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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 speeds 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.

Development Officer. The Development Officer for the Municipality of the County of Kings 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 Municipality of the County of Kings 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.

Highway. The whole right-of-way which is reserved for use in constructing the roadway and its appurtenances.

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 or chip seal courses, the maintenance period shall extend one year from the date of approval by the Engineer.

Municipality. The Municipality of the County of Kings.

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.

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.

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 village 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, catchbasins, and catchbasin 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 Road. The whole right-of-way which is reserved for use in constructing the roadway and its appurtenances, the boundaries being determined by the Municipality, pursuant to the **Municipal Reform (1994) Act.**

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 traveling 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.** This section must be read in conjunction with parts 5, 6, and 7 of Bylaw #60 - Subdivision Bylaw.

2.1 TENTATIVE APPROVAL

General

A copy of the Permit to Construct from Nova Scotia Department of Environment will be required prior to approval of 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 runoff 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
Tentative plan of survey showing proposed lot layout and all proposed public highways, road reserves, and easements to be transferred to the Municipality.

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 centreline 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 runoff 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 municipal roads 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 "dwg" or "dxf" format. Record drawings prepared manually must be submitted on both high quality bond paper (1 set) and mylar (1set).

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 labor 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 as a matter of course:

- Video inspection tape and report for sanitary sewer.
- Test results for air and pill 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 or chip seal will be required after completion, and prior to release of standby letter of credit.

2.3 LISTING PROCEDURE FOR SUBDIVISION ROADS

Before the constructed roads 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 road 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 roads in the subdivision.

3.0 CENTRAL 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 liters per person per day).

Design Peak Flow (Qp) 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 liters 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 Municipality, unless other wise 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 meters per second) and a maximum of 15 feet per second (4.6 meters 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 least 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 meters 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 14 feet (4.5 meters). 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 (5.5 meters).

The minimum depth of sanitary sewer mains shall not be less than 4 feet (1.2 meters).

Location

Where possible all sanitary sewer pipe and appurtenances shall be located within a street owned by the Municipality 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 favor of the Municipality. 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 (6 meters).

All sanitary sewer pipes shall be located as close as possible to the center 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 horizontal 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 ft. (120 m) for sewer main diameters of 15 in. (375 mm) or less. For sewer mains greater than 15 in (375 mm) in diameter, the maximum spacing shall be 500 ft. (150 mm).

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

Manholes must be cored and are not to be broken into by hammering or jack-hammering. 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 shall be used for sanitary sewer service laterals. Pipe for sanitary sewer laterals shall be white in color.

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

Clean-out Service laterals with a total length greater than 85 feet (25 metres) shall be installed complete with a wye type clean-out or approved manhole in locations approved by the Engineer.

Minimum Slope Sewer laterals shall have a minimum slope of 1 percent.

Depth The depth of sanitary sewer laterals shall not be less than 4 feet (1.2 metres) below a traveled way (such as a driveway or street) or less than 3 feet (1 meter) 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

(ii) Concrete/A.C. Main - Daigle D-50

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)

For laterals greater than 4 inches (100 mm), connection to the sewer main shall be made by installing a manhole on the sanitary sewer main.

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 forty-five degrees.

The center 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.

Ground-water 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 Manu-facturers

The following pumps and pump manufacturers are approved for use in sewage pumping stations in the Municipality:

(a) Submersible pumps manufactured by "ITT Flygt" or "Gorman Rupp."

(b) Self priming 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 4.5 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 continuos 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 meters per second).

(b) Maximum velocity of 6.6 feet per second (2.0 meters 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 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 meters 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 Municipality's central monitoring system. Adequate lightning arrestors shall be provided. The SCADA unit must be compatible with the system presently in use in Municipality.

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

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

(h) Any other at the request of the Municipality

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 Municipality. 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 Municipality.

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 meters per second) is maintained. The maximum velocity in any forcemain shall not exceed 8 feet per second (2.4 meter 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 meters) and a maximum cover of 8 feet (2.4 meters). 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 watermain. 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 meters) 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.

Check Valves

Wafer swing check valves shall be ANSI Series 125, with a minimum working pressure of 2 Mpa.

Ball Check valves shall be HDL Check Valves.

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 deflection 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 Kings County.

Manholes

Two field inspections of all manholes, catch basins, and valve chambers shall be conducted by the Municipality; 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 the work by the Municipality.

(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. Full colour VHS format video tape shall be provided.

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 force mains 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 CENTRAL WATER SYSTEM SPECIFICATIONS

4.1 SCOPE

This section specifies the requirements for a central 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 the Environment.

Quality Assurance

Water quality is monitored and maintained by the Municipality, 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 - Insures 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 liters per capita per day).

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

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

Ductile iron pipe shall be Class 350 conforming to AWWA C151, cement mortar lined to AWWA C104.

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 and C = 100 for ductile iron shall be used in the design calculations of the water distribution system.

Fitting shall be according to AWWA C110, cement mortar lined to AWWA C104, 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 ANSI B16.1.

Mechanical joint restraints for pipe up to 16 in. (400 mm) shall consist of ductile iron follower gland conforming to AWWA C153 and AWWA C111, with multiple wedge restraining mechanism, minimum working pressure rating of 350 psi (2410 kPa), and twist off lugs with a minimum factor of safety of 2:1. Joint restraints for pipe larger than 16 in shall be as approved by the Municipality.

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 meters per second) during maximum hourly domestic flow conditions or 8 feet per second (2.4 meters 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 meters) in length.

(b) Smaller than 8 inches (200 mm) in diameter for dead-end lines in excess of 300 feet (90 meters) 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 meters) 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 meters).

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 in. (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 m) 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 Municipality or the Nova Scotia Department of Transportation and Public Works or within an easement, of minimum 20 foot (6 meter) width, granted in favor of the Municipality. 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 centerline 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).

In the case of vertical bends, the thrust block shall be located below the fitting and shall be connected to the water main through the use of stainless steel tie rods securely embedded in the 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

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 4.10.

Side slopes shall conform to Provincial Safety Regulations.

The trench must be kept dry at all times during pipelaying. 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 in. (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 in. (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.

Polyethylene Encasement

Encasement, when required by the Engineer, shall be 200 micron polyethylene tube or sheet conforming to AWWA C105.

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 traveled 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 in. (19 mm): the common connection shall have a minimum inside diameter of 1.0 in. (25 mm).

Pipe Material Size and Length

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

- Copper tubing conforming to ASTM B88, type K annealed, minimum working pressure of 150 psi (1035 kPa).
- 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 "k" copper.

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 meters) 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 meters (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 meters (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 Department of Environmental Services.

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 center.

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 meters), the number of compression couplings used is to be kept to a minimum. Compression couplings shall not be used within 5 feet (1.5 meters) 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 in (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 in (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 in. 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 meters) 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 meters). 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 meters (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 meters).

Hydrants shall be provided with adequate drains to prevent freezing.

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 Municipality.

Notice 24 hours notice is required by Kings County 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 Kings County. 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 inch) 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 Kings County representative.

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

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

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

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 Kings County:

- 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, floodplains, 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 Greenwood Weather Station.

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

Where IDF curves are required for design, Figures 1 and 2 shall be used for all of Kings County.

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 Shearwater Weather Station, Figure 2, will be applied to Kings County.

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.

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 (1/2 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 0.30

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.

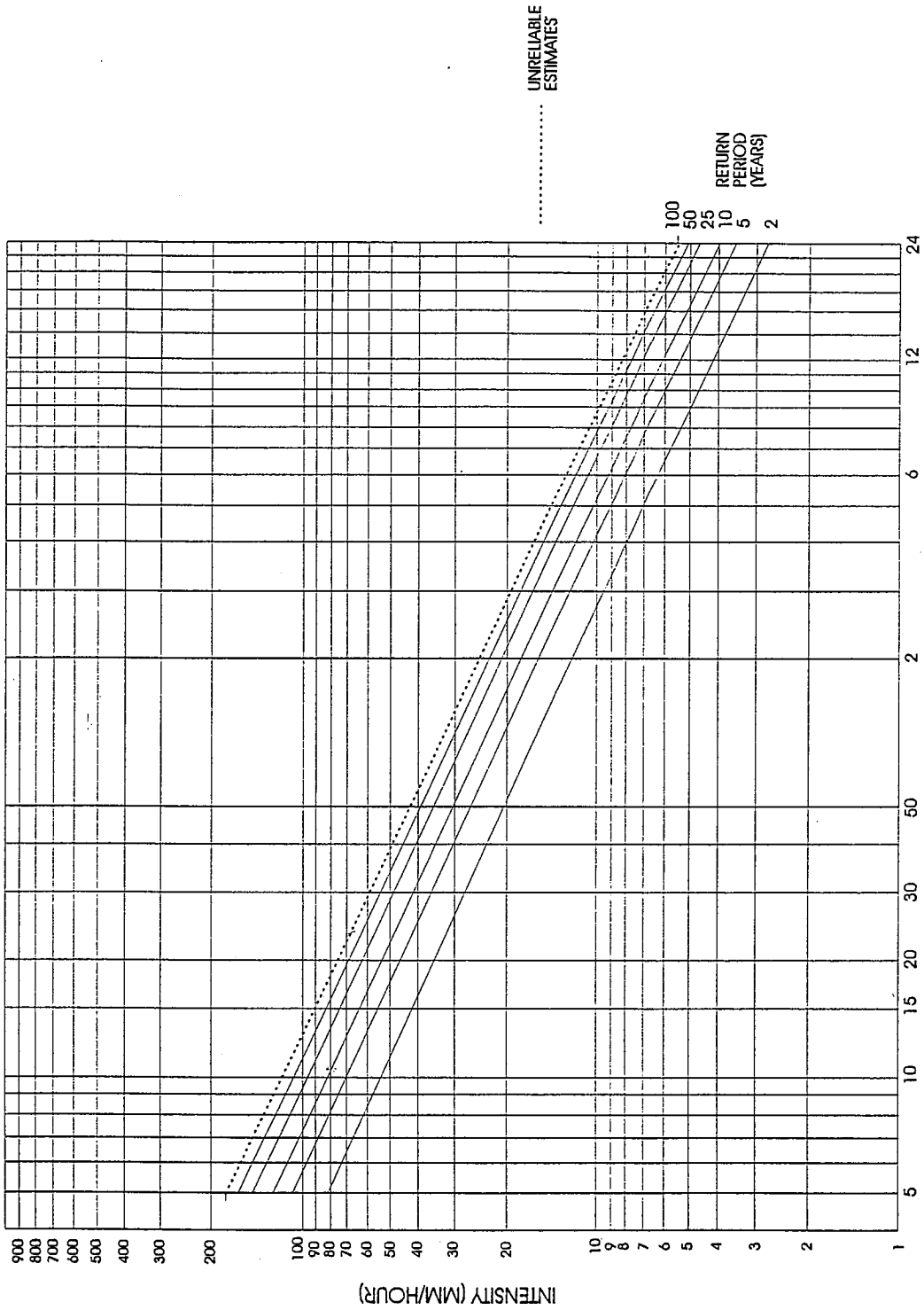


FIGURE 1 - RAINFALL INTENSITY-DURATION-FREQUENCY CURVES, GREENWOOD WEATHER STATION, N.S.
(BASED ON RECORDING RAIN GAUGE DATA FOR THE TIME PERIOD 1964-1990)

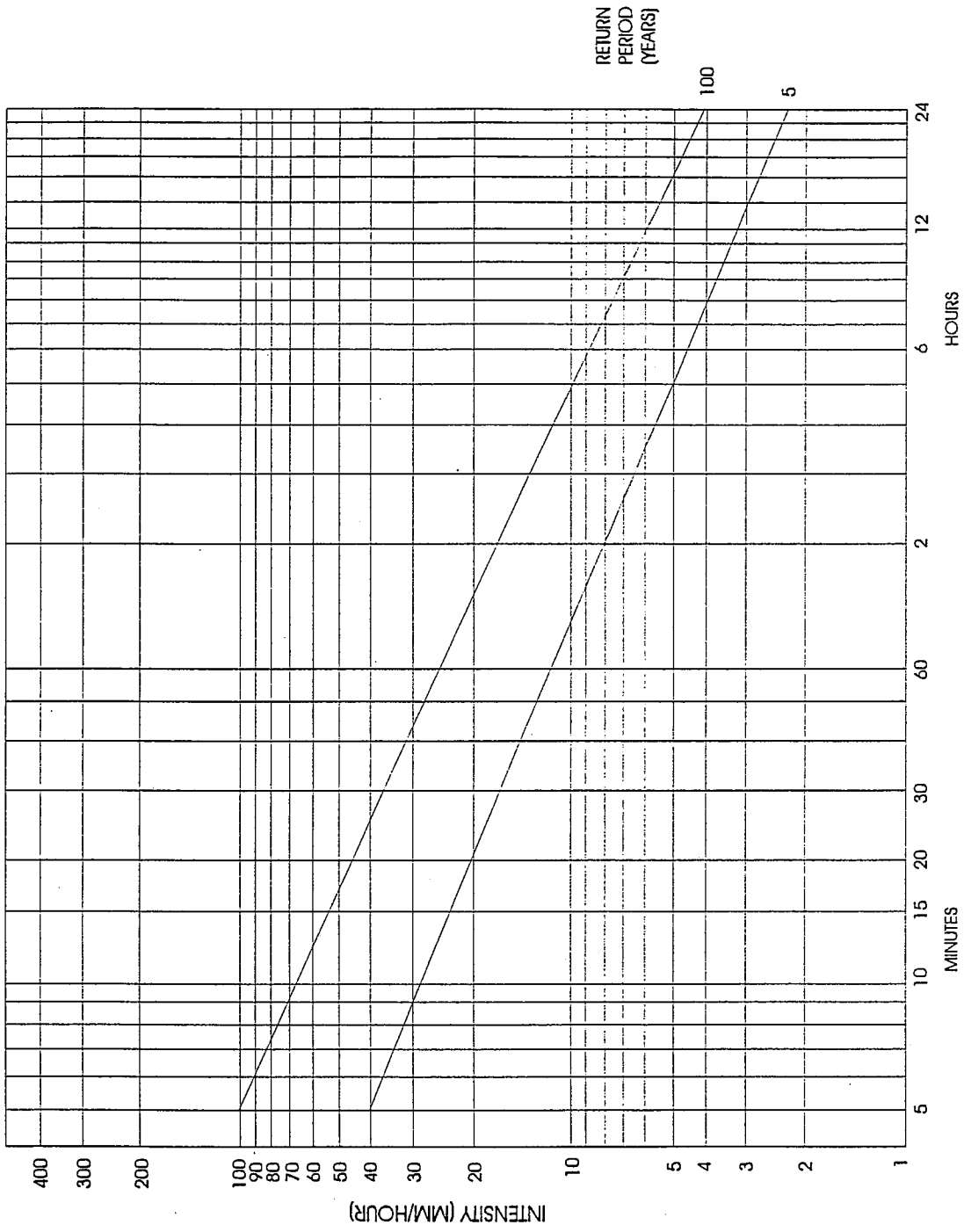


FIGURE 2 - WINTER RAINFALL INTENSITY-DURATION-FREQUENCY CURVES, SHEARWATER, N.S.

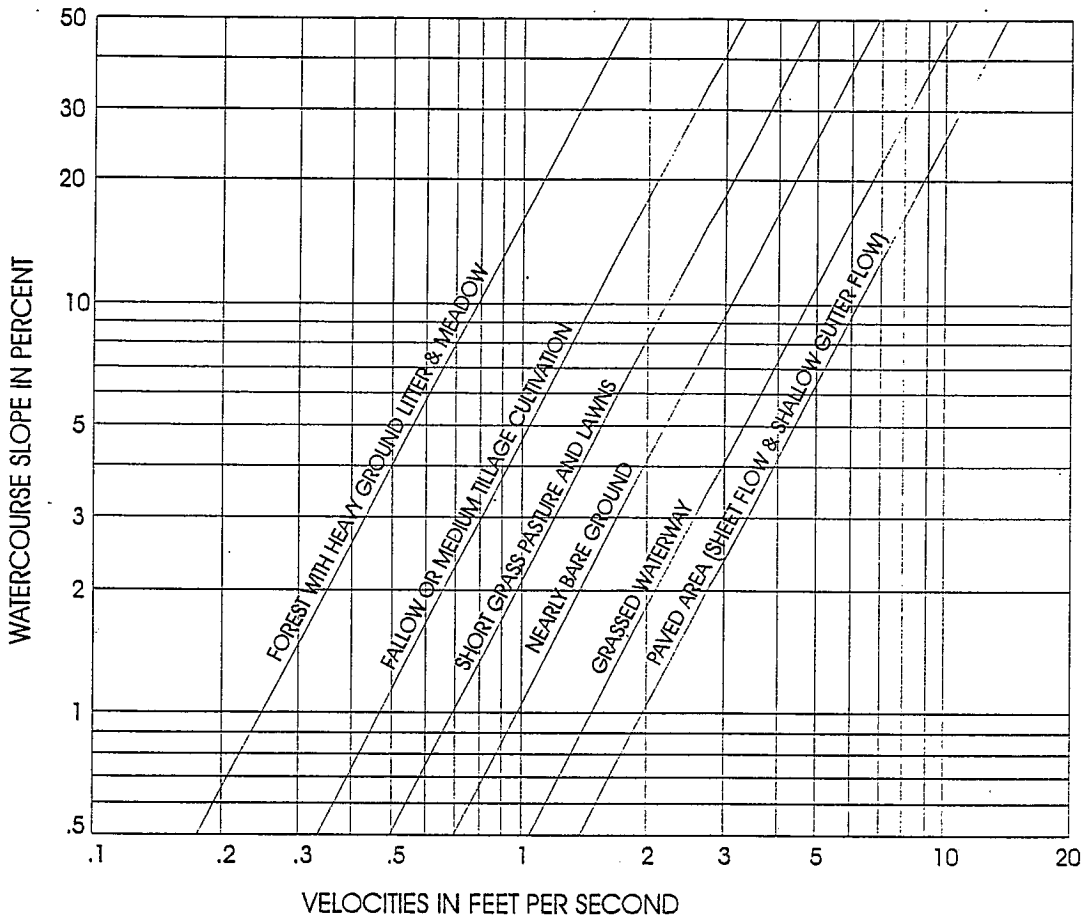


FIGURE 3 - AVERAGE VELOCITIES FOR ESTIMATING TRAVEL TIME FOR OVERLAND FLOW (SOURCE: SCS REPORT TR55)

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 favor of the Municipality. The minimum width of an easement is 20 ft (6.1 m).

Where subdivision storm drainage flows onto abutting land other than through a natural watercourse, a right of way or easement in favor of the Municipality 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 favor of the Municipality 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 Municipality 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 favor of the Municipality (See Appendix B) The easement must be in favor 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

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 ft 1.5 m).

The minimum depth for storm laterals at the property line is 3 ft (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 meters).

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 meter) 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 meters).

Catch basin leads shall be connected to a storm drainage main at a manhole.

Inlets

Vertical grates shall be installed at inlets.

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 18".

The minimum depth of bury for any driveway culvert is 12" (300 mm). The minimum depth of bury for any other culvert is 20" (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 least 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 2
SUGGESTED MAXIMUM PERMISSIBLE MEAN CHANNEL VELOCITIES IN STRAIGHT, UNIFORM CHANNELS

Channel		Mean Channel Velocity 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	70 (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 hydroseeding 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 SUBDIVISION ROADS

6.1 SCOPE

This section specifies the requirements for design of all Local Subdivision Roads within the Municipality of the County of Kings, pursuant to Bylaw #60 - Subdivision Bylaw.

A Local Subdivision Road consists of the road bed and all slopes, ditches, channels, waterways and appertaining structures necessary for proper drainage and protection.

The normal completion date for street constructed 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 1 to May 1, 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/hr. will be used for all subdivision roads unless a higher design speed is required by the Engineer.

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.

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. A right-of-way width of 50 feet may be permitted in cases of a fully serviced subdivision, or as determined by the Engineer.

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 ft (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 ft (150 m).

Cul-de-sacs are not to be used when the land can be effectively serviced by other road layouts. All cul-de-sacs must end in a permanent or temporary turn around area as approved by the Engineer. The grade of the bulb of a permanent cul-de-sac shall not exceed 4%. The maximum length of a cul-de-sac shall be 750 ft (230m).

Cul-de-sacs for subdivision roads without a storm sewer shall be laid out in accordance with Standard Drawing No. 2.

Temporary Turning Areas shall be laid out as shown on Standard Drawing No.7.

Boulevards will not be permitted in residential subdivisions.

Guard Rails are required on fills 10 ft (3 m) or greater (unless a slope of 6:1 can be provided) and in other hazardous areas. Refer to Standard Drawing No. 3 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. The Municipality will provide the metal signs at no cost to 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 ft (100 m)
Collector Roads	500 ft (150 m)
Arterial Roads	1000 ft (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 ft (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 ft (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 ft (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 ft (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.

TABLE 3

SUPERELEVATION FOR HORIZONTAL CURVES
DESIGN SPEED 50 KM/HR

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

TABLE 4 Sag and Crest Minimum Vertical Curve Length in Metres for a 50 km/hr Design Speed

EXIT GRADE %

A P P R O A C H G R A D E %	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8
-8	0	50	50	50	50	55	66	77	88	99	110	121	132	143	154	165	176
-7	50	0	50	50	50	50	55	66	77	88	99	110	121	132	143	154	165
-6	50	50	0	50	50	50	50	55	66	77	88	99	110	121	132	143	154
-5	50	50	50	0	50	50	50	50	55	66	77	88	99	110	121	132	143
-4	50	50	50	50	0	50	50	50	50	55	66	77	88	99	110	121	132
-3	50	50	50	50	50	0	50	50	50	50	55	66	77	88	99	110	121
-2	50	50	50	50	50	50	0	50	50	50	50	55	66	77	88	99	110
-1	50	50	50	50	50	50	50	0	50	50	50	50	55	66	77	88	99
0	56	50	50	50	50	50	50	50	0	50	50	50	50	55	66	77	88
1	63	56	50	50	50	50	50	50	50	0	50	50	50	50	55	66	77
2	70	63	56	50	50	50	50	50	50	50	0	50	50	50	50	55	66
3	77	70	63	56	50	50	50	50	50	50	50	0	50	50	50	50	55
4	84	77	70	63	56	50	50	50	50	50	50	50	0	50	50	50	50
5	91	84	77	70	63	56	50	50	50	50	50	50	50	0	50	50	50
6	98	91	84	77	70	63	56	50	50	50	50	50	50	50	0	50	50
7	105	98	91	84	77	70	63	56	50	50	50	50	50	50	50	0	50
8	112	105	98	91	84	77	70	63	56	50	50	50	50	50	50	50	0

Notes:

1. Curve lengths for grades between those shown in this table may be obtained by interpolating linearly.
2. Curve lengths in metres should not be less than the design speed in km/hr.
3. Values shown were calculated using K =11 (headlight control) for sag vertical curves and K = 7 for crest vertical curves within the following equation.
(K values were obtained from the Transportation Association of Canada (TAC) - Manual of Geometric Design Standards for Canadian Roads)

L=K*A where: L= length of curve in metres
K= sag or crest vertical curvature
A= algebraic difference between entrance and exit grades

6.3 ROADWAY

Clearing and Grubbing

Except under embankments which exceed 5 ft (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 Municipality. 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.

No burning of grubbings shall violate Municipal Bylaw #63 - By-Law to Control Fires

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 Municipality handout "Instructions for Placement of Driveway Entrances" shows rip-rap detail at the ends of culverts. 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 16 inch (400 mm) 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 ft (10 m) after gravel has been applied. On sections where guard rail is required the roadbed width will be increased by 3.25 ft (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 0.50 ft (150 mm) (3%).

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 ft (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 6.6. Any unsuitable material including soft or yielding material shall be removed, replaced with suitable material, and compacted.

6.4 GRAVELS

Subbase and Base Gravels

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 6.6.

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 WEARING SURFACE

The wearing course on Local Subdivision Roads shall be Asphalt Concrete or Double Chipseal. Asphalt concrete shall be applied in all Growth Centres. Double Chipseal shall be applied in all other areas.

Asphalt Paving

Prior to paving, the developer shall provide the Municipality 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 Municipality 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 28 lb/ft^2 (135 kg/m^2) at 2.5 inches thick.

Chipseal Surface

Prior to paving, the developer shall provide the Municipality 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 plant 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. Maximum Petrographic number should not exceed 150.

Walks, 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. The quantity per 10 cubic feet of all ingredients in the concrete shall be forwarded to the Engineer prior to the start of curbing.

6.6 INSPECTION AND TESTING

Notification

The Engineer shall be notified before construction work begins on any subdivision road. Inspections may be carried out at any time, however, inspections are required 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 Municipality 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/hr.

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 ft (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" (150 mm) lifts (compacted thickness). Backfill in trenches shall be placed in 12" (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" of trench backfill (300 mm) 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.

Control Strip Method-Gravels

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/hr.

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 ft (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 (VMA), %
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.

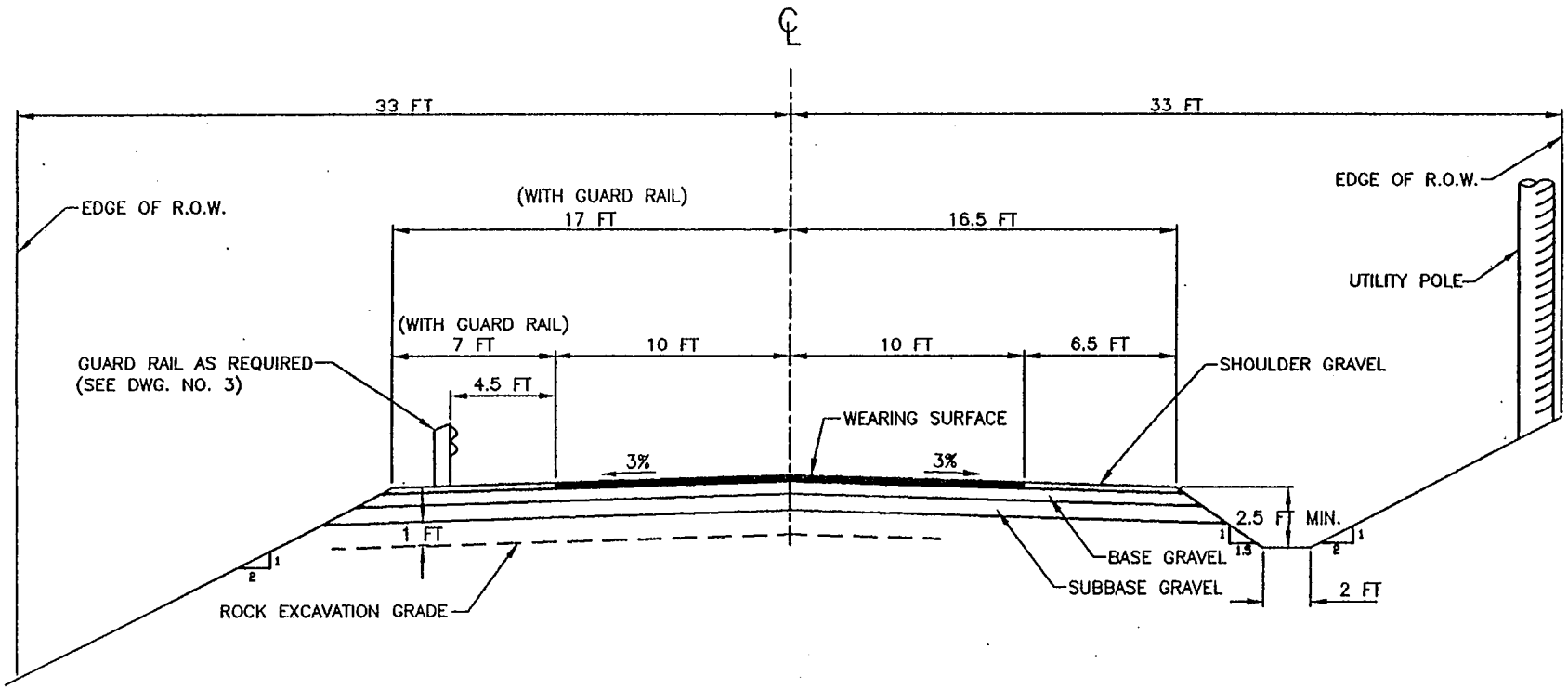
All test results shall be recorded and forwarded to the Engineer.

Curbing

At least one set (3) of concrete test cylinders (6 inch x 12 inch) shall be taken for every 328 ft (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 be 4650 psi (32 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.

Standard Drawings

No. 1 - Typical Cross Section - Subdivision Roads
No. 2 - Cul-de-Sac Layout
No. 3 - Guardrail Detail
No. 4 - Concrete Curb Detail
No. 5 - Trenching Detail
No. 6 - Clay Plug
No. 7 - Temporary Turning Area
No. 8 - Precast Manhole
No. 9 - Cast-in-Place Base for Precast Manhole



COURSE	LOCATION	MATERIAL	THICKNESS (INCHES)
WEARING SURFACE	GROWTH CENTRES	ASPHALT TYPE C	2.5
	OTHER AREAS	DOUBLE CHIP SEAL	N/A
SHOULDER	ALL AREAS	TYPE 1S GRAVEL	2.5
BASE	ALL AREAS	TYPE 1 GRAVEL	6
SUBBASE	ALL AREAS	TYPE 2 GRAVEL	8
SUBGRADE	ALL AREAS	AS APPROVED	VARIES

NOTES:

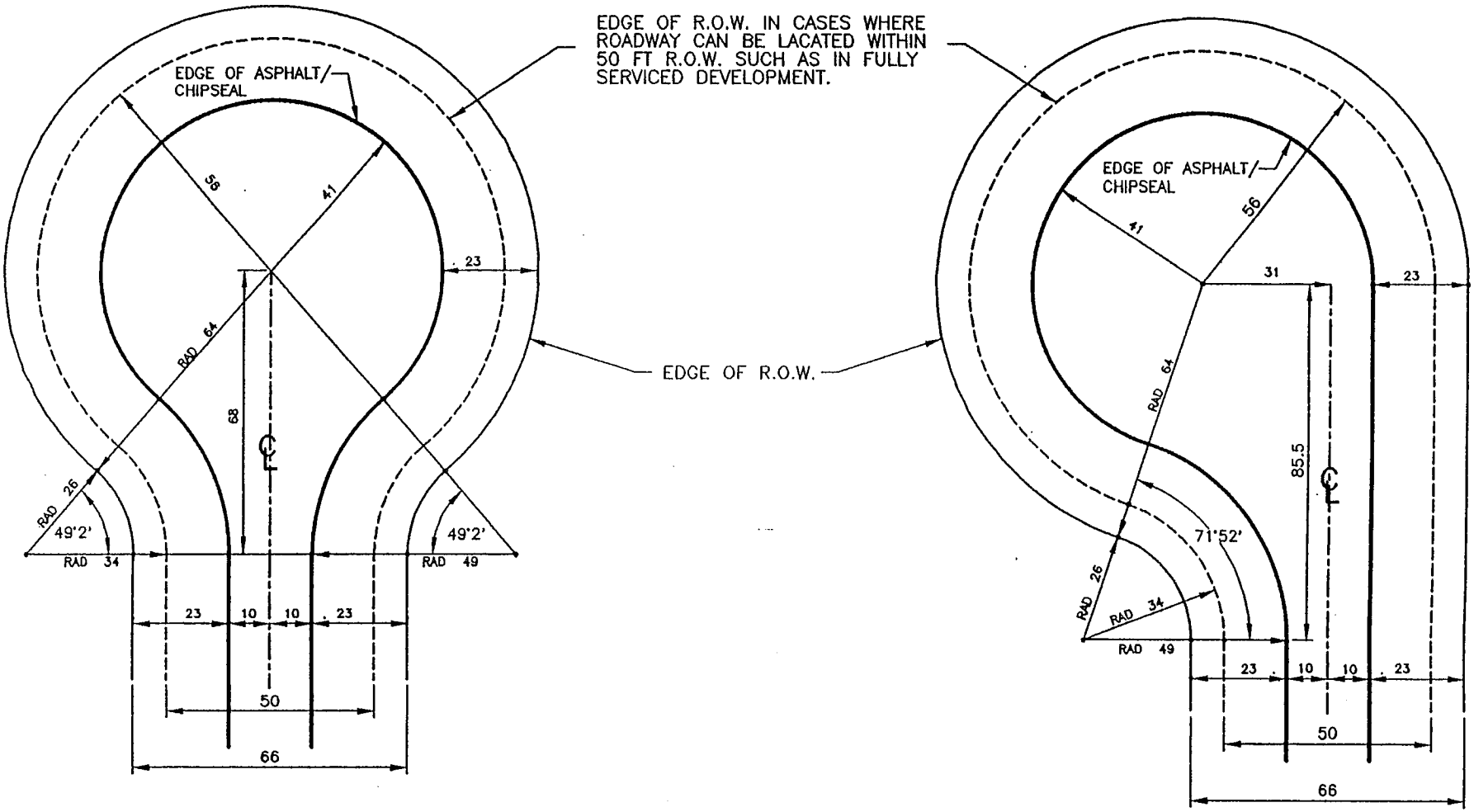
1. ALL DIMENSIONS ARE IN FEET.
2. DRAWING IS NOT TO SCALE.
3. SOILS WITHIN DITCHES AND ON CUT AND FILL SLOPES SHALL BE PERMANENTLY STABILIZED BY HYDROSEEDING WITHIN TWO WEEKS AFTER FINAL GRADES ARE REACHED. TEMPORARY STABILIZATION MEASURES SUCH AS APPLICATION OF STRAW OR WOOD CHIPS SHALL BE USED TO PREVENT EROSION OF EXPOSED SOILS DURING CONSTRUCTION AND PRIOR TO REACHING FINISHED GRADES.

MUNICIPALITY OF THE COUNTY OF KINGS

DEPT. OF ENGINEERING AND PUBLIC WORKS

TYPICAL CROSS-SECTIONS SUBDIVISION ROADS

APPROVED: Dec. 11 19 97	APPROVED: _ _ _ _ _ 19 _ _
MUNICIPAL ENGINEER	OPERATIONS MANAGER
DWG: NO. 1	DRAWN BY: C.D.C.



NOTES:

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

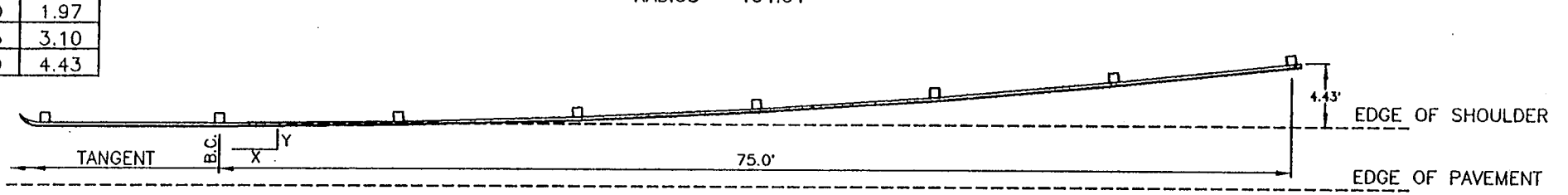
MUNICIPALITY OF THE COUNTY OF KINGS

DEPT. OF ENGINEERING AND PUBLIC WORKS

CUL-DE-SAC LAYOUT

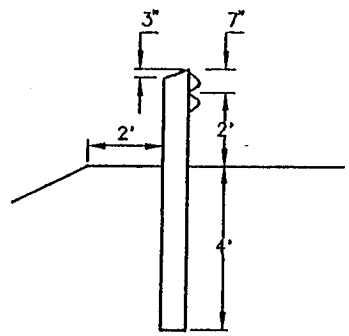
APPROVED: March 11 1997	APPROVED: _____ 19__
P. Munroe	
MUNICIPAL ENGINEER	OPERATIONS MANAGER
DWG: NO. 2	DRAWN BY: C.D.C.

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

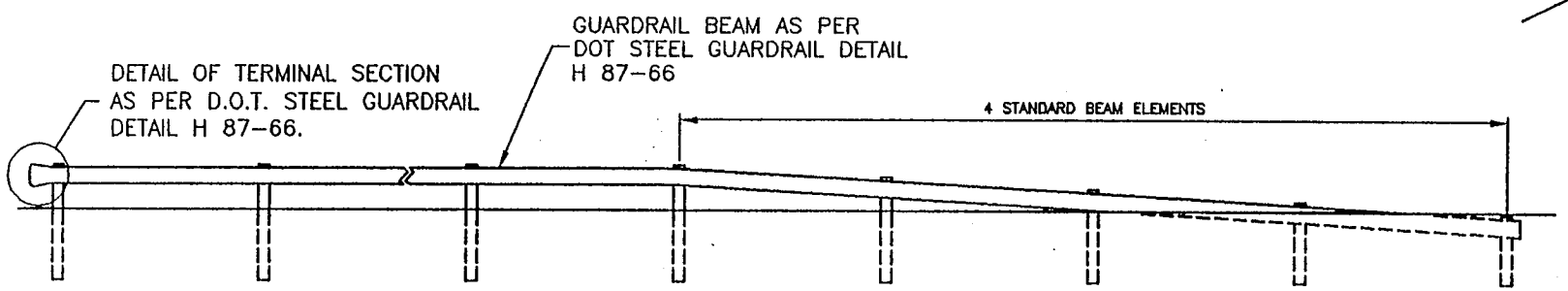


DIRECTION OF TRAVEL

PLAN–FILL OR CUT



POST DETAIL



ELEVATION

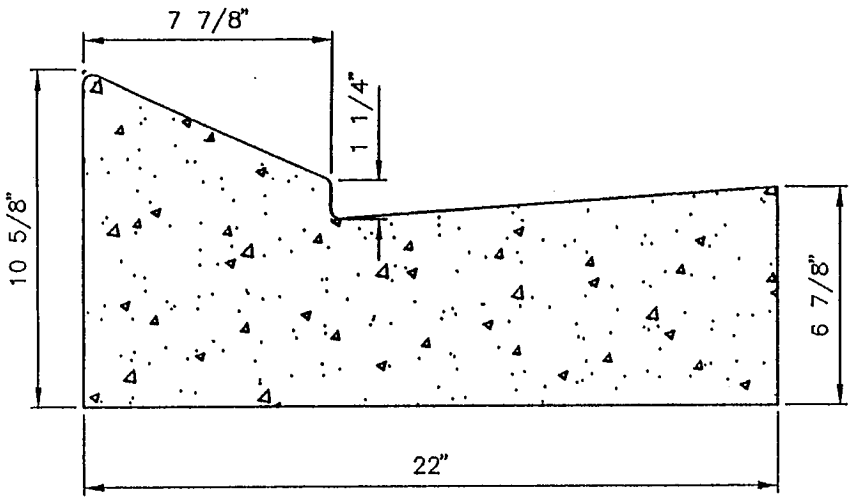
NOTES:

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 PLACE 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 SHEAR. 16mm SQUARE NUTS AND 19mm ROUND WASHERS ARE TO BE USED, ONE WASHER FOR EACH 240mm = 16mm BOLT.
5. SPLICE DETAIL IN ACCORDANCE WITH D.O.T. STEEL GUARDRAIL DETAIL H 87–66.

MUNICIPALITY OF THE
COUNTY OF KINGS
DEPT. OF ENGINEERING AND PUBLIC WORKS

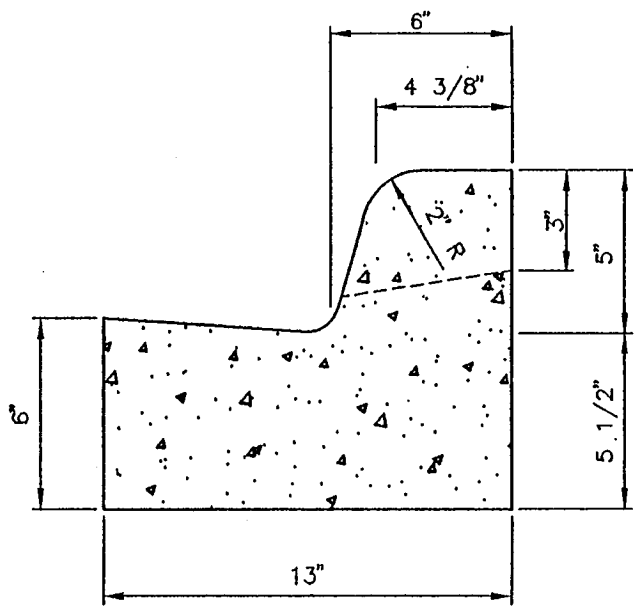
STEEL GUARDRAIL DETAIL
SUBDIVISION ROADS

APPROVED: Mar 11 19 97	APPROVED: _____ 19__
MUNICIPAL ENGINEER	OPERATIONS MANAGER
FILE: NO. 3	DRAWN BY: C.D.C.



MOUNTABLE CURB AND GUTTER

N.T.S.



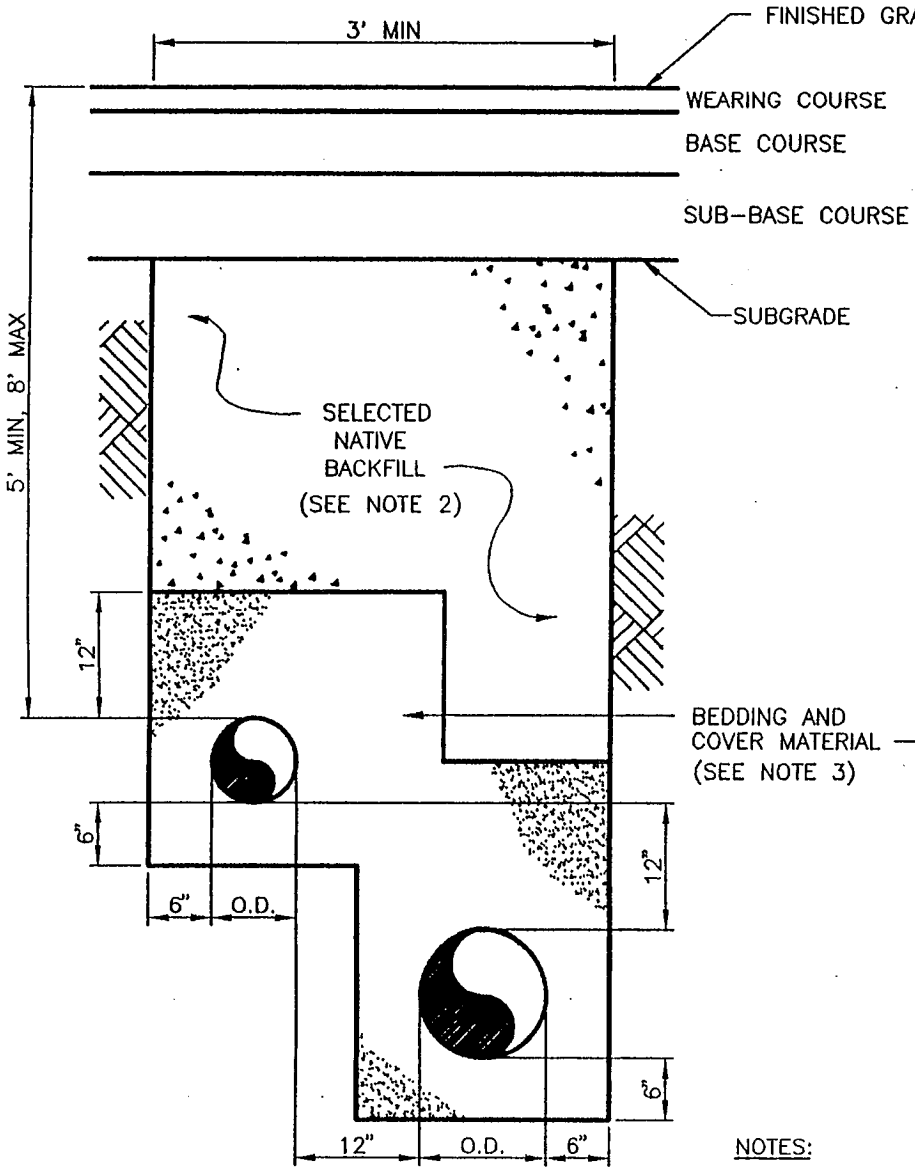
CURB AND GUTTER

(N.S.D.O.T. TYPE A) N.T.S.

NOTES:

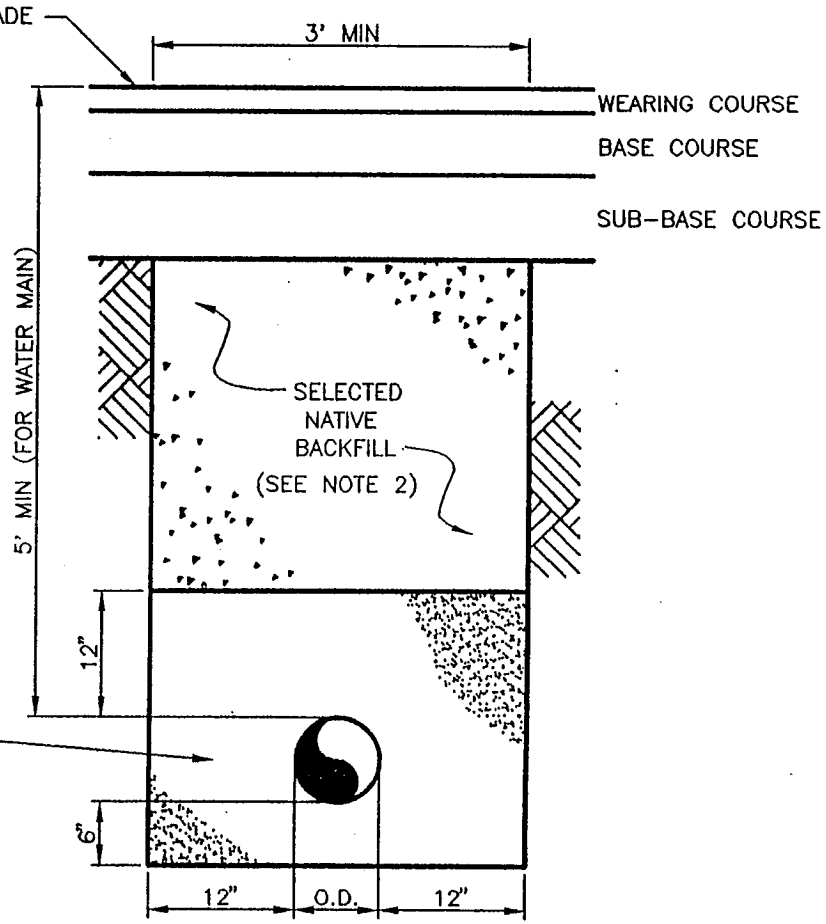
1. CURBS AND CURB AND GUTTER SHALL BE PLACED ON AN APPROVED GRANULAR BASE HAVING A MINIMUM DEPTH OF 6 INCHES.
2. EXPOSED EDGES SHALL BE FINISHED WITH A ROUNDED TOOL TO PRODUCE A 1" RADIUS OR AS SHOWN.

MUNICIPALITY OF THE COUNTY OF KINGS DEPT. OF ENGINEERING AND PUBLIC WORKS	
CONCRETE CURB DETAIL	
APPROVED: Nov. 11 19 97 R. Dunn MUNICIPAL ENGINEER	APPROVED: _____ 19__ OPERATIONS MANAGER
DWG: NO. 4	DRAWN BY: C.D.C.



WATER AND SEWER IN SAME TRENCH

N.T.S.



SINGLE PIPE IN TRENCH

N.T.S.

NOTES:

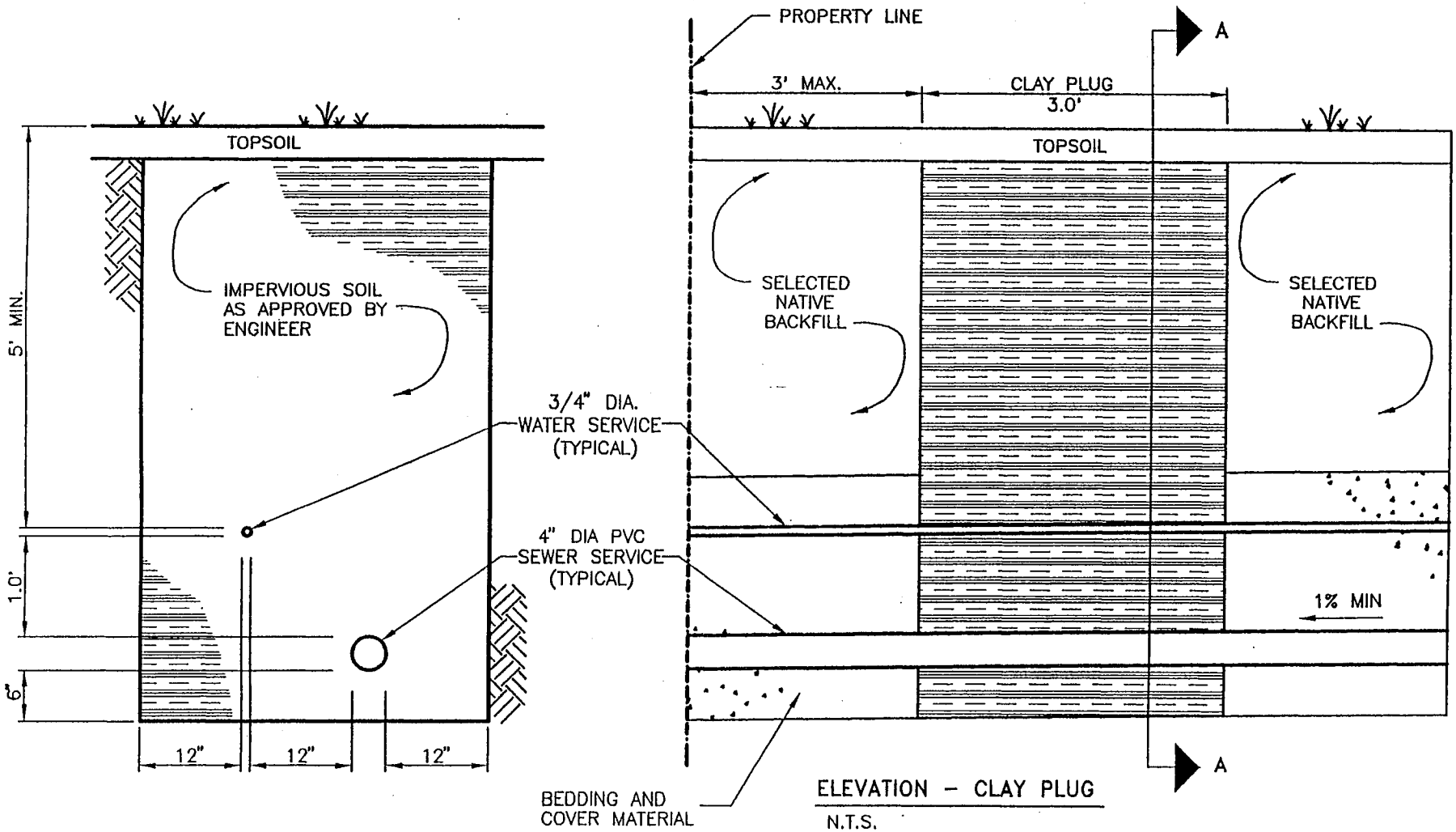
1. ALL DIMENSIONS ARE IN IMPERIAL.
2. COMPACT SELECTED NATIVE BACKFILL TO 95% STANDARD PROCTOR. COMPACT TOP 12" TO 98% STANDARD PROCTOR.
3. COPMACT BEDDING AND COVER MATERIAL TO 95% STANDARD PROCTOR.

MUNICIPALITY OF THE COUNTY OF KINGS

DEPT. OF ENGINEERING AND PUBLIC WORKS

TRENCHING DETAILS

APPROVED: April 19 97	APPROVED: _____ 19__
P. Dunn	
MUNICIPAL ENGINEER	OPERATIONS MANAGER
DWG: NO. 5	DRAWN BY: C.D.C.



SECTION A–A

N.T.S.

ELEVATION – CLAY PLUG

N.T.S.

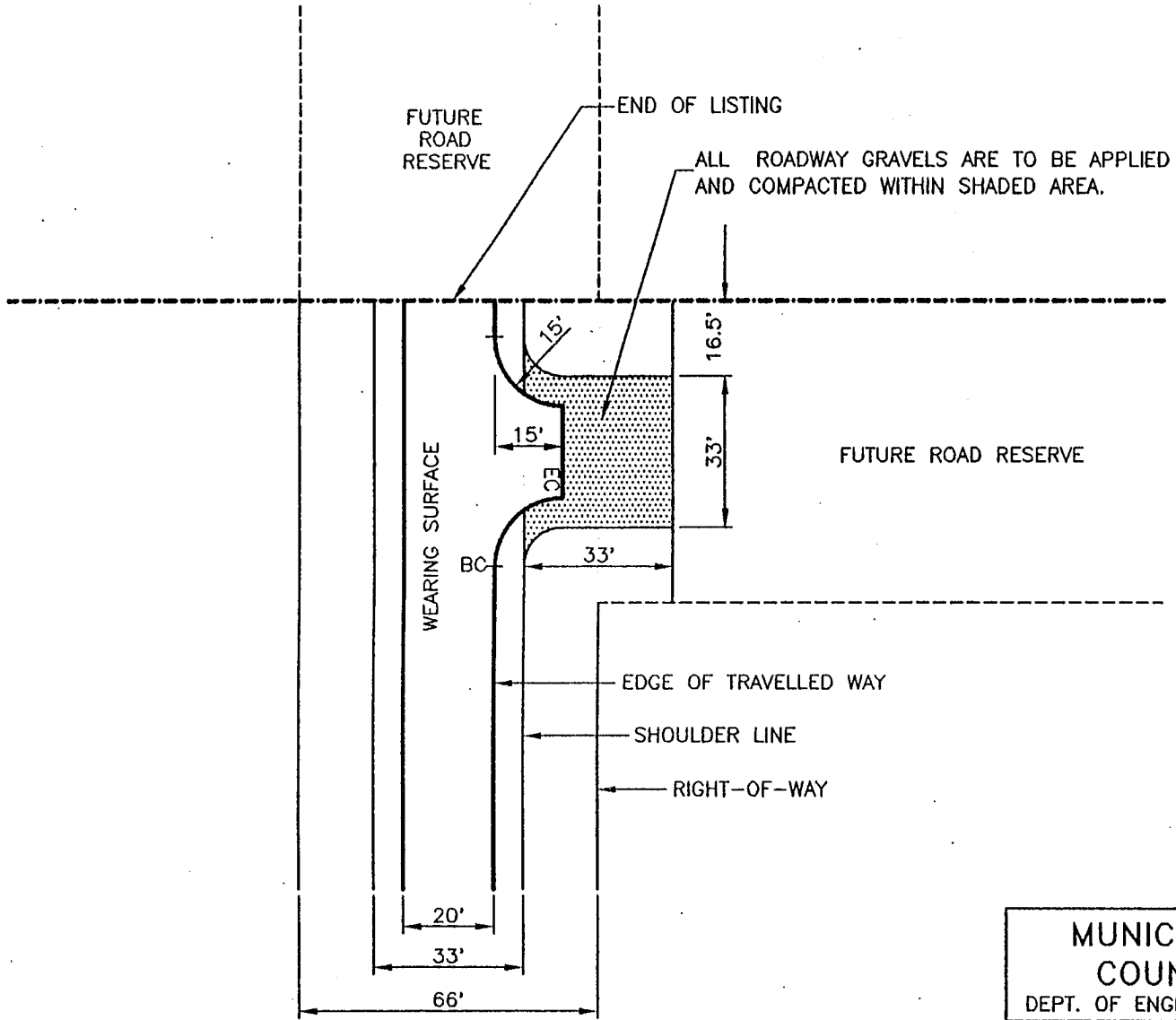
NOTES:

1. ALL DIMENSIONS ARE IN IMPERIAL.
2. WHERE NO WATER SERVICE IS TO BE INSTALLED, INSTALL SEWER LATERAL A MINIMUM OF 4' BELOW DRIVEWAY OR STREET AND NOT LESS THAN 3 FEET BELOW BOTTOM OF A DITCH.

MUNICIPALITY OF THE
COUNTY OF KINGS
DEPT. OF ENGINEERING AND PUBLIC WORKS

CLAY PLUG DETAIL

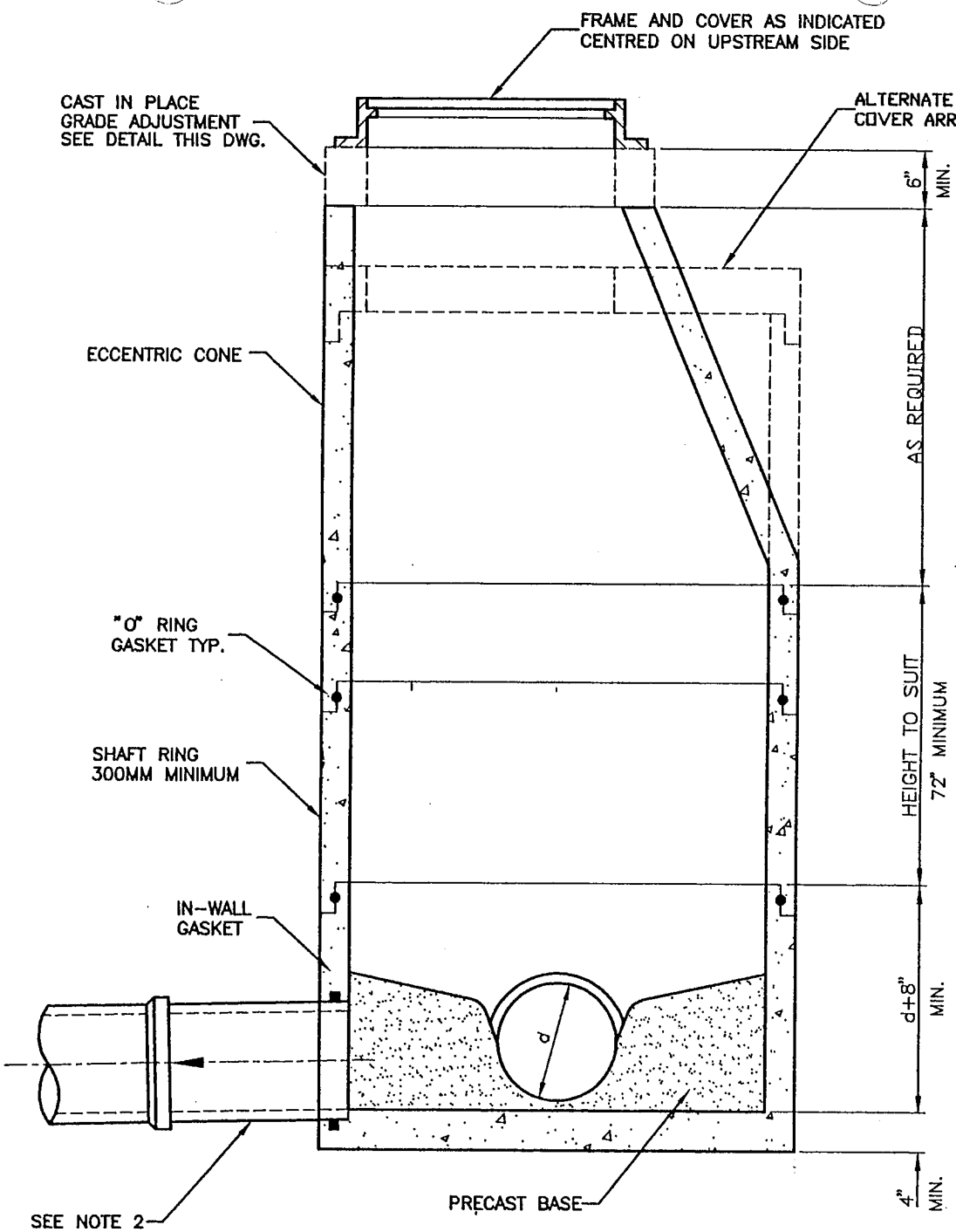
APPROVED: Mar 11 1997	APPROVED: _____ 19__
P. Dunn	
MUNICIPAL ENGINEER	OPERATIONS MANAGER
DWG: NO. 6	DRAWN BY: C.D.C.

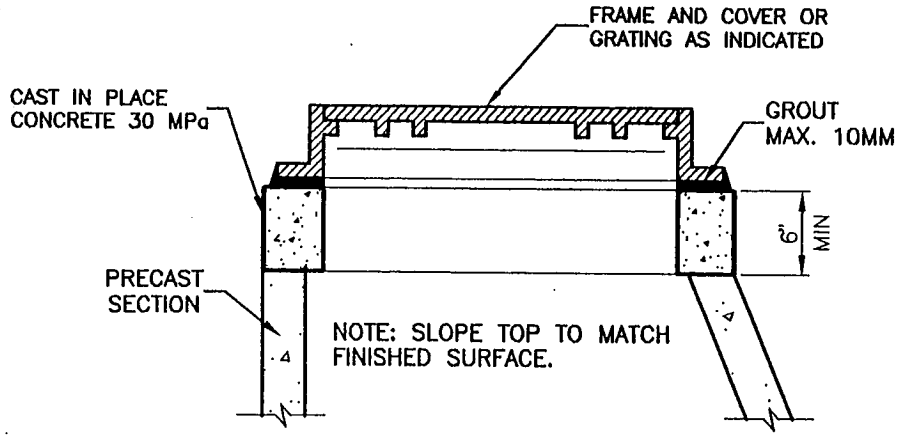


NOTES:

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 LISTING, A PERMANENT CUL-DE-SAC MUST BE BUILT.

MUNICIPALITY OF THE COUNTY OF KINGS DEPT. OF ENGINEERING AND PUBLIC WORKS	
TEMPORARY TURNING AREA	
APPROVED: March 19 97 MUNICIPAL ENGINEER	APPROVED: _____ 19__ OPERATIONS MANAGER
DWG: NO. 7	DRAWN BY: C.D.C.





NOTES:

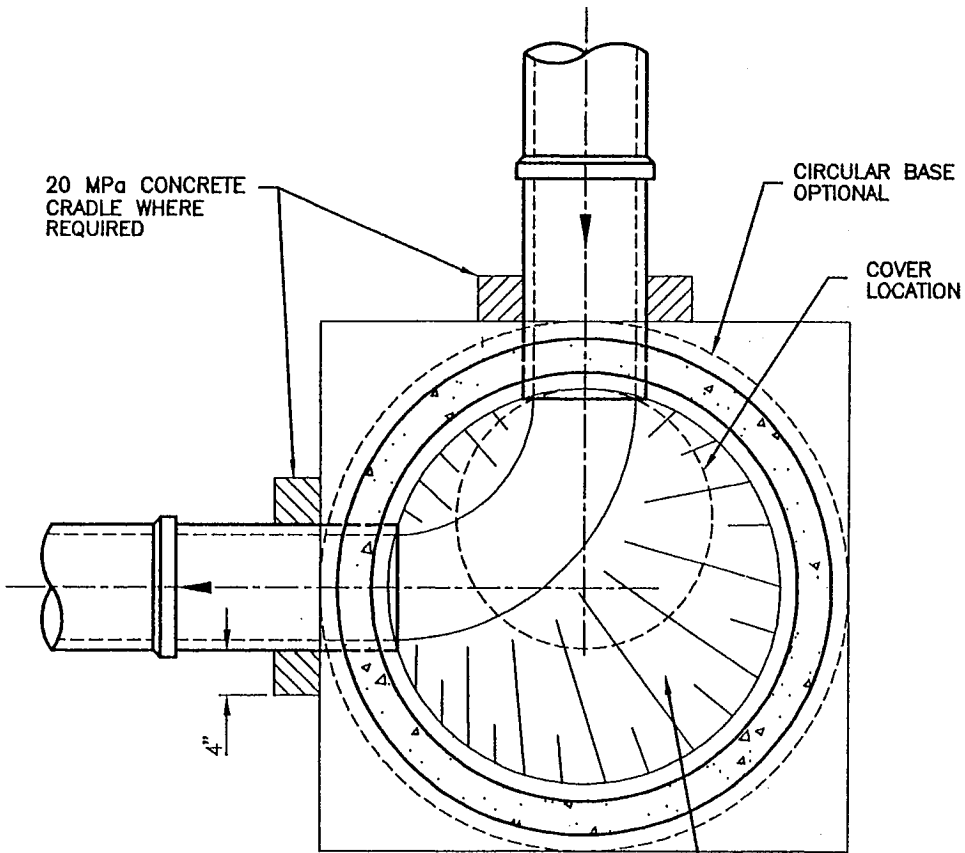
1. SEE DETAIL DWG. 9 FOR CAST-IN-PLACE BASE. CRADLE.
2. JOINT WITHIN 300MM NOT REQUIRED IF IN-WALL GASKET USED.
3. DRAWING NOT TO SCALE

MUNICIPALITY OF THE COUNTY OF KINGS

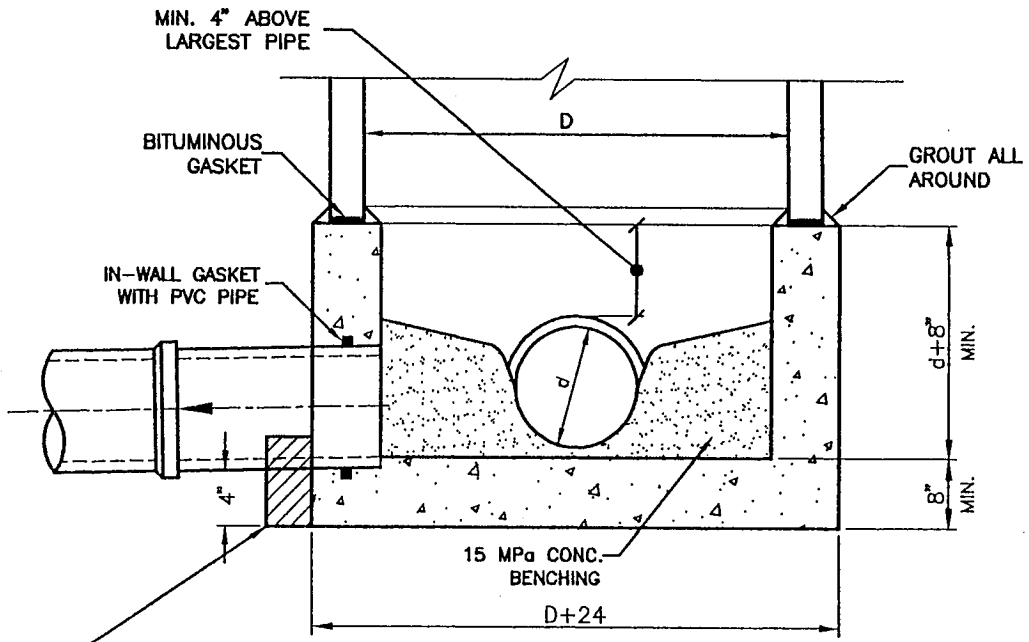
DEPT. OF ENGINEERING AND PUBLIC WORKS

PRECAST MANHOLE

APPROVED: April 1 1997	APPROVED: _____ 19__
MUNICIPAL ENGINEER	OPERATIONS MANAGER
DWG: NO. 8	DRAWN BY: C.D.C.



PLAN



SECTION

NOTES:

1. DRAWING NOT TO SCALE

MUNICIPALITY OF THE COUNTY OF KINGS

DEPT. OF ENGINEERING AND PUBLIC WORKS

CAST-IN-PLACE BASE FOR PRECAST MANHOLE

APPROVED: April 19 97	APPROVED: _____ 19__
MUNICIPAL ENGINEER	OPERATIONS MANAGER
DWG: NO. 9	DRAWN BY: C.D.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 Municipality of the County of Kings

ADDRESS: 89 Cornwallis Street (P.O. Box 100) Kentville, Nova Scotia B4N 3W3 (The Municipality)

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 is 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

N:\TAMMI\COCHRANE\CREDIT.LET

Appendix B

Standard Drainage Easement Agreement

THIS DRAINAGE EASEMENT dated this ____ day of _____, A.D., 19___ is made;

BETWEEN:

_____of _____, Kings County, Nova Scotia, the "Grantor"

- and -

THE MUNICIPALITY OF THE COUNTY OF KINGS, a body corporate pursuant to the provisions of the Municipal Act, R.S.N.S. 1989, Chapter 295, the "Grantee"

See Note 1

WHEREAS the Grantor owns Lot(s)_____ in _____ Subdivision, _____, Kings County, Nova Scotia; or

See Note 2

AND WHEREAS the Grantor owns lands immediately to the _____ of _____ Subdivision, _____, Kings County, Nova Scotia.

AND WHEREAS the Grantor has agreed to grant the right to water drainage for the roadways within the _____ Subdivision over and across lands of the Grantor by entering into this agreement.

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 on 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.-_____ 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 and maintenance of the said drainage easement.

3. The Grantee Covenants:

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.

See Note 4

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 by the Municipality.

Appendix C

Standard Statutory Declaration

CANADA
PROVINCE OF NOVA SCOTIA
COUNTY OF KINGS

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 _____, Kings County.

I, _____ of _____, in the County of Kings 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 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 sub-contractors, 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 due 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 Kings 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 _____, 1996

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 Municipality of the County of Kings, a body corporate pursuant to the Municipal Act, having its chief place of business at Kentville in the County of Kings 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 Kings;

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 By-law, which provisions are set forth in section 4(2) and 4(3) of By-law 60, the Subdivision By-law.

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 highway 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 By-law 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 Municipal Engineer, and in any event shall be not less than $_____

Completion Date and Require-ments

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 By-law and the Municipal Services Specification Manual of the Municipality.

Approval by Devel. Officer

5. The Municipality will authorize the Development Officer, subject to compliance by the Developer with all relevant matters specified in the Subdivision By-law 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, streets 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 Kentville, 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 the 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 the terms of this agreement, any security delivered to the Municipality under this agreement or any 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 By-law (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 or 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 4(3)(b) of the Subdivision By-law.

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 enure 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 the Municipality have executed this Agreement the day and year first above written.

SIGNED, SEALED AND DELIVERED

	_____(Developer)
	Per:_____
_____	
Witness	Per:_____
	MUNICIPALITY OF THE COUNTY OF KINGS
	Per:_____
_____	
Witness	Per:_____

Appendix E

Standard Water and Sewer Easement

THIS GRANT OF EASEMENT dated _____, 199__ is made between

_____ of _____, Kings County, Nova Scotia, the "Grantors"

- and -

_____, a chartered bank, with branches in Kings County, Nova Scotia, the "Mortgagee"

- and -

THE MUNICIPALITY OF THE COUNTY OF KINGS, a body corporate pursuant to the provisions of the Municipal Act, R.S.N.S. 1989, Chapter 295, the "Grantee"

BACKGROUND

1. The Grantors own Lot(s) ___ in _____ Subdivision, _____, Kings 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 Grantors for public benefit.

4. The Grantors 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 Grantors and the Mortgagee, the receipt of which is hereby acknowledged, the Grantors 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 in 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".