400}$$

L = Allowable Leakage (litres/hour)
S = Length of pipe (metres)
D = Nominal diameter of pipe (mm)
P = Pressure (kPa gauge)

When testing against closed gate valves, an additional leakage of 0.0012 litres/hr/mm diameter/valve is allowed.

3.6 Water Service Pipes and Appurtenances

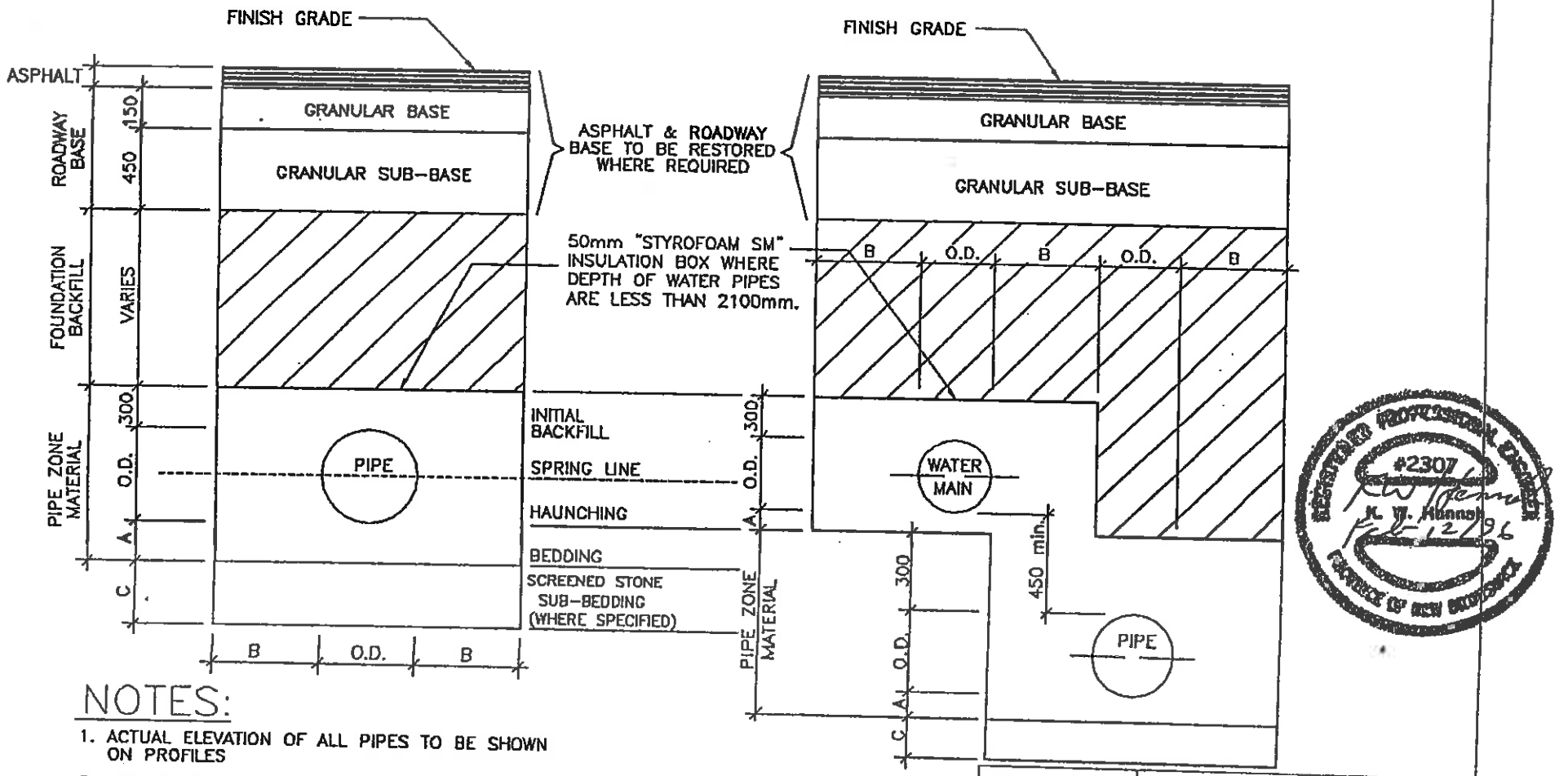
Excavation for service pipe shall be as outlined under Section 3.1 Excavation. Pipe Zone Material, Foundation Backfill and Compaction shall be as outlined under Section 3.2

Service pipe installation shall be as outlined under Section 3.3 Pipe Installation.

Each water service shall have a corporation stop in the main and a gooseneck formed in the pipe. A curb stop and drain complete with service box and cover shall be placed at the street line on each service line.

Sacrificial Anodes shall be placed on each copper service pipe in accordance with the supplier's recommendations.

Wherever provision is made for future connections either to mains or building services, the ends of the installed lengths of the pipe or the opening in the fittings shall be plugged or properly protected by the Developer in such a manner that injury or damage to the pipe or fittings will not occur. Each plugged end shall be marked by a 50 mm x 100 mm timber extending from the plugged end of the pipe to a minimum of six hundred (600) millimetres above the ground surface so that the property owner can easily locate the end of the installed service.



NOTES:

1. ACTUAL ELEVATION OF ALL PIPES TO BE SHOWN ON PROFILES
2. ACTUAL CONSTRUCTION WIDTHS SHALL BE IN ACCORDANCE WITH N.B. INDUSTRIAL SAFETY ACT.
3. ALL DIMENSIONS SHOWN IN MILLIMETRES.

PIPE SIZE O.D.	DIMENSIONS		
	A	B	C
UP TO 800	150	300	150
801 TO 1200	200	400	150
OVER 1200	300	600	150

#2307
K. W. Hunnol
12 96

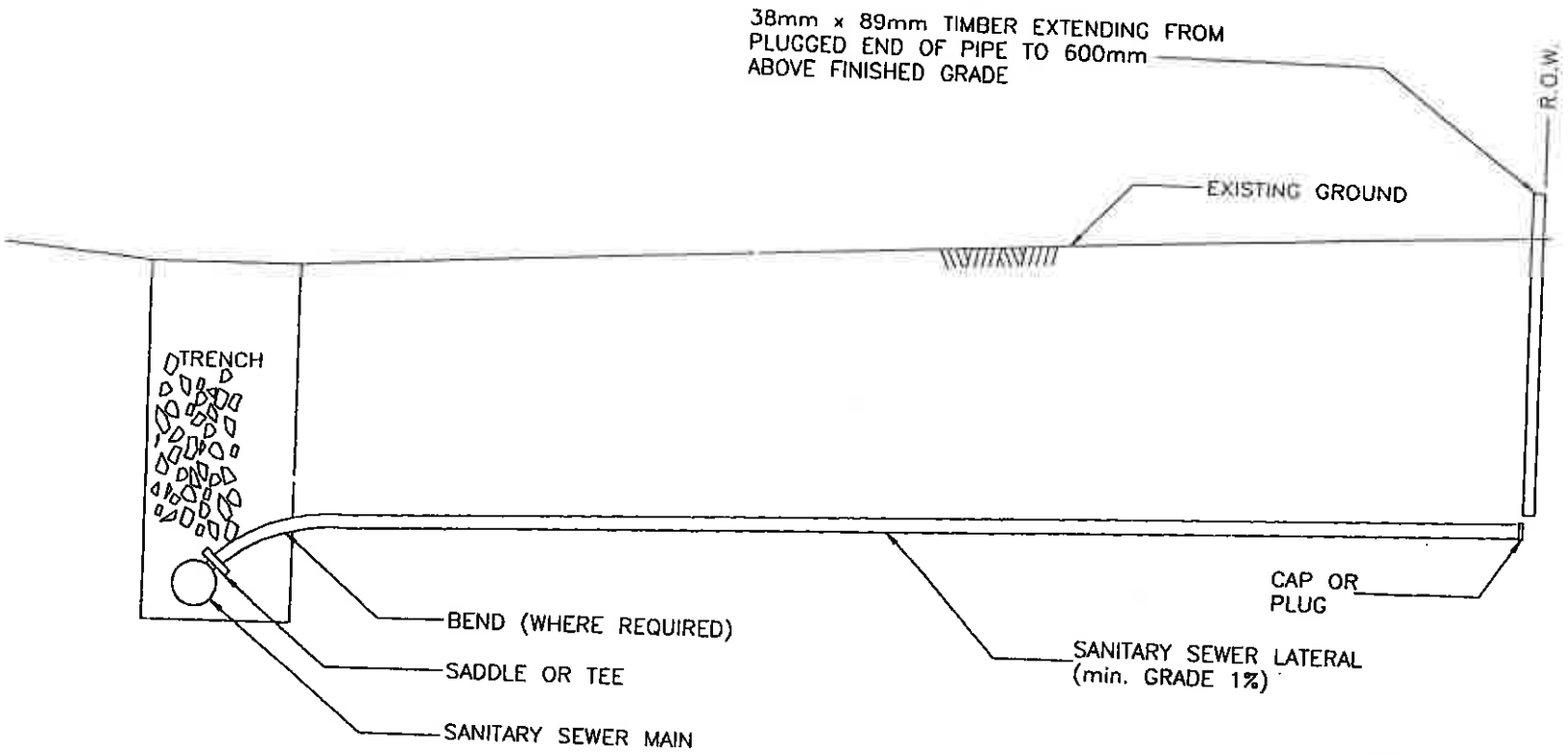
GODFREY ASSOCIATES LTD.
CONSULTING PROFESSIONAL ENGINEERS

MUNICIPALITY OF PERTH-ANDOVER
NEW BRUNSWICK

TYPICAL TRENCH
SINGLE & DOUBLE PIPE

REVISIONS

SCALE N.T.S.	PROJ. NO. 007-035	DRAWN K.D.T.	
DATE JAN. 1996		DRAWING 1 L	



NOTES:

1. SANITARY SEWER min. COVER 1200mm.
2. ALL DIMENSIONS SHOWN IN MILLIMETRES.
3. SANITARY SEWER TO BE 100 ø UNLESS OTHERWISE NOTED.

#2307
K. W. Hannah
March 27/96
PROVINCE OF NEW BRUNSWICK

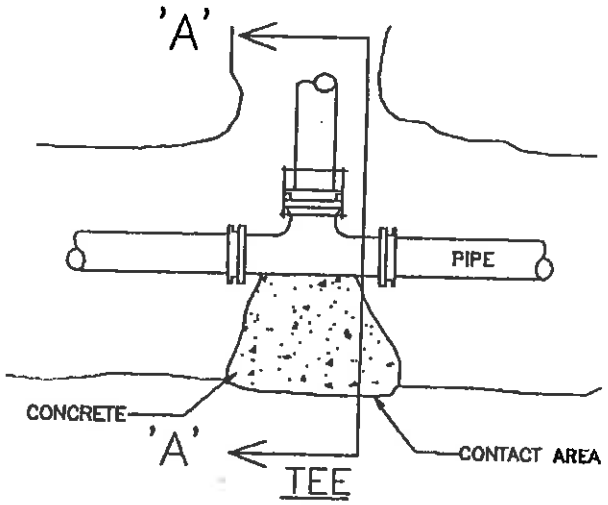
GODFREY ASSOCIATES LTD.
CONSULTING PROFESSIONAL ENGINEERS

MUNICIPALITY OF PERTH–ANDOVER
NEW BRUNSWICK

SANITARY SEWER
SERVICE CONNECTION

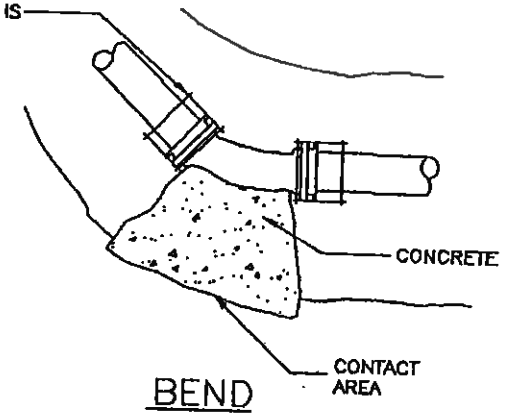
REVISIONS

SCALE	N.T.S.	PROJ. NO.	007–035	DRAWN	K.D.T.
DATE	JAN. 1996	DRAWING	5 L		

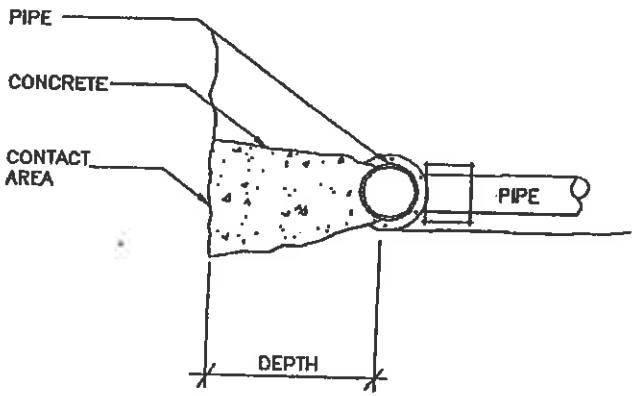


TEE

NOTE RESTRAINER REQUIRED @ PIPE JOINT IF PIPE JOINT IS LESS THAN 3000mm FROM FITTING



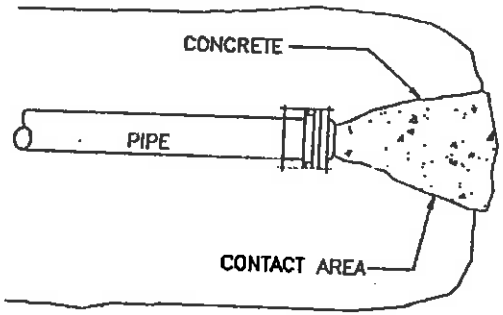
BEND



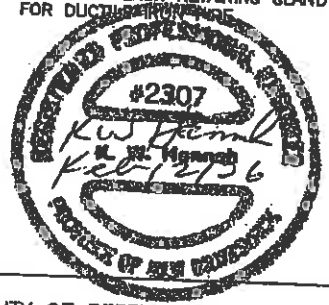
SECTION 'A'–'A'

NOTES:

1. CONTACT AREA OF THRUST BLOCKS TO BE AGAINST UNDISTURBED SOIL LEAVING JOINTS & BOLTS ACCESSIBLE.
2. FOR CONCRETE THRUST BLOCK DIMENSIONS REFER TO STANDARD CHART.
3. CONCRETE TO BE 14MPa min.
4. USE UNIFLANGE STYLE 1300 RESTRAINER WITH CAST IRON FITTINGS & PVC. PIPE.
5. USE UNIFLANGE STYLE 1350 RESTRAINER FOR RESTRAINING BELL JOINT PVC. PIPE.
6. USE UNIFLANGE STYLE 1360 RESTRAINER WITH PVC. FITTINGS & PVC. PIPE.
7. USE MAGOTTEAUX RETAINING GLAND FOR DUCTILE IRON PIPE.



CAP OR PLUG



GODFREY ASSOCIATES LTD.
CONSULTING PROFESSIONAL ENGINEERS

MUNICIPALITY OF PERTH–ANDOVER
NEW BRUNSWICK

CONCRETE THRUST BLOCK

REVISIONS

SCALE	N.T.S.	PROJ. NO.	007–035	DRAWN	K.D.T.
DATE	JAN. 1998	DRAWING		10 L	

THESE CHARTS ARE BASED ON SOIL BEARING CAPACITIES OF 100kPa, 200kPa AND AN INTERNAL PIPE PRESSURE OF 700kPa. WHERE DIFFERENT BEARING CAPACITIES OR INTERNAL PRESSURES ARE ENCOUNTERED, CONTACT AREAS SHOULD BE CALCULATED ACCORDINGLY.

FOR SOIL BEARING CAPACITY OF 200kPa.

PIPE DIA.	CAP OR PLUG		TEE		90° BEND		45° BEND		22 1/2° BEND		11 1/4° BEND	
MM.	AREA	DEPTH	AREA	DEPTH	AREA	DEPTH	AREA	DEPTH	AREA	DEPTH	AREA	DEPTH
150	0.15	0.35	0.15	0.35	0.20	0.35	0.15	0.35	0.10	0.35	0.10	0.35
200	0.25	0.35	0.25	0.35	0.35	0.35	0.20	0.35	0.10	0.35	0.10	0.35
250	0.40	0.50	0.40	0.35	0.55	0.50	0.30	0.35	0.15	0.35	0.10	0.35
300	0.55	0.50	0.55	0.35	0.80	0.50	0.45	0.35	0.25	0.35	0.15	0.35
350	0.75	0.65	0.75	0.50	1.10	0.65	0.60	0.50	0.30	0.35	0.15	0.35
400	1.00	0.65	1.00	0.50	1.40	0.80	0.80	0.50	0.40	0.35	0.20	0.35
450	1.30	0.65	1.25	0.65	1.80	1.00	1.00	0.65	0.50	0.35	0.25	0.35
500	1.60	0.80	1.60	0.65	2.20	1.00	1.20	0.65	0.60	0.35	0.30	0.35
600	2.20	1.00	2.20	0.80	3.15	1.00	1.70	0.80	0.90	0.35	0.45	0.35

FOR SOIL BEARING CAPACITY OF 100kPa.

PIPE DIA.	CAP OR PLUG		TEE		90° BEND		45° BEND		22 1/2° BEND		11 1/4° BEND	
MM.	AREA	DEPTH	AREA	DEPTH	AREA	DEPTH	AREA	DEPTH	AREA	DEPTH	AREA	DEPTH
150	0.30	0.50	0.30	0.50	0.40	0.50	0.25	0.35	0.15	0.35	0.10	0.35
200	0.50	0.50	0.50	0.50	0.70	0.65	0.40	0.50	0.20	0.35	0.10	0.35
250	0.80	0.65	0.80	0.50	1.10	0.80	0.60	0.50	0.30	0.35	0.15	0.35
300	1.10	0.80	1.10	0.65	1.60	0.80	0.90	0.65	0.45	0.35	0.25	0.35
350	1.50	1.00	1.50	0.80	2.15	1.00	1.15	0.80	0.60	0.50	0.30	0.35
400	1.95	1.15	1.95	1.00	2.85	1.15	1.50	1.00	0.80	0.50	0.40	0.50
450	2.50	1.15	2.50	1.15	3.55	1.30	1.90	1.00	1.00	0.65	0.50	0.50
500	3.10	1.30	3.10	1.30	4.35	1.45	2.35	1.15	1.20	0.65	0.60	0.50
600	4.50	1.60	4.50	1.45	6.25	1.80	3.40	1.30	1.70	0.80	0.90	0.50

NOTE: – MIN. CONTACT AREA IN METERS SQUARE AND MIN. DEPTH IN METRES
– FOR THRUST BLOCK CONFIGURATIONS SEE THRUST BLOCK DETAILS

REGISTERED PROFESSIONAL ENGINEER #2307 K.W. Hannah 26/12/96 PROVINCE OF NEW BRUNSWICK

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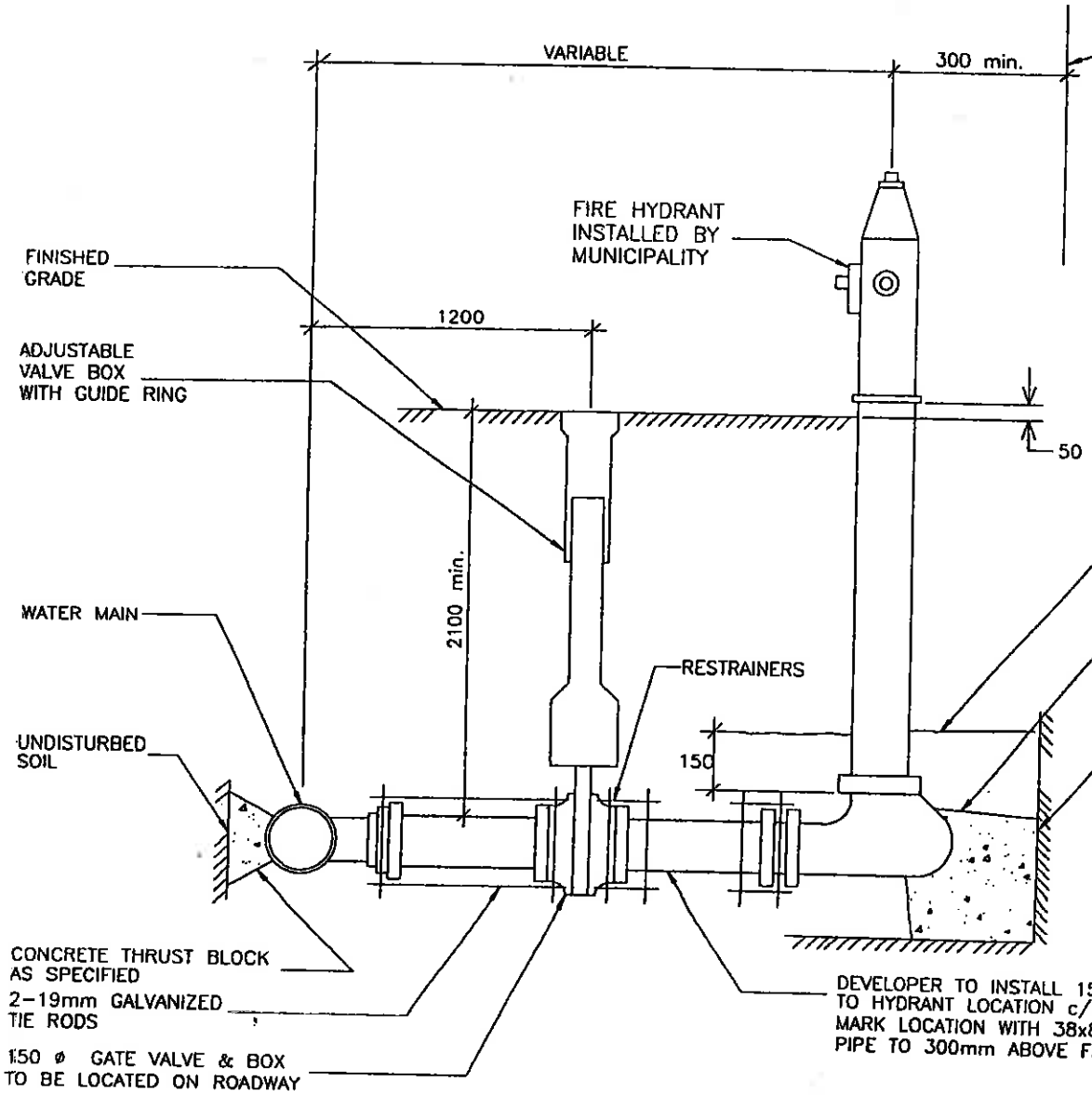
NEW BRUNSWICK

CONCRETE THR BLOCK
DIMENS S

REVISIONS

SCALE	N.T.S.	PROJ. NO.	007-035	DRAWN
DATE	JAN. 1996			DRAWING 11 L



NOTES:

1. ALL DIMENSIONS SHOWN IN MILLIMETRES.
2. MINIMUM RECOMMENDED VOLUME OF SCREENED STONE 0.5m – FILL 150mm ABOVE DRAIN HOLES. ALSO FILTER FABRIC TO BE USED TO KEEP FINES FROM CLOGGING SCREENED STONE.
3. USE UNIFLANGE STYLE 1300 RESTRAINER WITH CAST IRON FITTINGS & PVC. PIPE.
4. USE MAGOTTEAUX RETAINING GLANDS FOR DUCTILE IRON PIPE.

REGISTERED PROFESSIONAL ENGINEER
#2307
K. W. Hannah
PROVINCE OF NEW BRUNSWICK

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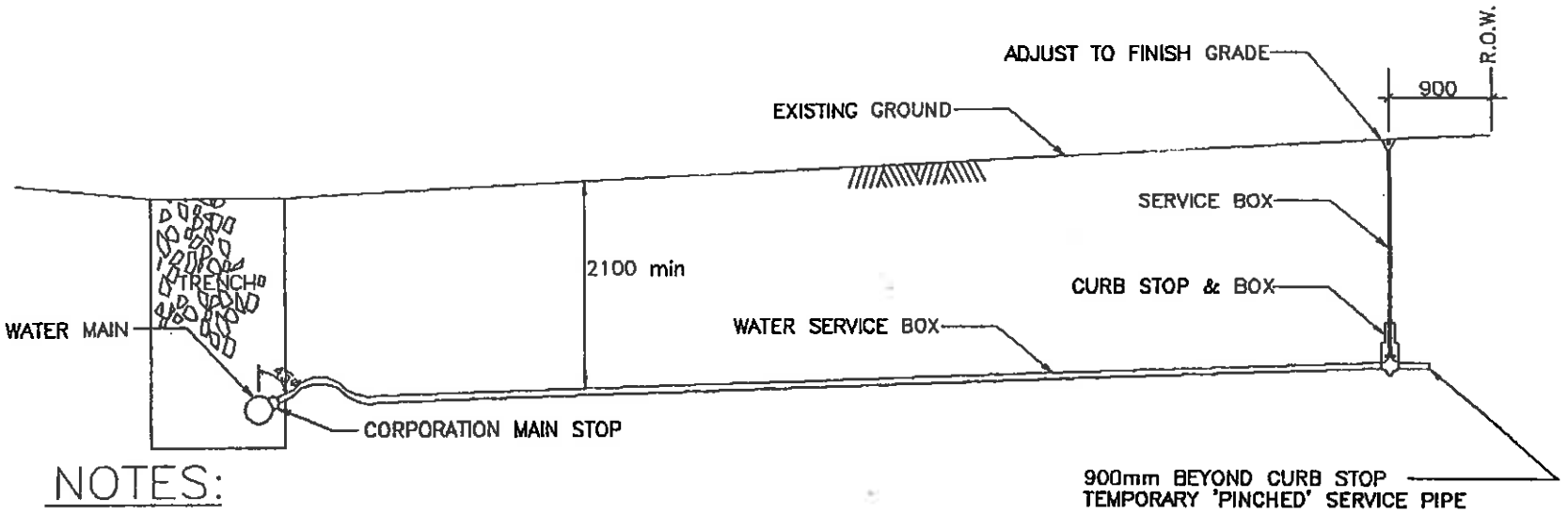
NEW BRUNSWICK

HYDRANT AND VALVE

REVISIONS

SCALE	N.T.S.	PROJ. NO.	007-035	DRAWN	K.D.T.
DATE	JAN. 1996			DRAWING	12 L



NOTES:

1. WATER SERVICE TO BE 19mm ø UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS SHOWN IN MILLIMETRES.

REGISTERED PROFESSIONAL ENGINEER #2307 K. W. Hannah 26-12-96 PROVINCE OF NEW BRUNSWICK

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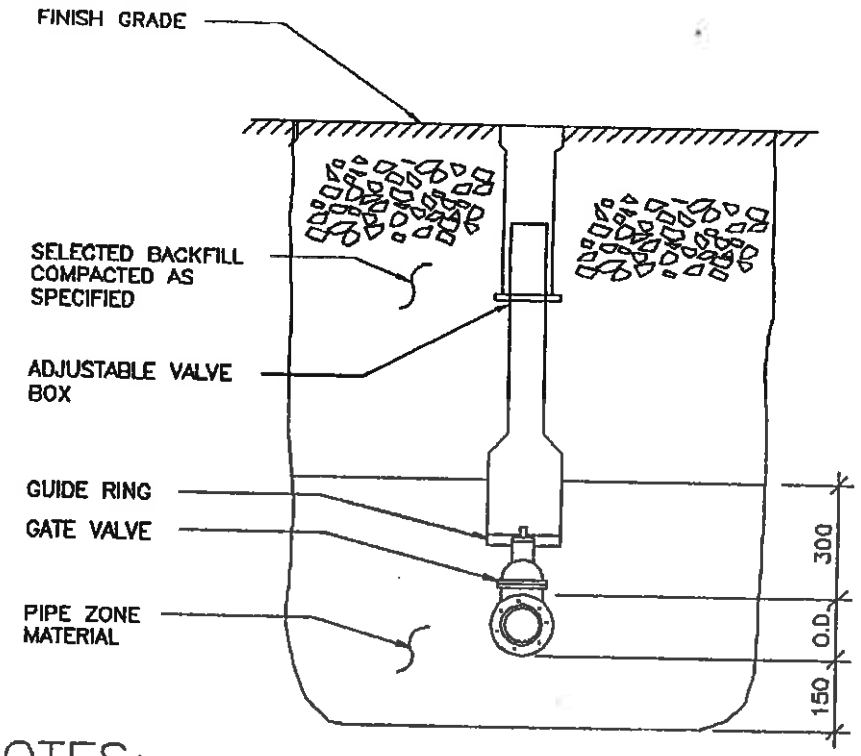
NEW BRUNSWICK

WATER SERVICE NNECTION

REVISIONS			
SCALE N.T.S.	PROJ. NO. 007-035	DRAWN	
DATE JAN. 1996	DRAWING 13 L		



NOTES:

1. ALL DIMENSIONS SHOWN IN MILLIMETERS.
2. USE UNIFLANGE STYLE 1300 RESTRAINER WITH CAST IRON FITTINGS & PVC. PIPE.
3. USE MAGOTTEAUX RETAINING GLANDS FOR DUCTILE IRON PIPE.
4. RESTRAINERS REQUIRED IF GATE VALVE IS LESS THAN 3000mm FROM ANY FITTING.

REGISTERED PROFESSIONAL ENGINEER #2307 K.W. Hannah Feb 12/96 PROVINCE OF NEW BRUNSWICK

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TYP. GAT 'ALVE & BOX

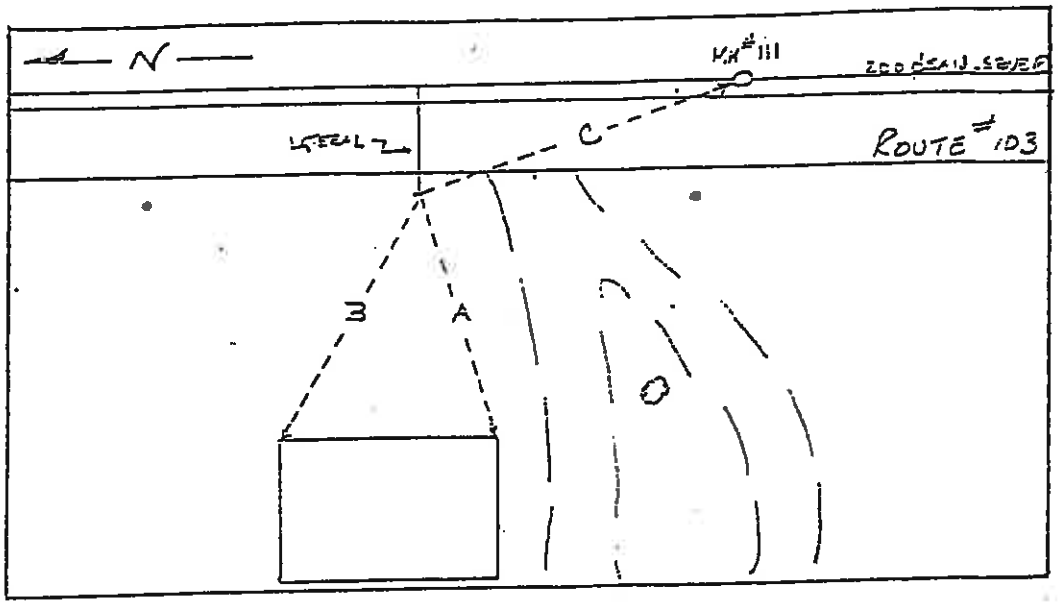
REVISIONS

SCALE	N.T.S.	PROJ. NO.	007-035	DRAWN	K.D.T.
DATE	JAN. 1996	DRAWING			

OWNER'S NAME: _____ NO: _____

STREET: _____

MATERIALS USED:



1 - 200 x 100 TEE
14 A m @ 100 ø PIPE (r...)

a = 48.2 metres
b = 49.8 metres
c = 32.2 metres

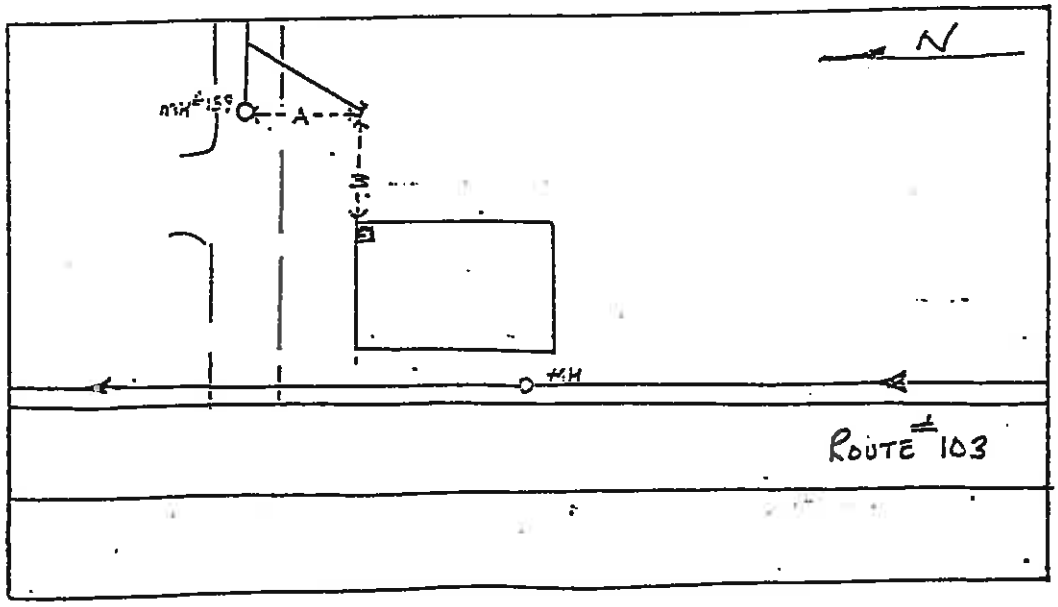
AT SEWER MAIN: Depth 2.9 Metres; Dis. From Downstream MH # 110 to ℄ Tee 42.6 Metre

At P/L: Depth 1.6 Metres; Dis. From Sewer Main 14.4 Metres

OWNER'S NAME: _____ NO: _____

STREET: _____

MATERIALS



200 x 100 TEE
1 BEND
5.2 m @ 100 ø PVC PIP

a = 5.9 metres
b = 8.9 metres
c = ___ metres

AT SEWER MAIN: Depth 2.4 Metres; Dis. From Downstream MH # 138 to ℄ Tee 83.0 ...tre

At P/L: Depth ___ Metres; Dis. From Sewer Main ___ Metres