REGION OF QUEENS MUNICIPALITY
MUNICIPAL SERVICES SPECIFICATION MANUAL

SEPTEMBER 1998

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1.0 DEFINITIONS

Whenever, in any part of these Specifications, the following terms are used, the intent and meaning shall be interpreted as follows:

Approval - The approval of the Engineer. The Engineer's decision will be final and binding in matters of design and construction.

Arterial Road - A road intended to move a relatively large volume of traffic at medium to high speed used where traffic movement is the primary consideration and land access secondary.

Collector Road - A road intended to collect traffic from local streets and move it to the arterials, used where traffic movement and land access are of equal importance.

Cul-de-Sac - A street having only one entrance / exit.

Department of Transportation and Public Works - The Nova Scotia Department of Transportation and Public Works.

Development Officer - The Development Officer for the Region of Queens Municipality acting directly, or through an assistant or representatives duly authorized by the Development Officer, and acting only within the scope of the particular duties assigned or within the tested scope of the authority.

Engineer - The Municipal Engineer for the Region of Queens Municipality acting directly, or through an assistant or representatives duly authorized by the Municipal Engineer, and acting only within the scope of the particular duties assigned or within the tested scope of the authority.

Forcemain - A section of sanitary sewer or watermain through which sewage or water respectively is either pumped or flows by gravity under a low pressure head.

Fully Serviced Public Streets - A public street that has concrete curb and gutter, storm sewer, catch basins, concrete sidewalks, asphalt concrete wearing surface in addition to the road bed, and appertaining structures necessary for proper drainage and protection. (Refer to Drawing No. 2)

Inspection - Field inspection by the Engineer at various stages of construction.

Lateral - A service pipe for either sanitary sewage, storm water or potable water that extends from the main to the property line.

Local Road - A road which has the main function of providing land access.

Main Line - A main line refers to the primary pipeline in a water or sewer system. In the case of a sewer line a main line includes both collection and trunk lines, and in the case of a water main includes both distribution and transmission lines.

Maintenance Period - One year from the date of final approval of a subdivision as issued by the Development Officer. For final asphaltic paving, the maintenance period shall extend one year from the date of approval by the Engineer.

Municipality - The Region of Queens Municipality

Natural Watercourse - The bed and shore of every river, stream, lake, creek, pond, spring, lagoon or other natural body of water, and the water therein, whether it contains water or not.

Public Street or Highway means any:

(i) **municipal public street** means any street or highway owned and maintained by a Regional Municipality;

(ii) **provincial public street** means any street or highway owned and maintained by the Department of Transportation and Public Works of the Province, excluding designated controlled highways pursuant to Section 20 of the Public Highways Act.

Professional Engineer - A Professional Engineer who is a member of the Association of Professional Engineers of Nova Scotia.

Roadbed - That portion of the roadway extending from shoulder line to shoulder line, and includes the subgrade and shoulders considered as a unit.

Roadway - The portion of highway included between the outside lines of gutters, or side ditches; including all the appertaining structures, and all slopes, ditches, channels, waterways etc. necessary for proper drainage and protection.

Road Right-of-Way - An area of land that is legally described in a registered deed for the provision of providing access and egress on which there is a public street or private road.

Run-off - Overland flow that occurs when the rainfall rate exceeds the soil's capacity to absorb water.

Sanitary Sewage - Wastewater from residential, industrial, institutional, and commercial buildings, excluding storm water runoff and ground water.

Set Back Line - A line drawn parallel to the boundary of a highway or street which is offset the setback distances required under a Land Use Bylaw or the Subdivision By-Law of the Municipality.

Services - All of the sanitary sewer, storm, and water systems.

Storm Sewer - A buried drain for conveyance of storm water that includes the storm sewer main, manholes, laterals, catch basins, and catch basin leads.

Street - The entire width between the boundary lines of a highway, and includes a public thoroughfare.

Sub-Base Course - The crushed rock or aggregate which is placed immediately upon the subgrade.

Subdivision - The division of any area of land into two or more parcels, and includes a re-subdivision or a consolidation of two or more parcels.

Subgrade - That portion of the roadbed upon which the sub-base course is to be placed.

Tributary Area - The area that contributes runoff flow to an inlet or given point immediately downstream of the contributing area. For the purposes of calculating infiltration into a sanitary sewer, the Tributary Area for a given section of sewer shall extend to the subdivision boundary.

Wearing Surface - The exposed material, placed directly upon the base course, which comprises the travelling surfaces.

2.0 SUBMISSION REQUIREMENTS

This section is intended to assist the applicant for subdivision approval prepare a submission for the approval of **municipal services**.

2.1 TENTATIVE APPROVAL

General

A copy of the Permit to Construct from the Nova Scotia Department of Environment will be required prior to approval of the Tentative Plan.

The following information is required with an application for tentative approval of subdivisions:

General Service Plan

Plan indicating proposed road layout, tributary service areas, and existing and proposed services; including pipe sizes, valves, hydrants, manholes, lift stations, directions of flow, and points of connection to existing systems.

Drainage Plan

Plan indicating contributing area, the area tributary to each inlet, natural watercourse, and existing and proposed storm drainage systems; including run-off rates at each inlet and outlet, pipe/culvert size, and other relevant features. Lot grading plans and minimum basement elevations may be required for areas prone to flooding.

Survey Plan

A Tentative plan of survey showing the proposed lot layout and all proposed public highways, road reserves, and easements to be transferred to the Municipality and include the following:

Detailed Design Drawings

- Plan and profile drawings (1" = 40' horizontal, 1" = 4' vertical), drawing size D (24" X 36" overall dimensions) indicating lot layout, manhole locations, lateral locations, valves, hydrants, pipe size, material, and slope, horizontal and vertical road alignment data, existing and proposed road centerline profiles, and proposed ditch profiles.
- Cross section elements if different than standard.
- Details for lift stations indicating pump data, invert elevations for gravity inlet, overflow, and forcemain, float elevations, base elevation, top elevation, wet well size, bypass piping arrangement, and other relevant details.
- Details for environmental control measures, and other relevant details as required or as requested by the Engineer.

Design Submission

Depending on the size of the proposed subdivision development, the following information may be required by the Engineer

- Design summary for the sewer system in tabular form giving population density, peak flow, design flow, pipe size, slope, minimum and maximum velocity, and depth of flow.
- Design summary for the water system in tabular form giving population density, domestic demand, fire flow requirements, maximum and minimum static pressures under normal operating conditions, and residual pressures under fire flow conditions.
- Design information for the storm drainage system in tabular form giving run-off rates at each inlet and outlet, design flow, pipe, culvert, or channel size, and depth of flow.
- Design information in tabular form for lift stations and forcemains giving minimum, maximum, and peak flow rates, pipe size, velocity on forcemain, and pump cycle time.
- System and Pump curves for lift stations and forcemains.
- Erosion and sedimentation control plan.

2.2 FINAL APPROVAL

The following information is required for final approval of a public street and services:

Record Drawings

- Reproducible record drawings stamped by a Professional Engineer. Plan and profile and detail drawings in accordance with those submitted for tentative approval are required. A drainage plan is also required.
- Record drawings prepared on a CAD system must be submitted in both hard and electronic format. Hard copies must be on a high quality bond paper (1 set) and mylar (1 set). Electronic copies are to be submitted on floppy disc or compact disc and be saved in AutoCAD as a "dxf" format and in accordance to Section 7.0. Record drawings prepared manually must be submitted on both high quality bond paper (1 set) and mylar (1 set).

Deeds and Easement Documentation

- Warranty Deed for all road right-of-ways and road reserves.
- Easement agreements for water, sanitary sewer, and storm drainage easements. (See Appendix B)
- Title certificate by developer's solicitor for land and easements being transferred.
- Legal Plan of Subdivision submitted for final approval.

Maintenance Deposit

- Statement of construction costs.
- Statutory declaration from developer indicating that all accounts for labour and material used in the construction of the subdivision and statutory liens have been paid in full (See Appendix C).
- Maintenance deposit in the form of cash or certified cheque for 10% of construction costs, to be held for the duration of the warranty period

Road Completion Agreement and Bond for Street Completion

- Completion Agreement - (See Appendix D)
  Agreement to be signed, sealed, and delivered for final approval.

- Standby Letter of Credit, or other permitted surety, in the amount of 120% of the estimated cost to complete the wearing surface of the road, to be held for a period of 2 years from the date of final approval of the subdivision, as granted by the Development Officer. (See Appendix A)

Operation and Maintenance Manuals

- O & M Manuals are required for pumps and other similar equipment.

Certificate of compliance

- A Certificate of Compliance is required from a Professional Engineer stating that the roads and services have been constructed in accordance with the approved plans and these specifications.

Inspection and Testing Reports

The following inspection and testing results as applicable, must be provided by the subdivider as a matter of course:

- Video inspection tape and report for sanitary sewer.
- Test results for air tests for the sanitary sewer, stamped by a Professional Engineer.
- Test results for hydrostatic leakage tests for water lines, stamped by a Professional Engineer.
- Bacteriological test results for water lines.
- Sieve Analyses for base and sub-base gravel.
- Compaction test results on trench compaction, subgrade, sub-base, and base courses.
- Test results for asphaltic concrete paving will be required after completion, and prior to release of standby letter of credit.

2.3 LISTING PROCEDURE FOR PUBLIC STREETS

Before the constructed streets are accepted for listing, the Municipality must receive confirmation from the Nova Scotia Department of the Environment that all their requirements have been met.

When the preceding information has been submitted and approved, the developer may then officially request the Municipality take over the public street system in the subdivision. The request should be accompanied by 12 copies of a final plan showing the entire subdivision, its boundaries and road layout. A fee of two hundred dollars plus document registration costs must also be paid at the time of the request. The Engineer may then recommend that the Development Officer officially list the streets in the subdivision.

3.0 SANITARY SEWER SYSTEM SPECIFICATIONS

3.1 SCOPE

This section specifies the requirements for a central sanitary sewer collection system. A sanitary sewer consists of main lines, laterals, pressure sewers and appurtenances (including manholes and lift stations).

In addition to these design criteria, all sanitary sewage systems shall conform to the *Nova Scotia Department of the Environment Standard and Guidelines for the Collection, Treatment and Disposal of Sanitary Sewage.* No systems shall be constructed until the design has been approved by the Engineer and by the Nova Scotia Department of the Environment.

3.2 DESIGN CRITERIA

General

The sanitary sewage system shall be designed for flows generated from all lands within the Serviceable Area which are naturally tributary to the drainage area as determined from topographic plans. In addition, lands within the Serviceable Area which are tributary by pumping or regarding which are at present or anticipated to flow through the design area are to be included.

Design shall be based on an appropriate population density according to land use.

Design Flows

Sewer Collection Mains shall be sized to conduct the domestic peak hourly water demand. .....

Average Dry Weather Flow (Q_A) shall be calculated on the basis of an allowance of 75 Imperial Gallons per person per day (340 litres per person per day).

Design Peak Flow (Q_P) shall be based on the peak wet weather flow according to the following:

$$Q_P = MQ_A + IA$$

Where M = Peaking Factor, determined using the Harman formula:

$$M = 1 + \frac{14}{4 + P^{0.5}}$$, where P = design population in thousands

And IA = Infiltration Allowance, determined as follows:

I = a minimum of 1080 Imperial Gallons per acre per day (12096 litres per hectare per day);
A = tributary area in Acres (Hectares) as defined in the *Definitions* section.

The Engineer reserves the right to request flow and other engineering calculations prior to approval to install a sewer system.

3.3 GRAVITY SYSTEMS

Main Line

Pipe Material

Polyvinyl Chloride (PVC), SDR 35 shall be used for sanitary sewer main installations within the Region, unless otherwise approved by the Engineer.

Hydraulic Design

Sanitary sewer mains shall be designed to convey the calculated Design Peak Flows. The designer shall ensure that surcharging of the system does not occur during such peak flow conditions by taking into consideration such factors as energy loss at manholes. The capacity of the sanitary sewer mains is to be calculated using the "Manning Formula" or an appropriate nomograph. A Manning Roughness coefficient (n) equal to 0.009 shall be used for PVC pipe.

When Operating under Design Peak Flow conditions from the tributary area when fully developed, sanitary sewage flow velocities shall be a minimum of 2 feet per second (0.6 metres per second) and a maximum of 15 feet per second (4.6 metres per second).

Calculations should be presented, in a tabular form, to indicate depths and velocities at minimum, average and maximum daily waste flow for the different sizes of sewer proposed.

Pipe Size

No sanitary sewer main shall be less than 8 inches (200 mm) in diameter.

Minimum Slope

Sanitary sewer mains shall generally have a minimum slope of 1 percent. Under special conditions slopes less than 1 percent may be permitted. Slopes less than 1 will only be considered where the depth of flow will be at lease 30 percent of the diameter of the pipe for Design Peak Flow. In no case shall the slope be reduced to less than 0.75 percent.

High Velocity Protection

Where velocities greater than 15 feet per second (4.5 metres per second) are attained, special provision shall be made to protect against displacement of pipe and structures by erosion and shock.

Depth

Sewer Mains shall be sufficiently deep to prevent freezing.

In general, the sanitary sewer shall be installed at a sufficient depth to provide service by gravity flow to all proposed lots within the proposed subdivision and provide service to adjoining lands.

The depth of sanitary sewer mains shall not normally exceed a maximum of 12 feet (4.5 metres). However, under special conditions, if full and justifiable reasons are given (such as elimination of a pumping station), the maximum depth of sanitary sewer mains may be increased to 18 feet.

The minimum depth of sanitary sewer mains shall not be less than 5 feet.

Location

Where possible all sanitary sewer pipe and appurtenances shall be located within a street owned by the Region or the Nova Scotia Department of Transportation and Public Works. If approved by the Engineer, sanitary sewer mains may be installed within an easement granted in favour of the Region. The actual width of the easement shall depend upon the depth of any pipe lines contained within the easement . The minimum width of any such easement shall be 20 feet.

All sanitary sewer pipes shall be located as close as possible to the centre line of the street or easement. Depending upon the length and location of the easement, the Engineer may require a travel way to be provided within the easement for access and maintenance purposes.

Where a need is identified by the Engineer to accommodate future upstream lands naturally tributary to the drainage area, an easement shall be provided from the edge of the street right-of-way to the upstream limit of the subdivision.

Joints

All joints on gravity lines shall be bell and spigot as recommended by the manufacturer.

Alignment

All sanitary sewer mains shall be laid with a straight alignment between manholes.

Manholes

General

A manhole is to be provided on a sanitary sewer at the end of each line, at any change in pipe size, slope or horizonal alignment and/or at all pipe intersections.

Hydraulic Losses

The following criteria shall be used for pipe elevation and alignment in sanitary sewer manholes to account for hydraulic losses through the manhole:

1. Minimum drop across manholes of similar diameters shall be:

    a) Straight run - 0.10 feet (30 mm)

        i) Deflections up to 45 degrees - 0.10 feet (30 mm)
        ii) Deflections 45 to 90 degrees - 0.20 feet (60 mm)

    b) The crown of a downstream pipe shall not be higher than the crown of an upstream pipe.

2. A drop manhole shall be constructed when the vertical drop between pipe inverts in the manhole exceeds 3 feet (1 metre).

Minimum Diameter

The minimum internal diameter of a manhole shall be 42 inches (1065 mm).

Maximum Spacing

The distance between manholes shall not exceed 400 feet (120 m) for sewer main diameters of 15 inches (375 mm) or less. For sewer mains greater than 15 inches (375 mm) in diameter, the maximum spacing shall be 500 feet (150 m).

Location

All sanitary sewer manholes are to be positioned so as to minimize the infiltration of surface water or ground water. Manholes shall not be located at or near drainage ditches or roadway low points.

In some situations where manholes cannot be easily located to minimize infiltration, the use of berms and/or water-tight frames and covers may be permitted by the Engineer.

Drop Manholes

Where the difference between invert elevations of any two pipes entering and leaving a manhole is greater than 3 feet, either an internal or external drop chamber shall be provided.

Frames & Covers

The following manhole frame and cover are approved for use:

a) IMP Type R60 for manholes within a public road allowance.
b) IMP R12 bolt down frame and cover for manholes in all easements or park areas.

Lateral Connections to Manholes

Service lateral connections to manholes shall be made using a "Kor-N-Tee" or "Insert a Tee" type connection.

Service Laterals

General

In any subdivision for which tentative or final approval is being sought a single sanitary sewer lateral shall be provided by the developer to each lot at the time of installation of services. The lateral shall extend from the main to the property line.

In the case of duplexes, semi-detached, row houses, or other similar development where each dwelling unit has road frontage, one lateral shall be installed to each unit.

Pipe Material

Polyvinyl Chloride (PVC), SDR 28 or SDR 35 shall be used for sanitary sewer service laterals.

Pipe Size

Minimum size lateral piping shall be 4 inches (100 mm) in diameter.

Clean-out

Service laterals with a total length greater than 100 feet shall be installed complete with a wye type clean-out or approved manhole in locations approved by the Engineer.

Every sanitary sewer drainage system shall have an internal clean-out that will permit the cleaning of the entire system from the house to the public sewer

system.

Every sanitary sewer drainage system shall have an internal backwater valve in case of possible surcharging of the public sewer system.

Minimum Slope

Sewer laterals shall have a minimum slope of 2 percent.

Depth

The depth of sanitary sewer laterals shall not be less than 5 feet below a travelled way (such as a driveway or street) or less than 3 feet (I metre) below the bottom of a ditch.

To minimize future maintenance costs, all service laterals shall be eliminated from the deep section of the sewer main either by installation of a rider sewer for lateral connections or by the installation of all laterals at manholes.

Connection to Mains

Service connections to an existing main in service shall be made using the approved saddles listed below:

i) PVC Main - Multi-Fittings saddle tee 4893XX (XX designating size of main and service) P.A.C. Type PVC-1

All saddles shall be fitted with a gasket and a double stainless steel strap and shall not protrude into the main.

Service connections to any newly constructed main shall be made using the approved service tee/wyes listed below:

i) Multi-Fitting Tee, gasket x gasket x gasket. 4800 xx 14860 xx 14700 xx.

ii) Multi-Fitting Tee/Wye, gasket x gasket x gasket. 48 xx (xx designating size of main and service).

Any service connection requiring a major change in horizontal or vertical alignment shall be constructed using a maximum of one horizontal and one vertical bend per service lateral unless an approved manhole structure or "wye" type clean-out is provided. All bends shall be long radius type with a maximum curvature of 45 degrees.

The centre line of any service connection shall be located at an angle of 45 degrees above the horizontal at the main.

Joints

Sewer joints shall be designed to prevent infiltration and to prevent the entrance of roots and shall be made in accordance with the manufacturer's recommendations.

Repairs

Repairs to pipe damaged after installation will only be accepted if carried out in accordance with the manufacturer's recommendations and the damaged section shall be retested.

Groundwater Movement

The designer shall assess the possible change in groundwater movement caused by the use of pervious bedding material and shall be responsible for

the design of corrective measures to prevent flooding as a result of this groundwater movement. Clay plugs at service lateral trenches may be required for low lying lots and impervious soils. See Standard Drawing No. 6.

3.4 PUMPED SYSTEMS

General

Pumping stations shall be provided when, in the opinion of the Engineer, a gravity system is neither possible nor economically feasible.

Sewage pumping station structures and electrical and mechanical equipment shall be protected from physical damage from the 1 in 100 year flood. Sewage pumping stations should remain fully operational and accessible during the 1 in 25 year flood.

During preliminary location planning, consideration should be given to the potential of emergency overflow provisions and as much as practically possible the avoidance of health hazards, nuisances and adverse environmental effects.

Unless otherwise approved by the Engineer, all pumping stations, pumps, and forcemains shall be designed for the ultimate sanitary sewer flows from the tributary drainage area. In the selection of pumps, both present and future conditions shall be considered, and pump overloading situations avoided.

Design parameters such as the roughness coefficient of pipe and flow volumes can vary over time, and such variances shall be considered in the selection of the pumps.

Pumping Stations

Wet Well Size

Wet wells shall be designed in accordance with the pump manufacturer's recommendations. For any pumping station, the wet well shall be of sufficient size to allow for a minimum of a fifteen minute cycle time for each pump. For a duplex station, the volume in cubic feet, between pump start and pump stop shall be 0.1 times the pumping rate of one pump, expressed in US gallons per minute. The wet well size and control settings shall be appropriate to avoid heat build-up in the pump motor due to frequent starting and to avoid septic conditions due to excessive detention time.

The wet well shall be designed for a retention time of between 15-30 minutes to avoid septic conditions.

Pump Manufacturers

The following pumps and pump manufacturers are approved for use in sewage pumping stations in the Region.

(a) Submersible pumps manufactured by "ITT Flygt"

(b) Above ground pumps manufactured by "Gorman Rupp".

All pumps shall be solids handling type complete with electric motors.

Emergency Overflows

Each pumping station shall be provided with an emergency overflow arrangement acceptable to both the Engineer and DOE. The invert of the overflow pipe at the pumping station shall be lower than the invert of any sanitary sewer laterals at the property line. As well, the invert of the overflow pipe shall be at an elevation high enough to prevent a surcharge in the drainage system to which it is connected from flooding the wet well of the pumping station.

In addition, all lift stations shall be provided with an emergency bypass valve chamber.

To prevent or minimize overflows, each pumping station shall be designed with a retention capacity calculated on the basis of Peak Design Flow for a duration related to frequency and length of power outages for the area.

In the absence of reliable data regarding the frequency and length of power outages, minimum retention capacity of 5.5 hours at Design Peak Flow shall be provided. An auxiliary power supply which meets the requirements of the Engineer may be used as a substitute for retention capacity at the pumping station.

All lift stations shall be provided both with a provision for an emergency pumping facility, as well as an overflow where possible.

Safety Precautions

The pumping station and appurtenances shall be designed in such a manner to ensure the safety of operations, in accordance with all applicable Municipal, Provincial and Federal regulations including the Occupational Health and Safety Act. All moving equipment shall be covered with suitable guards to prevent accidental contact.

Equipment that starts automatically shall be suitably and visibly posted to ensure that the operators are aware of this condition. Lock-outs on all equipment shall be supplied to ensure that the equipment is completely out of service when maintenance or servicing is being carried out.

The wet well structure shall be designed for all external loads, including bearing capacity with wet well full, and lateral earth pressure and hydraulic uplift with wet well empty.

Phased Development

In situations of phased development the effects of minimum flow conditions shall be investigated to ensure that the retention time in the wet well will not create an odor or septic problem and that pumping equipment will not operate too infrequently based on the manufacturer's recommendations.

Pump Selection

Pumping equipment is to be selected to perform at maximum efficiencies under normal operating conditions. Pumping stations, wet wells and dry wells are to be designed such that all pumps will operate under a continuous positive

prime condition during the entire pump cycle. System head calculations and curves shall be provided for the following operating conditions:

(a) C = 100 and low water level in the wet well.

(b) C = 120 and medium water level over the normal operating range in the wet well.

(c) C = 130 and overflow water level in the wet well.

Curve (b) shall be used to select the pump and motor since this most closely represents normal operating conditions. The extreme operating ranges will be given by the intersections of curves (a) and (c) with the selected pump curve. The pump and motor shall be capable of operating satisfactorily over the full range of operating conditions.

Surcharge

Pumping stations are to be designed such that the incoming sewers will not surcharge under the peak flow conditions.

Flow Velocity

Suction and header piping shall be sized to carry the anticipated flows. Flow velocities shall be:

(a) Minimum cleansing velocity of 2.6 feet per second (0.8 metres per second).

(b) Maximum velocity of 6.6 feet per second (2.0 metres per second).

Regardless of the above conditions, piping less than 4 inches (100 mm) in diameter is not acceptable, unless otherwise approved by the Engineer.

Piping

Pumping station internal piping shall be either ductile iron Class 54 with coal tar epoxy lining or stainless steel, Type 316 or 316L, 11 Gauge. Regular steel pipe spool pieces are not permitted.

Threaded flanges or uniflanges shall be used for all ductile iron pipe joints, fittings and connections within the station. Pressed or rolled vanstone neck flanges shall be used for all stainless steel pipe joints, fittings and connections. All piping within the pumping station shall be properly supported and shall be designed with appropriate fittings to allow for expansion and contraction, thrust restraint, etc.

Wet Well Inlet

Only one inlet shall be permitted per wet well. If more than one inlet pipe flows into the wet well, a manhole shall be provided outside of the lift station to collect the flow from contributing mains.

Hydraulic Analysis

A hydraulic transit analysis shall be undertaken to ensure that transients (water hammer) resulting from pumps starting, stopping, full load rejection during power failure, etc. do not adversely affect the pipe or valves in the system.

Valves

Hand operated gate or plug valves must be provided on discharge and/or suction piping to allow for proper maintenance. A check valve shall be provided on the discharge lines between the isolation gate valve and the pump. Check valves shall be accessible for maintenance.

Ventilation

Continuous gravity ventilation may be acceptable for submersible pumping stations provided that maintenance crews carry suitable portable ventilation equipment when visiting the site. Ventilation system for self-priming pumping stations must meet approval by the Engineer.

Access & Removal

Adequate access hatchways and doorways shall be provided. All pumping stations shall be provided with an acceptable device for the removal of pumps and motors for repair and maintenance. Submersible pumps shall be readily removable and replaceable without dewatering the wet well or disconnecting any piping in the wet well. All locks shall be keyed to the Municipality standard key system.

Pump Capacity

All pumping stations shall have a minimum of two pumping assemblies. If only two pumps are provided, they shall each have the same capacity, with each pump capable of handling the expected Design Peak Flow. Where three or more units are provided, they shall be designed to fit actual flow conditions and must be of such capacity that, with any one unit out of service, the remaining two units will have capacity to handle maximum sewage flows, taking into account head losses with parallel operation. The pump control circuitry shall be designed to automatically alternate pumps for each pump cycle. Run time metres shall be provided to record run time for two pumps operating simultaneously.

Electrical

Electric motors less than 10 horsepower shall be 208 volt, 3 phase; electric motors 10 horsepower and larger shall be 600 volt, 3 phase. Single phase pumps will only be permitted, if in the opinion of the Engineer, three phase power is not feasible. All pumping station control equipment shall be mounted in a CSA Type 3 enclosure that is weather tight, heated and rated NEMA4. Alternatively, control equipment may be mounted in an Aboveground, Prepackaged Valve Enclosure as manufactured by Gormann Rupp. Each panel shall be equipped with a pump controller complete with communications hardware, including but not limited to radio, radio power supply, antenna and interface cable. Communication software shall be provided and must be fully compatible with the Region's central monitoring system. Adequate lightning arrestors shall be provided. The SCADA unit must be compatible with the system presently in use in the Region.

The SCADA unit shall have two extra digital points and two extra analog points and shall be capable of transmitting the following signals and alarms to the central monitoring location:

(a) Hand-off-automatic selector switch status

(b) Output control through SCADA system

(c) Power generating system (overload, battery status, fuel tank level, etc.)

(d) Low level alarm

(e) High level alarm

(f) Panic alarm

(g) Building fire alarm

(h) Illegal entry alarm

(i) Pump information (overload, motor current, pump status, line voltage, pump running hours, pump starts and phase monitoring)

(j) Any other at the request of the Region.

Electrical service from the transmission main to the control panel and between the control panel and the pumping station shall be through buried conduit. Each pump cable shall be installed in a separate conduit and a spare conduit shall be provided for future use. All conduits entering or leaving must be adequately sealed to protect against corrosion from water intrusion or harmful gases.

Site Considerations

Whenever possible, all pumping stations and control panels shall be within the street right-of-way in an appropriate area specifically designated for that purpose. The ownership of this property shall be deeded to the Region. All pumping station land shall be graded such that ponding of water does not occur. The elevation of the top of the wet well shall be no less than 4 inches (100 mm) and no more than 6 inches (150 mm) above the finished grade of the pumping station lot. All exposed areas shall be sodded.

O & M Manual

Three copies of the pumping station operation and maintenance manual must be prepared in a form acceptable to the Engineer, and provided to the Engineer prior to acceptance of the pumping station. This manual must contain at least the following:

(a) System description

(b) Design parameters, system hydraulics and design calculations (including curves)

(c) As constructed civil, mechanical and electrical drawings

(d) Pump literature, pump curves and operating instructions

(e) Manufacturer's operation and maintenance instructions of all equipment

(f) Name, address, and telephone number of all equipment suppliers and installers

(g) Information on guarantees/warranties for all equipment

All special tools and standard spare parts for all pumping station equipment is to be provided by the contractor prior to acceptance of the system by the Engineer.

Forcemain

Pipe

PVC DR18 and Ductile Iron Class 350 pipe are approved for use for all sanitary sewer forcemains in the Region.

The hydraulic losses in the forcemain shall be calculated using the Hazen-Williams Formula or an appropriate nomograph assuming a roughness coefficient of C = 120 for any type pipe material.

Limiting Velocities

The forcemain shall be designed such that a minimum cleansing velocity of 2 feet per second (0.6 metres per second) is maintained. The maximum velocity in any forcemain shall not exceed 8 feet per second (2.4 metres per second). Regardless of the above conditions, piping less than 4 inches (100 mm) in diameter is not acceptable, unless otherwise approved by the Engineer.

Minimum/Maximum Depth

Forcemains shall have a minimum cover of 5 feet (1.5 metres) and a maximum cover of 8 feet (2.4 metres). The depth of cover shall be measured from the design grade at finished surface to the crown of the pipe line.

Slope

Forcemain slope does not significantly affect the hydraulic design or capacity of the pipeline itself. Under no circumstance, however, shall any forcemain be installed at zero slope. Zero slope installation makes line filling and pressure testing difficult, and promotes accumulation of air and wastewater gases.

Location

Forcemains shall not be located in a common trench with a water main. The soil between them shall be undisturbed. Force mains crossing water mains shall be laid to provide a minimum vertical distance of 1.5 feet (450 mm) between the outside of the force main and the outside of the water main. The water main shall be above the force main. At crossings, one full length of water pipe shall be located so both joints will be as far from the force main as possible. Special structural support for the water main and force main may be required.

Termination

Forcemains should enter the gravity sewer system at a point not more than 2 feet (0.6 metres) above the flow line of the receiving manhole. A 45 Degree bend may be utilized to direct the flow downward.

Valves

To prevent air locks in the pipe, automatic air relief and vacuum valves shall be located in a manhole at all high points of the forcemain system or in such other locations as directed by the Engineer. Blowoffs should be provided at all low points in the forcemain system as directed by the Engineer.

Air Relief & Vacuum Valves

Heavy duty type cast iron body with bronze trim and combination of small orifice and large orifice units shall be used. Small orifice size shall be 3.2 mm. Valves shall be suitable for operation at 1 Mpa working pressure and shall have flanged ends.

Operation shall be through independent floating stainless steel buoy balls located in both orifices.

Orifices shall be capable of expelling air at a high rate during filling and at a low rate during operation and will admit air while draining the pipeline. Seats shall

be replaceable.

Valves shall have no moving parts except for stainless steel balls which shall remain in the throat area discharging air without blowing shut or collapsing the balls.

Valves shall not leak in the closed position when pipe is being filled.

Changes in Direction

Any change in direction which is in excess of the pipe joint defection tolerance shall require a suitable fitting as approved by the Engineer. Thrust blocks shall be provided at any change of direction and shall be designed considering the operating pressure, surge pressure, peak flow velocity and in-situ material which the thrust block bears against. Thrust blocks shall be constructed of "ready mix" concrete and shall have a minimum 28 day compressive strength of 3000 psi (20 Mpa). In the case of vertical bends, the thrust block shall be located below the fitting and shall be connected to the forcemain through the use of stainless steel tie rods securely embedded in concrete. The use of restrained joints is not permitted unless used in conjunction with a thrust block and of a design acceptable to the Engineer.

Pipe Installation

Repairs to pipe after installation will only be accepted if carried out in accordance with the manufacturer's recommendations and shall be re-tested in accordance with this section.

3.5 INSPECTIONS & TESTING

General

Notify the Engineer at least 24 hours in advance of all proposed test. Perform tests in presence of a Professional Engineer, or his representative, and a representative of the Region of Queens.

Manholes

Two field inspections of all manholes, catch basins, and valve chambers shall be conducted by the Region, one at the completion of construction and the second prior to the end of the maintenance period.

If requested by the Engineer, all manholes shall be tested for leakage using either a hydrostatic or air vacuum method.

Video Inspection of Sanitary Sewer

Any part of the system failing the above tests or found deficient shall be repaired, retested and inspected to the satisfaction of the Engineer.

Closed Circuit Television Inspections shall be carried out at the following times:

(a) At completion of construction and prior to subdivision endorsement of acceptance of work by the Region.

(b) Two month prior to the end of the twelve maintenance period.

A colour camera is to be used for Television Inspections to provide full colour VHS format video tape. Upon completion a full colour VHS format video tape shall be provided to the Region of Queens' Engineer.

Air & Pill Tests

Air and Pill tests shall be carried out at the completion of the sanitary sewer installation. Pill tests shall be done after trenches are backfilled and compacted.

Pressure testing of the forcemains shall be conducted after backfilling. A test pressure of 1.5 time the working pressure shall be maintained for a period of 2 hours.

4.0 WATER SYSTEM SPECIFICATIONS

4.1 SCOPE

This section specifies the requirements for a water distribution system. A water distribution system consists of water mains, laterals and appurtenances, including pumping stations, pressure control facilities and reservoirs, which is designed to carry and distribute an adequate supply of potable water for domestic consumption and fire protection.

References

Reference standards and organizations supported by these specifications include:

- "Water Supply For Public Fire Protection" prepared by the Fire Underwriters Survey - Insurer's Advisory Organization (IAO)
- National Fire Protection Association (NFPA)
- American Water Works Association (AWWA)
- Canadian Standards Association (CSA)
- National Building Code (NBC)
- Canadian Plumbing Code (CPC)
- Underwriters Laboratories Of Canada (ULC)

DOE Requirements Met

As well, all water distribution systems shall conform to any requirements established by the Nova Scotia Department of the Environment. No system shall be constructed until the design has been approved by the Engineer and by the Nova Scotia Department of Environment.

Quality Assurance

Water quality is monitored and maintained by the Region, and the system must be designed such that the quality is maintained and water is distributed to the customers at an adequate pressure to supply their needs.

4.2 DESIGN CRITERIA

Demand

Water distribution systems shall be designed to accommodate fire flow plus peak daily demand unless otherwise approved by the Engineer. Hydraulic analysis of any system shall be carried out by the design engineer using the Hydraulic Grade Line for that particular Serviceable Area.

Fire flow demand shall be established in accordance with the latest requirements contained in "Water Supply for Public Fire Protection, a Guide to Recommended Practice", as prepared by the Fire Underwriter's Survey - Insurers Advisory Organization.

Water distribution systems shall be designed to accommodate the following water demands:

(a) Average daily demand: 80 Imperial Gallons per capita per day (364 litres per capita per day).

(b) Maximum daily demand: 200 Imperial Gallons per capita per day (909 litres per capita per day).

(c) Maximum hourly demand: 300 Imperial Gallons per capita per day (1364 litres per capita per day).

The demand use for water main size selection shall be equal to the fire demand plus the peak daily demand, or the domestic peak hour demand, whichever is greater.

The Engineer reserves the right to request flow and other engineering calculations prior to approval to install a water system.

Design Population

Water distribution systems shall be designed based on an appropriate population. The design population or assumed domestic demand must be clearly specified in the calculations submitted for review and approval.

Minimum Pressure

Water distribution systems shall be designed and sized such that during a fire flow condition, a residual minimum positive pressure of 20 psi (150 kPa) is maintained at all points in the water system.

4.3 WATER MAIN

Looping

Water distribution systems shall be designed to providing looping of water mains as frequently as road or easement layout permits.

Type of Pipe

Pipe shall be either Ductile Iron or Polyvinyl Chloride (PVC).

PVC pipe shall conform to AWWA C900, DR18.

The Hazen-Williams Formula or an appropriate nomograph using a pipe friction factor of C = 120 for PVC shall be used in the design calculations of the water distribution system.

Fitting shall be according to AWWA C110, with a minimum working pressure rating of 1035 kPa (150 psi).

Joints shall be mechanical or push-on conforming to AWWA C111, flanged where indicated conforming to AWWA C110 with Class 125 flanged ends conforming to ANSIB16.1.

Limiting Velocities

The water main shall be sized such that the maximum velocity in the pipe shall not exceed 5 feet per second (1.5 metres per second) during maximum hourly domestic flow conditions or 8 feet per second (2.4 metres per second) during fire flow conditions.

Minimum Pipe Size

The water distribution system shall be sized as outlined in the above clauses. However, in no instance shall the main be:

(a) Smaller than 6 inches (150 mm) in diameter for looped lines, or dead end lines less than 300 feet (90 metres) in length.
(b) Smaller than 8 inches (200 mm) in diameter for dead-end lines in excess of 300 feet (90 metres) in length.

Oversizing

Oversizing of water mains to accommodate the water supply requirements of future off-site development may be required as instructed by the Engineer.

Minimum/Maximum Cover

All water mains shall be designed with a minimum cover of 5 feet (1.5 metres) in common material or at suitable depth to prevent freezing of either the water main or the services.

In no situation is the depth of cover over the water main to exceed 8 feet (2.4 metres).

The depth of cover shall be measured from the design grade at finished surface to the crown of the pipe line.

Location

Waterlines installed in the same trench as sewer lines shall be installed to one side on a shelf of undisturbed earth, and shall maintain a horizontal and vertical separation of at least 12 inches (300 mm) between the crown of the sewer line and the bottom of the water line. Under no circumstances shall a water line in the same trench be lower than a gravity sewer line. If the vertical separation cannot be maintained, the two lines must be installed in separate trenches and maintain 10 feet (3) horizontal separation.

Under no circumstances shall a water line be installed in the same trench as a sewer forcemain. Water lines and sewer forcemains must be installed with a 10 foot (3 m) separation in separate trenches with undisturbed soil between the trenches.

All water pipe and appurtenances shall be located within a street owned by either the Region or the Nova Scotia Department of Transportation and Public Works or within an easement, of minimum 20 foot (6 m) width, granted in favour of the Region. Depending on the length and location of the easement, the Engineer may require a travel way to be provided within the easement for access and maintenance purposes. Water mains shall be installed as close as possible to the centreline of the easement.

Where a need for water mains is identified to accommodate future development on adjacent lands, easements shall be provided from the edge of the street right-of-way to the property boundary of the subdivision.

Change in Direction

Any change in direction which is in excess of the pipe joint deflection tolerance shall require a suitable fitting as approved by the Engineer. Thrust blocks shall be provided at any change in direction and shall be designed considering the operating pressure, surge pressure, peak flow velocity and in-situ material which the thrust block bears against. Thrust blocks shall be constructed of "ready mix" concrete and shall have a minimum 28 day compressive strength of 3000 psi (20 Mpa).

Pipe Installation

Pipe and fittings must not be installed when trench bottom is frozen, underwater, or when the trench condition or weather is unsuitable.
Repairs to pipe damaged after installation will be accepted if carried out in accordance with the manufacturer's recommendations but shall be retested in accordance with Section - Inspections and Testing.

Side slopes shall conform to Provincial Occupational Health and Safety Regulations.

The trench must be kept dry at all times during pipe laying. If water is encountered, pumping or other means of dewatering must be carried out. Under no circumstances are joints to be made under water without the prior approval and supervision of the Engineer.

Jointing shall be as recommended by the manufacturer.

The contractor shall keep the open end of the pipe sealed at all times when work is not in progress.

Granular bedding less than 0.75 inches (20 mm) shall be compacted to 95% of Standard Proctor density. After pipe is set to final grade and alignment, bedding shall be securely tamped by hand under the pipe haunches.

Instead of granular material, the bedding may consist of properly compacted, selected backfill compacted to 95% Standard Proctor Density, provided the selected material is free draining, with no particles larger than 0.75 inches (20 mm), and is free from large stones, frozen material, organics, or other deleterious material. Soils containing large rocks, organic matter, clay, or unstable materials may not be used for bedding.

Pipe cover material shall meet the same specifications as bedding, and shall extend the full width of the trench to a height of 12 inches (300 mm) over the top of the pipe. Backfill above the pipe cover material shall consist of selected native material free from boulders, organic matter, frozen material, or other deleterious material, compacted to 95% Standard Proctor Density. The final 12 inches (300 mm) of backfill material up to Subgrade level shall be compacted to 98% Standard Proctor Density.

Trench Drainage Relief System

The designer shall assess the possible change in groundwater movement caused by the use of pervious bedding material and shall be responsible for the design of corrective measures to prevent flooding as a result of this groundwater movement. Water mains installed in a single trench or in areas where sanitary sewer and/or storm sewer mains are not installed shall require a "Trench Drainage Relief System" to lower the hydraulic grade line of the groundwater in the trench below the invert of the water main.

4.4 SERVICE LATERALS

Number

All water distribution system laterals from the main line to the property line shall be provided by the developer or the property owner. A single service lateral shall be supplied to each existing lot or potential future lot which could be created under the zoning in effect at the time of installation of services.

Location

Whenever possible, service laterals shall not be installed in private driveways, parking areas, or other travelled areas.

For Duplex or semi-detached units, two lots may be serviced by a common connection from the main to the street line with individual connections and curb stops from the street line to the building. The individual service shall have a minimum inside diameter of 0.75 inches (19 mm), the common connection shall have a minimum inside diameter of 1.0 inches (25 mm).

Pipe Material Size and Length

Service lateral materials shall be made of one of the following materials:

- Polyethylene tubing conforming to CSA B137.1-M, type PE, Series 160.

All water service connections between the corporation stop and curb stop shall be a minimum of 3/4 inch (19 mm) in diameter, type PE, Series 160.

In order to avoid high friction losses in service piping, the maximum length of any 3/4 inch (19 mm) diameter service lateral shall be limited to 200 feet (55 metres) from the curb stop to the serviced building. Services longer than 200 feet shall require at least 1 inch (25 mm) diameter piping.

For services longer than 20 metres (66 feet), the number of compression couplings used is to be kept to a minimum.

Minimum Cover

All service laterals shall be installed with a minimum cover of 1.5 metres (5 feet) in common material or a suitable depth to prevent freezing of the service.

All connections to existing mains shall be carried out by the Region.

Connections to Existing Mains

Tapping sleeves and valves shall be provided where indicated. Pressure test tapping sleeve and valve before tapping main. Test tapping valves from both directions, inside wall of the gate when the sleeve is tested, and the outside wall by means of a cap with a tap in the centre.

Service connection joints shall be compression type, with a minimum pressure rating of 150 psi (1035 kPa). For polyethylene tubing, joints shall be according to CSA B137.1-M with stainless steel liners.

For services which are longer than 66 feet (20 metres), the number of compression couplings used is to be kept to a minimum. Compression

couplings shall not be used within 5 feet (1.5 metres) of the foundation of any serviced building.

Corporation and curb stops shall be brass conforming to ASTM B 62 with compression type joints. Thread on corporation stops are to conform to AWWA C800. All service connections on PVC mains require a service clamp (saddle) with bronze body, confined "o"-ring seal cemented in place, stainless steel straps suited for the main size, and outlet threads conforming to AWWA C800.

Service boxes shall be adjustable with cast iron bottom section, cast iron lid with recessed nut, and internal stem to suit the depth of bury.

4.5 VALVES

General

All connections to an existing water system shall be valved so that the system can be isolated by the valve at the start of the extension. The connection to the existing water system must be coordinated through the Engineer.

Type

All water system valves shall be mechanical joint or resilient seat gate valves and shall conform to AWWA standards. All valves must be accessible through valve boxes or chambers.

All buried valves on water mains 12 inches (300 mm) and smaller shall be gate valves conforming to AWWA C509, minimum working pressure rating of 200 psi (1380 kPa), with cast iron body and resilient rubber seat.

Buried gate valves larger than 12 inches (300 mm) shall be according to AWWA C500, minimum working pressure rating of 150 psi (1035 kPa), with cast iron body and bronze mounted mechanism.

Buried valves larger than 12 inches may be butterfly type as approved by the Engineer.

All meter chambers, air release chambers, and other special works must be approved by the Engineer.

Location

Valves shall be provided on the water mains at the following locations:

(a) Where required to adequately isolate sections of the water system as determined by the Engineer.

(b) Four valves per cross section, one on each leg of cross.

(c) Three valves per tee section, one on each leg.

(d) One valve per 1320 feet (400 metres) of water main where there are no intersections.

4.6 BACKFLOW PREVENTION DEVICES

Where Required

Backflow prevention devices are required on new services if there is a risk of contamination of the potable water supply. Premises which require backflow prevention devices include, but are not limited to, the following:

- Industrial, commercial and institutional buildings;
- Apartment buildings larger than four units;
- Sprinkler service lines.

Location

Backflow prevention devices shall be installed downstream of water meters. A water distribution connection is not permitted between a water meter and a backflow prevention device.

Where a meter by-pass is required, a backflow prevention device shall be installed on the main service line and on the by-pass line.

Products

Backflow prevention are Devices to be in accordance with CSA B64-M88.

4.7 FIRE HYDRANTS

Spacing/Location

Fire hydrants shall be provided at spacing in accordance with the requirements as contained in the latest revision of the publication "Water Supply for Public Protection". In no case shall the spacing exceed 500 feet (150 metres). The following are desirable hydrant locations:

(a) At high points of the water main profile unless an automatic air release valve is required at that location.

(b) At low points of the water main profile.

(c) At intersections of roads.

(d) Near middle of long blocks.

(e) At the end of dead-end streets or cul-de-sacs greater than 90 metres (300 feet) in length.

Fire hydrant laterals shall have a minimum diameter of 6 inches (150 mm) and shall be provided with a gate valve between the hydrant and the tee from the main. The depth of bury of hydrant laterals shall be 6 feet (1.8 metres).

Hydrants shall be provided with adequate drains to prevent freezing, except in the case of a high water table.

All fire hydrants shall be Dry Barrel type to AWWA C502 and shall be two piece

with safety break-away flange and stem. The safety flange shall be installed above the ground and shall be located no higher than 6 inches (150 mm) above finished grade.
Hydrants shall have two standard two one-half (2.5) inch hose nozzles and one standard pumper nozzle with an outside diameter of four and fifteen sixteenths (4-15/16) inches.

4.8 INSULATION

Insulation shall be placed where the depth of bury is less than 5 feet and shall conform to CAN/CGSB 51.20M, type 4, expanded polystyrene.

Insulation of a main shall consist of insulating the top of the pipe, and filling the annular space between the pipe and insulation with clean, dry sand.

4.9 PUMPING AND STORAGE FACILITIES

As a result of difference in ground elevations or distance from the source of supply, certain areas may require pressure boosting of the water system to provide adequate pressure and flows to meet either domestic or fire flow requirements.

To accomplish this, a pumping station may be required to service a specific and defined area of a water distribution system which is generally isolated from the remainder of the system. All pumps and pump houses must meet the requirements set by the Engineer.

Water pumping and storage facilities shall be designed in consultation with the Engineer.

4.10 INSPECTIONS AND TESTING

Valve Operation

The operation of any existing valve not part of new construction shall be by the Region.

Notice

Twenty four (24) hours notice is required by the Region of Queens for all filling, flushing, or chlorination operations for new construction.

Requirements

Testing shall be carried out with the following additional requirements:

(a) All services, hydrants, mains, and other appurtenances shall be included in the system test.

(b) Testing shall be performed in presence of a Professional Engineer or his representative and a representative of the Region. Test results shall be submitted, verified by a Professional Engineer licensed to practice in Nova Scotia and accompanied with a Professional Seal.

(c) All water used for pipe testing shall be the responsibility of the

contractor and shall be chlorinated potable water.

Hydrostatic Pressure Test

Lines shall be flushed before testing. The duration of each hydrostatic pressure test shall be at least (2) hours, and pressure shall be maintained at a minimum of 200 psi (1380 kPa).

Pressure gauges shall be Liquid filled type, minimum 100 mm (4 inches) face diameter, graduated in psi, accuracy 3% at maximum reading.

There shall be no leakage or drop in pressure for the duration of the test.

The test must be conducted with all proposed service laterals installed to the property line.

Should any section of the pipe disclose leakage, the contractor shall, at his own expense, locate and repair defective joints, and re-perform the test.

Disinfection

Chlorination of any water system can proceed only after the system has been successfully pressure tested, with the test witnessed by a Region of Queen's representative.

All lines shall be flushed before and after chlorination, and chlorinated according to AWWA C651.

Dechlorination of the water mains shall be the responsibility of the contractor.

Any dechlorination procedures shall satisfy the requirements of the Nova Scotia Department of Environment and the Region.

After chlorination and dechlorination are complete, water samples shall be delivered to the Nova Scotia Department of the Environment for bacteriological testing. Chlorination shall be repeated if necessary.

Bacteriological test results shall be forwarded to the Engineer.

5.0 STORM DRAINAGE SYSTEM SPECIFICATIONS

5.1 SCOPE

This section specifies the requirements for a storm drainage system. A storm drainage system is a system which receives, carries, and regulates flows in response to rain and snow including overland flows, sub-surface flows, groundwater flows, and snow melt.

The following design objectives are to be followed for the design of storm drainage systems in the Region of Queens Municipality;

- Prevent Loss of life and protect structures and property from damage due to a major storm event.
- Provide for safe and convenient use of streets, lots, and other improvements during and following storm events.
- Preserve natural watercourses and other natural features and minimize the long term effect of development on receiving watercourses and groundwater.
- Convey stormwater from upstream and on-site sources, and mitigate the adverse effects of such flow on downstream properties.

In addition to the following specifications, all storm drainage systems shall meet the requirements of the Nova Scotia Department of the Environment. No system shall be constructed until the design has been approved by both the Engineer and the Nova Scotia Department of the Environment.

5.2 DESIGN CRITERIA

Storm Drainage Systems

A Minor Drainage System consists of ditches, swales, driveway culverts, subsurface interceptor drains, curb & gutter, catch basins, pipes, manholes and laterals.

A Major Drainage System consists of ditches, roadways, roadway culverts, open channels, retention ponds, flood plains, and natural water courses.

Downstream Drainage Systems

All downstream drainage systems must have adequate capacity to receive and carry discharge from the proposed storm drainage system in addition to it's natural rate of discharge. An investigation of the downstream system shall be carried out from the outfall location of the proposed storm drainage system to a point sufficiently downstream that will demonstrate no adverse impacts on downstream lands, such as erosion or flooding.

The effect on downstream development will be assessed by the Engineer

based on this investigation. Mitigative measure may be required to alleviate any adverse downstream impacts.

Design Storm Frequencies

Minor Systems

Driveway culverts and other minor drainage systems shall be designed based on a design storm frequency of 1 in 5 years, except high value commercial and business areas.

High value commercial and business areas shall be designed based on a design storm frequency of 1 in 10 years.

Major Systems

Roadways, road cross culverts, and other major drainage systems shall be designed for the combined capacity of the major drainage system and minor drainage system and shall be based on a design storm frequency of 1 in 100 years.

The design capacity of a natural watercourse, including a floodplain, or any drainage system where a minor drainage system is not provided, shall be based on a design storm frequency of 1 in 100 years.

Meteorological Data

Meteorological data will vary depending on the design methodology used. All meteorological data must be supplied by the Atmospheric Environment Service, Environment Canada, or other similar government agency approved by the Engineer.

Figure 1 contains rainfall Intensity-Duration-Frequency (IDF) curves for year round rainfall at the Shelburne Weather Station.

Figure 2 contains rainfall Intensity-Duration-Frequency (IDF) curves for winter rainfall at the Shelburne Weather Station.

Where IDF curves are required for design, Figures 1 and 2 shall be used for all of the Region of Queens Municipality.

Rational Method

The designer shall indicate the design methodology used.

The Rational Method can be used for the calculation of peak runoff rates for drainage basins up to and including 640 Acres in area. It may be used for preliminary design of systems serving larger areas.

This method shall not be used for the design of storage facilities.

Run-off coefficients are given in Table 1.

For most residential, commercial, and industrial land use, coefficients for

summer ground conditions and year-round rainfall data from Figure 1 shall be used.

Where run-off from an area that includes a significant proportion of undeveloped land is to be determined, winter run-off conditions must be determined, and the worst case used in design. For winter conditions, rainfall data from the Shelburne Weather Station, Figure 2, will be applied to the Region of Queens Municipality.

Time of concentration shall include both inlet time and time of flow to the point at which flow is being estimated.

Figure 3 can be used to estimate travel time for overland flow.

Other Methods

Other methods such as those described in the US Soil Conservation Service Technical Report 55, 1975 (SCS TR 55) may be used if approved by the Engineer.

Storage Facilities

Stormwater storage facilities shall be designed using the storage-Indication method. The design storm and inflow hydrograph must be developed using accepted methods.

Where a structure is designed to accommodate a design storm frequency less than 1 in 100 years, an emergency spillway capable of discharging the 1 in 100 year overflow from the structure must be provided.

The overflow spillway shall discharge into a watercourse or major storm drainage system capable of receiving and carrying the 1 in 100 year discharge from the structure, in addition to it's rate of discharge prior to the spillway.

Information shall be supplied regarding maintenance and safety issues of a stormwater storage facility, complete with long term maintenance and replacement costs.

Location

No storm drainage shall be carried on, through, or over an approved residential lot within a subdivision. All storm drainage shall be carried by either an unconfined natural watercourse, excavated ditch, or storm sewer.

All excavated ditches and storm sewers within a subdivision shall be located either within a right-of-way or on an easement in favour of the Region. The minimum width of an easement is 20 feet (6.1 m).

Where subdivision storm drainage flows onto abutting land other than through a natural watercourse, a right-of-way or easement in favour of the Region shall

be provided.

Where a need is identified by the Engineer to accommodate future upstream development, and where no future road reserve is available, a drainage right-of-way or an easement in favour of the Region shall be provided.

Natural watercourses shall not be carried in roadside ditches or piped roadside storm drainage systems.

Discharge to Adjacent Properties

All storm drainage shall be self contained within the subdivision boundaries, except natural run-off from undeveloped areas.

All run-off from the developed limits of a subdivision must be directed to either a natural watercourse or storm drainage system owned by the Region or the Nova Scotia Department of Transportation and Public Works.

Discharge of run-off to adjacent properties other than in a natural watercourse is prohibited unless the developer obtains consent in writing from the adjacent property owner(s), and drainage easements over such natural property(ies) are provided in favour of the Region (See Appendix B). The easement must be in favour of the Municipality and filed in the Registry of Deeds, and accompanied by the title certificate of the developer's solicitor.

5.3 SYSTEM COMPONENTS

Buried Storm Drainage Systems

Pipe Material

Polyvinyl Chloride (PVC), SDR 35 shall be used for storm sewer main installation within the Region, unless otherwise approved by the Engineer.

Storm sewer pipes shall be designed to carry, without surcharging, the peak rate of storm flow. The Manning formula shall be used for pipe design.

Velocity

The minimum design velocity for storm sewers shall be 2 fps (0.6 m/s). Consideration shall be given to initial minimum cleansing velocity for phased development.

The maximum design velocity for storm sewer shall be 15 fps (4.5 m/s) for pipes up to and including 30" (750 mm) in diameter. The maximum design velocity for storm sewer pipes greater than 30" (750 mm) in diameter shall be 20 fps (6 m/s).

Pipe Size

The minimum diameter for a storm sewer main shall be 12" (300 mm).

The minimum diameter for a catch basin lead shall be 10" (250 mm).

Pipe sizes shall not decrease in the downstream direction unless approved by

the Engineer.

Depth

The minimum depth for a storm sewer main located within the road right-of-way is 5 feet (1.5 m).

The minimum depth for storm laterals at the property line is 3 feet (0.9 m).

Manholes

Manholes shall be installed at all changes in grade or alignment, at all intersections and at intervals not exceeding 400 feet (120 metres).

The minimum internal diameter of a manhole shall be 42 inches (1050 mm).

Service Laterals

All laterals from the storm sewer main to the property line shall be provided by the developer or owner and shall have a minimum grade of 2 percent. The depth of laterals shall not be less than 3 feet (1 metre) within the right-of-way.

Catch Basins

Catch basins shall be installed at the curb of the street and shall be adequately spaced to prevent ponding on the street and to prevent water from entering on or flowing in the travel lanes during storm events corresponding to the design of the Minor Drainage System. In no case shall the spacing of the catch basins exceed 330 feet (100 metres).

Outfalls

The design of outfalls shall take into consideration such factors as public safety, erosion control, appearance, etc. Horizontal grates shall be installed at outfalls.

Ditches/Open Channel Drainage System

Roadway ditches shall conform to the standard cross section for local subdivision roads (See Standard Drawing No. 1), and shall have adequate capacity for the 1 in 100 years storm.

Velocity

To prevent erosion, the maximum velocity during a 1 in 100 years storm event in ditches or open channels shall not exceed the values given in Table 2.

Culverts

The size of culverts (including driveway culverts) shall generally be as shown on the approved engineering drawings. The minimum size for any other culvert shall be 16 inches.

The minimum depth of bury for any driveway culvert is 12 inches (300 mm). The minimum depth of bury for any other culvert is 20 inches (500 mm).

Culverts other than driveway culverts shall be designed for the 1 in 100 year peak flow with a headwater depth not greater than the diameter of the pipe.

Roadway and driveway culverts generally do not require grating. Storm sewer outfalls, and culverts greater than 85 feet (26 m) require inlet and outlet grating.

All culverts shall be either corrugated steel pipe (CSP) to CAN3-G401-M

(galvanized), or reinforced concrete pipe to ASTM C76-M or CAN/CSA A257.2.

Minor Drainage System Connections

Roof Drains

Roof drains shall discharge on the ground surface and shall not be connected to a storm drainage system.

Foundation Drains

Where a buried storm drainage system exists, foundation drains will normally be connected to the main by laterals. The invert of the lateral at the property line must be at lease 2 feet (610 mm) above the top of the main at the point of connection.

Where a buried storm drainage system does not exist, Section 9.14 of the National Building Code of Canada, latest revision, shall apply.

Under no circumstance shall foundation drains direct stormwater to the street surface, sidewalk or adjacent property.

TABLE 1

RECOMMENDED COEFFICIENT OF RUNOFF VALUES FOR VARIOUS SELECTED LAND USES

Description of Area	Runoff Coefficients
Business	
Downtown	0.70 to 0.95
Neighbourhood	0.50 to 0.70
Residential	
Single-family	0.30 to 0.50
Multi-units, detached	0.40 to 0.60
Multi-units, attached	0.60 to 0.75
Suburban	0.25 to 0.40
Residential (½ acre lots or more)	0.25 to 0.40
Apartment dwelling areas	0.50 to 0.70
Industrial	
Light	0.50 to 0.80
Heavy	0.60 to 0.90
Parks, Cemeteries	0.10 to 0.25
Playgrounds	0.20 to 0.40
Railroad yard	0.20 to 0.40
Unimproved	0.10 to .030

It is often desirable to develop a composite runoff coefficient based on the percentage of different types of surface in the drainage area. This procedure is often applied to typical "sample" blocks as a guide to selection of reasonable values of the coefficient for an entire area. Coefficients with respect to surface type, currently in use are:

Character of Surface	Runoff Coefficients
Street	
Asphalt	0.70 to 0.95
Concrete	0.80 to 0.95
Drives and walks	0.75 to 0.85
Roofs	0.75 to 0.95
Lawns, sandy soil	
Flat, 2%	0.05 to 0.10
Average, 2 to 7%	0.10 to 0.15
Steep, 7%	0.15 to 0.20
Lawns, heavy soil	
Flat, 2%	0.13 to 0.17
Average, 2 to 7%	0.18 to 0.22
Steep, 7%	0.25 to 0.35

The coefficients in these two tabulations are applicable for storms of 5 to 10 year frequencies. Less frequent, higher intensity storms will require the use of higher coefficients because infiltration and other losses have a proportionally smaller effect on runoff.

Winter Runoff Coefficient (all areas and surfaces with summer coefficients less than or equal to 0.80)	0.80

Source: Hydrology, Federal Highway Administration, HEC No. 19, 1984.

TABLE 2

SUGGESTED MAXIMUM PERMISSIBLE MEAN CHANNEL VELOCITIES IN STRAIGHT, UNIFORM CHANNELS

Velocity Channel		Mean Channel fps (metres per second)
Fine sand		1.5 (0.46)
Coarse sand		2.5 (0.76)
Fine gravel		6.0 (1.83)
Earth		
Sandy silt		2.0 (0.61)
Silt clay		3.5 (1.07)
Clay		4.0 (1.22)
Grass-lined earth		
Bermuda grass	-sandy silt	6.0 (1.83)
	-silt clay	8.0 (2.44)
Kentucky Blue grass	-sandy silt	5.0 (1.52)
	-silt clay	7.0 (2.13)
Poor rock (usually sedimentary)		10.0 (3.05)
Soft sandstone		8.0 (2.44)
Soft shale		3.5 (1.07)
Good rock (usually igneous or hard metamorphic)		20.0 (6.10)

5.4 EROSION AND SEDIMENT CONTROL

An Erosion and Sediment control plan shall be provided in compliance with Provincial regulations, and a copy submitted to the Engineer. The plan shall address measures during construction of roads, services, and houses, as well as long term measures after the completion of development.

The Erosion and Sediment Control Plan, as well as control measures taken, shall comply with the Erosion and Sedimentation Control Handbook for Construction Sites, as prepared by the Nova Scotia Department of the Environment.

During construction, surface water flows across the construction site must be minimized. Exposed soils within ditches and on cut and fill slopes shall be permanently stabilized by hydro seeding or equivalent within two weeks after final grades are reached. Temporary stabilization measures such as application of straw or wood chips shall be used to prevent erosion of exposed soils during construction and prior to reaching finished grades. These measures are required to prevent downstream sedimentation of watercourses and within culverts.

Long term environmental protection measures to be addressed in the subdivision design may include, but are not limited to:

- minimization of erosion and sediment transport
- protection of outfall areas
- utilization of wetland areas for filtration of stormwater run-off
- minimization of disruption to natural watercourses.

6.0 PUBLIC STREET

6.1 SCOPE

This section specifies the requirements for design of all Public Streets and Fully Serviced Public Streets within the Region of Queens Municipality.

For the approval of a municipal street, the public street shall consists of the road bed and all slopes, ditches, channels, waterways and appertaining structures necessary for proper drainage and protection. (Refer to Drawing No. 1)

The developer may construct a Fully Serviced Public Street that shall consist of concrete curb and gutter, storm sewer, catch basins, concrete sidewalks, asphalt concrete wearing surface in addition to the road bed, and appertaining structures necessary for proper drainage and protection. (Refer to Drawing No. 2)

The normal completion date for street construction and related works within a subdivision is to be November 30 of each year in order to allow for inspection and approval by the Municipal Engineer. Street construction will not be approved from December 1st to May 1st, or during such time as spring weight restrictions are administered on the highway.

The developer will be responsible for access, with suitable culverts, to all lots on which a structure exists at the time of listing.

All sewers, water mains, electrical, telephone and such utilities located on the street must have Municipality approval with respect to location, prior to their installation. All utilities shall be approved by the Engineer prior to Final Approval.

6.2 DESIGN CRITERIA

"The function of locating roads and building lots relative to topographical features, constitutes the practice of engineering as defined by the engineering profession act of Nova Scotia. Therefore, the design of subdivisions and their services when submitted to the Municipality must be over the **Seal of a Professional Engineer**."

General

This section covers the more common aspects of design encountered in subdivision development. In cases where this section needs to be expanded or additional specifications are required, the "Geometric Design Standards for Canadian Roads and Streets" as published by Transportation Association of Canada shall be used as a guide. In general, a design speed of 50 km/hour will be used for all public streets.

Road designs should recognize and/or incorporate natural features such as watercourses, wet areas, habitats, and rock outcrops.

Street names which will duplicate or be confused with the names of existing streets on roads in the same community of the proposed subdivision shall not be used.

TABLE 3

SUPERELEVATION FOR HORIZONTAL CURVES

DESIGN SPEED 50 KM/HOUR

Radius of Curve	Superelevation (e)
6600 feet (2000 m)	0.066 ft/ft (0.020 m/m)
3300 feet (1000 m)	0.066 ft/ft (0.020 m/m)
2200 feet (700 m)	0.069 ft/ft (0.021 m/m)
1330 feet (400 m)	0.102 ft/ft (0.031 m/m)
825 feet (250 m)	0.131 ft/ft (0.040 m/m)
525 feet (160 m)	0.161 ft/ft (0.049 m/m)
300 feet (90 m) (min)	0.197 ft/ft (0.060 m/m)

Right-of-way

The minimum right-of-way width shall generally be not less than be 66 feet (20 m). In most cases this right-of-way will be sufficient. However, in certain instances, the Engineer may require a greater width of right-of-way to facilitate traffic, construction and/or maintenance requirements, and to ensure maximum drainage ditch back slopes can be accommodated including all utilities. A right-of-way width of 50 feet may be permitted in cases of a fully serviced public street, or as determined by the Engineer, in accordance to the **Municipal Services Specifications Manual of the Region of Queens Municipality**.

Any property susceptible to damage as a result of construction must be within the right-of-way. All slopes (either in cuts or fills), which will not be eventually eliminated by changes in lot elevations, must be included within the right-of-way.

An acceptable right-of-way access to adjacent property must be provided and deeded to the Municipality. These access roads must not be more than 1310 feet (400 m) apart. These access roads will be located along the boundary of the subdivision for which approval is being sought in such a manner as to not prejudice development of adjacent land.

Road Layout

Roads must be laid out where reasonably possible in prolongations of other roads, either in the same subdivision or in adjacent subdivisions. Unless there are unique circumstances, the minimum length of road considered for listing will be 500 feet (150 m).

Cul-de-sacs for subdivision roads without a storm sewer shall be laid out in accordance with Standard Drawing No. 3.

Temporary Turning Areas shall be laid out as shown on Standard Drawing No. 8.

Boulevards will not be permitted in residential subdivisions.

Guard Rails are required on fills 10 feet (3 m) or greater (unless a slope of 6:1 can be provided) and in other hazardous areas. Refer to Standard Drawing No. 4 for details of guardrail construction and location.

Signage installation including stop signs, street signs and all other required signs shall be the responsibility of the developer. Sign posts and all other materials and labour are to be supplied by the developer. Sign locations are to be determined by the Engineer.

Intersections

Where subdivision roads meet existing classes of provincial highways, the minimum distance between these intersections shall be:

Local Roads	330 feet (100 m)
Collector Roads	500 feet (150 m)
Arterial Roads	1000 feet (300 m)

and shall be located in such a manner as to satisfy sight distance requirements.

Within the subdivision the minimum distance between intersections of local roads will be 250 feet (75 m) measured centre line to centre line.

All intersecting roads must intersect at an angle of 70 to 90 degrees for a minimum distance of 100 feet (30 m) from the intersection measured from the respective centre lines.

Offset intersections will not be permitted.

Horizontal Alignment

Horizontal curves will have a minimum horizontal curve radius of 300 feet (90 m). Horizontal curves on collector roads shall be superelevated according to the values set out in Table 3. Superelevation for radii not shown in Table 3 may be obtained from the Transportation Association of Canada (TAC) manual, Table H.3 3.1c. Two thirds of the superelevation shall be developed at the beginning and end of the curve, in accordance with the TAC manual.

Vertical Alignment

Straight or gently rolling grades with proper vertical curves are required to provide adequate stopping sight distance in accordance with Table 4. In all cases a profile will be required, showing proposed grades. In general a grade of 6% will be considered to be the maximum allowable, however, in difficult circumstances grades up to 8% may be approved. Grades in excess of 8% will only be approved in exceptional circumstances and with prior approval of the Engineer. The minimum grade shall be 0.5%. Grades at intersections shall not exceed 2% for at least 50 feet (15 m) measured from the shoulder of the intersecting road.

The vertical curve length for both sag and crest curves shall not be less than the minimum values indicated in Table 4.

Side slopes in cuts shall be a minimum of 2:1 (horizontal to vertical) and 1:4 in rock cuts or as otherwise required. All embankment slopes shall be 2:1 or as otherwise required by the Engineer should the material be less stable than normally experienced.

6.3 ROADWAY

Clearing and Grubbing

Except under embankments which exceed 5 feet (1.5 m) in depth all roots, stumps, moss and all other vegetable matter within the right-of-way shall be removed. In no case shall grubbing material be buried in roadway fills.

The right-of-way shall be cleared for its full width except when less clearing is approved by the Region. All brush, trees and cuttings shall be burned or disposed of in such a manner as to give a neat appearance to the cleared area, but in no circumstances are the cuttings to be disposed of in the roadway fills.

Roadway

Roadway culverts, underdrains, driveway culverts, and storm drainage systems where required, shall be provided and placed by the developer. The ends of all pipes shall be rip-rapped with 12 to 18 inch (300 to 450 mm) diameter flat stones. The right-of-way shall be left properly drained and should the work, as performed, create pockets of isolated water holes, this drainage condition shall be rectified.

Roadside ditches shall be constructed by the developer unless storm sewers are provided. For the standard ditch cross-section see Standard Drawing No. 1. The minimum ditch depth shall be 2.5 feet (0.75 m). Culvert sizes shall be provided by the developer based on ditch flows. The minimum allowable culvert size shall be 18 inch diameter. Ditches must be designed to convey the appropriate storm water flows.

Roadbeds shall be constructed in accordance with Standard Drawing No. 1. The roadbed will have a top width of 33 feet (10 m) after gravel has been applied. On sections where guard rail is required the roadbed width will be increased by 3.25 feet (1 m) on the side the guard rail is to be installed. The roadbed will be constructed concentric to the centre line of the right-of-way, except in areas where extra roadway width is required or extra right-of-way may be required, and will be graded to the satisfaction of the Engineer.

The crown of the roadbed shall be at least 2% slope towards each drainage ditch.

Black muck, peat and other unsuitable materials under the roadbed must be removed prior to placing embankment material. Rock cuts will be excavated to at least 1 foot (300 mm) below the subgrade and backfilled with material satisfactory to the engineer. Water pockets will not be left in the bottom of rock cuts. All backfill in cuts or embankment must be with grading material approved by the Engineer. The top 12 inches (300 mm) of subgrade must be free of rocks larger than 6 inches (150 mm) maximum dimension.

The Subgrade must be well-drained, and compacted using the Control Strip method described in Section 6.8. Any unsuitable material including soft or yielding material shall be removed, replaced with suitable material, and compacted.

6.4 GRAVELS

Sub-base and Base Gravels (Wearing Surface)

The Sub-Base Course shall conform to Gravel Type 2, Division 3, Section 7 of the Nova Scotia Department of Transportation and Public Works Standard Specifications. The base course must be applied to compacted depth of not less than 8 inches (200 mm).

The Base Course shall conform to Gravel Type 1, Division 3, Section 7, of the Standard Specifications. Surfacing shall be applied to a compacted depth of not less than 6 inches (150 mm).

Compaction of Subbase and Base gravels shall be via the Control Strip method described in Section 6.8.

Shoulder Gravels

Shoulder gravels shall conform to Gravel Type 1S, Division 3, Section 7, of the Nova Scotia Department of Transportation and Public Works Standard Specifications. Shoulder gravels must be applied to a compacted thickness of 2.5 inches (200 mm) or greater over the base course gravels. See Standard Drawing No. 1.

6.5 ASPHALT PAVING

Prior to paving, the developer shall provide the Region with an affidavit signed by a Professional Engineer which states that the aggregate(s) and asphalt cement have been duly sampled and tested, and that the asphalt concrete to be manufactured from these ingredients has been duly designed to achieve the specified properties. The affidavit will also list the test results for this testing and design. The Region may also require the affidavit to state that the hot mix asphalt concrete plant conforms to the Nova Scotia Department of Transportation and Public Works Standard Specifications.

Prior to the laying of asphalt concrete, when directed by the Engineer, liquid asphalt shall be applied upon the prepared subgrade as per Division 4, Section 5, of the Nova Scotia Department of Transportation and Public Works Standard Specifications.

Asphalt concrete shall conform to Division 4, Section 4, of the Nova Scotia Department of Transportation and Public Works Standard Specifications, Type C asphalt. The asphalt concrete shall be placed to a total spread of (168 kg/m^2) at 3 inches thick.

6.6 CHIPSEAL SURFACE

Prior to paving, the developer shall provide the Region with an affidavit signed by a Professional Engineer which states that the aggregate(s) and emulsified asphalt have been duly sampled and tested, and that the chipseal surfacing to be prepared from these ingredients has been duly designed to achieve the specified properties. The affidavit will also list the test results for this testing and design. The Municipality may also require the affidavit to state that the emulsified asphalt conforms to the Nova Scotia Department of Transportation and Public Works Standard Specifications.

The graded aggregate seal shall consist of the application of two courses of high float emulsified asphalt and graded aggregate, spread and compacted on a prepared and primed surface.

Primer The primer shall be liquid asphalt and conform to Division 4, Section 5 of the Nova Scotia Department of Transportation and Public Works Standard Specification.

High-Float Emulsified Asphalt The emulsified asphalt shall be HF-150S and conform to Division 4, Section 1 of the Nova Scotia Department of Transportation and Public Works Standard Specifications.

Aggregates Aggregates shall conform to Division 4, Section 9 of the Nova Scotia Department of Transportation and Public Works Standard Specifications.

6.7 SIDEWALKS, CURBS AND GUTTERS

Portland cement concrete curbs shall conform to Division 5, Section 16 of the Nova Scotia Department of Transportation and Public Works Standard Specifications, or as approved by the Engineer. Curbing must be placed just prior to the spread of asphalt.

6.8 INSPECTION AND TESTING

Notification

The Engineer shall be notified before construction work begins on any public street. Inspections may be carried out at any time, however, inspections are required by the subdividers consulting engineer at the following stages:

(1) After clearing and grubbing (pre-culvert and drains);

(2) After completion of subgrade and installation of drainage structures and other buried services;

(3) Prior to paving or chip sealing;

(4) Prior to Region takeover of roads.

Subgrade

Subgrade material shall be placed and compacted to a minimum of 95 percent of maximum dry density attained using the "Control Strip" method as described below. Additional guidance on the Control Strip method may be found in the DOT Standard Specification for Highway Construction and Maintenance (April, 1996), Division 2, Earthworks.

Control Strip Method-Subgrade

A Control Strip is a lift of compacted subgrade material constructed on a 100 foot long (30 m) section, minimum 10 feet (3 m) wide, of prepared surface selected by the Engineer. A maximum dry density or "Control Density" shall be established for the subgrade lift (for embankment areas) or cut surface (cut areas) using the following method.

A Control Strip shall be constructed at the beginning of work. A new Control Strip shall be constructed whenever there is a change in the type or source of material or any change in the compaction equipment used. The Control Strip thickness shall be the same as the completed lift thickness. No additional lifts shall be placed over an existing Control Strip until the Control Density is determined and the Control Strip is approved by the Engineer. The Control Strip moisture content shall be adjusted to produce the necessary compaction as directed by the Engineer. The surface of the Control Strip shall be kept moist until testing is complete.

To determine the Control Density, a minimum of six (6) moisture and density tests shall be taken at random locations on the Control Strip by the Engineer, using nuclear equipment. Test results shall be averaged to determine the in-place maximum dry density.

Compaction equipment shall be capable of obtaining a uniform density throughout the depth of the layer being compacted. Minimum compaction equipment shall be a vibratory steel roller(s) weighing not less than 6 tonnes (metric), having a vibratory capacity of at least 1500 VPM with a minimum dynamic or centrifugal force of 8000 kg, operated in the vibratory mode, and at a speed not exceeding 8 km/hour.

A lift of subgrade material shall be spread over the entire Control Strip section. The maximum compacted lift thickness shall be 12 inches (300 mm). Measurements for the Control Density will then commence and continue during repeated passes of the compaction equipment until a maximum dry density is achieved. A "Pass" is one complete coverage of the Control Strip layer with the compaction equipment.

Testing of the Control Strip shall be discontinued when the difference in average dry density between each Pass is less than 10 kg/m^3 (0.62 lb/ft^3).

This maximum dry density shall be the Control Density used to determine the percent compaction in other areas of the project for the same subgrade material and lift thickness.

At least one field density test shall be taken for every 500 feet (150 m) of roadway subgrade.

Soft Spots

All "soft spots" in the subgrade shall be removed to a depth (typically 4 feet) specified by the Engineer and replaced with approved backfill. "Soft spots" shall be removed and backfilled in the presence of the Engineer.

Trenches

Bedding, cover and backfill in trenches shall be to the depth and with materials indicated. Pipe bedding shall be placed in 6 inch (150 mm) lifts (compacted thickness). Backfill in trenches shall be placed in 12 inch (300 mm) lifts (compacted thickness). All bedding, cover and backfill materials shall be compacted to 95% Standard Proctor Density with the exceptions that the top 12 inches (300 mm) of trench backfill below subgrade shall be compacted to 98% Standard Proctor Density. If clear stone is used as a bedding material, it shall be compacted to 70% Relative Density.

Field density tests shall be taken within a section of trench to determine level of effort required to achieve the specified compaction for each of the following:

(1) pipe bedding,
(2) pipe cover material,
(3) trench backfill excluding final 12 inches (300 mm) to subgrade; and
(4) final 12 inches (300 mm)

Compaction within trenches may proceed using the compactive effort determined for each of the above provided there is no change in materials, equipment or site conditions. Such a change will require a re-determination of the compactive effort. Quality control testing of compaction within trenches shall be as required for site soil conditions or as directed by the Engineer.

Moisture content of subgrade and trench backfill materials must be controlled to obtain the specified compaction.

The results of laboratory and field density tests shall be submitted to the Engineer.

Gravels

Gravels Type 1, Type 1S and Type 2 shall be placed and compacted to a minimum of 100 percent of maximum dry density attained using the "Control Strip" method as described below. Additional guidance on the Control Strip method may be found in the DOT Standard Specification for Highway Construction and Maintenance (April 1996), Division 3, Granular Materials.

A Control Strip is a course of compacted gravel constructed on a 100 foot long (30 m) section, minimum 10 feet (3 m) wide (except for shoulder gravels), of prepared surface selected by the Engineer. A maximum dry density or "Control Density" shall be established on the gravel course using the following method.

A control strip shall be constructed at the beginning of work. A new Control Strip shall be constructed whenever there is a change in the type or source of material or any change in the compaction equipment used. The Control Strip thickness shall be the same as the completed course thickness. For example, the Control Strip compacted thickness for the Sub-base course (Type 2 gravel) shall be 8 inches (200 mm). The Control Strip compacted thickness for the Base course (Type 1 gravel) shall be 6 inches (150 mm). The Control Strip compacted thickness for the Shoulder gravels (Type 1S gravel) shall be 2.5 inches (62.5 mm). No additional gravel lifts shall be placed over an existing control strip until the control density is determined and the control strip is approved by the Engineer. The control strip moisture content shall be adjusted to produce the necessary compaction as directed by the Engineer. The surface of the control strip shall be kept moist until testing is complete.

To determine the Control Density, a minimum of six (6) moisture and density tests shall be taken at random locations by the Engineer, using nuclear equipment. Test results shall be averaged to determine the in-place maximum dry density.

Compaction equipment shall be capable of obtaining a uniform density throughout the depth of the layer being compacted. Minimum compaction equipment shall be a vibratory steel roller(s) weighing not less than 6 tonne (metric), having a vibratory capacity of at least 1500 VPM with a minimum dynamic or centrifugal force of 8000 kg, operated in the vibratory mode, and at a speed not exceeding 8 km/hour.

A course of gravel shall be spread over the entire Control Strip section. The maximum compacted lift thickness within a gravel course shall be 8 inches (200 mm). Measurements for the Control Density will then commence and continue during repeated passes of the compaction equipment until a maximum dry density is achieved. A "Pass" is one complete coverage of the Control Strip layer with the compaction equipment.

Testing of the Control Strip shall be discontinued when the difference in average dry density between each Pass is less than 10 kg/m^3. This maximum dry density shall be the Control Density used to determine the percent compaction in other areas of the project for the same thickness and class of gravel as that used in the Control Strip.

Moisture content of gravels must be controlled to obtain the specified Control Density.

At least one field density test shall be taken for every 500 feet (150 m) of roadway gravels for each gravel lift.

The results of laboratory and field density tests shall be submitted to the Engineer.

Asphalt Concrete

In addition to the requirements of Section 6.4, a minimum of one series of tests per day shall be performed for each 500 tonnes of asphalt concrete. Every individual road shall have at least one series of tests. The series of tests shall include all of the following:

(1) Marshall Stability, kN
(2) Marshall Flow, x 0.25 mm
(3) Voids in Mineral Aggregate
(4) Air Voids, %
(5) Asphalt Cement Content, %
(6) Gradation of Extracted Aggregate

There shall be at least one field density test per day for each 500 tonnes (metric) of asphalt concrete placed. Each lift for every individual road shall have at least one field density test taken.

Test results shall conform to the Nova Scotia Department of Transportation and Public Works Standard Specification - Metric Edition, Division 4, Section 4.

All test results shall be recorded and forwarded to the Engineer.

Curbing and Sidewalks

At least one set (3) of concrete test cylinders (6 inch x 12 inch) shall be taken for every 328 feet (100 m) (linear) of curbing and tested for compressive strength at 7 days (1) and 28 days (2). These results will be forwarded to the Engineer. The minimum 28 day compressive strength shall br 5000 psi 35 Mpa. Concrete mix design specifications shall conform to the Nova Scotia Department of Transportation and Public Works Standard Specification - Metric Edition, Division 5, Section 7, Table 5.1.

6.9 PRIVATE ROADS

All proposed private roads within the Municipality shall be shown on a Final Plan of Subdivision.

The minimum width of a proposed street shall be 20 metres (66 feet) or such lesser width, but not less than 15 metres (50 feet).

Council may upon the request of the subdivider consider the re-classification of a private road to a public street upon the subdivider meeting with the requirements of the Municipal Services Specification Manual.

Pre-Private Road Acceptance Requirements

Prior to acceptance by the Municipality of an existing private road to a public street, the subdivider shall be responsible for the following:

(a) complete geotechnical inspection(s) and testing of the existing private road bed by the subdividers consulting Engineer; and

(b) advise the Director of Engineering and Works of proposed test dates, sites and times; and

(c) the results of all inspection reports; and

(d) a comprehensive engineering assessment and written report on the condition of the existing private road indicating compliance or non-compliance with the Municipal Services Specifications Manual; and

(e) all the above shall be under the Seal of a Professional Engineer licensed to practice in Nova Scotia.

Agreement Alternative

As an alternative to the complete construction and acceptance requirements for Municipal Public Street, and the subdivider may enter into a written agreement with the Municipality.

Agreement Provisions

Agreements entered into between a subdivider and the Municipality in accordance with Section 6.9 shall contain reasonable provision with respect to any or all of the following:

(a) the time within which any Municipal Public Street construction shall be commenced and completed; and

(b) the phasing of any street construction; and

(c) the acceptance of any street by the Municipality; and

(d) the provision and acceptance of easements and right-of-way; and

(e) any other matter related to the requirements for street construction.

Bonding for Street Completion

Where a subdivider proposes to complete construction of a Private Road to a Municipal Public Street after receiving approval of the Engineering design drawing for the proposed street the following shall be required:

(a) the subdivider shall post a performance bond in the amount of one hundred and twenty (120) percent of the estimated cost to complete the street; and

(b) the subdivider shall submit to the Development Officer for approval an estimate of costs to complete the construction of the street and the Development Officer may revise the estimate if it is, in the opinion of the Municipal Engineer, inadequate. Such estimates shall include all construction related costs including, but not limited to, professional engineering contract management and site supervision and inspection of all construction and work; and

(c) the performance bond shall be posted before endorsement of approval of any final plan of subdivision being given; and

(d) the performance bond and the maintenance bond referred to in this section and 'Street Acceptance Requirements' section shall be in the favour of the Municipality and may be in the form of cash, certified cheque or letter of credit or bond issued by a surety or guarantee company license by the Province of Nova Scotia and conditional on the execution and completion of the agreement in accordance with the terms of the agreement and the requirements of this Bylaw and shall not be subject to cancellation, termination or expiration during the period of time for completion of the work.

Street Acceptance Requirements

Following completion of any Private Road to a Municipal Public Street and prior to acceptance by the Municipality of any street, the subdivider shall:

(a) post a maintenance bond in the amount of ten (10) percent of the actual cost of construction of the street for a period of twelve (12) months; and

(b) provide "as-built", reproducible engineering design drawings for the street including plan and profile of streets drawn to the required scale and certified by a professional engineer; and

(c) provide four (4) copies of the final street plan showing the Municipal Public Street and all drainage right-of-way outlined in red, road reserves outlined in yellow and easements outlined in green; and

(d) provide legal conveyance of ownership of the right-of-way for the Municipal Public Street, road reserve and easement to the Municipality. This conveyance shall be in the form of a warranty deed and the subdivider shall, through his legal counsel, certify that all property to be conveyed is free from all encumbrances; and

(e) be responsible for all registration and other costs associated with the requirements of this section.

Distance Between Intersections

The distance between public street, highway or private road intersections, a combination thereof shall not be less than 61 metres (200 feet) measured from the nearest rights-of-way, or such greater distance as may be required by the Department of Transportation and Public Works and/or the Municipality to meet their specifications.

Maximum Four Approaches

There shall not be more than four public street or highway or private road approaches or any thereof in an intersection.

Continuous Frontage

Continuous street frontage shall not exceed 366 metres (1,200 feet) in growth centres.

Cull-de-Sac

A cull-de-sac not exceeding 366 metres (1,200 feet) in length may be used in the development of odd shaped areas of land in Growth Centres. (See Drawing No. 3)

6.10 PUBLIC STREET AND PRIVATE ROAD SIGNAGE MATERIAL

Public Street and Private Road Signage

Signs shall be made of plate or extruded aluminum with highway grade reflective vinyl markings. Signage will be securely fixed to posts.

Public Street and Private Road Name Signage

Signs shall be 8 inch extruded aluminum covered with retro-reflective material with white letters on green background.

Posts

Posts will be of galvanized steel tubing complete with anchor base (Telespar equivalent). All anchors and fasteners will be of galvanized steel.

7.0 GENERAL MAPPING SPECIFICATIONS

7.1 SCOPE

The purpose of this policy is to identify requirements for computer aided drawings for the Region of Queens Municipality.

This procedure is issued under authority of the Chief Administrative Officer of the Region of Queens Municipality.

Drafting work done by or for the Region of Queens Municipality must be done in a format which is transferrable to MapInfo. (File format extension will be .TAB, .DAT, .ID, .MAP) or AUTO CAD Light (file extension .DXF) as defined by this procedure. Preference is to have all files come into the Region as readable MapInfo files.

Consultants preparing Computer Aided Drafting (CAD) drawings for projects initiated by the Region of Queens Municipality must obtain those digital layers identified by the Region of Queens Municipality to ensure acceptable registration with the Corporate GIS. The Consultant will enter a licensing agreement, the terms of which are identified in Appendix "F".

7.2 GEO-REFERENCING

Nova Scotia Coordinate Survey System

It is required that all computer aided drafting (CAD) work be referenced using real world coordinates (Nova Scotia Coordinate Survey System).

Map Projection

The Nova Scotia Transverse Mercator projection and grid system (MTM 3 degrees Zone 5) will be used for referencing all data.

Datum

The reference for all coordinates must be ATS 77.

Units

All coordinates must be supplied in metric units.

Coordinate Accuracy

Absolute coordinate accuracy depends on the source of the data (i.e. total station, digitized, interactive data entry). The source of data must be identified.

Measurements and distances must be collected to at least three decimal places (i.e. 245.123 for 245.123 metres). However, most computer software (AutoCad Surveying packages) store coordinates with greater precision. These numbers should not be truncated.

Real world coordinate must be shown correctly (i.e. no front end truncating of coordinates). Real world coordinates must be represented with 10 digits.

Survey Data

Real world coordinates obtained from field surveys must be loaded into a CAD drawing file to accurately locate features. This method of data entry is the most accurate and therefore the most desirable form of entry. The surveyor must separate features by layer before the information is transferred to a CAD to simplify transfer to the Region of Queens Municipality Corporate GIS.

Control Drawing

A combination of the extract and survey information (if available) should be used to create a control drawing. This control drawing is used to ensure that the positional accuracy of the data is not lost. The Region of Queens Municipality will provide digital control files, where applicable, to which new development can be added. Survey information (tied to Nova Scotia Coordinate Control) can be merged with the extract to check absolute positioning of the data.

7.3 COMPUTER AIDED DRAWINGS STRUCTURE

All computer aided drawings files must contain a definite structure with respect to layering, linetypes, symbols, lettering and dimensions.

Layers

Layers have been defined to hold specific features. Each feature must be placed on the correct drawing layer. All layers are defined in the phototype drawing for the specific application.

Plan view is to be extruded as a separate file from the Plan and Profile drawing. All other data, i.e. legend, neatline, insets, profile grids, etc. must be removed. This requirement is made to facilitate incorporation into GIS layers. All layer requirements identified apply to this file.

Linetypes

Standard linetypes must be used in all CAD drawings. Features must be coded with the correct linetype and placed in the correct layer.

Symbols

Standard symbols must be used to identify all features in engineering drawings.

AutoCad Data Entry

Automated drafting work done for the Region of Queens Municipality must be done using AUTOCAD unless otherwise approved by the project supervisor. Drawings prepared using other CAD packages are acceptable if and only if they meet the requirements defined in the procedure.

The following guidelines are recommended for data entry using AUTOCAD:

(a) Specialized AUTOCAD functions (e.g. Circle) which may cause problems when translating from CAD to GIS should be avoided.

(b) When digitizing is necessary, stream mode should be avoided. In the event that stream mode is used, weeding of points should be applied to a level which maintains the integrity of the curve. The PLINE command should be used instead of the LINE command if stream mode is necessary.

(c) If data is obtained through digitizing, document all source map information including: scale, date, file (sheet) numbering, originator, method of data capture/creation.

(d) Any feature, other than point and line features, that can be created as a polygon, should be created as a polygon. Further, no hatching will be applied to any polygon feature (e.g. buildings, sidewalks, boardwalks, etc.)

(e) Do not double digitize boundary lines which separate adjacent polygons. Adjacent polygons (within a thematic layer) should share a common boundary.

(f) All features outlines will be captured so that the feature lies to the right of the line (right hand rule).

(g) All single line features which possess a director of flow will be captured in the direction of flow (e.g. streams, sewer pipes, etc.)

(h) Features such as utility poles, catch basins, manholes, fire hydrants, water valves, and other such features suitable for display as points should be supplied as point data. Avoid the use of symbols.

(i) All features shall have a corresponding label file.

General Compilation Rules

Point or line features must not be displaced for cartographic enhancement.

All features which enclose a defined area between layers must snap.

Straight line features must be captured as two point line segments. Vertices should only be present in a line feature when there is a change of direction in that feature.

All curved line features representing man made objects must appear cartographically smooth when viewed at 1:500 scale.

The consultants shall be required to use the Nova Scotia Topo Database Feature Codes, Version 4.00, edited November 24, 1994 and the symbols and codes used by Engineers and Architects for automated drafting purposes as a secondary source.

Delivery of CAD Files (Re: Consultants)

CAD files must be provided for all projects. The following guidelines must be followed for acceptable delivery of CAD files to the Region of Queens Municipality.

Delivery Media:

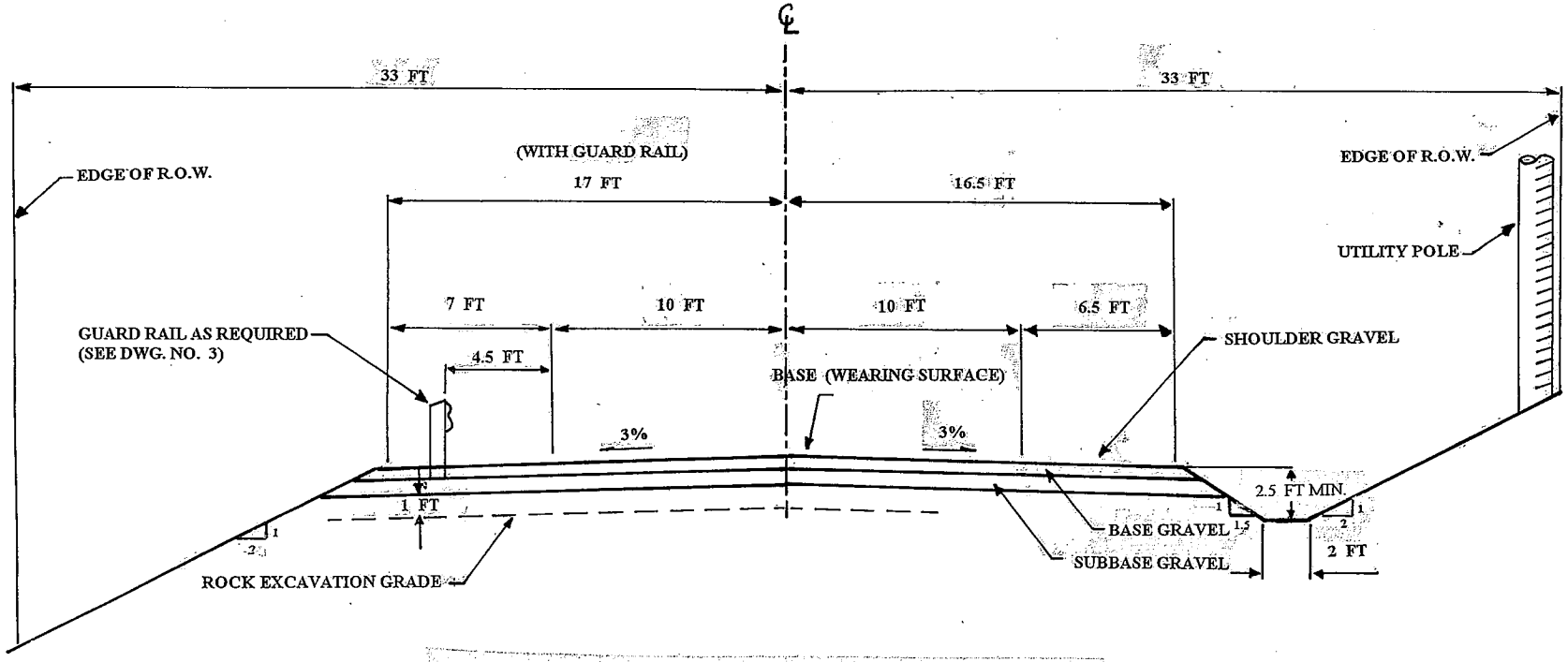
(a) 3.5" High Density Disk
(b) 4mm Digital Tape
(c) CD ROM

Format:

(a) AUTOCAD DXF., or
(b) MAPINFO Format

Any files that require compression must be supplied with extraction utility and labelled as compressed. Files which have been backed up must be supplied with necessary information for restoring files.

Complete documentation will be supplied which includes file names, descriptions of files, size of files, and other information which may assist. Where information relating to attributes, such as: source, accuracy, collection method and party who collected data.



COURSE	LOCATION	MATERIAL	THICKNESS (in.)
	All Areas	Double Chip Seal	N/A
Shoulder	All Areas	Type 1S Gravel	2.5
Base (Wearing Surface)	All Areas	Type 1 Gravel	6
Subbase	All Areas	Type 2 Gravel	8
Subgrade	All Areas	As Approved	Varies

NOTES:

1. ALL DIMENSIONS ARE IN FEET.

2. DRAWING IS NOT TO SCALE.

3. SOILS WITHIN DITCHES AND ON CUT AND FILL SLOPES SHALL BE PERMANENTLY STABILIZED BY HYDROSEEDING WITHIN TWO WEEKS AFTER FINAL GRADES ARE REACHED. TEMPORARY STABILIZATION MEASURES SUCH AS APPLICATION OF STRAW OR WOOD CHIPS SHALL BE USED TO PREVENT EROSION OF EXPOSED SOILS DURING CONSTRUCTION AND PRIOR TO REACHING FINISHED GRADES.

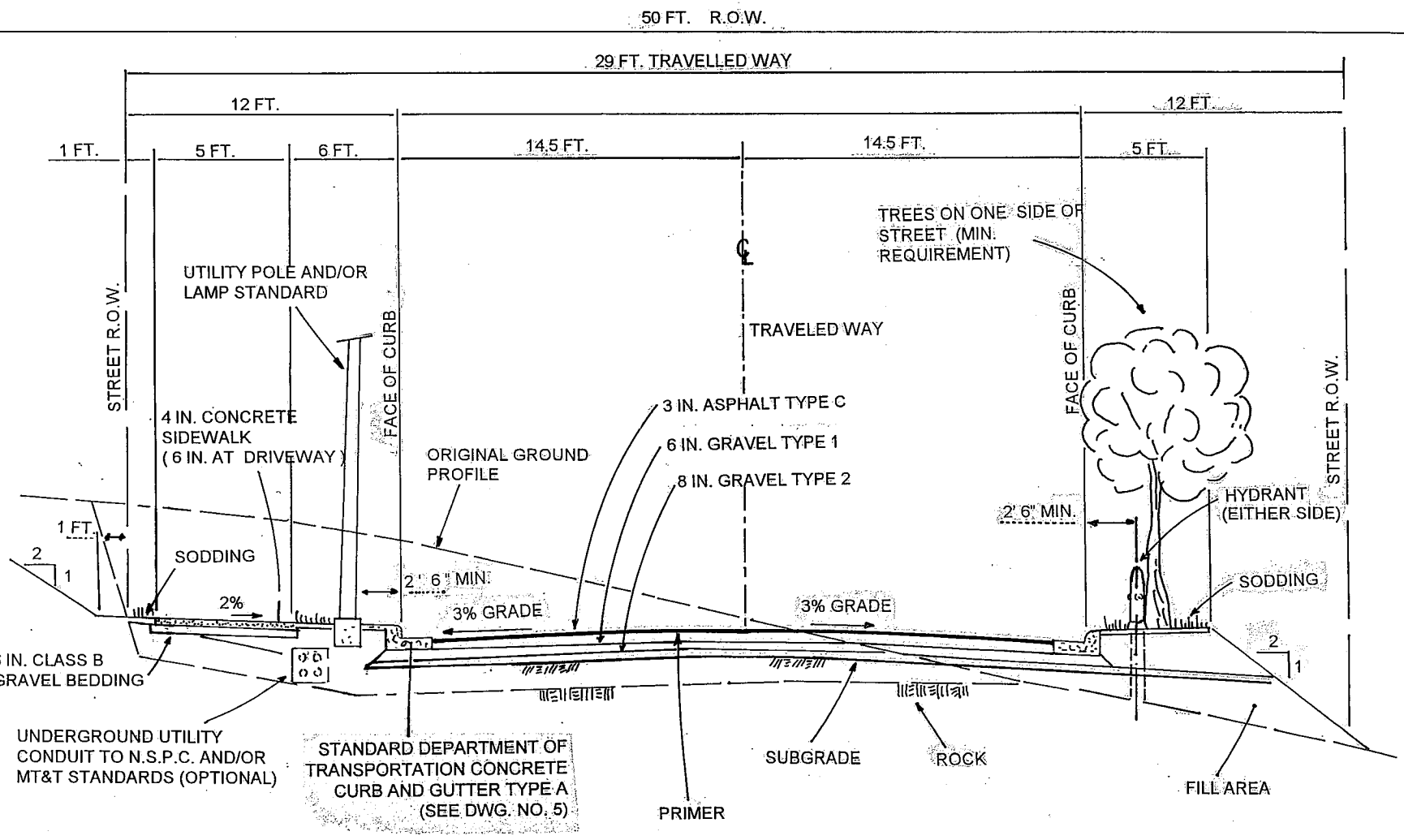
REGION OF QUEENS MUNICIPALITY

DEPT. OF ENGINEERING AND PUBLIC WORKS

TYPICAL CROSS -SECTION
PUBLIC STREET

Approved September 21 1998
Roy Turner P Eng
Municipal Engineer

Dwg: No. 1 Drawn by : J.C.



NOTES:

1. **SAND FILTER OF APPROVED DESIGN THICKNESS SHALL BE USED IF SUBGRADE IS OF CLAY MATERIAL.**
2. **ROCK TO BE EXCAVATED TO A DEPTH OF 1 FT. BELOW SUBGRADE AND FILLED WITH APPROVED COMMON FILL.**
3. **DRAIN STREET SURFACE TO CATCHBASINS AND STORM SEWERS AS SPECIFIED.**

REGION OF QUEENS MUNICIPALITY

DEPT. OF ENGINEERING AND PUBLIC WORKS

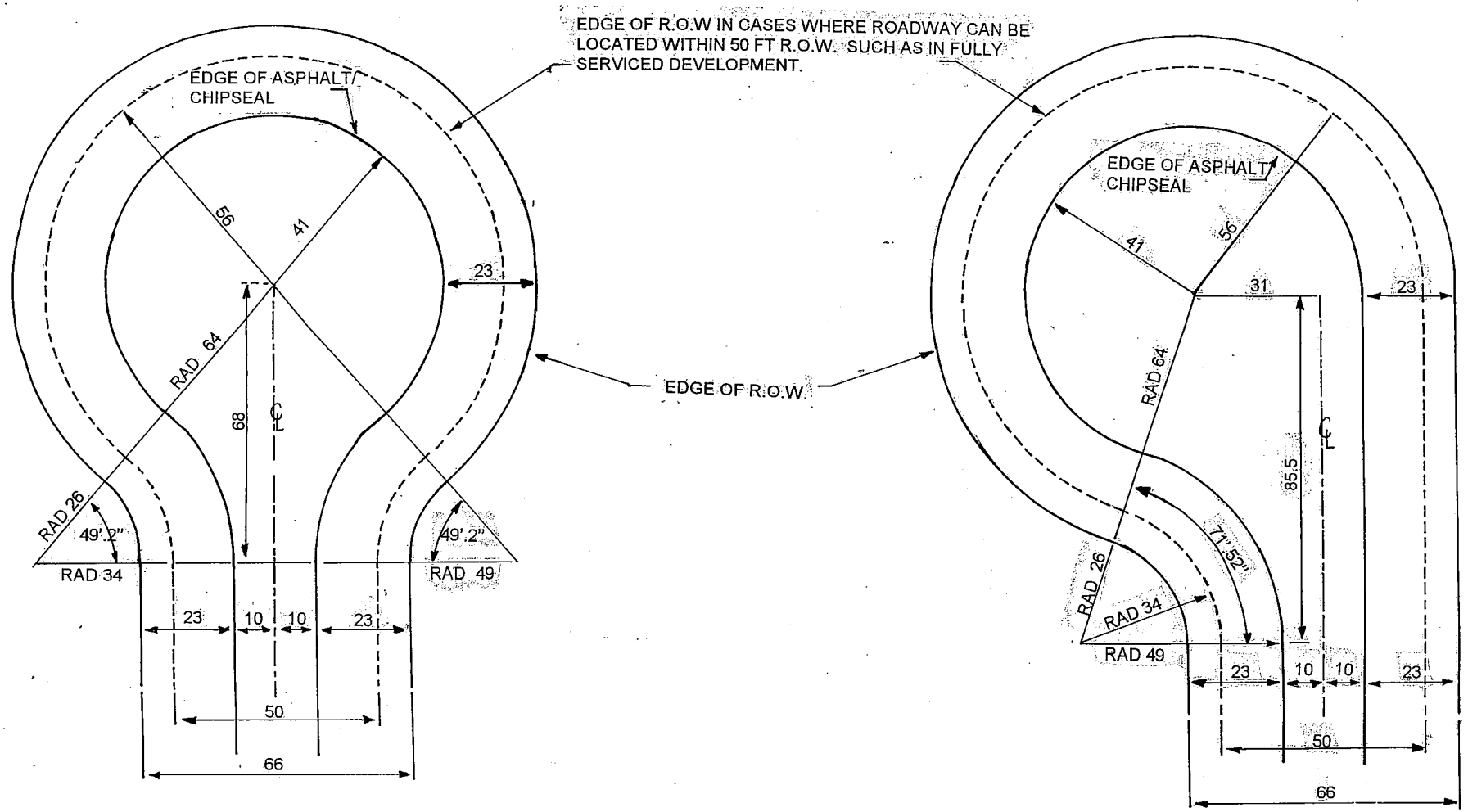
STANDARD FULLY SERVICED PUBLIC STREET CROSS SECTION

Approved September 21 19 98

Roy Turner P Eng

Municipal Engineer

Dwg: **No. 2** Drawn by : J.C.



NOTES:

1. ALL DIMENSIONS ARE IN FEET.
2. DRAWING NOT SCALE

REGION OF QUEENS MUNICIPALITY

DEPT. OF ENGINEERING AND PUBLIC WORKS

CUL-DE-SAC LAYOUT

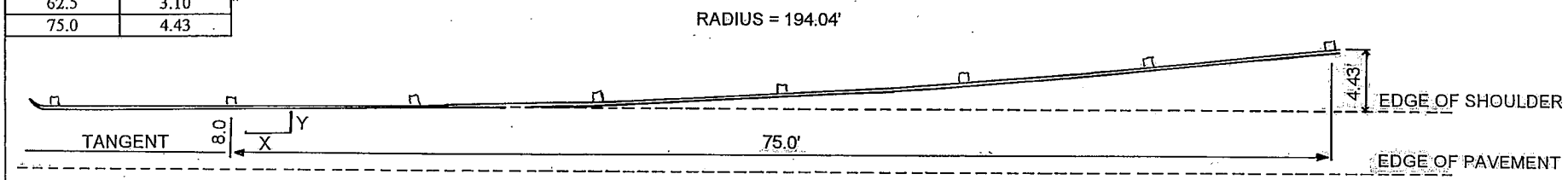
Approved September 21 19 98

Roy Turner PEng

Municipal Engineer

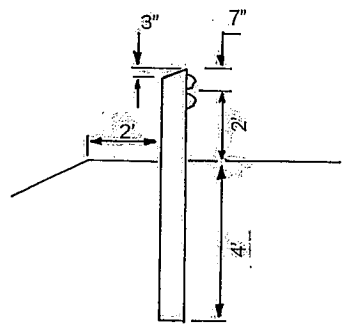
Dwg: No. 3 Drawn by : J.C.

POST OFFSET TABLE	
FILL OR CUT (FEET)	
X	Y
12.5	0.13
25.0	0.49
37.5	1.12
50.0	1.97
62.5	3.10
75.0	4.43

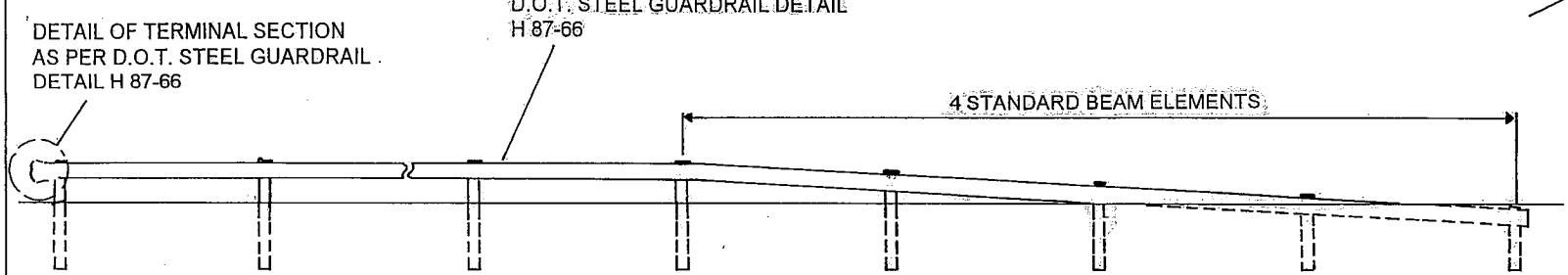


DIRECTION OF TRAVEL

PLAN - FILL OR CUT



POST DETAIL



ELEVATION

NOTES:

1. ALL DIMENSIONS ARE IN IMPERIAL.
2. ALL LATERAL DIMENSIONS MEASURED FROM FACE OF RAIL.
3. GUARDRAIL MAY BE PLACED AS PRACTICAL FROM EDGE OF SHOULDER. IN NO CASE MAY GUIDE RAIL BE PLACED DOWN THE SLOPE.
4. ALL BOLTS, NUTS, AND WASHERS SHALL BE GALVANIZED BY THE HOT DIP PROCESS. POST BOLTS MUST BE CAPABLE OF WITHSTANDING 106 kN IN SINGLE SHEER. 16mm SQUARE NUTS AND 19mm ROUND WASHERS ARE TO BE USED: ONE WASHER FOR EACH 240 mm = 16mm BOLT.
5. SPLICE DETAIL IN ACCORDANCE WITH D.O.T. STEEL GUARDRAIL DETAIL H 87-66.

REGION OF QUEENS MUNICIPALITY

DEPT. OF ENGINEERING AND PUBLIC WORKS

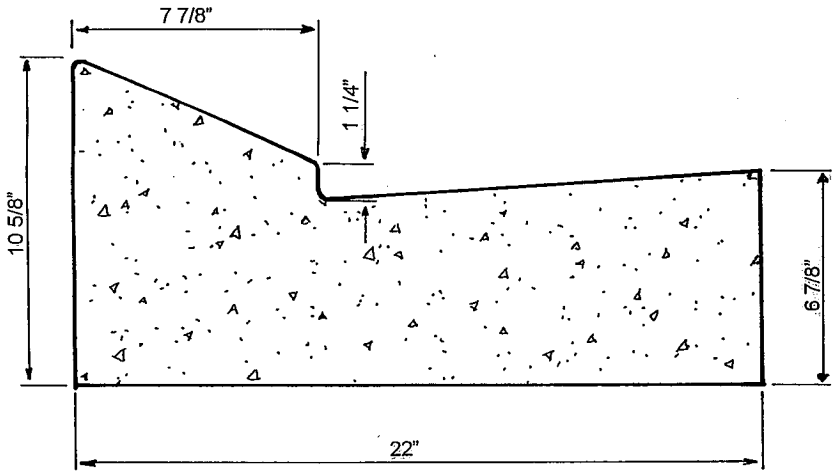
STEEL GUARDRAIL DETAIL
SUBDIVISION ROADS

Approved September 21 19 98

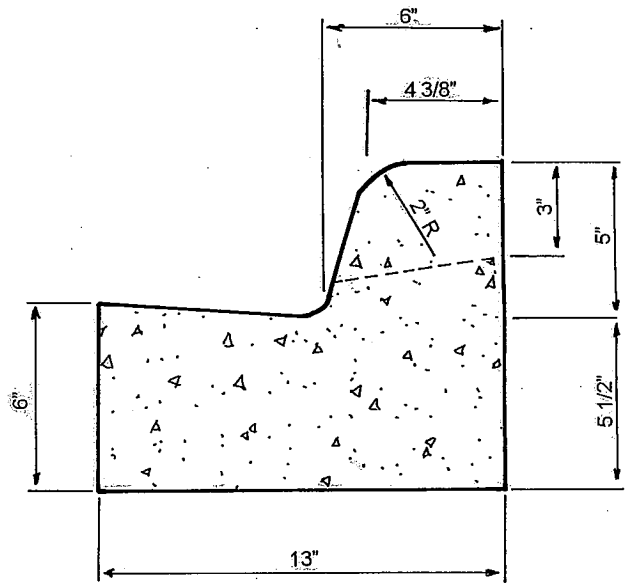
Roy Turner P Eng

Municipal Engineer

Dwg: No. 4 Drawn by : J.C.



MOUNTABLE CURB AND GUTTER
N.T.S.



CURB AND GUTTER
(N.S.D.O.T. TYPE A) N.T.S.

NOTES:

1. CURBS AND CURB AND GUTTER SHALL BE PLACED ON AN APPROVED GRANULAR BASE HAVING A MINIMUM DEPTH OF 6 INCHES.
2. EXPOSED EDGES SHALL BE FINISHED WITH A ROUNDED TOOL TO PRODUCE A 1" RADIUS OR AS SHOWN.

REGION OF QUEENS MUNICIPALITY

DEPT. OF ENGINEERING AND PUBLIC WORKS

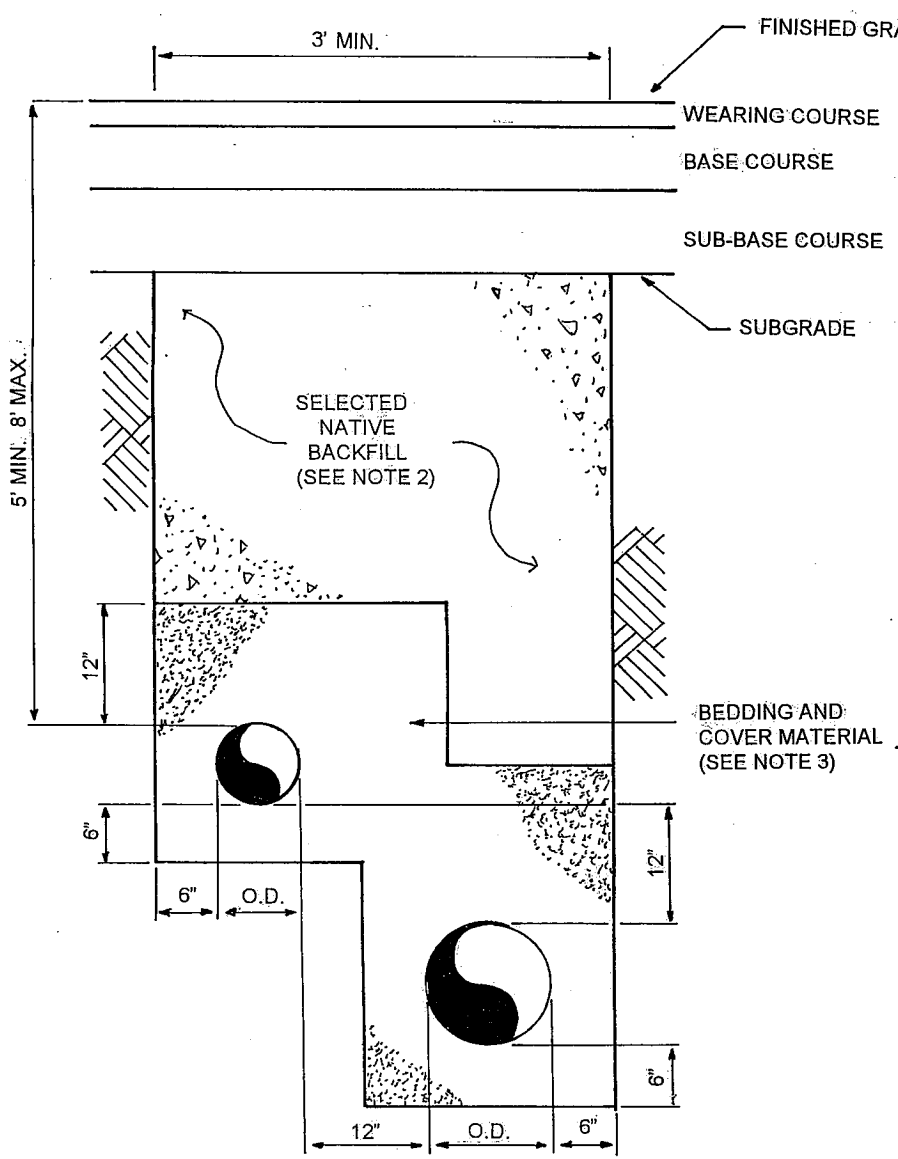
CONCRETE CURB DETAIL

Approved September 21 19 98

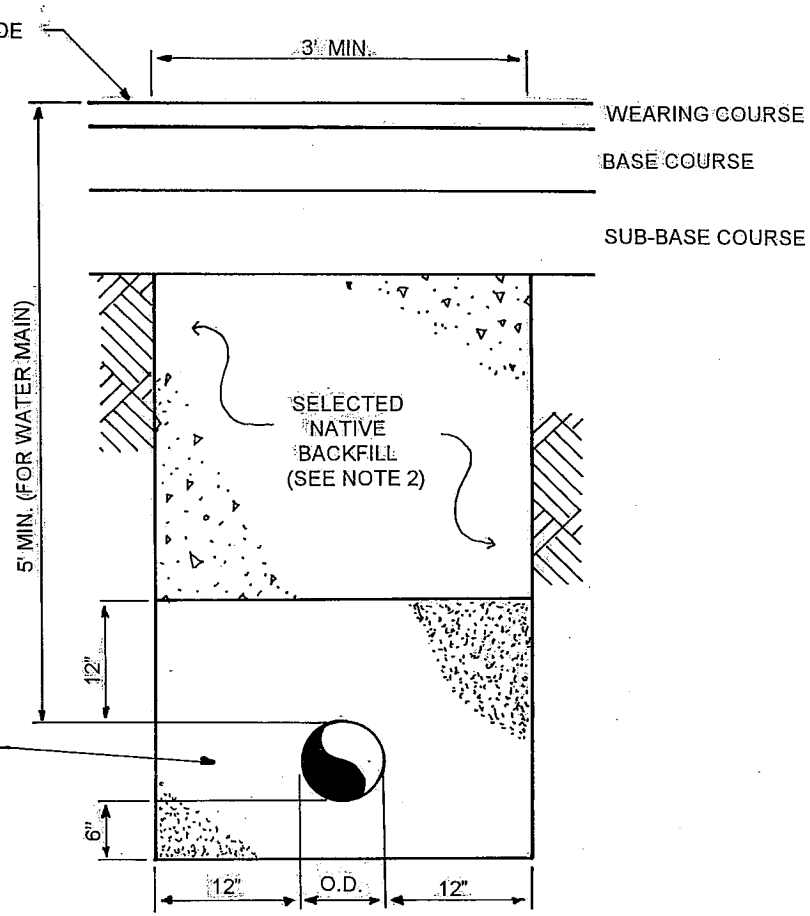
Roy Turner P Eng

Municipal Engineer

Dwg: No. 5 Drawn by : J.C.



WATER AND SEWER IN SAME TRENCH
N.T.S.



SINGLE PIPE IN TRENCH
N.T.S.

NOTES:

1. **ALL DIMENSIONS ARE IN IMPERIAL**
2. **COMPACT SELECTED NATIVE BACKFILL TO 95% STANDARD PROTOR. COMPACT TOP 12" TO 98% STANDARD PROCTOR.**
3. **COMPACT BEDDING AND COVER MATERIAL TO 95% STANDARD PROCTOR**

REGION OF QUEENS MUNICIPALITY

DEPT. OF ENGINEERING AND PUBLIC WORKS

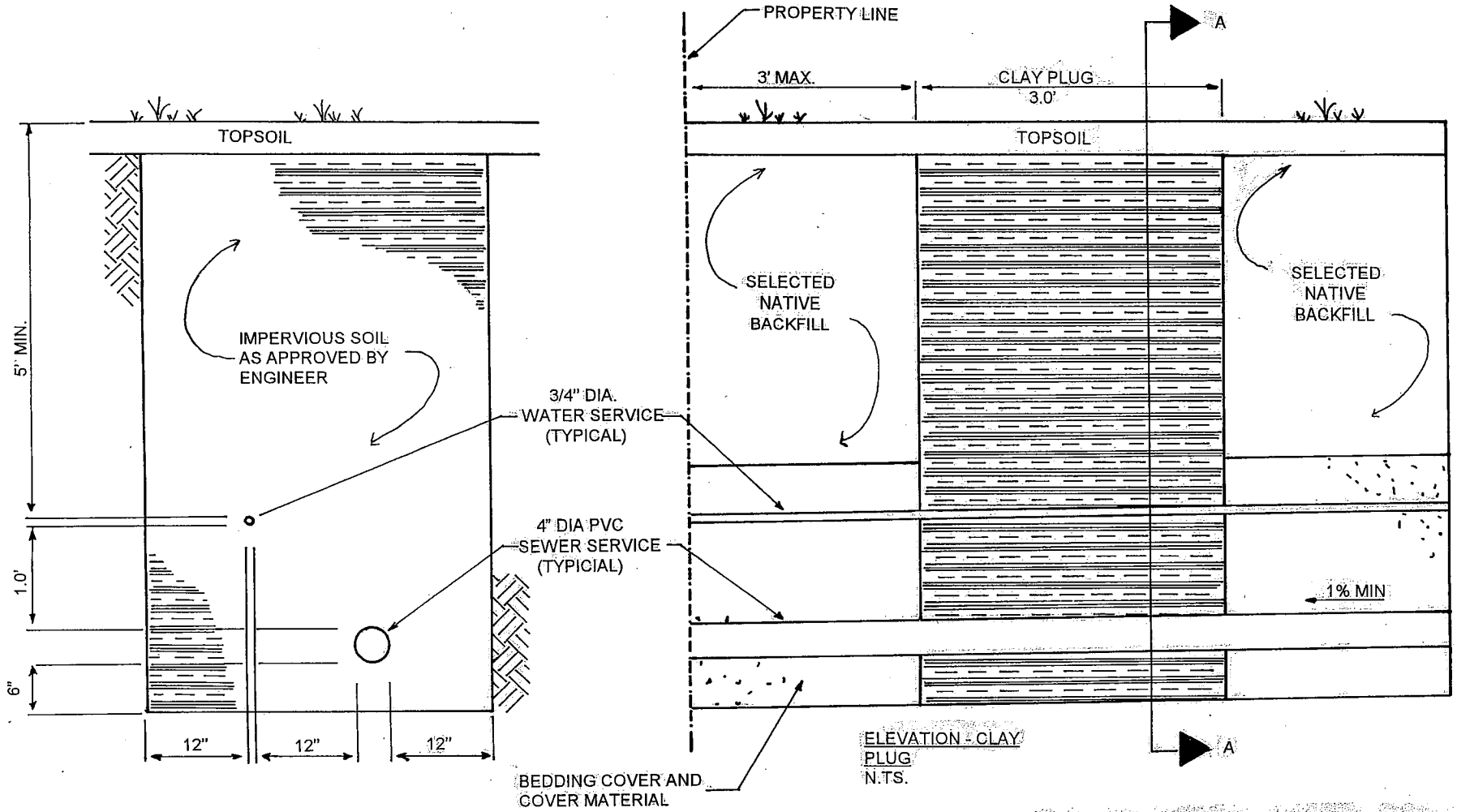
TRENCH DETAILS

Approved September 21 19 98

Roy Turner P Eng

Municipal Engineer

Dwg: No. 6 Drawn by : J.C.



SECTION A-A
N.TS.

ELEVATION - CLAY
PLUG
N.TS.

NOTES:

1. ALL DIMENSIONS ARE IN IMPERIAL SCALE.
2. WHERE NO WATER SERVICE IS TO BE INSTALLED, INSTALL SEWER LATERAL A MINIMUM OF 5' BELOW DRIVEWAY OR STREET AND NOT LESS THAN 3' BELOW BOTTOM OF A DITCH.

REGION OF QUEENS MUNICIPALITY

DEPT. OF ENGINEERING AND PUBLIC WORKS

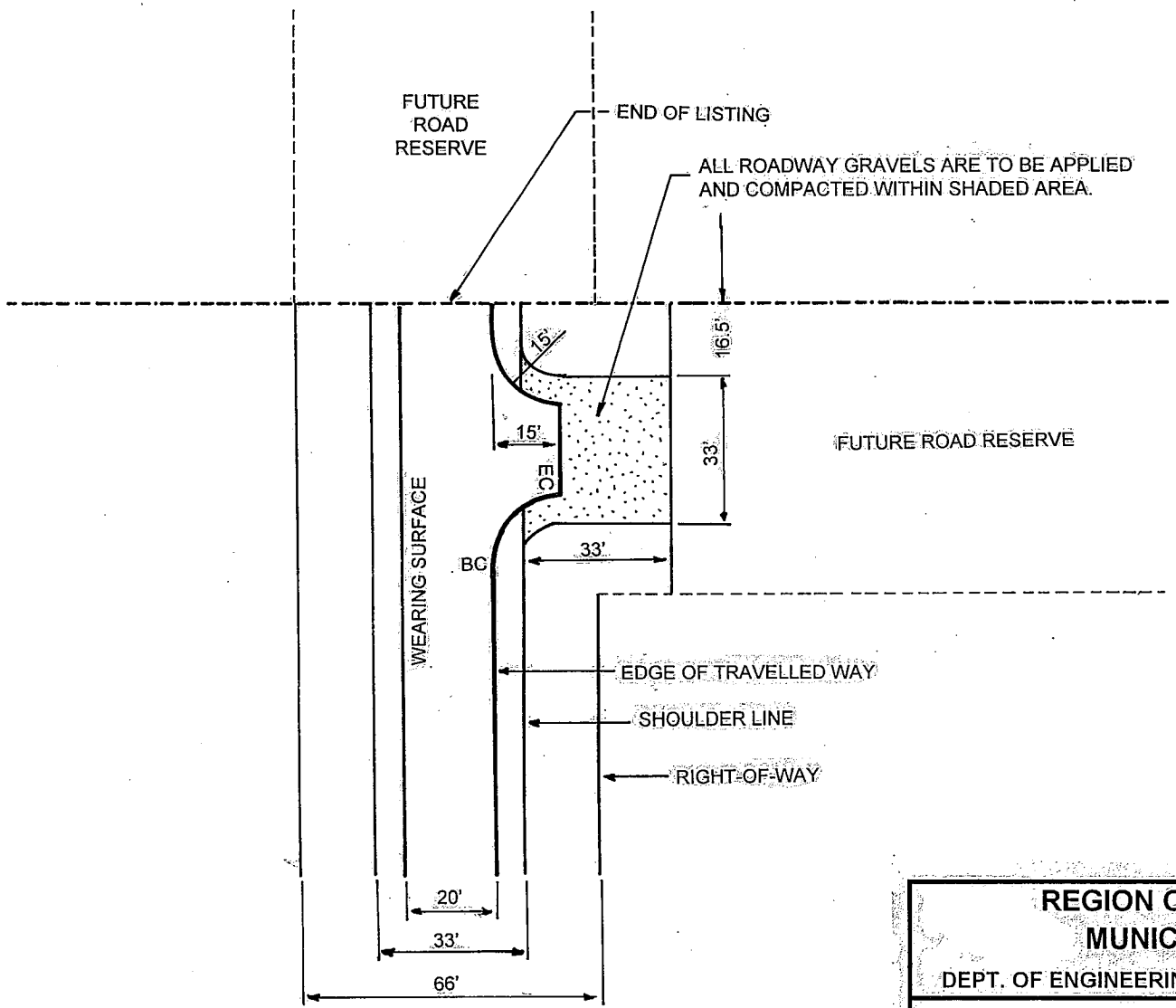
CLAY PLUG DETAIL

Approved September 21 1998

Roy Turner, P.Eng.

Municipal Engineer

Dwg: No. 7 Drawn by : J.C.



NOTES:

1. ALL DIMENSIONS ARE IN FEET.
2. DRAWING IS NOT TO SCALE.
3. IF THE DEVELOPER DOES NOT OWN THE PROPERTY BEYOND THE END OF THE LISTING, A PERMANENT CUL-DE-SAC MUST BE BUILT.

REGION OF QUEENS MUNICIPALITY

DEPT. OF ENGINEERING AND PUBLIC WORKS

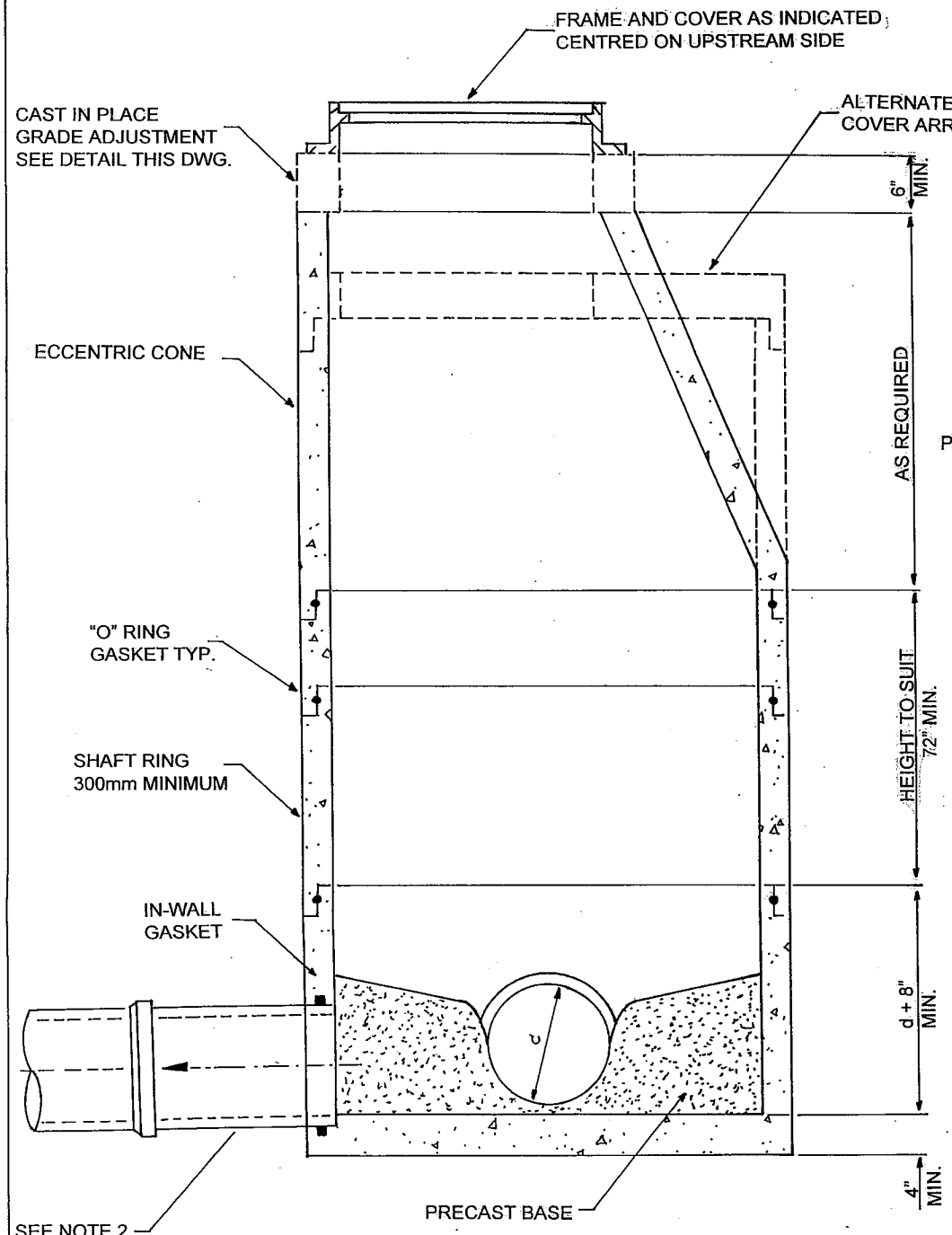
TEMPORARY TURNING AREA

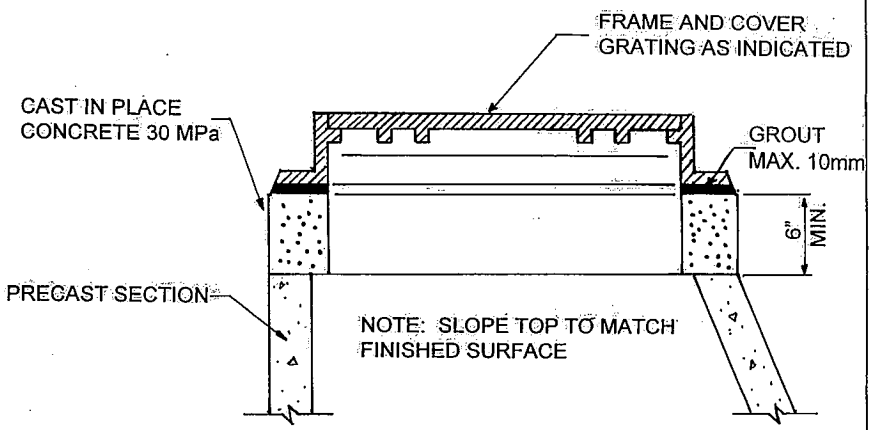
Approved September 21 1998

Roy Turner P Eng

Municipal Engineer

Dwg: No. 8 Drawn by : J.C.





NOTES:

1. SEE DETAIL DWG. 10 FOR CAST-IN-PLACE BASE CRADLE.
2. JOINT WITHIN 300mm NOT REQUIRED IF IN-WALL GASKET USED.
3. DRAWING NOT TO SCALE.

REGION OF QUEENS MUNICIPALITY

DEPT. OF ENGINEERING AND PUBLIC WORKS

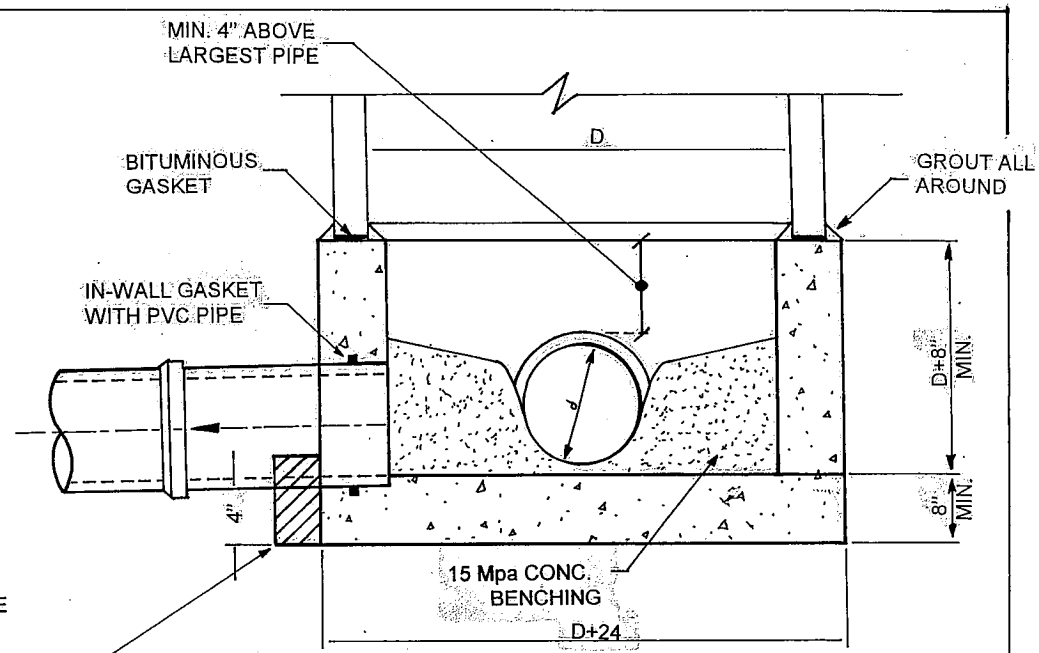
PRECAST MANHOLE

Approved September 21 19 98

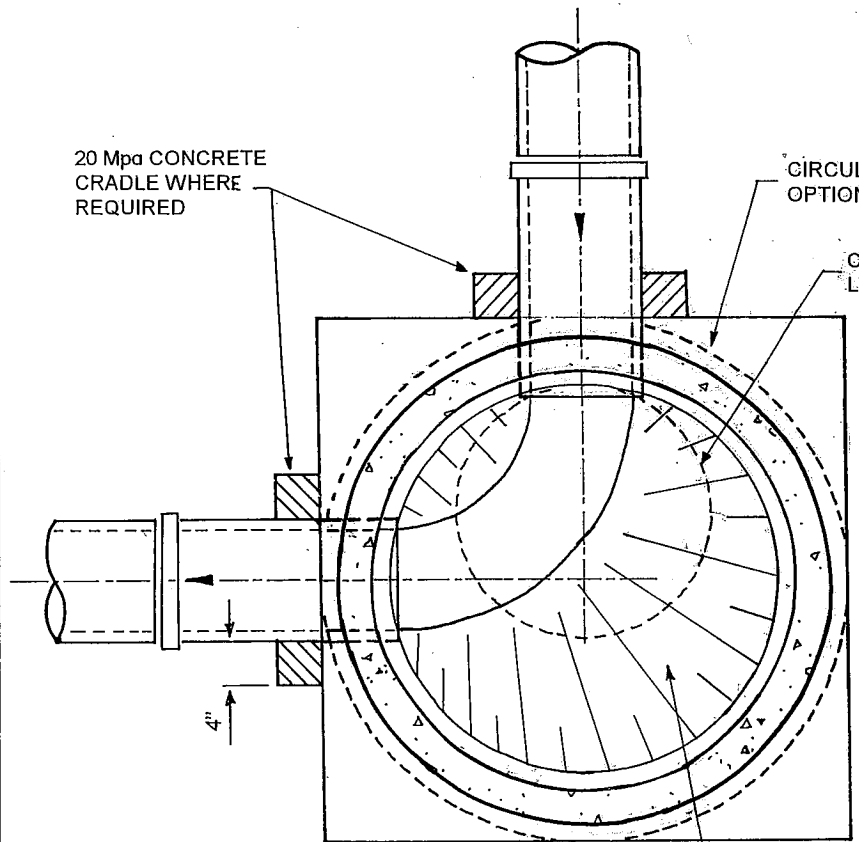
Roy Turner P Eng

Municipal Engineer

Dwg: No. 9 Drawn by : J.C.



SECTION



PLAN

WHEN PIPE STUB IS GREATER THAN 300MM FROM OUTSIDE FACE, USE CONCRETE CRADLE

NOTES:

1. DRAWING NOT SCALE

REGION OF QUEENS MUNICIPALITY

DEPT. OF ENGINEERING AND PUBLIC WORKS

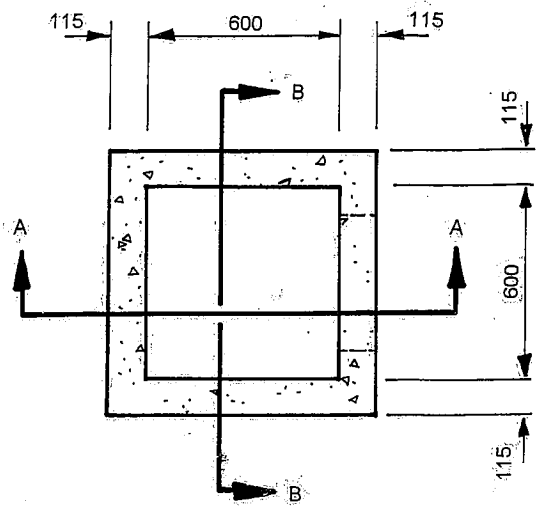
CAST-IN-PLACE BASE FOR PRECAST MANHOLE

Approved September 21 1998

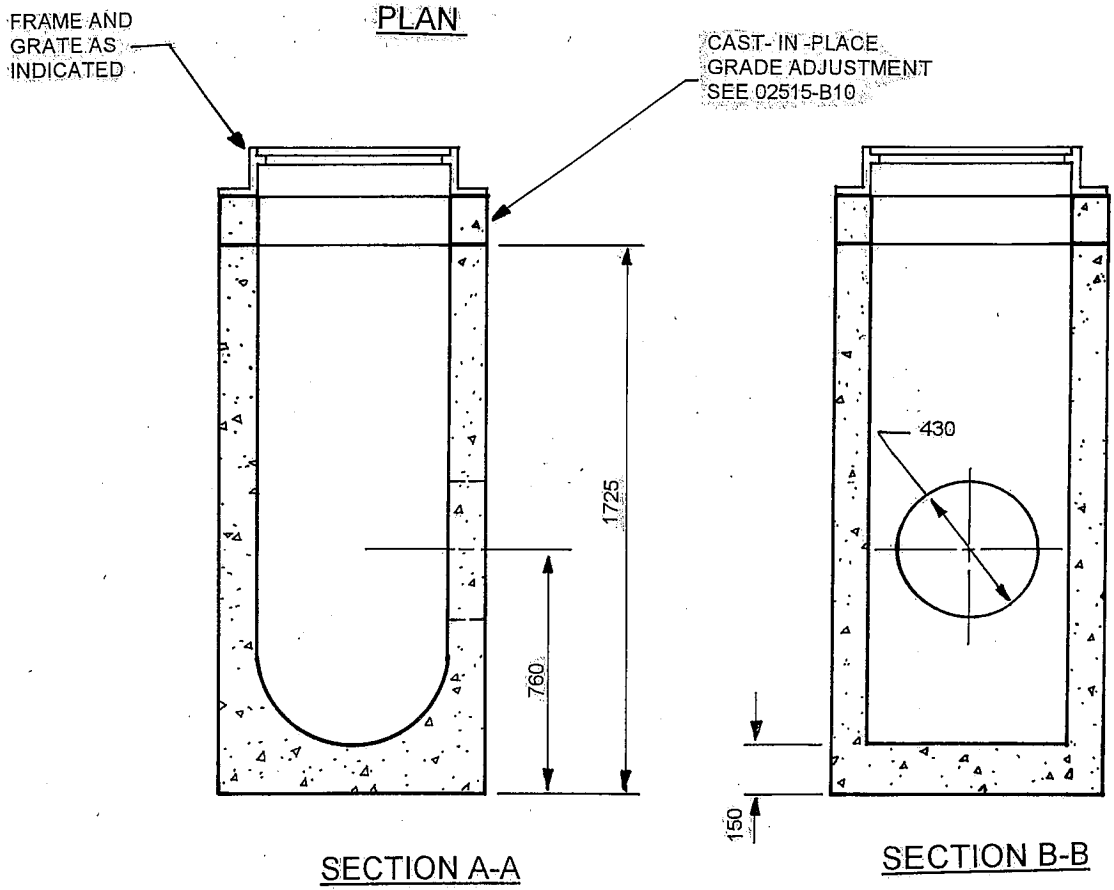
R. Roy Fraser P.Eng

Municipal Engineer

Dwg: No. 10 Drawn by : J.C.



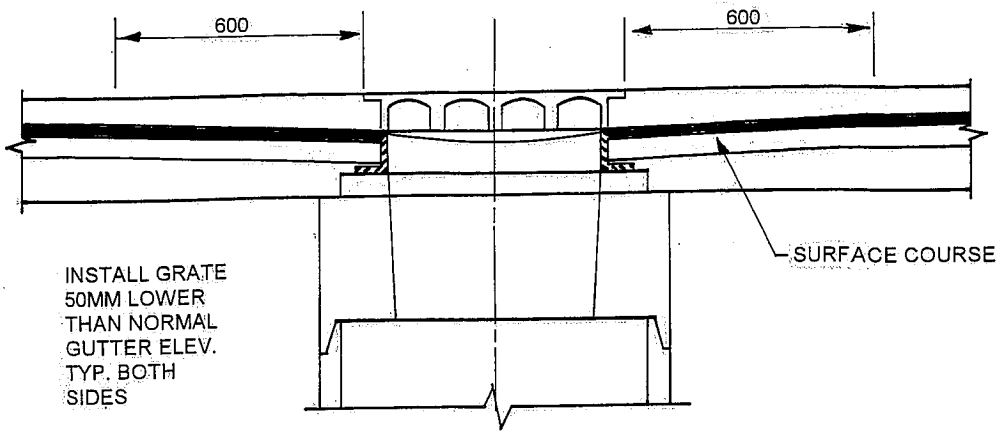
PLAN



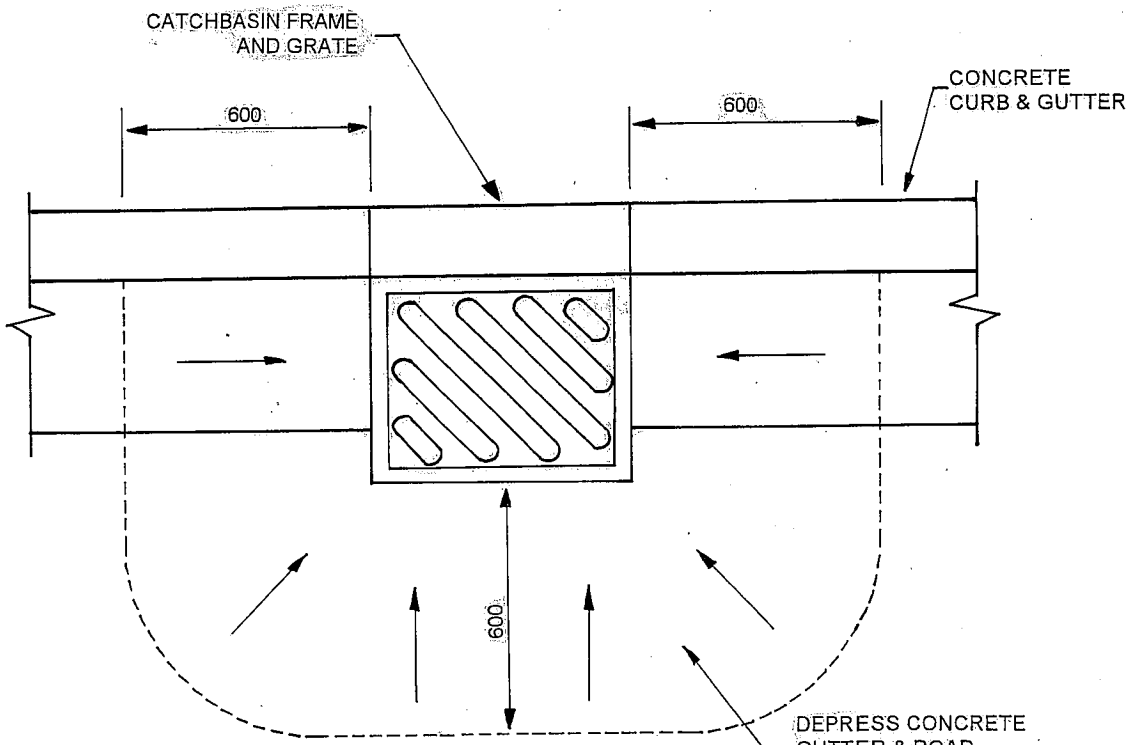
SECTION A-A

SECTION B-B

REGION OF QUEENS MUNICIPALITY DEPT. OF ENGINEERING AND PUBLIC WORKS	
600 SQ. PRECAST CATCHBASIN	
Approved September 21 1998 Roy Turner P Eng Municipal Engineer	
Dwg: No. 11	Drawn by : J.C.

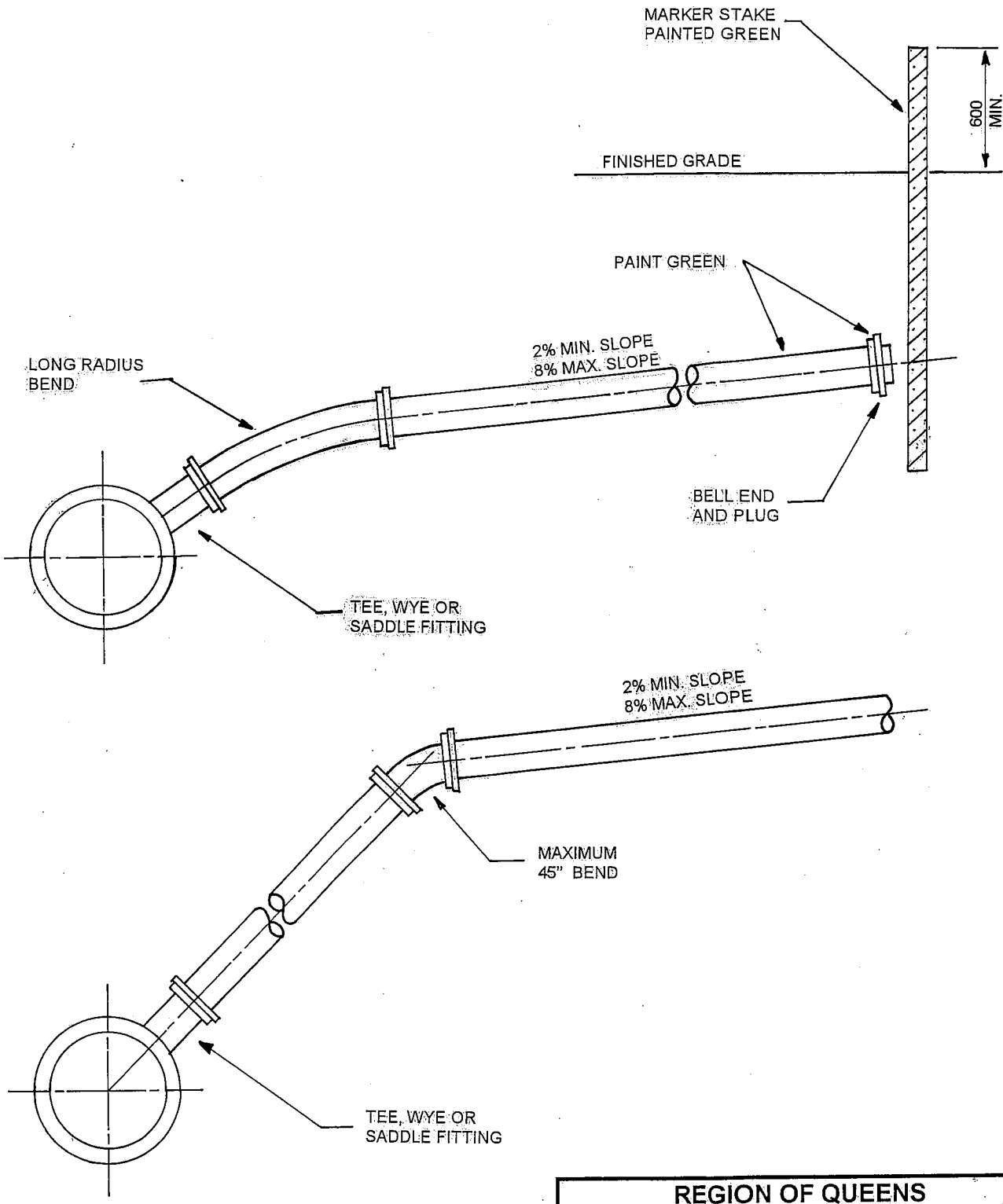


SECTION



PLAN

REGION OF QUEENS MUNICIPALITY
DEPT. OF ENGINEERING AND PUBLIC WORKS
ASPHALT DEPRESSION AT CATCHBASIN
Approved September 21 19 98 Roy Turner PEng Municipal Engineer
Dwg: No. 12 Drawn by : J.C.



CONNECTION TO DEEP SEWER

REGION OF QUEENS MUNICIPALITY

DEPT. OF ENGINEERING AND PUBLIC WORKS

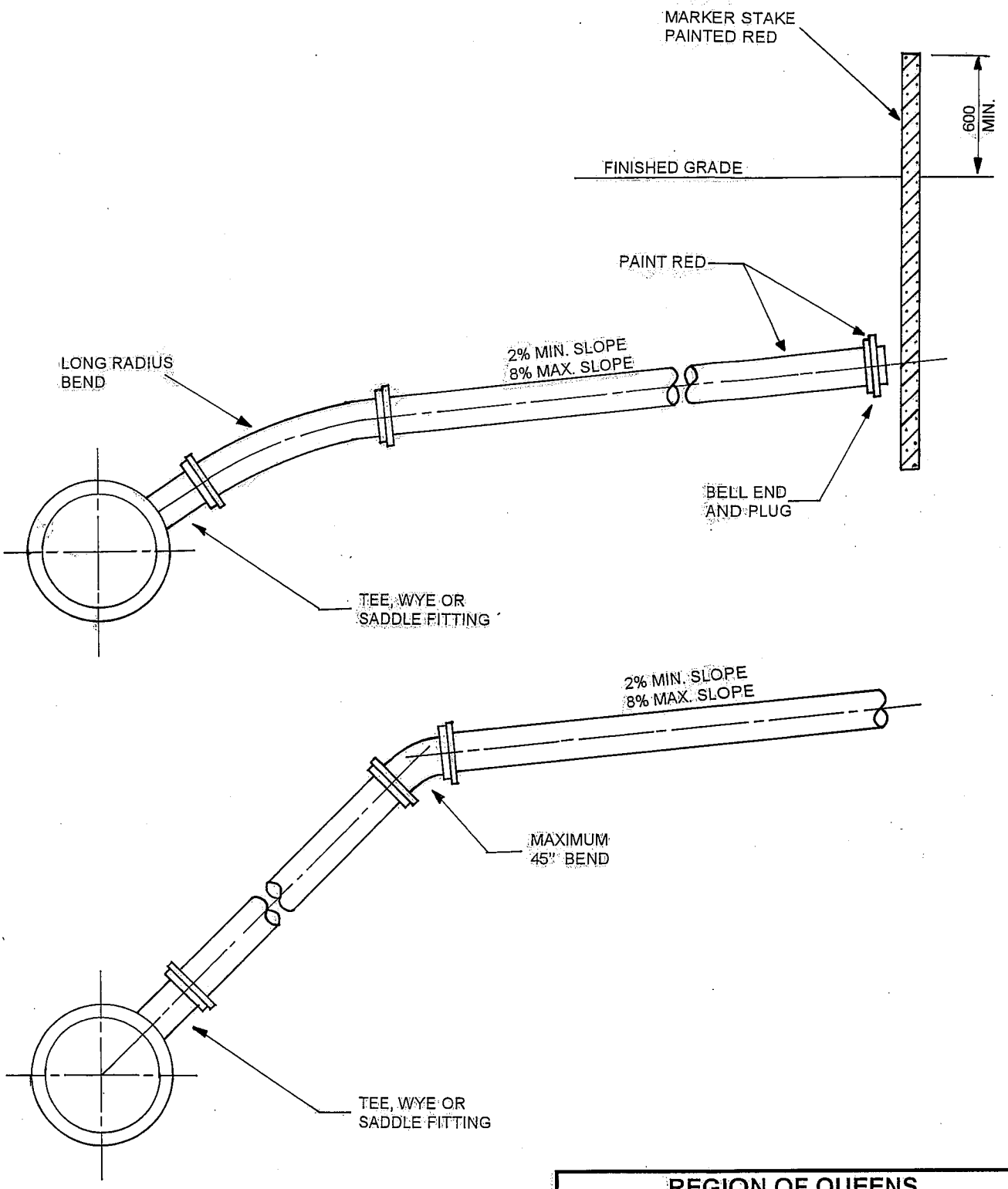
STORM SEWER SERVICE CONNECTION

Approved September 21 19 98

Roy Turner P Eng

Municipal Engineer

Dwg: No. 13 Drawn by : J.C.



CONNECTION TO DEEP SEWER

REGION OF QUEENS MUNICIPALITY

DEPT. OF ENGINEERING AND PUBLIC WORKS

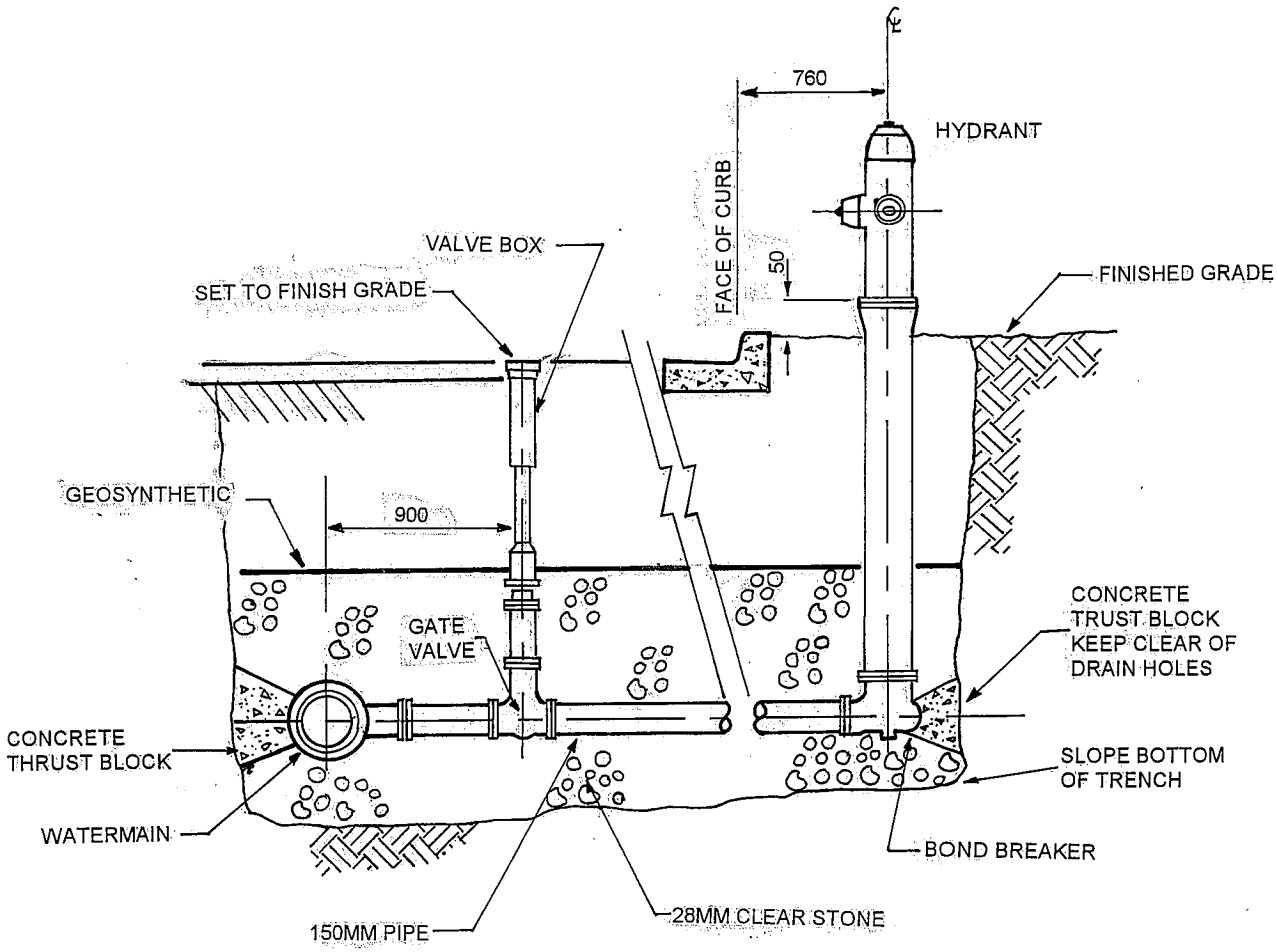
SANITARY SEWER SERVICE CONNECTION

Approved September 21 19 98

Roy Turner P.Eng

Municipal Engineer

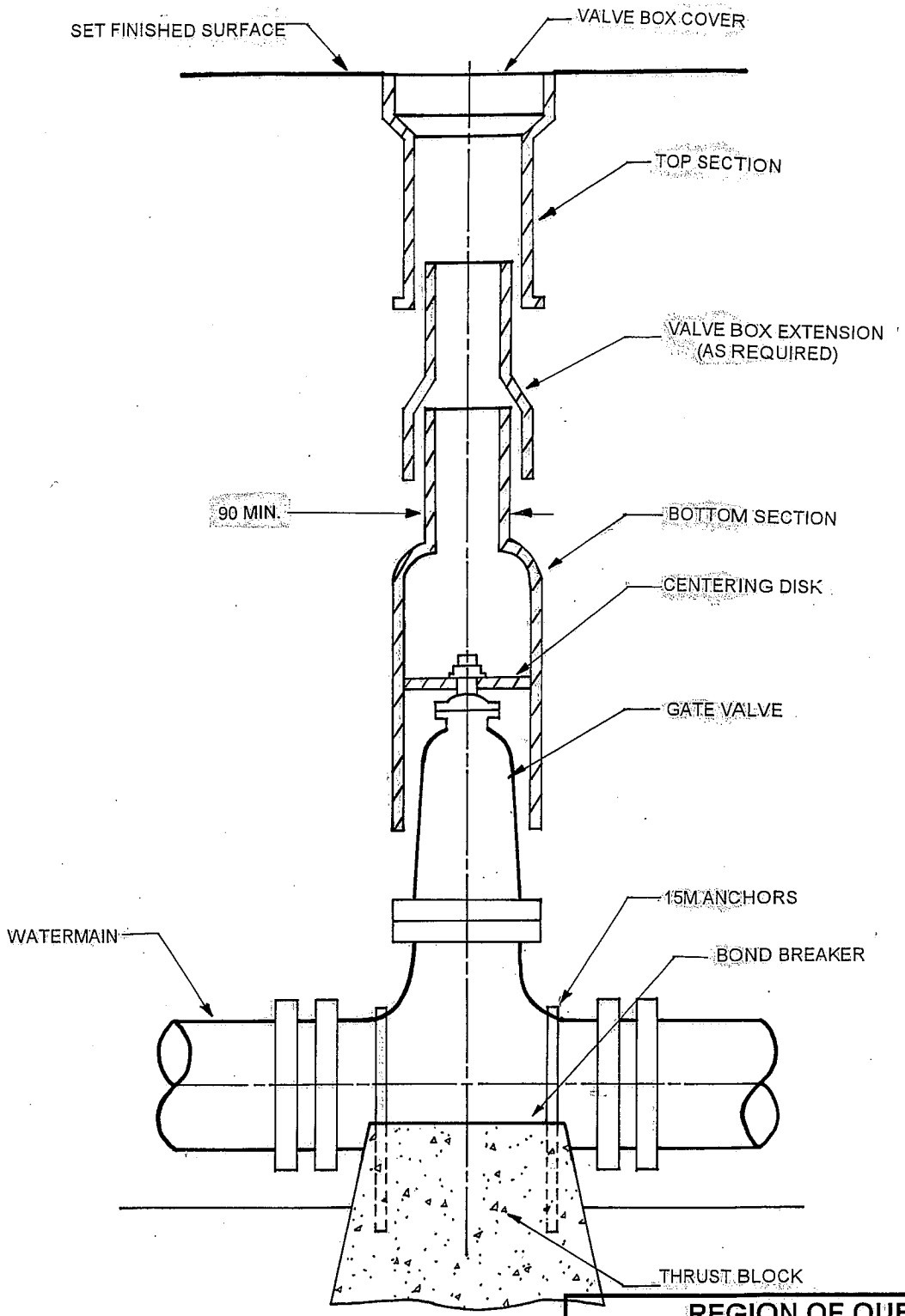
Dwg: No. 14 Drawn by : J.C.



NOTE:

1. SEE 02518-E4 AND 02518-E5 FOR THRUST BLOCKS.

REGION OF QUEENS MUNICIPALITY DEPT. OF ENGINEERING AND PUBLIC WORKS	
STANDARD *FIRE HYDRANT*	
Approved September 21 19 98 Roy Turner PEng Municipal Engineer	
Dwg: No. 15	Drawn by : J.C.



NOTE:

THRUST ANCHOR ONLY REQUIRED FOR POLYETHYLENE AND PVC PIPE GREATER THAN 150 MM.

REGION OF QUEENS MUNICIPALITY

DEPT. OF ENGINEERING AND PUBLIC WORKS

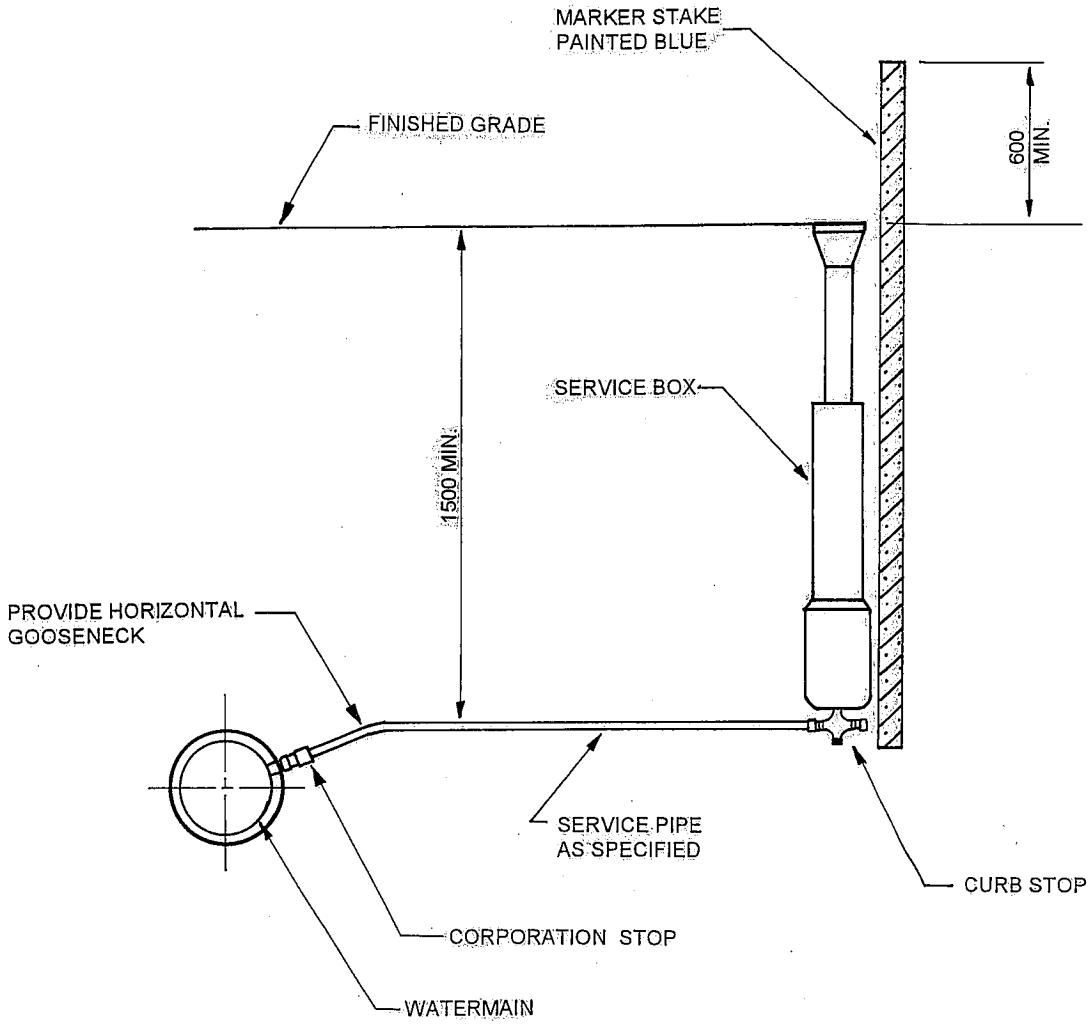
GATE VALVE AND VALVE BOX

Approved September 21 19 98

Roy Turner P Eng

Municipal Engineer

Dwg: No. 16 Drawn by : J.C.



REGION OF QUEENS MUNICIPALITY

DEPT. OF ENGINEERING AND PUBLIC WORKS

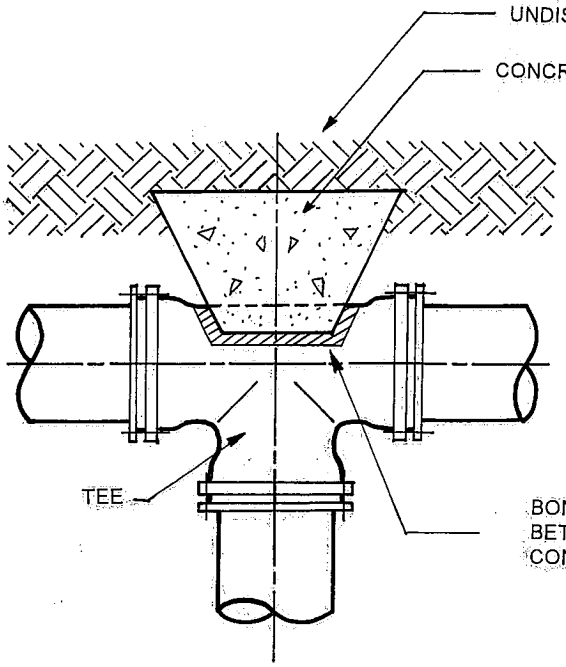
RESIDENTIAL/COMMERCIAL WATER SERVICE CONNECTION

Approved September 21 1998

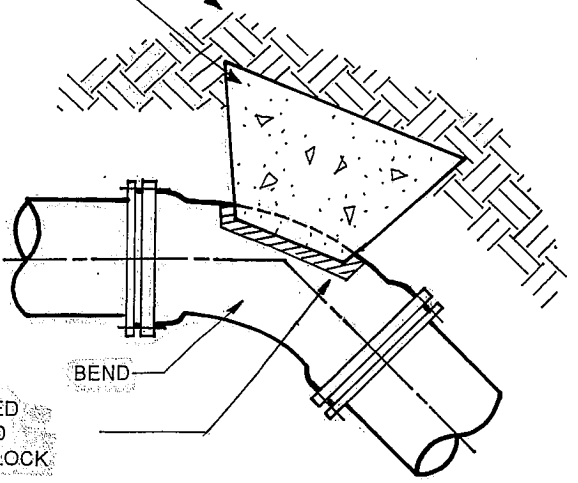
Roy Turner P Eng

Municipal Engineer

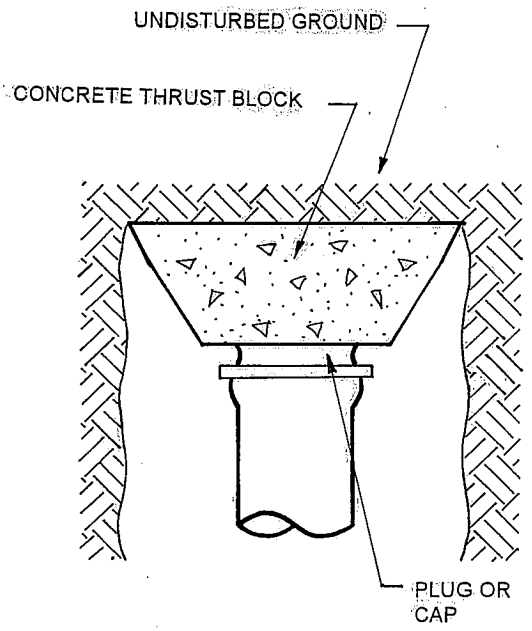
Dwg: No. 17 Drawn by : J.C.



TEE



HORIZONTAL BENDS



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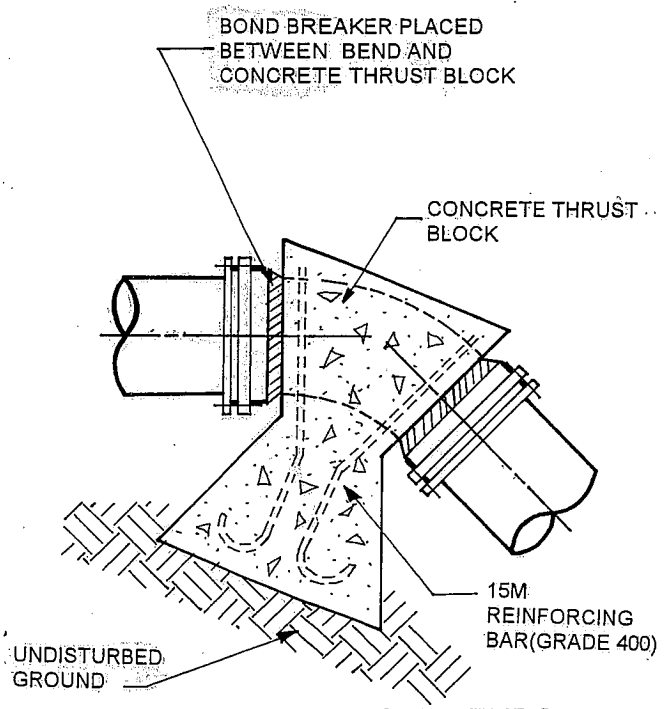


VERTICAL BENDS

NOTE: SEE 02518-E5 FOR THRUST BLOCK REQUIREMENTS

REGION OF QUEENS MUNICIPALITY

DEPT. OF ENGINEERING AND PUBLIC WORKS

THRUST BLOCK DETAILS

Approved September 21 19 98

Roy Turner P Eng

Municipal Engineer

Dwg: No. 18 Drawn by : J.C.

MINIMUM CONTRACT AREAS FOR CONCRETE THRUST BLOCKS

PIPE DIA.	AREA, M²FOR SOIL SUPPORTING CAPACITY OF 100 kPa					
MM	CAP/ PLUG	TEE	90°BEND	45°BEND	22.5°BEND	11.25°BEND
100	0.25	0.25	0.32	0.20	0.16	0.16
150	0.48	0.48	0.64	0.40	1.24	0.16
200	0.80	0.80	1.12	0.64	0.34	0.16
250	1.28	1.28	1.76	0.96	0.48	0.24
300	1.76	1.76	2.56	1.44	0.72	0.40

MINIMUM DISTANCE FROM FITTING TO UNDISTURBED GROUND

PIPE DIAMETER,MM	MM
100	450
150	450
200	450
250	600
300	750

VERTICAL THRUST BLOCKS
THRUST COMPENSATION FOR BY MASS OF CONCRETE (M³)

PIPE DIA. MM	45° BEND	22.5° BEND	11.25° BEND
100	0.40	0.20	0.20
150	0.80	0.40	1.40
200	1.40	0.70	0.70
250	2.10	1.10	1.10
300	3.00	1.50	1.50

NOTES:

1. SEE 02518-E4 FOR THRUST BLOCKS CONFIGURATIONS.

2. THESE TABLES ARE BASED ON SOIL SUPPORTING CAPACITIES OF 100kPa AND AN INTERNAL PIPE PRESSURE OF 1035 kPa. WHERE DIFFERENT SUPPORTING CAPACITIES OR INTERNAL PRESSURES ARE ENCOUNTERED, CONTACT AREAS SHOULD BE CALCULATED ACCORDINGLY. SAFE SUPPORTING CAPACITY SHOULD BE DETERMINED BY THE DESIGN ENGINEER, AND SHOULD INCLUDE AN APPROPRIATE FACTOR OF SAFETY.

REGION OF QUEENS MUNICIPALITY

DEPT. OF ENGINEERING AND PUBLIC WORKS

THRUST BLOCK REQUIREMENTS

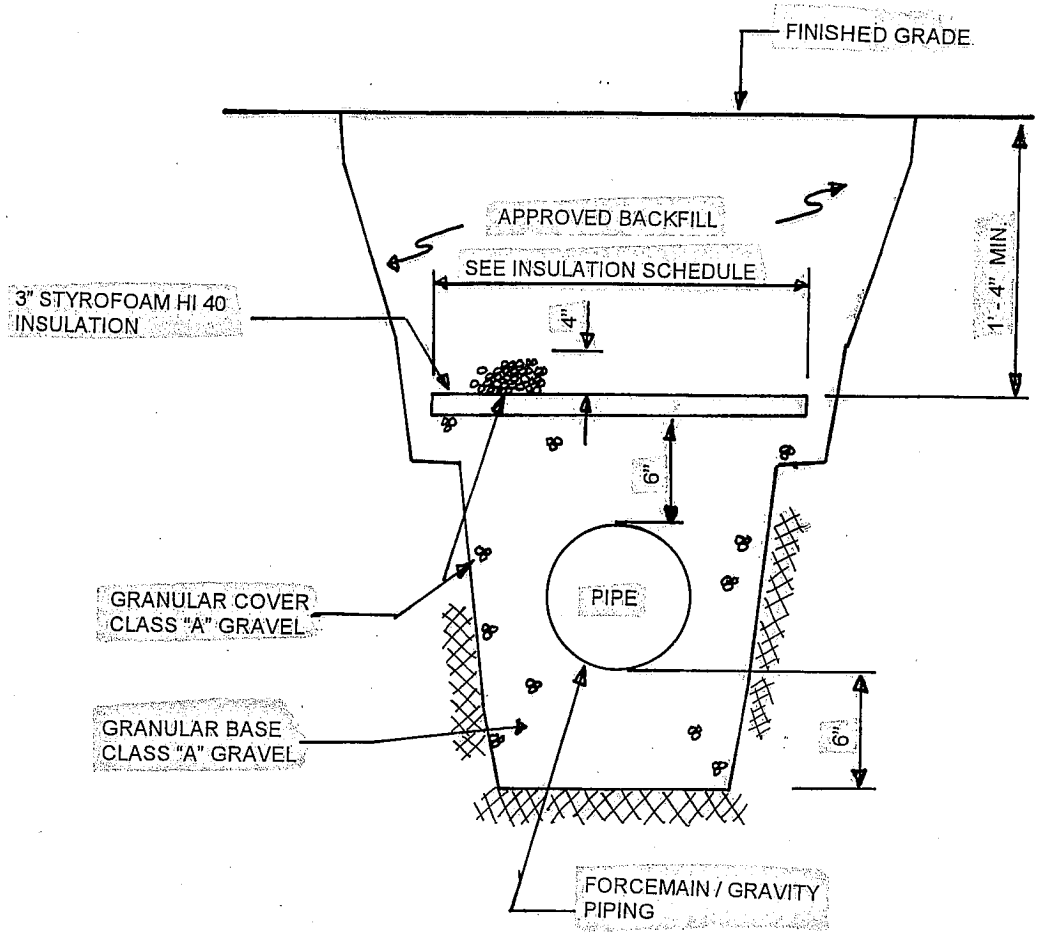
Approved September 21 19 98

Roy Turner P Eng

Municipal Engineer

Dwg: No. 19 Drawn by : J.C.

INSULATION SCHEDULE	
DEPTH TO PIPE	WIDTH OF INSULATION
2' - 0"	5' - 0"
3'- 0 "	4' - 0" (MIN.)



INSULATION DETAIL

REGION OF QUEENS MUNICIPALITY

DEPT. OF ENGINEERING AND PUBLIC WORKS

WATERMAIN & SERVICE PIPE INSULATION FOR SHALLOW BURIAL

Approved September 21/19 98

Roy Turner PEng

Municipal Engineer

Dwg: No. 20 Drawn by : J.C.

APPENDIX 'A'

STANDARD STANDBY LETTER OF CREDIT

LETTER OF CREDIT

NAME OF BANK:_____ Date Issued: _____

Branch: _____

Letter of Credit No. _____Amount: _____

Issued subject to the Uniform Customs and Practices for Documentary Credits being ICC Publication UCP 500.

TO: The Region of Queens Municipality (The Municipality)

ADDRESS: 249 White Point Road
P.O. Box 1264
Liverpool, Nova Scotia
B0T 1K0

WE HEREBY AUTHORIZE YOU TO DRAW ON THE

_____
(Name of Bank), being a Schedule 1 or Schedule 2 chartered bank
for the account of _____
(Name of Customer)

UP TO AN AGGREGATE AMOUNT OF _____
Dollars ($ _____) available on demand.

PURSUANT TO THE REQUEST OF OUR CUSTOMER: _____
we the _____
(Name of Bank)

hereby establish and give you an irrevocable Letter of Credit in your favour in the above amount which may be drawn on by you at any time and from time to time, upon written demand for payment made upon us by you which demand we shall honour without enquiring whether you have the right as between yourself and the said Customer to make such demand, and without recognizing any claim of our said Customer, or objection by it to payment by us.

DEMAND shall be by way of a Letter signed by the Clerk of the Municipality under the corporate seal attached to which shall be the original Letter of Credit. Presentation shall be made to the Bank at: _____
(Address)

THE LETTER OF CREDIT, we understand, relates to those Municipal services and financial obligations set out in an Agreement between the Customer and the Municipality and referred to as: _____

_____

(Name of Project or Agreement)

THE AMOUNT of this Letter of Credit may be reduced from time to time as advised by notice, in writing, to the undersigned by the Clerk of the Municipality.

THIS LETTER OF CREDIT will continue in force for a period of one year, but shall be subject to the condition hereinafter set forth.

IT IS A CONDITION of this Letter of Credit that it shall be deemed to be automatically extended without amendment from year to year from the present or any future expiration date hereof, unless at least 30 days prior to the present or any future expiration date, we notify you in writing by registered mail that we elect not to consider this Letter of Credit to be renewable for any additional period.

DATED at _____, Nova Scotia this the _____ day of

_____, 199__.

COUNTERSIGNED BY:

_____

(NAME OF BANK)

PER: _____

(Authorized Signing Officer)

APPENDIX 'B'

STANDARD DRAINAGE EASEMENT AGREEMENT

THIS DRAINAGE EASEMENT dated this _____ day of _____, A.D., 19__ is made:

BETWEEN:

_____ of _____,
Queens County, Nova Scotia, the "Grantor"

- and -

THE REGION OF QUEENS MUNICIPALITY, a body corporate pursuant to the provisions of the Queens Regional Municipality Act, Revised Statues 1995, Chapter 295, the "Grantee"

See Note 1 **WHEREAS** the Grantor owns Lot(s) _____ in _____ Subdivision, _____, Queens County Nova Scotia; or

See Note 2 **AND WHEREAS** the Grantor owns lands immediately to the _____ of _____ Subdivision, _____, Queens County, Nova Scotia.

AND WHEREAS the Grantor has consented to the construction and maintenance of ditches under the terms of this Grant of Easement.

WITNESS THAT in consideration of the sum of ONE DOLLAR ($1.00) now paid by the Grantee to the Grantor, the receipt of which is hereby acknowledged:

See Note 3 1. The Grantor conveys to the Grantee:

a. An easement in perpetuity to enter, construct, maintain , inspect, alter and repair a storm drainage system including ditches and all appurtenances thereto, on and under a portion of the lands described in Schedule ___ annexed hereto;

b. The right at all times for the Grantee, its servants, agents, contractors and employees to enter in the lands of the Grantor with machinery, material, vehicles and equipment necessary for the repairs and maintenance of the said drainage easement.

See Note 4 2. The Grantor conveys to the Grantee:

a. An easement in perpetuity to discharge onto the adjacent lands of the Grantor as shown on the survey plan prepared by _____,

NSLS No. _____ and dated _____, 19 __, under his/her file number of _____;

b. The right at all times for the Grantee, its servants, agents, contractors and employees to enter on the lands of the Grantor with machinery, material, vehicles and equipment necessary for the repairs to and maintenance of the said drainage easement.

3. The Grantee covenants:

See Note 4

a. To fill in all excavations and as far as possible restore the surface to the same condition as prior to the commencement of construction or of any subsequent work on the easement.

b. That upon creation of new roadways upon the affected lands of the Grantor to the end that drainage from the municipal highways within _____ Subdivision can be directed into any ditching or storm sewer system within or under such new roadways on the said lands presently owned by the Grantor or others, the Grantee will upon presentation to it of a suitable form of release, relinquish its rights to the natural drainage system granted herein.

4. The easement herein is declared to be appurtenant to and exists for the benefit of municipal highways of the Grantee within _____ Subdivision, and said lands of the Grantor described in Schedule _____ hereto and referred to herein are made subject to the said easement.

Explanatory Notes:

1. Required for an Easement within the boundaries of a Subdivision.

2. Required for an Easement adjacent to a Subdivision.

3. Required for an Easement which contains a ditch, storm sewer, or other appurtenances that are to be owned and maintained by the Municipality.

4. Required for an Easement which permits the discharge of storm water runoff onto adjacent land, either over land or through a ditch that is not owned or maintained bythe Municipality.

APPENDIX 'C'

STANDARD STATUTORY DECLARATION

CANADA
PROVINCE OF NOVA SCOTIA
COUNTY OF QUEENS

IN THE MATTER OF:

A construction Contract entered into by _____ Limited, "the Contractor for the construction of:

- ☐ Highway
- ☐ Storm Sewer
- ☐ Sanitary Sewer
- ☐ Water Line

in the _____ Subdivision at _____, Queens County.

I, _____ of _____, in the County of Queens and Province of Nova Scotia, do solemnly declare:

1. **THAT** I am the ☐ President or ☐ _____ of the Contractor named in the contract above mentioned, and as such have a personal knowledge of the facts hereunder declared.

2. **THAT** no accounts due and payable by the Contractor on or before the date hereof with respect to subcontractors, labour and materials whatsoever entering into the construction of that work remain unpaid.

3. **THAT** all wages have been paid in full.

4. **THAT** all amounts owing by the Contractor for Worker's Compensation, employee's income tax deducted at source, employment insurance deducted from wages and salaries, vacation pay allowances and all other charges of whatsoever nature sue or payable by reason of the performance of that work covered by the said contract have been duly deducted and/or paid according to law.

5. **THAT** I am authorized by the Contractor to make this declaration on its behalf.

AND I make this solemn declaration conscientiously believing it to be true and knowing that it is of the same force and effect as if made under oath and by virtue of the Canada Evidence Act.

DECLARED BEFORE ME at _____,
in the County of Queens and Province of Nova Scotia
this _____ day of _____, 199__.

_____
A Barrister (Commissioner) of the
Supreme Court of Nova Scotia

_____
President or Responsible Official

APPENDIX 'D'

STANDARD ROAD MAINTENANCE AGREEMENT

This Agreement made this _____ day of _____, 199__

BETWEEN:

_____, a body corporate with Head Office at _____,in the County of _____ and Province of Nova Scotia.

"the Developer"

OR

_____ (and) _____ (both) of _____ in the County of _____ and Province of Nova Scotia.

"the Developer"

AND

The Region of Queens Municipality, a body corporate of the Province of Nova Scotia, having its chief place of business at Liverpool in the County of Queens and Province of Nova Scotia.

"the Municipality"

Whereas the Developer has applied to the Development Officer of the Municipality for final subdivision approval of lots within the Subdivision ("the Subdivision") located at _____ in the County of Queens;

And Whereas the Municipality has agreed to authorize the Development Officer to give final approval to such lots within the Subdivision upon the terms herein provided upon the Developer entering into and carrying out this Agreement;

And Whereas the Planning Act S. 99(3)(c) authorizes a subdivider to enter into a bond or other security satisfactory to Council to install and provide the streets and other services to the standards set out in the Subdivision Bylaw, which provisions are set forth in Part 5 of the Subdivision Bylaw.

Witnesses that in consideration of the premises and of the promises and undertakings herein contained the parties agree to and with one another as follows:

Street Dedication

1. The Developer will forthwith convey to the Municipality any roads, streets or highways within the Subdivision required to be so conveyed together with any required easements or rights-of-way and will simultaneously cause its solicitor to provide a certificate to the Municipality that the Developer has good title to such roads, street or highways, easements and rights-of-way free and clear of encumbrances, and that the Developer has corporate capacity and has taken all required actions to authorize the execution and delivery to the Municipality of the deed of the said roads, streets or highways, easements and rights-of-way.

Security

2. The Developer will provide to the Municipality cash, certified cheque, bond or letter of credit for street completion meeting the requirements of the Subdivision Bylaw of the Municipality and the reasonable approval of counsel acting on behalf of the Municipality.

Amount of Security

3. The amount of the security referred to in Paragraph 3 shall be 120% of the cost of construction, as estimated by the Developer's Consulting Engineer, and in any event shall be not less than $ _____.

Completion Date and Requirements

4. The Developer will within 20 days of completion of construction of the roads, streets or highways referred to herein, which completion of construction will be completed by no later than _____, 199__ ("the Completion Date"), provide to the Development Officer a certificate of a licensed Professional Engineer (Civil) that the roads, streets or highways meet all standards of the Subdivision Bylaw and the Municipal Services Specification Manual of the Municipality.

Approval by Development Officer

5. The municipality will authorize the Development Officer, subject to compliance by the Developer with all relevant matters specified in the Subdivision Bylaw other than as dealt with herein, to grant final approval to the lots within the Subdivision qualifying for approval under this Agreement.

Acceptance of Dedication

6. The Municipality will accept dedication of the roads, street or highway together with required easements and rights-of-way.

Steps on Default

7. If the Developer fails to complete the said work by the Completion Date, the Municipality through its Municipal Engineer may serve notice on the Developer, by registered mail posted at Liverpool, Nova Scotia and addressed to the Developer at _____, Nova Scotia, requiring the Developer to proceed with said work immediately.

Right to Cure

8. If the Developer fails to complete said work forthwith or within thirty days after the service of such notice, the Municipality may complete the work pursuant to the direction of the Municipal Engineer at the expense of the Developer. The cost of such work completed by the Municipality shall be certified by the Municipal Engineer and shall be done and payable by the Developer immediately upon the completion of work.

Rights on Default in Performance

9. If said sum so due and payable is not paid by the Developer to the Municipality immediately, the same may be realized out of the security held by the Municipality in respect of the work or under the terms of this agreement or any agreement collateral hereto, or may be sued for in any court of competent jurisdiction. In particular, the Municipality, after satisfying any and all costs due and payable by the Developer under this agreement, shall pay the balance remaining, if any, to the Developer, provided one year has elapsed from the date the said streets and services are finally completed. The remedies of the Municipality are cumulative and not exclusive.

Release of Security

10. Upon completion of the said work by the developer and the approval of the same by the Municipal Engineer or the Engineer appointed by the Municipality, and upon compliance with all other terms of this agreement by the Developer and payment of all sums of money owing to the Municipality under this agreement collateral hereto shall be released, provided one year has elapsed from the date of completion of the said streets and no costs for maintenance or repairs of same as provided hereunder is outstanding.

Maintenance Agreement

11. The Developer agrees to maintain and keep in good repair the streets and services to a level prescribed by the Subdivision Bylaw (which streets were constructed by the Developer and conveyed to the Municipality) for a period of one year from the date all of the said streets and all work contemplated by this agreement is finally completed and the Subdivider agrees to abide by any direction reasonably made by the Municipal Engineer regarding such maintenance and repair. This maintenance and repair obligation does not include removal of snow and ice which is the

responsibility of the Municipality.

Settlement of Disagreement

12. Should the parties hereto disagree as to whether the said work is being done or has been done in accordance with the said regulations or with due diligence, the matters in dispute shall be referred to the Municipal Engineer whose decision shall be final and binding upon the parties hereto. A certificate signed by the Municipal Engineer disclosing the Developer's failure to complete the work maintenance contemplated by this agreement shall be conclusive evidence that the Developer has breached this agreement and the Municipality therefore is entitled to realize on its security as provided herein.

Maintenance Agreement

13. The Developer will also, upon request by the Development Officer, post a maintenance bond in favour of the Municipality as contemplated by 5.4 of the Subdivision Bylaw.

Ownership

14. The Developer warrants that it is the owner in fee simple of the lands referred to herein and can give full effect to all the promises and undertakings made herein.

Benefit and Binding

15. This Agreement shall ensure for the benefit of land and be binding upon not only the parties hereto but also their respective heirs, representatives, successors and assigns.

IN WITNESS WHEREOF the Developer and Municipality have executed this Agreement the day and year first above written.

SIGNED, SEALED AND DELIVERED

) _____
) Name of Developer
)
)
) Per: _____

_____)
Witness

) Per: _____
)
) **REGION OF QUEENS MUNICIPALITY**
)

)
) Per: _____

_____)
Witness

) Per: _____

APPENDIX 'E'

STANDARD WATER AND SEWER EASEMENT

THIS GRANT OF EASEMENT dated _____, 199__ is made

BETWEEN

_____ of _____,
Queens County, Nova Scotia,

the "Grantor(s)"

AND

THE REGION OF QUEENS MUNICIPALITY, a body corporate pursuant to the provisions of the Queens Regional Municipality Act, Revised Statutes of 1995, Chapter 295,

the "Grantee"

BACKGROUND:

1. The Grantor(s) own lot(s) _____ in _____ Subdivision, _____, Queens County, Nova Scotia.

2. The Mortgagee has an interest in the Lot under a mortgage granted to the Mortgagee by the Grantors.

3. The Grantee intends to run a new [*sewer/water*] line across the lands of the Grantor(s) for public benefit.

4. The Grantor(s) and the Mortgagee have consented to the construction and maintenance of such [*sewer/water*] line under the terms of this Grant of Easement.

TERMS:

5. In consideration of the sum of **ONE DOLLAR ($1.00)** now paid by the Grantee to the Grantor(s) and the Mortgagee, the receipt of which is hereby acknowledged, the Grantor(s) and the Mortgagee convey to the Grantee, an easement:

   to enter, construct, maintain, inspect, alter and repair an underground [*sewer/water*] line including all appurtenances to the line, on and under the lands described I Schedule "A";

   for the servants, agents, contractors and employees of the Grantee to enter on the lands with machinery, material, vehicles and equipment necessary for the use of the easement.

6. The Grantee covenants to fill in all excavations and as far as possible restore the surface to the same condition as prior to the commencement of construction or of any subsequent work on the easement.

7. This easement is declared to be appurtenant to and for the benefit of lands of the Grantee described in Schedule "B".

APPENDIX 'F'

STANDARD DATA LICENSE

Data License

For the

SCALE	DESCRIPTION OF LAYER	FEATURE CODE

OR ANY PART THEREOF, hereinafter call the **Database**

BETWEEN:

THE REGION OF QUEENS MUNICIPALITY, Nova Scotia hereinafter called "the Region of Queens"

AND

_____
Name of Company, Department or Agency Receiving the Database, hereinafter called "the User"

Conditions of Use

The following conditions apply to the release of the Database by the Region of Queens:

1. The Database is a single user copy and will be used only by:

   NAME _____
   ADDRESS _____
   _____
   _____
   TELEPHONE _____ FAX _____
   E-MAIL _____

2. The Database is released to the User to be used exclusively for Contract _____ (provide contract number).

3. The user shall not copy, distribute, loan, lease, sell or otherwise make the database available for any other use other than the contract number referenced in Section 2, or make the Database available to any other party without the prior written consent of the Region of Queens.

The above conditions are agreed to:

Date	Signature of User

4. The Region of Queens shall not be liable to the User or to any other person acting under the direction of the User for any loss or damage of any kind including the personal injury or death arising from the use of the Database or accompanying written materials or from errors, deficiencies or faults therein, whether such damage is caused by negligence or otherwise. If errors or omissions are found, the Region of Queens will be notified by the User.

5. This agreement is the entire agreement between the parties and supersedes all previous agreements, or understandings between the Region of Queens and the User thereto whether written or oral, in connection with or incidental to the Database.

6. This agreement shall be binding upon the parties hereto and each or their executors, administrators, successors and assigns and shall ensure the benefit of such executors, administrators, successors and authorized assigns.

7. This agreement will be in effect after signed copy is received by the Region of Queens at the following address:

249 White Point Road
P.O. Box 1264
Liverpool, Nova Scotia
B0T 1K0

APPENDIX "G"

CONNECTION OF THE BUILDING SEWER LATERAL T O THE PUBLIC SEWER SYSTEM

CONNECTION OF THE BUILDING SEWER LATERAL TO THE PUBLIC SEWER SYSTEM

OWNERS'S CONNECTION RESPONSIBILITIES:

1. The owner of a building, shop, store, office, the nearest part of which is not more than one hundred feet (100 ') from any portion of a public sewer shall be required at the owners expense to construct a building sewer connection therefrom and connect the same to the said public sewer in accordance with the provisions of the Sewer By-law. The construction of the required building sewer and the connecting of same to the public sewer must be fully completed within one hundred and twenty (120) days after the date of the receipt of written notice from the Region of Queens Municipality to do so.

2. No unauthorized person shall uncover, make any connections with or openings into, use, alter or disturb any public sewer or appurtenance thereof without first obtaining a permit from the Engineer. The property owner seeking such permit shall make application on a form furnished by the Engineer. The permit application shall be supplemented by plans, specifications and other information as is deemed necessary by the Engineer.

3. The owner shall have the connection inspected by the Municipality prior to covering of the connection.

4. No person shall connect a water storm, sump pump, basement tile, floor drains, or roof drains to a public sanitary sewer.

5. In the construction of a building sewer connection, the size, slope, alignment, and the materials of construction together with the methods used in excavating, placing of pipe, jointing, testing, backfilling the trench, and connecting to the public sewer must all conform with the requirements and standards set out by the Engineer.

6. Every sanitary sewer drainage system shall have an internal cleanout that will permit the cleaning of the entire system from the house to the public sewer system.

7. Every sanitary sewer drainage system shall have an internal backwater valve in case of possible surcharging of the public sewer system

8. Every person connecting to a public sewerage system shall construct the connection according to the requirements of the National Building Code and all Plumbing Codes in force at the time of such connection.

9. Where a building has been connected to the public sewer system or the Engineer has ordered, in writing, a building to be so connected, the Engineering may thereafter order the owners of any outhouse or private sewage disposal system situate on the subject property to remove such outhouse, destroy or fill the private sewage disposal system within ninety (90) days of the giving of such order.

10. All costs associated with the installation, connection, maintenance or repair of a building sewer connection to the public sewer system, including the costs of any necessary permits, are the sole responsibility of the owner. The owner shall further indemnify the Region from any loss or damage that may be directly or indirectly occasioned by the installation, connection, maintenance or repair of the building sewer connection.

11. It shall be the duty of any person, firm or corporation who constructs any private sewer or building sewer connection, to securely protect the resulting opening or excavation in accordance with the Nova Scotia Occupational Health and Safety Act, and the Nova Scotia Department of Labour Regulations.

12. The Region of Queens Municipality is not responsible for any part of a building sewer connection that is not in a public street, highway or sewer easement.

CONNECTION FEE:

1. There will be a one time connection fee of ninety dollars ($90.00) per owner. This must be paid when obtaining a permit to connect from the Region of Queens Municipality. A sample permit form is attached.

SEWER USER FEE:

1. Every owner of land on which any building is connected to a public sewer system, or on which a building is situate that the Engineer has ordered connected to a public sewer system, and the time allocated for such connection has expired, shall pay to the Region an annual sewer service charge.

2. Sewer user fees shall be levied on the owners of all properties commencing four (4) months from the date on which a property owner has been notified in writing that municipal sewerage services are now available to his/her property or the date on which a building on the property has been connected to the public sewer, whichever is the earlier.

3. The annual sewer user fee shall be payable in six equal installments and will be billed bi-monthly. Current fee is $216.00 per **annum** for residential buildings.

SERVICE CONNECTION SPECIFICATIONS

PART 1 - GENERAL

Description

This section specifies requirements for supplying and constructing sanitary sewer building service connections.

Definitions

Bedding: Material used to support pipe below and up to spring line.

Cover Material : Material placed from top of bedding to a minimum distance of 12" above outside top of pipe.

PART 2 - PRODUCTS

House Service Connections

1. Polyvinyl Chloride (PVC) Gravity Pipe:

   a) Manufacture: to CSA B182.1

   b) Materials: Use PVC Compound 12 454-B, 12454-C or 12364-C, all conforming to ASTM D1784

   c) Joints: Bell & Spigot with rubber gasket

   d) Supply: Pipe to be supplied from plant certified by CSA

   e) 4" diameter DR28 or DR35 PVC

2. Polyethylene Pipe Forcemain:

   a) Manufacture to CSA B 137.1

   b) **Connection Methods:**

      Polyethylene pipe can be joined together or to fittings through the use of insert fittings.

   c) **Insert Fittings** are pushed inside of the pipe and stainless steel external clamps are placed around the outside of the pipe forcing the pipe surface into the serrations of the fitting. The method provides a satisfactory water-tight joint on pipe up to 2 inches in diameter.

d) Minimum 2" diameter Series 75 PSI Canron Red Stripe Equivalent

3. **Cleanouts:**

Every building sewer lateral shall have an internal cleanout installed to permit the cleaning of the entire sewer system from the building to the public sewer system.

4. **Backwater Valve:**

Every building sewer lateral shall have an internal backwater valve installed to prevent possible surcharging of the public sewer system into the building.

Pipe Bedding Materials

1. Do not include materials greater than ¾" in size;

2. Class "A" to NSDOTC Specifications.

Cover Materials

1. Do not include materials greater than ¾" in size;

2. Class "A" to NSDOTC Specifications.

PART 3 - EXECUTION

Depth of Pipes

1. Minimum depth of sanitary sewer pipe to be five (5) feet to top of pipe in order to prevent freezing.

2. If minimum depth of five (5) feet cannot be maintained, insulate as per attached insulation details.

Pipe Bedding

1. Place bedding materials as shown on Drawings.

2. Shape bed true to line and grade, free from sags and high points.

3. Shape bedding to cylindrical surface with radius conforming to pipe in accordance with pipe manufacturer's recommendations.

4. Place bedding materials simultaneously on each side of spring (centerline) of pipe.

5. Compact full width of bed to 98% maximum dry density in accordance with Standard Proctor Density.

6. Keep pipe joint clear of bedding materials to permit jointing. After jointing is completed, place bedding materials as specified.

Installation of Pipes

1. Install pipes as specified herein and in accordance with the following:

   a) PVC pipe as recommended by PVC manufacturer.

   b) Commence laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.

   c) Lay pipes on prepared bed, true to line and grade as shown on Drawings.

   d) Ensure that barrel of each pipe is in contact with shaped bed throughout its full length.

   e) Ensure that ends of pipe about against each other so that there is no unevenness along inside.

   f) Lower pipe into trench carefully.

   g) Keep ends of pipe clean.

   h) Do not expose pipes to localized high temperatures.

   i) Handle pipe with special care during temperatures below freezing.

   j) Keep pipe clean as work progresses. Do not allow water to flow through pipe during construction.

   k) Keep trench dry and do not lay pipe in water.

   l) Whenever work is suspended, install a removable watertight bulkhead at open ends of last pipe laid.

   m) Do not lay pipe until preceding pipe joint has been completed and pipe is carefully embedded and secured in place.

   n) PVC Pipe: make use of pipe flexibility without exceeding manufacturer's recommended maximum deflection.

   o) Do not exceed Pipe manufacturer's recommendation in deflecting pipe joints.

   p) Maintain minimum 2% grade and maximum 8% grade.

q) Make up required horizontal and vertical bends from standards bends of 45% or less, separated by straight section of pipe, having minimum length of four pipe diameters. Use long sweep bends where possible.

Jointing Polyvinyl Chloride (PVC) Pipe

1. Insert gasket in groove of bell end of rope if gaskets are supplied separately.

2. Lubricate spigot.

3. Insert and push spigot end into bell up to but not beyond depth of stop reference mark.

Placing Cover

1. Place cover materials from pipe bedding to 12" above top of pipe.

2. Place cover materials in uniform layers not exceeding 6".

3. Compact each layer to 98% maximum dry density in accordance with Standard Proctor Density.

4. Provide 10" layer of cover material above pipe before using mechanical compactor on top of pipe.

Service Inspection

1. Do not backfill house service connections until inspected and measurements of locations have been taken by the Engineer or someone acting in his stead.

APPENDICES “H” “H1" “H2"

STOPPING SIGHT DISTANCE

APPENDIX "H1"

STOPPING SIGHT DISTANCES - IN METERS

TABLE I

POSITIVE GRADES

APPROACH SPEED km/h	0%	+1%	+2%	+3%	+4%	+5%	+6%	+7%	+8%	+9%	+10%
30	30	30	30	29	29	29	29	29	29	28	28
35	37	37	36	36	36	36	35	35	35	35	34
40	44	44	44	43	43	42	42	42	41	41	41
45	53	52	52	51	51	50	50	49	49	49	48
50	62	61	61	60	59	59	58	58	57	57	56
55	72	71	70	70	69	68	67	67	66	65	65
60	83	82	81	80	79	78	77	76	75	75	74
65	96	94	93	91	90	89	88	87	86	85	84
70	109	107	105	104	102	101	99	98	97	96	95
75	122	120	118	116	115	113	111	110	108	107	105
80	137	137	132	130	128	126	124	122	120	119	117
85	152	149	147	144	142	139	137	135	133	131	129
90	169	165	162	159	156	154	151	149	146	144	142
95	184	181	177	174	171	168	165	162	160	157	155
100	194	190	186	183	179	176	173	170	168	165	163
105	205	200	196	192	189	185	182	179	176	173	171
110	216	211	206	202	198	194	191	188	184	182	179
115	225	220	215	211	207	203	199	195	192	189	186
120	235	230	225	220	215	211	207	203	200	196	193
125	246	240	234	229	224	220	215	211	208	204	200
130	257	250	244	239	234	229	224	220	216	212	208

EYE HEIGHT = 1.05m

OBJECT HEIGHT = 150mm - FOR INTERSECTIONS, COMMERCIAL & INSTITUTIONAL LOTS
= 600mm - RESIDENTIAL PROPERTIES

APPENDIX "H2"

STOPPING SIGHT DISTANCES - IN METERS

TABLE II

NEGATIVE GRADES

APPROACH SPEED km/h	0%	-1%	-2%	-3%	-4%	-5%	-6%	-7%	-8%	-9%	-10%
30	30	30	30	31	31	32	32	32	33	33	34
35	37	37	38	38	39	39	39	40	40	41	42
40	44	45	45	46	46	47	47	48	49	50	50
45	53	53	54	55	55	56	57	58	59	60	61
50	62	63	64	65	66	67	68	69	70	71	73
55	72	73	74	75	77	78	79	81	82	84	86
60	83	85	86	87	89	91	92	94	96	98	101
65	96	97	99	101	103	105	107	109	112	114	117
70	109	111	113	115	118	120	123	126	129	133	136
75	122	125	127	130	133	136	139	143	146	151	155
80	137	140	142	146	149	153	156	161	165	170	176
85	152	155	159	163	166	171	175	180	185	191	198
90	169	173	176	181	185	190	195	201	208	214	222
95	184	189	193	198	203	208	214	221	228	235	244
100	194	198	203	208	214	219	226	233	240	248	257
105	205	209	214	220	226	232	239	247	255	264	274
110	216	221	226	232	239	246	253	261	270	280	291
115	225	231	237	243	250	258	266	275	285	296	308
120	235	241	248	255	262	270	279	289	300	312	325
125	246	252	259	267	275	284	293	304	316	329	343
130	257	264	271	279	288	298	308	320	332	347	362

EYE HEIGHT = 1.05m

OBJECT HEIGHT = 150mm - FOR INTERSECTIONS, COMMERCIAL & INSTITUTIONAL LOTS
= 600mm - RESIDENTIAL PROPERTIES